

METHODOLOGY FOR SUPPLY, INSTALLATION & SIZING OF CABLES

Supply of 1.1kV grade Cables:

- The quantities of various type of 1.1kV grade power and control cables shall be assessed by POWERGRID. The Sizes of 1.1 kV grade Control cables to be adopted for installation is enclosed at Appendix I. For Sizes of Power Cable, Clause 1.1.4 of Section Power and control Cable rev 06 is amended as Appendix-II. For Applications in addition to those specified, appropriate cable size shall be considered by the contractor with prior approval of Employer during execution stage
- Supply of 1.1kV grade power and control cables of various sizes shall be as per unit quantities mentioned in BPS.
- The Cables from Control Room/SPR/ACDB/DCDB/BMK to Equipment Marshalling box (MB)/Local control Cubical (LCC) shall be considered under the BPS item for supply of cables.
- The Interpole cables between AIS Instrument Transformer (CT/CVT), Surge Arrester and associated Junction Box shall be as per unit quantities mentioned in BPS.
- The Interpole cables between Circuit Breaker, Isolator and associated Marshalling box shall be deemed to be included in price of Equipment.

Installation of 1.1kV grade Cables:

- The quantity of Installation of cables is to be assessed by the contractor for the complete scope of work specified in Section project.
- The installation of 1.1kV grade power and control cables (including interpole cable of Equipment & illumination cables) shall be quoted in "LOT" basis.
- Supply and installation of Cable accessories like lugs, glands etc. for entire cabling work shall be deemed to be included in Installation charges of cables quoted by contractor in Bid price schedule.
- No variation shall be admissible on account of Installation of Cables/supply and installation of associated accessories, irrespective of variation (either positive or negative) in supply quantity of Cable specified in BPS.

Extra Consumption of 1.1 kV Power and control cables.

The Contractor shall make every effort to minimise wastage of the cables during installation. The Permitted Overall scarp/wastage shall be limited to 0.50% of actual supplied quantity for each size of cables. Any wastage more than the above limit shall be recovered from the contractor. All balance unused cables shall be returned to the employer by rewinding in separate drums for each size with discrete markings on drums.

Cut pieces of Cables having length less than following shall be considered for Scrap. The Contractor shall dispose of the scrap (if any), at their own cost :

1.) Length less than 20 M

- a) Control Cable (3C, 5C, 7C & 10 Core)
- b) Power Cable(2CX 6Sqmm,4CX6Sqmm, 4CX16Sqmm)

2.) Length less than 50 M

- a) Control Cable having more than 10 Cores
- b) Power Cable of sizes above 16 Sq mm

For Illumination purpose, ACP's shall be supplied as per BPS. From ACP to luminous all the required cables, accessories(including lugs and gland for cables between MLDB & ACP) , SLP/JB etc as required shall be assessed and supplied by the contractor. The price of these items shall be deemed to be included in price of luminaries.

METHODOLOGY FOR SUPPLY, INSTALLATION & SIZING OF CABLES**Appendix-I: Control Cable Sizes**

S.No.	From	To	Proposed Cable size
1.	CB MB	CRP panels	i) 10CX2.5Sq mm ii) 19CX1.5 Sq mm iii) 27CX 1.5 Sq mm
2.	CB MB	Earth switch MB	i) 3CX 2.5 Sqmm ii) 5C X2.5 Sq mm
3.	Isolator MB	Earth switch MB	10CX2.5Sq mm
4.	Isolator MB	CRP panels	19CX1.5 Sq mm
5.	CT	CT JB	i) 5C X2.5 Sq mm ii) 10C X2.5 Sq mm
6.	CT JB	CRP panels	i) 5C X2.5 Sq mm ii) 10C X2.5 Sq mm
7.	CVT	CVT JB	i) 5C X2.5 Sq mm ii) 10C X2.5 Sq mm
8.	CVT JB	CRP panels	i) 5C X2.5 Sq mm ii) 10C X2.5 Sq mm
9.	LA	LA JB	3C X2.5 Sq mm
10.	LA JB	CRP panels	5C X2.5 Sq mm
11.	Reactor MB/CMB (for 1-Ph)	CRP panels	i) 3CX2.5Sq mm ii) 5CX2.5 Sq mm iii) 19CX 1.5 Sq mm iv) 27CX 1.5 Sq mm v) Paired Cables
12.	ICT MB/CMB (for 1-Ph)	CRP panels	i) 3CX2.5Sq mm ii) 5CX2.5 Sq mm iii) 19CX 1.5 Sq mm iv) 27CX 1.5 Sq mm v) Paired Cables

Note: i) For applications in addition to those specified, appropriate cable size shall be considered by the contractor with prior approval of Employer during execution stage.

ii) GTP of 1.5 Sq mm Cable shall be submitted during detailed engineering stage for employers approval.

METHODOLOGY FOR SUPPLY, INSTALLATION & SIZING OF CABLES**Appendix-II Power cable sizes.**

S.No.	From	To	Existing Cable size	Cable type
1.	Main Switch Board	LT Transformer	2-1C X 630 mm ² :For each phase 1-1C X 630 mm ² : for neutral	XLPE
2.	Main Switch Board	AC Distribution Board	2-3½C X 300 mm ²	XLPE
3.	Main Switch Board	Oil Filtration Unit	1-3½C X 300 mm ²	XLPE
4.	Main Switch Board	Colony Lighting	1-3½C X 300 mm ²	XLPE
5.	Main Switch Board	HVW pump LCP	1-3½C X 300 mm ²	XLPE
6.	Main Switch Board	Main Lighting distribution board	2-3½C X 300 mm ²	XLPE
7.	AC Distribution Board	D.G. Set AMF Panel	For 500 kVA DG set: 2-3½C X 300 mm ² For 250 kVA DG set: 1-3½C X 300 mm ²	XLPE
8.	AC Distribution Board	Emergency Lighting distribution board	3½C X 70mm ² :For 765/400kV S/s 3½C X 35mm ² :For 400/220kV S/s	PVC
9.	AC Distribution Board	ICT MB	3½C X 70mm ² :For 765/400kV S/s 3½C X 35mm ² :For 400/220kV S/s	PVC
10.	AC Distribution Board	Bay MB	3½C X 70mm ² :For 765/400kV S/s 3½C X 35mm ² For 400/220kV S/s	PVC
11.	Bay MB	AC Kiosk	1-4C X 16 mm ²	PVC
12.	AC Distribution	Battery Charger	1-3½C X 70 mm ²	PVC

METHODOLOGY FOR SUPPLY, INSTALLATION & SIZING OF CABLES

	Board	220 V		
13.	AC Distribution Board	Battery Charger 48 V	1-3½C X 35 mm	PVC
14.	DCDB	Battery	2-1C X 150 mm2	PVC
15.	DCDB	Battery Charger	2-1C X 150 mm2	PVC
16.	DCDB	Protection/PLCC panel	1-4C X 16 mm2 : 765/400kV S/s 1-4C X 6 mm2: 400/220kV S/s	PVC
17.	Main Lighting DB	Lighting panels(Indoor)	1-3½C X 35 mm2	PVC
18.	Main Lighting DB	Lighting panels (outdoor)	1-3½C X 70 mm2	PVC
19.	Main Lighting DB	Receptacles (Indoor)	1-3½C X 35 mm2	PVC
20.	Main Lighting DB	Receptacles (Outdoor)	1-3½C X 70 mm2	PVC
21.	Lighting Panel	Sub lighting panels	These Cables shall be included in Price of item for Lighting fixture	PVC
22.	Lighting Panel	Street Lighting Poles	These Cables shall be included in Price of item for Lighting fixture	PVC
23.	Lighting Panel/ Sub lighting panels	Lighting Fixtures (Outdoor)	These Cables shall be included in Price of item for Lighting fixture	PVC
24.	Bay MB	Equipment	1-4C X 16 mm ² : For CB 1-4C X 6 mm ² : For Isolator/earths switch 1-2C X 6 : For CT/CVT	PVC
25.	ELDB	Lighting panel	3½C X 70mm ² :For 765/400kV S/s 3½C X 35mm2 :For 400/220kV S/s	PVC

ANNEXURE-V : SECTION GTR REV 15 CLAUSE NO 24.1

Clause No 24.1 of Section GTR Rev 15 is amended as below:

24.1 Technical requirements for 765/400/220/132kV* Air Insulated Switchgear (AIS) Equipment*:

(A) Circuit Breaker

- (i) The manufacturer(s) whose 765/400/220/132kV* Circuit Breaker(s) are offered, must have, manufactured, type tested (as per IEC/IS or equivalent standard) and supplied 715/345/220/132kV* or higher voltage class Circuit Breaker(s), which are in satisfactory operation# for atleast two (2) years as on the date of NOA.
- (ii) Alternatively, the manufacturer, who have established manufacturing and testing facilities in India for the offered Circuit Breaker and not meeting the requirement stipulated in (i) above, can also be considered provided that
 - a) 715/345/220/132kV* or higher Voltage class Circuit Breaker(s) must have been manufactured in the above Indian works & type tested (as per IEC/IS standard) and supplied as on the date of NOA.
 - b) In case manufacturer meets the technical requirement through clause (ii) above, warranty obligations for additional warranty of two(2) years over & above the warranty period as specified in the bidding documents shall be applicable for the entire quantity of the offered Circuit Breaker(s) to be supplied under the contract. Further, contractor shall furnish performance guarantee for an amount of 3% of the ex-works cost of the Circuit Breaker(s)* for the additional warranty period in addition to the contract performance guarantee to be submitted by the contractor

(B) Isolator, Current Transformer, Capacitive Voltage transformer, Inductive Voltage transformer, Surge Arrester and Wave Trap)

- (i) The manufacturer whose 765/400/220/132kV* equipment(s) are offered, must have manufactured, type tested (as per IS/IEC or equivalent standard) and supplied 715/345/220/132kV* or higher voltage class equipment(s), which are in satisfactory operation# for at least two (2) years as on the date of NOA.
- OR
- (ii) The manufacturer, who have established manufacturing and testing facilities in India for the offered equipment(s) and not meeting the requirement stipulated in (i) above, can also be considered provided that:
 - a) 715/345/220/132kV* or higher Voltage class equipment(s) must have been manufactured in the above Indian works & type tested (as per IS/IEC standard) as on the date of NOA.

ANNEXURE-V : SECTION GTR REV 15 CLAUSE NO 24.1

- b) Manufacturer has manufactured, type tested (as per IS/IEC or equivalent standard) and supplied equipment(s) of 345kV or above voltage class (applicable for 765kV* Equipment)/220kV or above voltage class (applicable for 400kV* equipment) / 66kV or higher voltage class (applicable for 132kV* equipment), which are in satisfactory operation# for at least two (2) years as on the date of NOA.
- c) Warranty obligations for additional warranty of two (2) years over & above the warranty period as specified in the bidding documents shall be applicable for the entire quantity of the offered equipment(s) to be supplied under the contract. Further, contractor shall furnish performance guarantee for an amount of 3% of the ex-works cost of the equipment(s)* for the additional warranty period in addition to the contract performance guarantee to be submitted by the contractor.

OR

- (iii) The manufacturer, who have established manufacturing and testing facilities in India for the offered equipment(s) based on technological support of a parent company or collaborator and not meeting the requirement stipulated in (i) above, can also be considered provided that:

- a) 715/345/220/132kV* or higher Voltage class equipment(s) must have been manufactured in the above Indian works & type tested (as per IS/IEC standard) as on the date of NOA.
- b) The parent company or collaborator meets the qualifying requirements stipulated under (i) given above.

A valid collaboration agreement for technology transfer / license to design, manufacture, test and supply the 765/400/220/132kV* Air Insulated Switchgear (AIS) Equipment(s)* in India, shall be submitted.

- c) The parent company/collaborator shall furnish performance guarantee for an amount of 3% of the ex-works cost of such equipment(s) and this performance guarantee shall be in addition to contract performance guarantee to be submitted by the contractor

Legend:

* : voltage class of respective equipment as applicable.

: **satisfactory operation** means certificate issued by the Employer/Utility certifying the operation without any adverse remark.

NOA: Notification Of Award

SHORT CIRCUIT FORCES & SPACER SPAN FOR 765kV & 400kV GANTRY STRUCTURE

For new 765kV and 400 kV AIS switchyard with one & a half breaker switching scheme, three gantry type arrangement (i.e. arrangement having single gantry in Tie bay) shall be considered. Further, Short-Circuit Forces (SCF) for the design of Gantry Structure and spacer spans shall be as mentioned below:

Voltage Level: 765kV, Fault Level: up to 50kA for 1 sec								
Bus Type	Height of Bus (from FGL)	Max Span	Bus Conductor Configuration	Ph-Ph Spacing	Normal Tension per phase	SCF per phase	Spacer Span	Applicable Wind Speed
Main Bus	27 Mtr	108 Mtr	Quad Bull	15 M	8T	9.75T	6 Mtr	Up to 50 m/s
Jack Bus	40 Mtr	140 Mtr		15 M	9.5T	11.26T	6 Mtr	Up to 50 m/s
Jack Bus	40 Mtr	114 Mtr		15 M	9.5T	11.10T	6 Mtr	Up to 50 m/s
Voltage Level: 400kV, Fault Level: up to 63kA for 1 sec, Bay Width : 24 Mtr								
Bus Type	Height of Bus (from FGL)	Max Span	Bus Conductor Configuration	Ph-Ph Spacing	Normal Tension per phase	SCF per phase	Spacer Span	Applicable Wind Speed
Main Bus	15 Mtr	72.0 Mtr	Quad Bersimis	6.5 M	5T	7.32T	4 Mtr	Up to 50m/s
Jack Bus	23 Mtr	75.0 Mtr		6.5 M	5T	7.36T	4 Mtr	Up to 47m/s
Jack Bus	23 Mtr	75.0 Mtr		6.5 M	5T	7.36T	3.5 Mtr	50m/s
Jack Bus	23 Mtr	59.0 Mtr		6.5 M	5T	7.12T	4 Mtr	Up to 50m/s
Jack Bus	23 Mtr	46.0 Mtr		6.5 M	4T	6.20T	4 Mtr	Up to 50m/s

Above shall also be applicable for following cases unless otherwise specified elsewhere:

- (i) Extension of 765kV switchyard with existing three gantry type arrangement
- (ii) Extension of 400kV switchyard with existing three gantry type arrangement and having bus heights matching with above.

For design of gantry structures with spans, wind speed or conductor configurations other than that mentioned above, conductor tension shall be considered based on actual requirement of present & future scope of work. Relevant design calculations for such cases shall be submitted by the contractor for employer's approval.