



Technical Standard

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Mondi Štětí a.s.

Electrical installation

Distribution

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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 Electrical installation. Deviations from these instructions are permitted only by separate agreement.

The Electrical Contractor (Supplier) shall carry out the Electrical Power 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

2 NORMS AND STANDARDS

2.1 General

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:
 - o 250/2021 Sb. „Zákon o bezpečnosti práce v souvislosti s provozem vyhrazeným technických zařízení a o změně souvisejících zákonů“
 - o NV 190/2022 Sb. „Nařízení vlády o vyhrazených technických elektrických zařízeních a požadavcích na zajištění jejich bezpečnosti“
 - o 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 Building Electrification and Lighting
- MEIA0014 Lighting Design Criteria
- 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 SCOPE OF POWER INSTALLATION

3.1 General

Electrical power installation package shall comprise the supply, delivery, installation, testing and putting to work of the following equipment and materials:

- Cable trays and necessary tray supporting and fixing materials
- Cables
- Cable installation and marking materials
- Cable warning tapes and covers for underground installation
- Safety switches, field switches (e.g. local control switches) and connection boxes
- Earthing system
- All markings (labels) specified by the mill standards
- Testing and commissioning including measurement reports and red pen drawings

As the producer of the construction waste the Supplier is responsible for the collection, removal, transport and handling of the construction waste. However, the Purchaser shall

be responsible for providing waste skips/receptacles and for emptying them, except when they contain problem waste.

3.2 Materials, Installation and Installation Meetings

The Supplier shall install and test all electrical equipment and apparatus in their installation scope ready for putting into service.

All equipment and materials shall be according to Mondi's standards. If any required installation materials are not mentioned in Mondi's standards or if the Supplier requires making any exceptions to the materials mentioned, this should be stated clearly in the List of Materials by the Supplier.

Recommended manufactures for Electrical and Instrument equipment are given in document MEIA0002

The Supplier shall obtain the Purchaser's approval for the inclusion of any equipment or materials which are not in accordance with Mondi's standards.

The Supplier is invited to propose to the Purchaser any deviations from the drawings and documents which he thinks might be an improvement, or of some advantage to the Purchaser.

It shall be the responsibility of the Supplier, before starting the work, to check possible interfaces and interferences with other Suppliers so that cables, cable trays etc. can be installed properly and without hindrance, taking into consideration the installation schedule of other equipment.

The Supplier must hold the relevant authorization according to §7 of Act No. 250/2021 Coll. And for activities on reserved technical facilities, use professionally qualified persons according to § 190 of Act No. 250/2021 Coll. The Supplier's foremen shall have detailed knowledge and experience about the installation work included in the contract, e.g. considering the corrosive climate of a paper mill, and they shall work in co-operation with other Suppliers to verify locations of motors, cable trays etc. well before cable pulling.

If the Supplier's installation is found to differ from the contract, the Supplier shall correct the fault without delay, if it has occurred during the installation or guarantee time, at no charge to the Purchaser. The site foreman shall be authorized to carry out such adjustments to the Supplier's scope of supply.

The Supplier shall use only sub-suppliers accepted by the Purchaser. They shall have also good experience in related industrial installation works.

The Supplier shall participate in those installation meetings held at the mill site which concern the electrical installation. The minutes of these installation meetings shall form part of the contract so that the changes and additional works which are charged extra shall be accepted by the Purchaser and the Supplier as being included in the contract.

Properly accepted and signed Requests for Change Order shall be used as basis for all extra works. The RCO's shall describe the work and its cause in detail and include an estimation on materials and working hours needed, for approximate total cost.

Delivery limits of electrification and Electrical Instructions for Equipment and Machinery Suppliers are given in document MEIA0001

3.3 Materials and Supervision of Material Quantities

The Supplier shall ensure that there is always sufficient material and equipment in his stock that the installation work is not delayed due to the lack of such material or equipment.

The Supplier shall keep a continuous check of the quantities of materials used, comparing them with the materials still required, based on the working drawings and material lists, to avoid the possibility of estimates of material quantities being exceeded.

The Purchaser shall have the right to buy material from the Supplier's stock at the prices given in the unit price lists, provided this does not delay the installation work.

In order to enable the Purchaser to follow up the installation time schedule and the use of material, the Supplier shall furnish a list of the incoming material and deliveries when requested.

The Supplier shall provide weekly the Purchaser with Work Status and Progress Reports written in English or local language (or both) depending of an agreement with the Purchaser. (i.e. details of manpower, list of mounted motors/equipment, list of pulled cables, terminations etc.) so that the Purchaser can monitor the progress of the installation.

The cable lengths shown on the cable lists supplied by the Purchaser are estimated ones. The Supplier shall measure the actual installed lengths of the cables and mark them on the Purchaser's cable lists.

During the installation work the Supplier shall maintain a record of material installed, using the same material denominations and units as in the material lists.

All questions relating to the material lists, cable lists and lists of additional and extra work will be handled in the installation meetings. Any unclear matters shall be brought to the attention of the Purchaser for clarification without any delay.

4 DISTRIBUTION SYSTEM

The Distribution system details are given in document MEIA0004 Electrical Design Criteria

5 INSTALLATION INSTRUCTIONS

5.1 General

The work shall include, but not be limited to, assembly, erection, wiring, testing and all other services necessary to put the electrical system in condition ready for operation.

The work shall include cable trays and power cabling from the MCC's to drive equipment and sub-MCC's.

The work shall include control, measurement and alarm circuit cabling, including cable trays between the MCC's and process control system cubicles and various control places, and all other equipment required according to this standard and electrical installation enquiries.

Fire barriers in the walls and floors between the different fire rated areas will be by others. The Supplier shall supply and install all necessary fire protection during the installation phase. Typical fire barriers are shown on reference drawings.

The scaffolding will not be specified separately, but the cost shall be included in the total price.

The cost of any compulsory acceptance inspections and/or certificates shall be the responsibility of the Supplier and shall not be charged separately.

5.2 General Description of Equipment to be Installed

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

5.2.1 Cable Tray Rack System Installation

The Supplier shall supply prefabricated ladder-type cable trays, comprising straight pieces, horizontal and vertical bends, Tee pieces and crosses, tele conduits and covers as specified, together with all necessary supports and fittings to connect the trays and curves together.

The Supplier shall supply and install all necessary material and hardware to support and fix the trays and drop-outs to motors and field equipment etc.

The material for cable trays (and supports) and ladder racks shall be hot dip galvanized, acid-proof steel (EN 1.4401) or aluminium 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 cable tray widths shall be 800 mm, 600 mm, 400 mm, 300 mm and 200 mm.

Size of tele conduit shall be 100 x 25 mm.

The cable trays and supports shall be designed for the following minimum loads, plus an 80 kg spot load between supports, with a maximum deflection of 1:200.

Width	800 mm, load 120 kg/m + spot load
Width	600 mm, load 90 kg/m + spot load
Width	400 mm, load 60 kg/m + spot load
Width	300 mm, load 50 kg/m + spot load
Width	200 mm, load 30 kg/m + spot load

The cable trays shall be supported at intervals not exceeding the maximum distance specified by the cable tray manufacturer.

Pipe bridges shall be assembled in pieces on ground. Cable trays with accessories as supports etc. shall be installed at the same time. When the pipe bridge piece is lifted to its final place trays shall be fitted together.

Top cable tray on each rack at pipe bridges shall have metal cover. Also some specific areas inside the Mill shall have covered trays. Cover material is same as the top cable tray material.

Typical installation drawings for motor drop-outs are shown in Appendix I. The drop-outs shall be fixed at the lower end with acid-proof steel brackets (EN 1.4401) onto the water resistant floors so that the drop-out itself terminates 100 mm above the floor.

The locations of drop-outs will not be shown on the installation drawings, but shall be agreed on site between the Purchaser and the Supplier. They shall be located so as not to disturb future maintenance or operation of the equipment, nor obstruct transport or walk ways. During the installation the Supplier shall co-ordinate with other Suppliers so as to avoid interferences. He shall also utilize the same drop-outs for the requirements of the instrument installation, where possible.

The Purchaser will require the Supplier to relocate any drop-out which in his opinion does not comply with the general practice of the trade. No horizontal sections of the drop-outs shall be located lower than 2.1 m above walking floor level.

The inner radius of angles and tee pieces for all cable tray runs shall be generally not less than 600 mm, unless otherwise specified. However, smaller radius may be used for control cable trays and other special cases, subject to agreement with the Purchaser. The wider radius shall be used, if necessary, for other medium voltage cabling and in such a way that the bending radius requirements specified by the cable manufacturer for the cable are met.

Cable trays shall not pass through the holes in floors or walls separating different fire areas. In order to maintain the integrity of the fire barrier the cable tray shall terminate on one side at approx. 200 mm from the wall, so that the distance from the wall to the last crossbar is not more than 250 mm. The cable tray on the other side of the same hole may be nearer than this, by agreement with the Purchaser.

The Supplier shall mark on the side of the cable trays, in an indelible manner and in an easily visible location, the function of each cable tray, as indicated in the cable tray routing drawings.

5.2.2 Cabling

The Supplier shall supply all cables, together with all materials such as lugs, glands, clamps, kick protections, conduits, cable and wire markers, terminating materials, nuts,

bolts and screws necessary for the proper installation of the cables (if not excluded in the contract). The cost of all these material shall be included in the price of the cable.

The cables shall be normally installed on the cable trays. However, individual cables may be fixed directly onto the structures, subject to agreement with the Purchaser.

All cables shall enter equipment from below. When it is not possible to enter cables from below, cables entering from above to field boxes shall be equipped with heat – shrinkable sleeves for cable glands.

The cables shall be installed on the cable trays to which they are assigned in the power layouts and cable lists.

Power cables shall be drawn on the upper trays and control and instrumentation cables on the lower ones, as indicated in the drawings.

The order from top to bottom will be:

- High voltage cables
- Medium voltage cables
- Sectional drives power cables
- Low voltage power cables
- Building electrification cables
- 230 V control, lighting and respectable cables
- Signal and communication cables
- Data network cables

The distance between cable trays will be 0.3 m.

Generally, cables of different voltage grade rating shall not be installed on the same cable tray. In those locations where there is only one cable tray for both power and control cables, they shall be segregated by being installed on opposite sides of the cable tray. Where the installation of signal cables and power or control cables on the same tray is unavoidable (e.g. motor droppers), the signal cables shall be separated from the other cables by minimum 200 mm air space, or by a metal plate barrier if this is not possible.

Control cables having stranded conductors shall be terminated by means of approved cable ferrules of the correct size for the conductor.

The estimated length of each cable will be shown on the cable lists provided by the Purchaser.

Cables shall be run straight and parallel within the trays.

Cables shall also be fixed within 600 mm of the terminating point.

Cable tying:

- All cables shall be tied on bends and crossings to every pole
- In horizontal trays cables are tied every 3 meters
- In vertical tray sections cables are tied to every second pole
- Cables may be tied in groups not exceeding 10

- Arch clamps suitable for the cable trays material shall be used on cable tying to vertical tray sections
- Plastic coated stainless steel wire can be used on cable tying to horizontal tray sections
- Stainless steel cable ties could be also used for cable tying
- Plastic cable ties shall not be used.

All brackets, screws, hangers, wire ropes etc. shall be manufactured from aluminium or stainless material. All fixings shall be made with screws, not nails or similar.

Where necessary for the good order and progress of the installation, the Supplier can pull cables to field equipment before the actual field device is installed. However, this is subject to agreement with Purchaser if the exact location of the equipment is not known.

Cables and cable trays installed in places liable to mechanical damage shall be adequately protected. Cables and cable trays passing through floors shall be protected up to a distance of 2 m above the floor level. Cover material is same as the cable tray material.

Outside of the electrical and cable rooms, cables leaving cable trays shall either be run in conduit or otherwise mechanically protected. 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), aluminium or acid-proof steel.

All cables and wires shall be installed in continuous lengths from one end of the circuit to the other if not otherwise specified.

All wiring shall be tagged at terminations by an approved method.

The cables can be exposed to direct sunlight and shall be UV-resistant when installed outdoors.

Power cables shall be installed parallel in one layer and fastened, when required, as specified. Power cables shall not be bundled. Control and instrumentation cables may, if necessary, be bundled and installed in several layers.

EMC shielded cables should be used for VSD used motors.

The switchgear supplier will deliver and install the cable current transformers for the switchgear end of the MV cables.

Where required, torque wrenches shall be used for tightening the connections of large cables. The torque wrench shall be properly pre-calibrated, and thus tightened connections shall be marked with drawing ink.

In the final installation of cables on bends, the cables shall be bent only once, and the installed bending radius shall not be less than the minimum specified by the cable manufacturer. Any cable which has been deformed by excessive bending shall be replaced by the Supplier without charge to the Purchaser.

Inside the MCC cable compartments the cables shall be fixed to the C-bars provided by means of cable clamps (for large power cables) or weather-resistant cable ties (for

smaller cables). Power cables shall be connected in a loop so that a clip-on ammeter can be used to measure phase and earth currents.

The connection of power cables shall be made so that the correct phase sequence is maintained throughout the installation.

Where cables pass through firewalls or floors, the openings shall be closed and sealed by an approved type fire resistant plastering by electrical contractor.

The Purchaser will excavate and fill in any cable trenches required, but the Supplier shall lay the cables in the trenches and shall supply and install all necessary cable protection and marking materials.

Supplier shall make all holes up to and including 50 mm diameter in walls and floor, larger holes should be always done from Civil company in collaboration with Civil Designer.

The Supplier shall organise his installation so that it will be possible to energise part of the MCC's and control racks, and take starters and modules into operation, while the cabling work for other starters and modules is in progress. The Supplier shall be responsible for safe working procedures during this time.

Induction motors will be supplied and installed by others. The motors will be delivered with a connection box fitted with cable glands and terminals for connecting the cables. Where the delivered cable glands are not suitable for the cables to be installed, the Supplier shall remove the gland and supply and fit the correct one. The Supplier shall connect the motors. Where necessary, the Supplier shall change the internal connection of the motor connection box (Y or D) to suit the supply voltage. The Supplier shall check the motor rotation direction and connect the motor to rotate in the correct direction. Where necessary, the Supplier shall rotate in the connection box the motor phase sequence. Change of phase sequence to achieve right direction of rotation shall be made in motor terminal box, and not at MCC end of the feeder cable. All this work shall be included in the price of the cable connection.

The Supplier shall make the cable number labeling according to Cabling and Marking Instruction for Electrification and Automation.

The Supplier shall specify in the tender the manufacturers and types of the cables he intends to use when the cables are delivered by the Supplier.

The cable standard MEIA0005 specifies the cables to be used in all Mondi projects. Ambient temperature in process areas and outdoors are shown on appendix of General Mill Specifications Summary MG0001.

5.2.3 Marking and Name Plates

All devices must be equipped with position numbers according to Project standards already when delivered.

The delivery shall include all necessary nameplates for the field instruments, motors, panels, desks, boxes and cables. The Purchaser approves the nameplate texts.

The quality and text of the nameplates have to comply with the project marking instructions.

5.2.4 Earthing

Earthing system shall fulfil the condition of the global earthing system specifications (IEC 61936-1). Global earthing system consists of:

- Earthing electrodes and earthing conductors
- Earthing /equipotential bars
- Protective conductors and protective bonding conductors
- Lightning protective conductors and lightning ground electrodes

All these items together will ensure that there are no dangerous touch voltages.

All equipment required to be earthed by the Inspection Authority (for example Technical Inspection of Czech Republic) shall be earthed, whether specifically mentioned in the drawings or not.

All earth conductors above earth shall be so located as to be readily visible for inspection.

All earth conductors and armouring in cables shall be terminated at both ends, unless otherwise specified, by using approved connectors.

All earth connections shall be made only after the surface has been thoroughly cleaned of paint and dirt. Earth wires shall not run parallel to single core cables.

The Supplier shall supply the earthing cables.

The Supplier shall supply all necessary installation material such as lugs, clamps, joints and mechanical protection as well as all necessary nuts, bolts and screws. All this material shall be Stainless Steel and shall be included in the price.

The joints of the main under earth earthing electrode (to foundation re-bars etc.) or earthing loop (around the building) shall be of Compression type joints. Compression type joints shall be used also in other locations, unless subject to continuous moisture.

The Supplier shall supply and install in each cable rooms underneath electrical rooms and transformer bay one or more copper earth bars as well as to process area, as shown in the material lists and drawings.

Individual items of equipment shall be connected either by a separate earthing cable, or by using one core of the supplying power cable, as shown in the drawings (PE-wire, yellow-green).

Earth electrode consists of 70 mm² cu or bare Fe/Zn flat bar iron (5x40 mm), which is installed around the building underneath building foundation at about 1 m depth. Supplementary connecting ropes across the building will be installed at about 80 m intervals. Piling reinforcement steel or 70 mm² cu will be connected to earth electrode at about every second or third column. Pigtails for earthing cable connection will be taken up at about every third outside wall building column and one in a transformer room and one or two in cable room on the ground floor. Pigtails for earthing cable connection will be taken up also a few places inside the building.

Process towers/ tanks in the outside of buildings shall be connected to the earthing electrode. Purpose of these connections is lightning protection and also potential equalizing.

Earthing cable (120 mm² Cu yellow-green) will be installed in loop form on main cable routes at each building. The main earthing cable will be connected to earth electrode (pigtailed) at regular intervals. The earthing loops of different buildings will be connected together.

Each feeder bus-duct shall be including the earthing wire all the way from the feeding transformer.

TN-S system neutral (N) and protective earth (PE) shall not be connected together at any part of the distribution system other than at the main distribution centre.

Each feeder or motor cable shall include earthing wire all the way from the feeding panel or MCC to motors.

All electrical equipment located at electrical rooms will be connected to earthing bars with adequate size yellow green copper cable for potential equalizing.

Field equipment potential equalizing earthing cables will be connected to earthing bars or directly to the main earthing cable.

The earthing and lightning protection are given in document MEIA0013

5.2.5 Signal Earthing

Screened signal cables shall be used for low voltage signals. The screen will be connected to functional earthing (FE) in electrical or rack rooms. The screen will be isolated in the field end.

Separate dedicated earthing bars will be installed for signal earthing. Only control system signal earths and signal cable shields will be connected to functional earthing bars.

Functional earthing bars (FE) will be connected to protective earthing bars (PE) with 120 mm² Cu cable. There will not be separate earth electrode for functional earthing.

Black insulated Cu-cables, marked with FE, will be used for signal functional earthing.

The earthing and lightning protection are given in document MEIA0013

5.2.6 Lightning Protection

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.

All buildings with explosion hazard area, tanks containing flammable liquid and high chimneys shall be protected according IEC 62305 standards. The protection class shall be defined due risk analysis.

All metallic parts on the roof shall be connected to the lightning protection net (hand trails, walkways, cable trays, ventilation equipment, etc.). Also metal-sheeted outside walls shall be connected to the lightning protection net.

Lightning protection net shall be connected to the main earthing electrode. Interval of the connection points shall be about every third wall column (outside walls) and every outside corner of the building.

The earthing and lightning protection are given in document MEIA0013

5.2.7 Equipment

According to the requirements, some process motors will be provided with local switches for jog or normal starting. Additionally, process motors will be provided with a lockable main circuit safety switch, installed close to the motor, for use during mechanical maintenance of the machine. Requirements for these switches will be notified separately.

For motor control circuits with multicore cables, a junction or terminal box will be used. The requirement for terminal boxes will be notified separately.

All cables shall enter from below into these control and terminal boxes.
Control voltage distribution panels shall be in accordance with project standard.

5.2.8 Testing

The Supplier shall carry out the testing and all other services necessary to check their installation work, in order to put the electrical system in safe and functional condition ready for the final testing of the process (“water runs” by others).

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

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.

Cabling Test

Before energising, the Supplier shall carry out the following cable tests:

- Tightening up of all joints and connections
- Checking of the power cable connections
- Checking of the control cable connections
- Checking of the cable markings
- Commissioning measurements and measurement reports

Connections of cables shall be checked by using a tester. After checking, the corresponding wiring diagrams shall be marked with an “OK” sign in coloured pen or marked up with additional notes, if any problems found. The diagrams shall be also dated and signed by the responsible Supplier's testing person. These marked copies shall be given to the Purchaser, as soon as possible.

All cabling and wiring shall be tested for continuity, short circuits and earth faults.

MV cables shall be submitted to MV insulation testing after installation, in the presence of the Purchaser.

Megger tests shall be made on each and every power circuit when the installation is complete and before power is applied. Motor windings shall be meggered (to earth) and power cables meggered (phase/phase and phase/earth) prior to connection of the cables to the motor. No electronic circuits or control cables shall be meggered. The meggered resistance values shall be indicated on the test report.

It shall be the Supplier's responsibility to make certain that megger testing does not damage electrical equipment or injure personnel.

Operational and Mechanical Tests

The following tests shall be carried out by the Supplier:

- check and ensure the correct phase sequence
- Check control voltages
- Check motor nameplate data and components in motor starters according to equipment lists and circuit and wiring diagrams, and make corrections to the drawings if necessary
- Check and adjust intelligent motor controllers according to motor nominal current and, if necessary, make corrections to the circuit diagrams. Where the intelligent motor controllers must be changed to one of a different rating, the purchaser will provide it, and the Supplier shall change it.
- Check and test of protective relays for circuit breakers will be done by mcc supplier
- Operation of the control circuit without power circuit energised, including functional tests of:
 - Local switch
 - Field devices
 - Motor starter

And with power circuit energised (while motor clutch still open):

- Check and ensure correct direction of rotation for motors (together with purchaser)
- Measure and record motor currents

Immediately prior to energising a motor for the first time, the Supplier shall request the Purchaser to check the motor for correct lubrication.

The Supplier shall fill in the results of the tests on a test report supplied by the Purchaser. (The mark-up copy of each wiring diagram shall be attached with this test report.)

The costs of all these tests and activities shall be included in the installation price.

5.2.9 Production Trial Run

If the Purchaser so requires, the Supplier shall make available a shift work team (3 shifts 8 hours/day, 7 days/week, 2 persons/shift) during the commissioning and test runs to correct any faults arising in the installation covered by this Contract, which have not been detected earlier.

The Purchaser will pay for the costs of this shift work team in accordance with the price in the Contract. The shift work team may only be utilised for so called finishing works if the test run program allows it.

6 CHANGES IN SCOPE

The Purchaser reserves the right to vary the quantities of material or labour mentioned in this standard and electrical installation enquiry specification. Such changes shall be charged or compensated according to the unit prices.

7 EXCEPTIONS TO THIS STANDARD

The Purchaser reserves the right to request extra work to be done, which may be different from that mentioned in this standard, using the unit prices. If unit prices corresponding to the extra work are not included, the Supplier shall make an offer of the work.

8 TIME SCHEDULE

Detail installation times are shown in The Master Time Schedule.

The electrical installation work will take place simultaneously with civil construction work and piping and machinery installation. The Supplier shall take this factor into consideration when planning his work.

The Supplier shall complete his work in time to permit the checkout, commissioning and test runs to be carried out according to the detail time schedules.

The Supplier shall ensure that lack of material or manpower will not prevent the installation being completed according to these detail time schedules.

9 DRAWINGS AND LISTS

The Purchaser will supply the following drawings and documents for the electrical installation:

- LV one-line diagrams
- Electrical circuit or motor lists
- Wiring diagrams
- Power layouts
- Electrical room layouts
- Cable tray installation drawings for process areas
- Cable tray installation drawings for electrical rooms
- Cable lists
- Field component lists
- MCC and panel layouts and standards
- Earthing layouts
- Earthing connection diagrams
- Rack room layouts

All other drawings and documents needed by the Supplier shall be provided by himself.

All drawings used for the electrical installation shall be approved by the Purchaser and stamped accordingly.

The Purchaser reserves the right to issue additional typical drawings during the course of the work to modify or clarify this standard. Such drawings shall thereupon become part of the contract.

During the contract negotiations the Supplier shall accept the Purchaser's Coordinating Erection Time Schedule, concerning the delivery of final installation documents. The documents are for various installation areas and the time shown is weeks before the corresponding part of the work starts.

The power cable lists and the control cable lists may be delivered at different times: installation of the power cables shall not be delayed because the control cable list is missing, and vice versa.

When the installation work is completed, the Supplier shall deliver by minimum a 2 sets of working drawing copies on which the made modifications are marked with red pencil.

The installation will not be accepted before the drawings above have been handed over.

10 DRAWING -UP OF TENDER

10.1 General

The Tender shall be in accordance with this standard and electrical installation enquiry specification.

Any difference between the Tender and the requirements of this standard shall be fully detailed and the reasons given.

The Supplier shall give details of the organisation and staff he proposes to use at the mill site during the installation.

A reference list of previous completed contracts shall also be included.

The Supplier shall also make a proposal for storage and warehousing on the site.