AERIAL BUNCHED CABLES

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ABOUT US

From a modest beginning with Conductors, Compounds and Wires & Cables, almost three decades ago, the Polycab Group Set up a State of Art manufacturing facilities at Daman in 1997, to address key market determinants. Starting the project from scratch Polycab was able to design a manufacturing facility around State of Art disciplines of Computer integrated manufacture .The Quality & Manufacturing setup is sourced out from the World renown Machinery and Technology Suppliers with constant upgradations and expansions.

At POLYCAB, We study the requirements of the penultimate users with our commitment for Quality and Value. These are converted into process specifications based on Indian & International Standards.

In an on going effect to improve Customer satisfaction POLYCAB offers a variety of services: -

- **Commercially Competitive Prices.**
- **Reliable & Consistent quality.**
- **Reliable & just in time delivery.**
- **Product development for a changing market**
- **A target stocking policy.**
- **Technical Support for Applications /Projects.**

POLYCAB derives its strengths from its Customers. The Growth of latter is a prerequisite to the growth of the Company and hence Customer satisfaction is its prime Objective. Over the years sincere service and dedication of its Customers has earned the Company distinguished clientele Which includes leaders in Sectors like Utilities, Power Distribution, Oil Refineries, Oem's, EPC Contractors, Steel & Metal, Cement, Petroleum, Chemical, Atomic Energy & Nuclear Power etc. etc.

For any Company the key to establish itself in the export market is QUALITY. Not surprisingly, considering its quality conscious approach towards manufacturing Polycab enjoys a good reputation in the global market.

Now the company has monthly manufacturing capacity to Process over 1500 Tons of Rod Copper & Tinned Copper, 1000 Tons of Alloy & Aluminium and over 800 Tons of fine tinned & Bare Copper Wires, to produce a wide range of Conductors for H.T. & L.T. Power Cables, Control Cables, Instrumentation, House Wires, Flexibles, Submersible & Welding Cables, FS Cables, Aerial Bunched Cables, AAC, AAAC, ACSR Bare and Earthing Conductors.

Our constant efforts to incorporate latest efficiency mechanism in our manufacturing and service are the key factors of "Adding Value through Conductors & Cables". Our plant at Daman offers NIL sales tax to the customers and a wide marketing network to cater domestic and exports requirements.

With offices, personnel, distributors, dealers, stockists throughout the Country, Polycab offers the highest level of Customer Service.

AERIAL BUNCHED CABLES FOR OVERHEAD DISTRIBUTION

INTRODUCTION

Aerial Bunched Cable (ABC) is a very novel concept for Over Head power distribution. When compared to the conventional bare conductor over head distribution system, ABC provides higher safety and reliability, lower power losses and ultimate system economy by reducing installation, maintenance and operative cost. This system is ideal for rural distribution and specially attractive for installation in difficult terrains such as hilly areas, forest areas, coastal areas etc.

ABC is also considered to be the best choice for power distribution congested urban areas with narrow lanes and by-lanes. In developing urban complex, ABC is the better choice because of flexibility for rerouting as demanded by changes in urban development plan.

CONSTRUCTION OF ABC

XLPE/HDPE insulated power conductors of Aluminium (Neutral conductor and street lighting conductors if and when necessary) are laid together (twisted) around a high tensile stranded and galvanized steel (Aluminium Alloy may be used) insulated or bare messenger wire to form the Aerial Bunched Cable. This assembly is directly strung on to distribution pole/towers by means of standard hardwares available in the market but care shall be taken to render the messenger wire completely insulated from earthing at any point of distribution in case of HT ABC.

The XLPE (Cross-linked Polyethylene) insulation is black in colour and is stabilized against deterioration caused by exposure to direct sunlight and ultraviolet radiation. XLPE is cross-linkable low density polyethylene which is made thermoset by special formulation from base polymer of thermoplastic low density polyethylene. XLPE combines the best electrical properties of LDPE and superior thermo mechanical properties.

MATERIALS

(i) Aluminium conductors conform to IS:8130 (Class-II)
(ii) Stranded high tensile galvanized steel messenger wire conforms to IS:398 (Part-2). Alternatively Aluminium Alloy messenger wire conforms to IS:398 (Part-IV)
(iii) XLPE and HDPE insulation of power conductors conform to IS: 7098 (Part I & II) and IS: 6474 respectively.

Since, the tension from the current carrying conductor is totally removed by introduction of messenger wire the operating temperature of the conductor is 90^0 C as against 75^0C of the bare conductor under tension thereby allowing ABC to carry current equivalent to that of bare conductor of the same size.

STRINGING

No difficulty is envisaged during stringing of ABC in the conventional method but care shall be taken that insulated conductors do not get damaged during installation. Dragging the ABC on the ground is to be avoided. Tension to be applied during stringing shall be 25% of the breaking load of the messenger wires. This will allow line to have sag within specified limit of 1.5% of the span at the lowest ambient temperature.

JOINTING

While mid-span jointing permissible for LT ABC system by conventional technique, our recommendation will be to draw the line in such a way as to bring the joints at the supports. Mid-span jointing is not at all recommended in the case of HT lines our recommendation is for outdoor type HV terminations only. Under unavoidable circumstances, line tapping at the support points may be allowed through suitably designed clamp connectors/PG clamps. The semiconducting screen continuity shall be maintained at all joints as far as possible to avoid fluctuations during system disturbances. The 3-phase screens may be shorted and earthed through suitable non-linear surge arrestor. Attempting to make a tap off from power conductors in the region where catenary is under tension is not recommended.

APPLICATION

ABC can be conveniently used:

a) as replacement of bare lines in Rural Areas, in woods and in other localities & narrows streets where the space is limited.
b) as replacement of bare lines where reliability of supply is of prime importance.
c) as replacement of bare lines where high degree of stability of supply voltage is of importance.
d) in hilly terrains where cost of erection of overhead lines or under ground cable becomes very high.
e) as reinforcement of existing system without increasing voltage.
f) for temporary supplies.

ADVANTAGES

In comparison to bare overhead power distribution lines, ABC has very high reliability in maintaining services because power and neutral conductors are insulated with the best dielectric medium, resulting in the following advantages:

1) Less fault rate on account of good protection against line and ground faults by high winds or falling trees or birds especially in hilly areas & forests as encountered in rural distribution networks.

2) High insulation resistance to earth in all seasons and polluted atmospheres. Negligible leakage currents and low losses.

3) Multiple circuits of Power and Telephone cables could be strung in the same set of poles or any other supports like walls etc.

4) Better adaptability to run concurrently with existing over-head bare conductor system without any interference.

5) High capacitance and low inductance leading to low impedance of lines.

6) Lower voltage drop, higher current capacities. VIS-À-VIS Better Voltage Regulation.

7) Longer spans and longer distance lines are possible with better system stability.

8) ABC cables are much safer than bare Conductors.

9) It can be over hung in dense vegetation and forests.

10) Additional connections can be easily and quickly made with hot-line connectors.

11) Total lines costs are reduced.

12) Maintenance is very easy.

COMPARATIVE COSTS INDEX:

System	Cost Index
U.G.Cable System	1.00
O.H.Bare Conductor System	0.35
ABC System	0.50

RELIABILITY, SAFETY AND FLEXIBILITY:

ABC Cables are highly reliable and insulation has been developed to withstand heat, cold and intense sunlight. Disturbance and faults occur five to ten times more often in open wire lines than in ABC lines. There is no risk in touching the live cable and the insulation reduces the number of short circuits and over-voltages in overhead cables during thunderstorms. Few hardware accessories are needed as each one can be used with many different sizes of cable. This makes installation and storage easier. Streets can easily be get lit at little extra cost by using the ABC cables that have an extra conductor for lighting. The cable can be supplied with one or two insulated conductors for street lighting.

EXPERIENCE:

After extensive research Polycab has successfully developed and introduced Aerial Bunched Conductor Cables, and have already achieved technical competence, manufacturing ability, and marketing experience by supplying ABC cables to the following Customers: -

1.BSES LTD (for Gridco – Orissa)
2.North Delhi Power Ltd - Delhi

TAILOR MADE DESIGN

POLYCAB have recognized the need for H.T & L.T ABC cables in the emerging market due to thrust in the Transmission & Distribution network revamping programme by Govt. of India. We can interact with you to design for you ABC cables to meet your specific requirements.

HARDWARE AND ACCESSORIES:

The hardware and accessories for AB cables are made by various reputed manufacturer and is easily available in India. They are similar to the standard hardware available for Bare conductor overhead distribution lines.

APPROVAL & CERTIFICATION

1. **BIS License for IS-694-1990 for 1100V Wires & Cables.**
2. **BIS License for IS- 1554.**
3. **BIS License for IS-7098 PART I & II**
4. **BIS License for Overhead Aluminium Conductor (IS-398) and Copper Conductor (IS-282) and IS-8130 for other Conductors.**
5. **Quality System Certification upgradation from ISO- 9002 to ISO-9001 by Underwriters Laboratories, in final stage**
6. **Safety Certification for various conductors as per BASEC are under finalisation.**

QUALITY SETUP

Conductors are generally the only means to transport current or signals with required safety norms. Therefore the material of its construction, purity and other important aspects of metallurgy are the critical factors to source the wire rods. We have latest 3-D profile die checking and refurbishment system. The sourcing of wire drawing, lubricant is from company like Houghton Italy and intensive inspection testing Conductor to ensure quality.

At Polycab, We do;

QA IN PLANNING

Customer requirements, alongwith the orders are taken into quality planning with due care for designing, manufacturing, testing and performance aspects.

QA IN RAW MATERIALS

The raw materials are procured from the best sources from the domestic and global market. These sources are selected on the based on the company's stringent quality vendor evaluation/ continuous assessment and testing.

QA ONLINE

The company has online computerised control system on all its critical processes and a team of online testing engineers to ensure the consistency in quality

TESTING

Each consignment of conductor & wires is exhaustively tested before dispatch clearance, by highly qualified, Experienced and dedicated testing team.

The testing setup is broadly classified as follows

(1) R.M. Testing Labs.
(2) Routine Testing for Conductor, LT wires & Cables
(3) Type Testing Labs include FR/FS/FRLS testing

All the laboratories are equipped with the modern testing Instruments. All the instruments are under strict Calibration and environment control.

TECHNICAL PARTICULARS

LT Aerial Bunched Cable 1100 Volts (3 1/2 core). Reference standard: Generally to IS: 7098 (1)88.

Sl No.	Description		3x25 + 1x16 + 1x35	3x35 + 1x16 + 1x35	3x50 + 1x25 + 1x35	3x70 + 1x35 + 1x35	3x95 + 1x50 + 1x55
1.	**Power/Neutral core:**						
1.2	**Conductors**						
	a) Nom. cross sectional area						
	(i) Power cores	(mm2)	25	35	50	70	95
	(ii) Neutral core	(mm2)	16	16	25	35	50
	b) Max.D.C.resistance conductor at 20 C						
	(i) Power cores	(Ohm/Km)	1.20	0.868	0.641	0.443	0.320
	(ii) Neutral core	(Ohm/Km)	1.91	1.910	1.200	0.868	0.641
	c) Approx. diameter of Conductor						
	(i) Power cores	(mm)	6.2	7.3	8.35	10.1	12.00
	(ii) Neutral core	(mm)	5.1	5.1	6.20	7.30	8.35
	Insulation:						
1.2	Minimum thickness:						
	(i) Power cores	(mm)	0.9	0.9	1.0	1.1	1.1
	(ii) Neutral core	(mm)	0.7	0.7	0.9	0.9	1.0
2.	**Messenger Wire (Bare):**						
	(i) Nom. cross sectional area	(Sq. mm)	35	35	35	55	55
	(ii) Approx. breaking load	(KN)	41	41	41	62	62
3.	**Current ratings:** Continuous current carrying Capacity of cable in Air at Ambient temp. 40 ^{0} C	(Amp.)	99	122	149	190	235
4.	**Approx. weight**	**(kg./km.)**	**580**	**665**	**810**	**1165**	**1430**
5.	**Number of cores:**						
	(i) Power cores		(No.) : 3				
	(ii) Neutral core		(No.) : 1				
	(iii) Bare messenger		(No.) : 1				
6.	**Derating factor:** Derating factors for variation In air Temp.						
	Air Temp	(^{0}C)	30 35 40 45 50 55				
	Rating factor		1.12 1.06 1.0 0.94 0.88 0.83				
7.	**(i) Identification of Power core:**		By providing ridges on the insulation:				
	(ii) Laying:		Three power cores and one neutral core shall be suitably twisted around bare H.T. Steel Messenger./ AAAC				
8.	**Details of the Power/Neutral core:**						
	(i) Conductor:						
	(a) Material		Aluminium to IS: 8130/84				
	(b) Flexibility class as per IS: 8130/84		Class-2				
	(c) Form of conductor		Compacted circular				
	(ii) Insulation:						
	(a) Material		Cross linked Polyethylene to IS: 7098(I)/88				
	(b) Colour of Insulation		Black				
9.	**Details of the Messenger wire (Bare)**						
	(i) Material		ACSR/AAAC Conductor to IS: 398(II) & (IV) respectively.				
	(ii) Form of conductor		Stranded circular/compacted circular.				

TECHNICAL PARTICULARS

LT Aerial Bunched Cable 1100 Volts (4 core). Reference standard: Generally to IS:7098(1)88.

Sl No.	Description		3x25 + 1x25 + 1x35	3x35 + 1x35 + 1x35	3x50 + 1x50 + 1x35	3x70 + 1x70 + 1x55	3x95 + 1x95 + 1x55
1.	**Power/Neutral core:**						
1.1	**Conductors**						
	a) Nom. cross sectional area						
	(i) Power cores	(mm2)	25	35	50	70	95
	(ii) Neutral core	(mm2)	25	35	50	70	95
	b) Max. D.C. resistance conductor at 20^0 C						
	(i) Power cores	(Ohm/Km)	1.20	0.868	0.641	0.443	0.320
	(ii) Neutral core	(Ohm/Km)	1.20	0.868	0.641	0.443	0.320
	c) Approx. diameter of Conductor						
	(i) Power cores	(mm)	6.2	7.3	8.35	10.1	12.0
	(ii) Neutral core	(mm)	6.2	7.3	8.35	10.1	12.0
1.2	**Insulation:** Minimum thickness:						
	(i) Power cores	(mm)	0.9	0.9	1.0	1.1	1.1
	(ii) Neutral core	(mm)	0.9	0.9	1.0	1.1	1.1
2.	**Messenger Wire (Bare):**						
	(i) Nom. cross sectional area	(Sq. mm)	35	35	35	55	55
	(ii) Approx. breaking load	(KN)	41	41	41	62	62
3.	**Current ratings:** Continuous current carrying capacity of cable in Air at Ambient temp. 40^0 C	(Amp.)	99	122	149	190	235
4.	**Approx.weight**	**(kg./km.)**	**610**	**725**	**880**	**1270**	**1570**
5.	**Number of cores:**						
	(i) Power cores		(No.) : 3				
	(ii) Neutral core		(No.) : 1				
	(iii) Bare messenger		(No.) : 1				
6.	**Derating factor:** Derating factors for variation In air Temp.						
	Air Temp	(^{0}C)	30 35 40 45 50 55				
	Rating factor		1.12 1.06 1.0 0.94 0.88 0.83				
7.	(a) Identification of Power core**:**		By providing ridges on the insulation				
	(b) Laying		Three power cores and one neutral core shall be suitably twisted around bare H.T.Steel Messenger. /AAAC**.**				
8.	**Details of the Power/Neutral core:**						
	(i) Conductor:						
	(a) Material		Aluminium to IS: 8130/84				
	(b) Flexibility class as per IS: 8130/84		Class-2				
	(c) Form of conductor		Compacted circular				
	(ii) Insulation:						
	(a) Material		Cross linked Polyethylene to IS: 7098(I)88				
	(b) Colour of Insulation		Black				
9.	**Details of the Messenger wire (Bare)**						
	(i) Material		ACSR/AAAC. Conductor to IS: 398 (II) & (IV) respectively				
	(ii) Form of conductor		Stranded circular/compacted circular.				

TECHNICAL PARTICULARS

LT Aerial Bunched Cable 1100 Volts (5 core) with Street Lighting Conductor. Reference Standard: Generally to IS:6474-71

Sl. No.	Description	3x16 + 1x16 + 1x25	3x25 + x16 + 1x25	3x35 + 1x16 + 1x25	3x50 + 1x16 + 1x35	3x70 + 1x16 + 1x50	3x95 + 1x16 + 1x70	3x120 + 1x16 + 1x70
1.	**Power /Neutral core**:							
1.1	**Conductors**							
	(a) Nom. cross sectional area							
	(i) Phase Conductor (mm2)	16	25	35	50	70	95	120
	(ii) Street Lighting Conductor (mm2)	16	16	16	16	16	16	16
	(b) Max. D.C. resistance conductor at 20^0 C							
	(i) Phase Conductors (Ohm/Km)	1.91	1.20	0.868	0.641	0.443	0.320	0.253
	(ii) Street Lighting (Ohm/Km)	1.91	1.91	1.910	1.910	1.910	1.910	1.910
	(c) Approx. diameter of conductor							
	(i) Phase Conductor (mm)	4.4	5.5	6.8	7.9	9.6	11.3	12.7
	(ii) Street Lighting conductor (mm)	4.4	4.4	4.4	4.4	4.4	4.4	4.4
1.2	**Insulation:**							
	Minimum thickness:							
	(i) Phase Conductor (mm)	1.0	1.0	1.0	1.2	1.4	1.4	1.6
	(ii) Street Lighting Conductor (mm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2.	**Messenger Wire (Bare)**							
	(i) Nom. cross sectional area (Sq.mm)	25	25	25	35	50	70	70
	(ii)Approx. breaking load (KN)	7.4	7.4	7.4	10.3	14.7	20.6	20.6
3.	**Current ratings**:							
	Continuous current carrying Capacity of cable in Air at							
	Ambient temp. 40^0C (Amp.)	51	70	86	105	130	155	180
4.	**Approx.weight (Kg./Km)**	**310**	**390**	**490**	**640**	**890**	**1180**	**1430**
5.	**Number of cores**:							
	(i) Power cores	(No.) : 3						
	(ii) Neutral core	(No.) : 1						
	(iii) Bare messenger	(No.) : 1						
6.	**Derating factor**:							
	Derating factors for variation In air Temp.							
	Air Temp (^{0}C)	30 35 40 45 50 55						
	Rating factor	1.12 1.06 1.0 0.94 0.88 0.83						
7.	**(a) Identification of Power cores**:	By providing ridges on the insulation						
	(b) Laying	Three power cores and one neutral Core shall be suitably twisted around Bare AAAC Messenger.						
8.	**Details of the Power/Neutral core**:							
	(i) Conductor:							
	(a) Material	Aluminium to IS:8130/84						
	(b) Flexibility class as per IS: 8130/84	Class-2						
	(c) Form of conductor	Compacted circular						
	(ii) Insulation							
	(a) Material	High Density Polyethylene to IS: 6474 – 1971						
	(b) Colour of insulation	Black						
9.	**Details of the Messenger wire (Bare)**							
	(i) Material	All Alloy Aluminium Conductor to IS: 398 (IV)						
	(ii) Form of conductor	Stranded Compacted circular.						

TECHNICAL PARTICULARS

LT Aerial Bunched Cable 1100 Volts (4 core). Reference standard: Generally to IS: 6474-71.

Sl No.	Description		3x16 + 1x25	3x25 + 1x25	3x35 + 1x25	3x50 + 1x35
1.	**Power/Neutral core:**					
1.1	**Conductors**					
	a) Nom. cross sectional area					
	(i) Power cores	(mm2)	16	25	35	50
	(ii) Neutral conductor	(mm2)	25	25	25	35
	b) Max. D.C. resistance conductor at 20^0 C					
	(i) Phase Conductor	(Ohm/Km)	1.91	1.20	0.868	0.641
	(ii) Neutral Conductor	(Ohm/Km)	1.38	1.38	1.38	0.968
	c) Approx. diameter of conductor (Compacted)					
	(i) Phase conductor	(mm)	4.4	5.5	6.8	7.9
	(ii) Neutral Conductor	(mm)	5.8	5.8	5.8	6.8
1.2	**Insulation**:					
	Minimum thickness:					
	(i) Phase Conductor	(mm)	1.0	1.0	1.0	1.2
2.	**Messenger Wire (Bare)**					
	(i.) Nom. cross sectional area	(Sq. mm)	25	25	25	35
	(ii.) Approx. Tensile Strength	(KN)	7.4	7.4	7.4	10.3
3.	**Current ratings:** Continuous current carrying Capacity of cable in Air at Ambient temp. 40^0 C	(Amp.)	60	76	92	110
4.	**Approx.weight**	**(kg./km.)**	**250**	**330**	**430**	**580**
5.	**Number of cores:**					
	(i) Power cores		(No.) : 3			
	(ii) Neutral messenger core		(No.) : 1			
6.	**Derating factor**:					
	Derating factors for variation I In air Temp.					
	Air Temp	(^{0} C)	30 35 40 45 50 55			
	Rating factor		1.12 1.06 1.0 0.94 0.88 0.83			
7.	**(i) Identification of Power core:**		By providing ridges on the insulation			
	(ii) Laying:		Three power cores and one neutral core shall be suitably twisted around bare AAAC Messenger.			
8.	**Details of the Power/Neutral core:**					
	(i) Conductor					
	(a) Material		Aluminium to IS:8130/84			
	(b) Flexibility class as per IS: 8130/84		Class-2			
	(c) Form of conductor		Compacted circular			
	(ii) Insulation:					
	(a) Material		High Density Polyethylene to IS: 6474 –1971			
	(b) Colour of insulation		Black			
9.	**Details of the Messenger wire (Bare)**					
	(i) Material		All alloy aluminium Conductor to IS: 398 (IV)			
	(ii) Form of conductor		Stranded compacted circular.			

FINISHED AERIAL BUNCHED CABLE TESTING

Prior to despatch, cable is subjected to rigorous testing. Test procedures followed at our works are according to various national & International specifications and are covered in this paper.

Following tests are performed on Aerial Bunched Cables:-

1. Test on Phase/Street lighting conductor

TESTS	METHOD OF TESTING
a) Tensile test	IS: 10810 pt - 2
b) Wrapping test	IS: 10810 pt - 3
c) Conductor Resistant Test	IS: 10810 pt - 5
d) Test for thickness of insulation	IS: 10810 pt - 6
e) Physical test for polyethylene insulation	
(i) Tensile strength & Elong. Test	IS: 10810 pt - 7
(ii) Melt flow Index	IS: 10810 pt - 23
(iii) Vicat softening Point	IS: 10810 pt - 22
(iv) Carbon Black Content & dispersion	IS: 10810 pt - 32
(v) Colour factness	IS: 10810 pt - 18
(vi) Environmental stress cracking	IS: 10810 pt - 29
(vii) Bleeding & Blooming	IS: 10810 pt - 19
(viii) Volume Resistivity test	IS: 10810 pt - 43
(f) High Voltage test including water immersion test.	IS: 1596

2. Test for messenger conductor: -

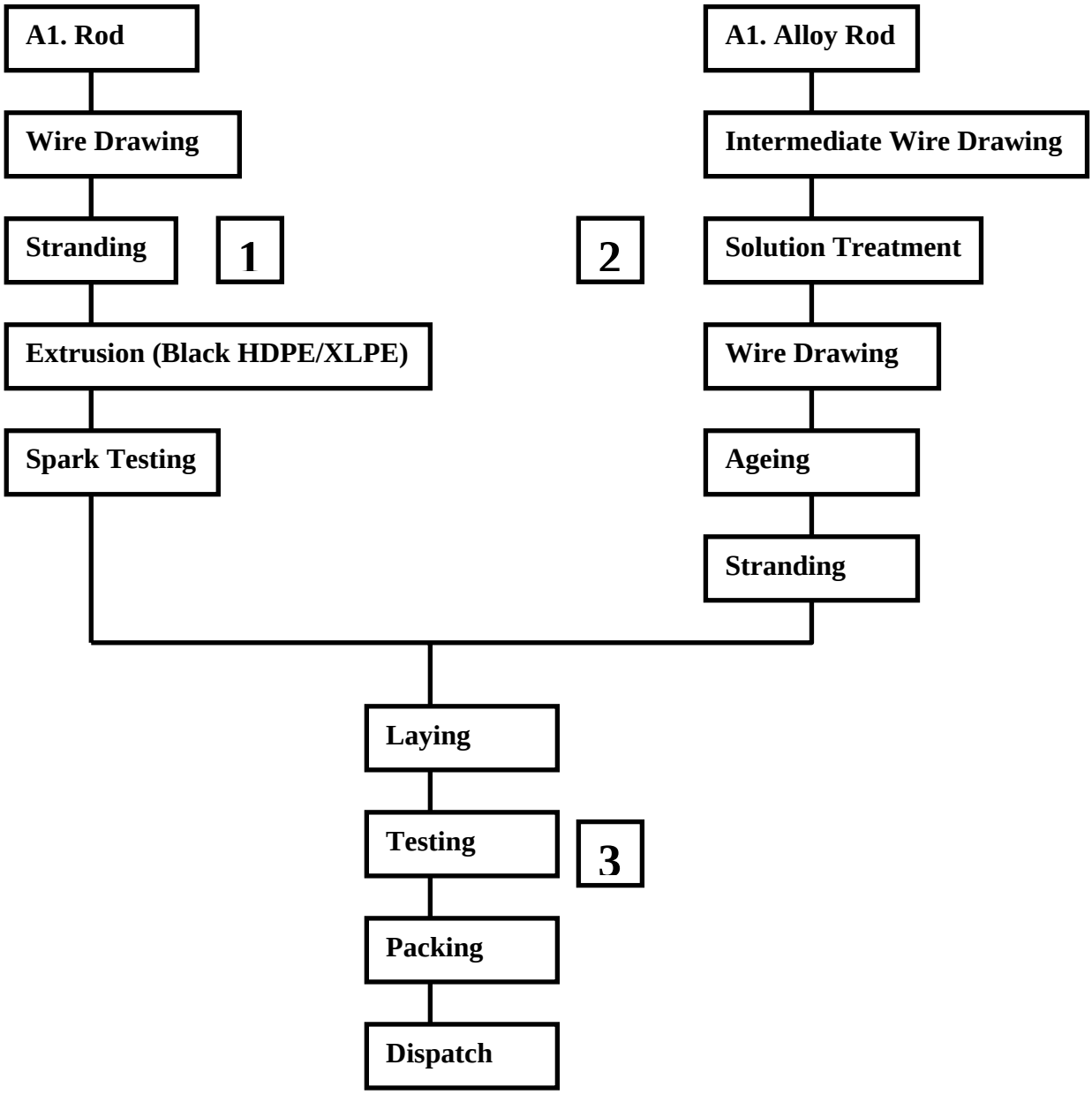
(a) Breaking load test	IS: 398 (pt-IV)
(b) Elongation test	IS: 398 (pt-IV)
(c) Resistance test	IS: 398 (pt-IV)

3. Dimentional test as per the parameters specified in the technical particulars.

4. Bending test on completed cable shall also as performed. The diameter of mandrel shall be 10 (D+d)

   Where D = Overall diameter of the cable
   D = Dia over conductor.

PROCESS FLOW CHART FOR MANUFACTURE OF AERIAL BUNCHEDCABLES



1. **Manufacture of phase/street lighting conductor**.
2. **Manufacture of messenger conductor**.
3. **Twisting of cores for manufacture of Aerial Bunched Cables**.