



# GIVING CITIES THE POWER TO SHINE

Version 1.1



701, Rustomjee Aspiree, Bhanu Shankar Yagnik Marg, Off Eastern Express Highway, Ston (E),  
Mumbai - 400 022 | Tel.: 022-6218 2300 | E-mail: luminaires@bajajelectricals.com | www.bajajelectricals.com  
f/BajajElecBiz t/BajajElecBiz i/bajajelecBiz B/BajajElectricals

Highmast and Poles Catalogue

# “ WE ILLUMINATE NATIONS ”

The last few decades have witnessed a rapid acceleration in globalisation, mainly due to growth in international trade and increase in the use of smart technology. This has led to growing urbanisation and digitalisation, particularly in developing countries.

To fulfil the demands arising out of accelerated globalisation and its effects, Bajaj Electricals Limited has expanded its horizon, through a host of smart indoor and connected outdoor solutions. These solutions are catalysts driving change within urban communities. Furthermore, Bajaj Electricals aims to provide technologically advanced IoT-enabled smart solutions to consumers, to help create sustainable living spaces for them.

We offer a range of lighting solutions such as Smart Poles, Sports Lighting, Architectural Lighting and Solar Lighting. Besides this, we also provide lighting solutions for commercial premises, industrial spaces (i.e. Healthcare, Automotive, Steel and Power Industry), IBMS solutions and holistic solutions to create energy-efficient buildings and smart cities.

We strive to provide a one-stop shop solution to our customers, with the help of a complete on-ground support system as well as digital platforms like cloud-based connectivity and wireless solutions. This will enhance productivity and make it easier to create sustainable and smart infrastructure.

The diverse range of solutions we are aiming to provide, demonstrates our ambition to reach out to, enrich and illuminate millions of lives, cities and nations across the world.



# “ CUSTOMER PERCEPTION ”



# “ Q1 ”

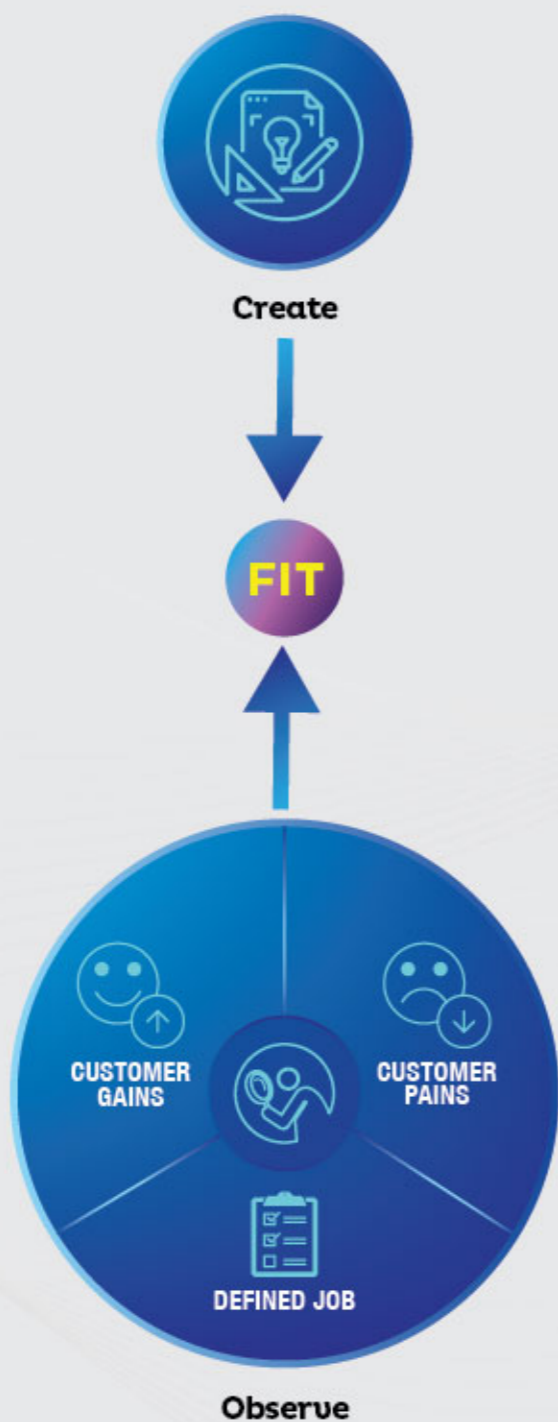
In today's world, when it comes to purchasing lighting solutions for upgrade or greenfield projects, consumers consider price as the most important factor. Along with this, quick delivery and a long warranty period go a long way in satisfying consumer. However, essential aspects such as quality, longevity, reliability, cost of spares, maintenance cost and the reputation of the brand are often ignored, leading to discomfort in the future.

At Bajaj Electricals, we understand the need of the hour and provide innovative and smart lighting solutions to cater to customer requirements in order to change their perspective towards long lasting quality, reliability and cost of ownership.

Quality One (Q1) has always been our motto and 'Inspiring Trust' is our ideology. Keeping this in mind, we deliver only the best quality products and solutions.



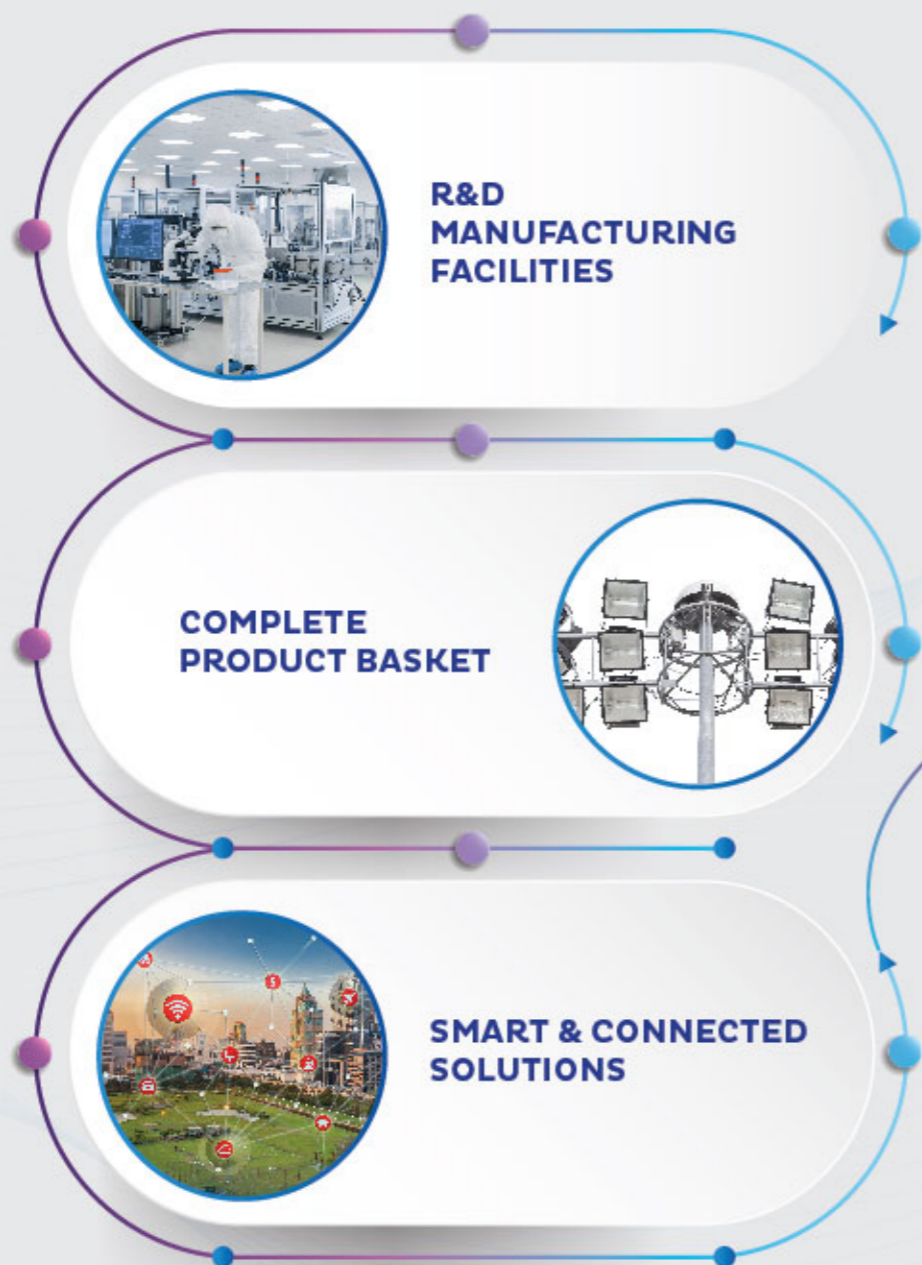
“ OUR PERSPECTIVE ON CATEGORIZING EVERY NEED OF OUR CUSTOMER ”



“ ADOPTING THE Q1 MOTTO HELPS CONVERT CONSUMER PAINS TO CONSUMER GAINS ”

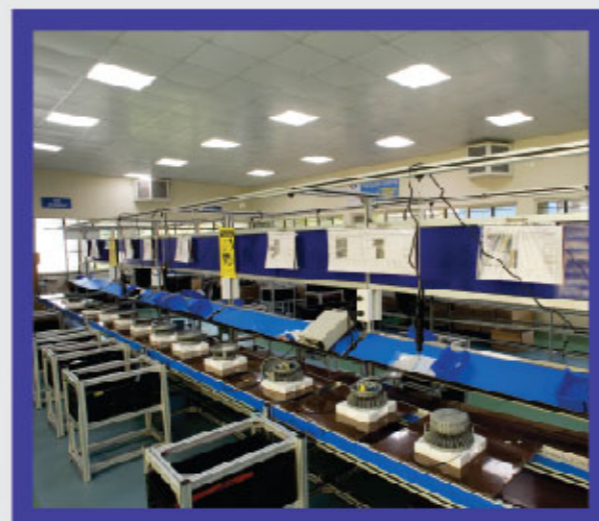


# “ BAJAJ ILLUMINATION - CONCEPT TO CARE ”



# “ OUR STATE-OF-THE-ART MANUFACTURING FACILITIES ”

Our certifications and futuristic manufacturing facilities are a testament to our commitment in developing products of the highest standard. Each product is carefully crafted to set benchmarks in the industry and deliver a high level of performance.



# “ ABOUT THE MANUFACTURING FACILITY ”

Bajaj Electricals Limited has a world-class manufacturing facility in Ranjangaon about 55 km from Pune, Maharashtra. This plant covers an area of 67840 sq. m. and has the manufacturing capacity of 40000 MT per year. With a well-engineered layout, the plant is equipped to manufacture transmission line towers, monopoles, high masts, octagonal poles, conical poles and other fabricated structures.

The Ranjangaon manufacturing unit has been specifically designed with the best machineries and systems from around the world. Few salient features of the plant are provided below:

- 1000 Ton 12 m long Press Brake from LVD, Belgium
- CNC Profile Cutting machine from MESSER, Germany
- CNC Submerged Arc Welding machines from BODE, UK
- CNC Angle Punching and Shearing machines from FICEP, Italy
- Remote radio controlled Hot Dip galvanizing plant from GIMECO, Italy
- Vacuum Plate lifting machine from Allen Wheeler, UK

Also, the unit is equipped with remotely controlled 13 m long galvanising bath, mast straightening machines and more. These advanced technologies and the internal team of experts come together to ensure quality-driven processes at every step.

With a state-of-the-art manufacturing facility, Bajaj is equipped to deliver the best possible services to its clients. The plant is certified to meet stringent quality standards: ISO 14001, ISO 9001 and ISO 45001.



“ **NABL ACCREDITED  
PHOTOMETRIC LABORATORY** ”



“ **OUR FUTURISTIC R&D CENTRE  
AB SQUARE** ”





# “ ALWAYS AT YOUR SERVICE ”

Our highly trained service engineers ensure you have a hassle-free experience. Our spare parts are available at over 20 Bajaj Electricals warehouses across India. In addition, our 24x7 service registration facility through the mobile app and dealer extranet gives more power in your hands.

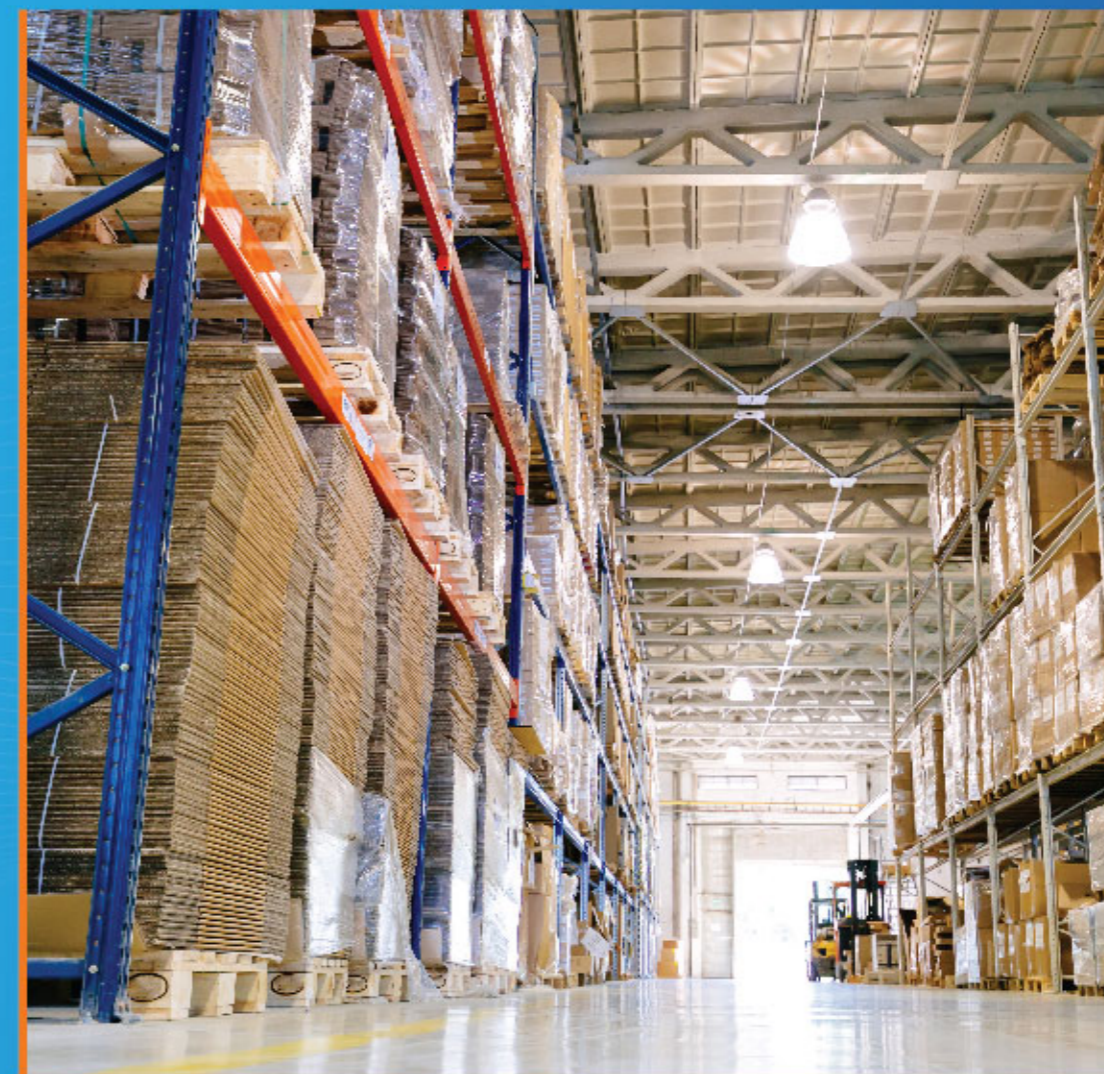
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10:00 AM to 7:00 PM (MON - SAT)

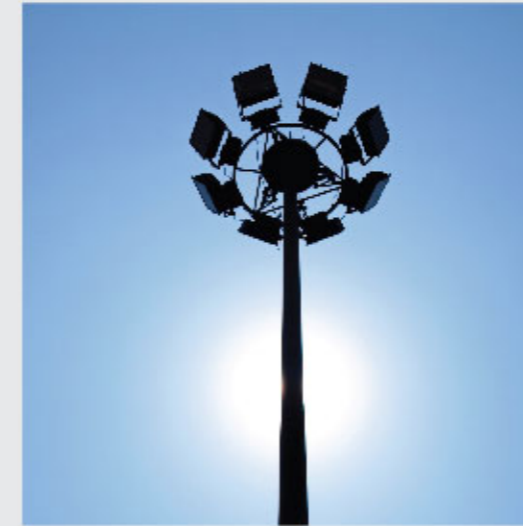


# “ STACKED FOR GREATER EFFICIENCY ”

The systematic storage facility at our warehouse enables us to use space optimally and ensures that the stock is easily accessible when needed. It creates an efficient working environment and eliminates any bottlenecks in the flow of the stock.



## FACILITIES OFFERED AT GLANCE



### WHY BEL HIGHMASTS AND POLES ARE PREFERRED?

BEL has been a pioneer in the field of high-mast lighting for over 30 years. It has unmatched experience in illumination, structural lighting, luminaires product design, development, manufacturing, project management and project execution.



### SALIENT FEATURES

BEL has over 45,000 masts and 8,00,000 street light poles Across India and abroad,

We offer the most economical and optimum design of mast structures due to our high tensile steel. Along with quality operating systems premium performance economical offerings and popularity, BEL caters to ovary budget.

In addition BEL has all facilities such as manufacturing of high mast, luminaires and in-house illumination, structural lighting and a luminaires product design cell.

BEL has been in the industry for over 30 years and in the high mast business for over 30 years, We have an extensive network of 20 branches across the country. Our dedicated managers and engineers are always ready to reach out to customers 24x7.

We also have a dedicated plant for CNC-controlled plasma shoot cutting, bending and fully-automatic submerged arc welding for longitudinal joints and galvanisation.

We purchase Zinc and High-Tensile Steel directly from manufacturers for quarantine and consistent physical and chemical properties.

BEL also offers Wind Tunnel Testing for force coefficient.

All structural calculations are vetted through IIT-Bombay, IT-Channel, EIL CPWD, PWD, NTPC PGCIL, IRS, and various other consultants and ielts Our structural program is validated by testing full sized masts at Jyoti and SERC.

We type test winches in consultation with IIT-Bombay.

Our user-friendly operating system is extremely simple and comes with a docking arrangement for carriages.



### OPERATING SYSTEMS FOR EVERY BUDGET

In order to provide quality products, we look into the customer budgets and study feedback from various clients. Only then, have we designed and developed the following operating systems.

Premium System | Performance System | Popular System | Economic System



### BEL HAS IN-HOUSE FACILITIES FOR ILLUMINATION DESIGN

BEL has a team of well-qualified, informed and experienced illumination design engineers who prepare the designs with the help of the best available software.

BEL illumination design engineers are equipped to offer optimum designs for all lighting applications like stadiums, traffic junctions, airports, sea ports, container yards, railway marshalling yards, etc. Several lighting projects conforming to Indian/International standards, have been designed and successfully executed.



### CIVIL/STRUCTURE DESIGN

BEL has an in-house set up for structural and foundation design for the masts. Designs generally conform to ILE TR No. 7 and IS 875 part 3, or other international standards specified by clients. Masts conforming to various terrains, wind zones and heights have been designed by BEL over these years for installations in India and abroad. BEL has designed, manufactured and installed masts of heights up to 72m and for special applications and structures for signages etc.



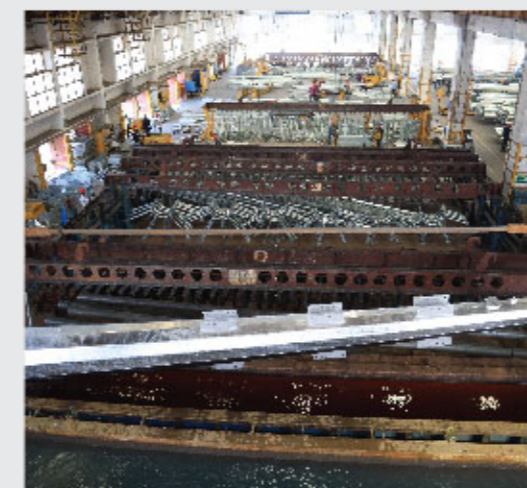
### MECHANICAL DESIGN

BEL has an in-house team of engineers with latest solid modeling software to design the complete raising/lowering system and special application products to cater to customer-specific requirements.



### ELECTRICAL SYSTEM DESIGN

BEL has an in-house team of engineers for design of outdoor and indoor distribution for plant electrification, outdoor illumination, industrial plant illumination projects to cater to the customer requirements. We have successfully executed many projects for reputed customers in India.



### MANUFACTURE, QUALITY CONTROL, RAW MATERIAL AND OTHERS

Bajaj Electricals' manufacturing plant is one of the best in the world and is fully equipped with all state-of-the-art CNC-controlled machineries for consistent and accurate fabrication.

With these facilities, BEL is capable of manufacturing high masts conforming to international standards and as per the requirement of the user.

High tensile steel and zinc is purchased from the manufacturers for guaranteed physical and chemical properties.

In-house mechanical and chemical testing facilities and trained QA engineers ensure quality of all inbound materials as well as items manufactured at plant.

Trained safety engineers ensure safety for the workmen in the factory and provide guidelines for the site execution. The plant is ISO 9001 and 14001 and ISO 45001 certified.

## RAISING AND LOWERING WINCH LIGHTING MASTS



### INTRODUCTION

BEL has been a supplier of high-quality masts for more than 30 years, offering the best solutions for external illumination requirements.

These masts are capable of accommodating any lighting system and are also ideal for mounting CCTV cameras and RF equipment's. BEL's manufacturing facility is one of the best in the world, one that offers masts of all types and capacities, suiting the customers' requirements.

In order to offer quality products and to meet the budget of customers, BEL has designed various premium, performance, economy and popular operating systems. In case, price is not a constraint, we propose customers to go for our premium operating system.

### ADVANTAGES

Best space utilisation | Perfect suspension | Maintenance-friendly | Motorised operation | Sleek and aesthetic | Double drum winches

### APPLICATIONS

Airports and sea ports | Railway sidings and yards | Car parks and junctions | Highways and expressways | Industrial floodlighting | Top security zones | Switchyards | Special applications | Sports arenas and stadiums

### DESIGN

Masts are designed as per PLG7 of ILP UK, SABS0225, wind velocity as per IS 875 part 3 in India and as per the relevant local standards in other countries. The method of construction using overlapping joints provides good damping and greatly resists resonance caused by wind-induced oscillations. The mechanical and electrical systems generally conform to the requirement of PLG7.

BEL has successfully conducted wind tunnel testing for the mast specimen to arrive at correct force co-efficient at Wichita State University, Kansas, USA.

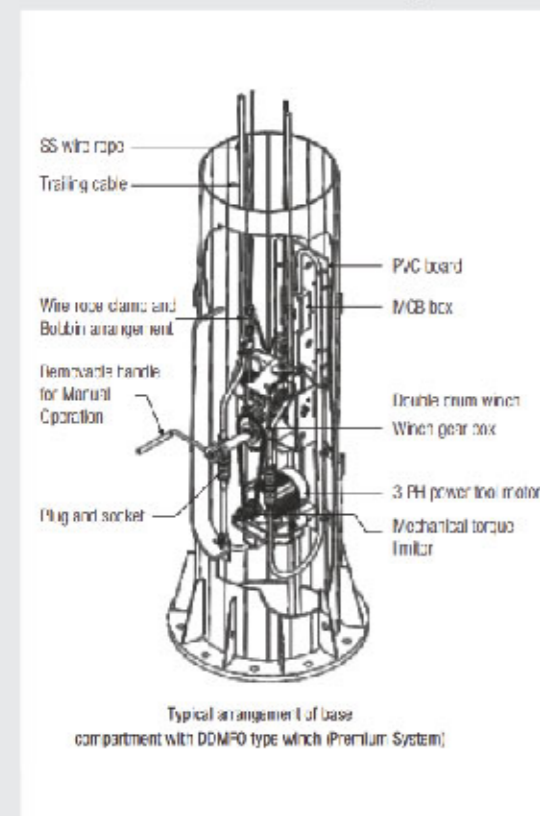
## MAST CONSTRUCTION

The high mast shaft is of polygonal shape and has continuously tapered sections with dimensions and thickness. These are as required in the design made from high tensile steel conforming to BSEN 10025 grade S350/ IS 2062 grade E250. The plate is plasma-cut, folded to give the desired polygonal shape and welded along the longitudinal seams. BEL section lengths are typically designed and are such that transverse welding is not required.

The plate is plasma-cut, folded to give the desired polygonal shape and welded along the longitudinal seams, as per the requirements of standard through renowned third party agency. The partial penetration welds done through GMAW and SAW are proven over a period of time in masts of all heights and for all applications.

The taper-fit friction joints are assembled on-site, with equipment that are usually available at construction sites. The site fabrication work is not required during assembly. The overlap required is 1.5 times the diameter at the joint.

The edge of the door opening is reinforced to guard against buckling and is provided with a vandal resistant locking device. The shaft is attached to the flange using full strength but welds with supplementary gussets provided between bolt holes. All steel work is generally galvanised to BSEN ISO 1461 or other standards agreed in Contract.



## MAST HEAD ASSEMBLY

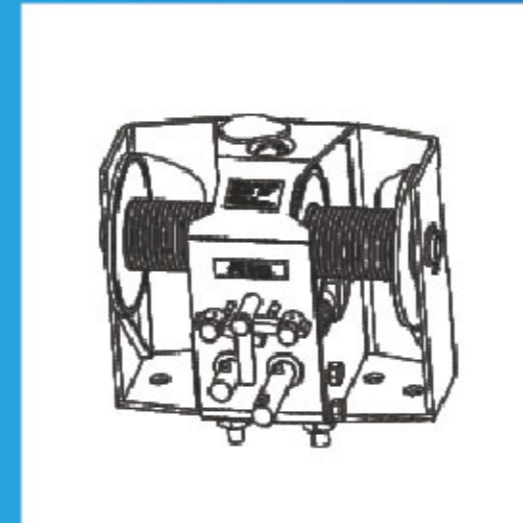
The mast head assembly is fitted with a three-six pulley system which can accommodate wire ropes and electric cables, as per requirements. The pulley is made from non-corrodible material and it runs on a self-lubricating bush bearing. This bearing is made with a stainless steel spindle of a diameter appropriate for wire ropes and multi-core flexible cables. Arrangement is provided to separate electric cables and steel wire ropes, and also to prevent ropes and cables leaving the pulley's grooves.

Pulleys are housed in a chassis, integral with a sleeve, which slips over the top of the mast and is secured axially and in azimuth. Guides and stops are provided for docking the luminary carriage. The complete assembly is hot-dipped galvanised after fabrication. The pulley assembly is protected with a weatherproof hot-dipped galvanised canopy.

Depending on the requirement, we can provide 3 ropes and cables. We can also provide pulley arrangement for special application.

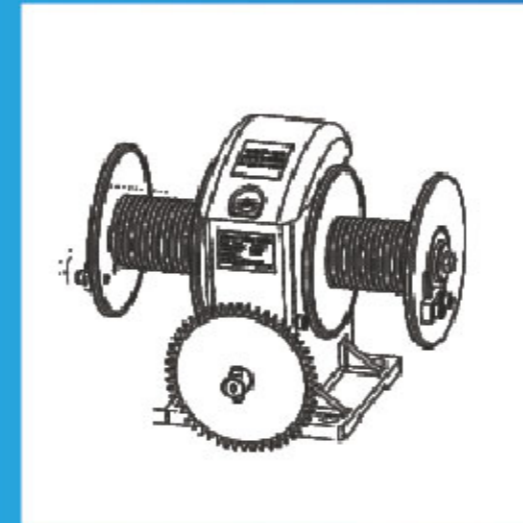
## LUMINAIRES CARRIAGES

The luminares carriage is fabricated from ERW steel pipes designed to act as an electric conduit with holes for cable entry. It is fitted with junction box mounting bracket(s) and is in two halves joined by bolted flanges to permit removal from an erected mast. Luminaires fixing arms and plates are welded to the carriage. Carriage is fitted with buffer arrangements to prevent damage to the mast finish during movement. Rollers or other moving parts are not required.



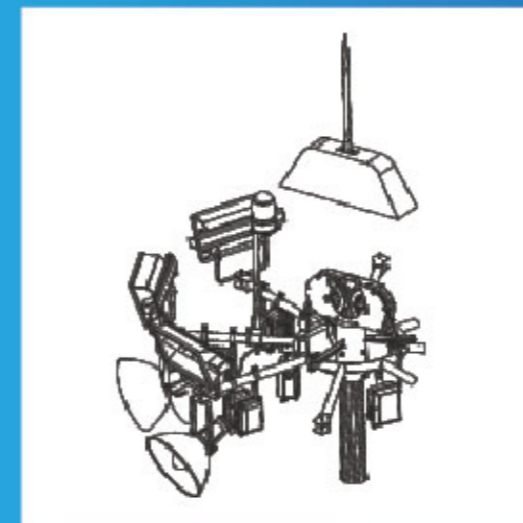
## WINCHES

Winches are completely self-sustaining, self-lubricating by means of oil bath, grooved double drum with a gear ratio of 53:1. Single gear and double gear design of winches are available in BEL range. Winches can be operated by a motor or manually. Power tools for operating the winch are available in integral or common versions. BEL winches have been rigorously type-tested based on the relevant standards under the guidance and presence of experts from Indian Institute of Technology, Bombay.



## SUSPENSION SYSTEM

Suspension wires are stainless steel grade 316/304 of 7/19 (6/19 WSC) construction and are provided with stainless steel thimble and terminals. Normal suspension systems come with two continuous wire ropes without any intermediate joints. Suspension systems supplied by BEL are properly designed with suitable clamps to prevent entangling of wire ropes and cables. This unique arrangement increases the life of the wire ropes and cables. Other types of suspension systems are also offered against specific requirements.



## ELECTRICAL SYSTEM

Multi-core flexible power cables are provided for power supply. Cables come with EPR insulation, PCP sheathing and cotton braiding to get the required strength and flexibility. PVC insulated and PVC sheathed cables are also supplied in economy and popular systems. These cables terminate in the base compartment through specially designed metal clad plugs and sockets. At the masthead, cables are connected to weatherproof cast aluminium/HDG junction box on the luminaires carriage.

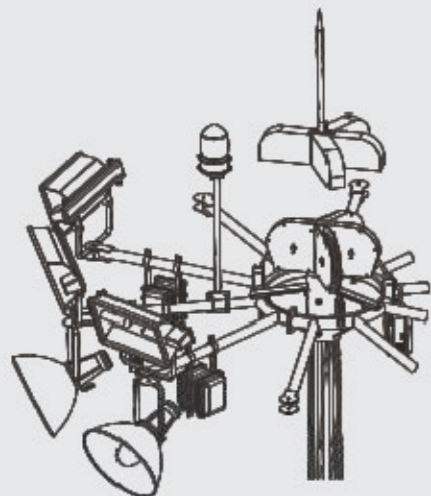
Junction box on the luminaires carriage. The power cables are factory-cut for ease of installation. A box is provided inside the base compartment of the mast for local MCB isolation of the power supply. Masts shall have facility for testing the luminaires at the bottom level for premium operating system (this facility is not provided for masts located in hazardous area). Masts in hazardous areas are with a flame-proof plug socket unit at the bottom.

## EARTH POINT AND LIGHTNING FINIAL

A 12mm diameter GI bolt is provided on the door stiffener in the base compartment as earth point. All standard masts are provided with a single spike lightning finial on the head frame at the topmost point. The mast body acts as conductor and earth strip is connected to the mast door stiffener.

## FOUNDATION BOLT SET

Foundation bolt set comprises of an anchor plate with high tensile studs. Mechanical properties of the studs are given in the data sheet. As foundation bolts are very important in the structural safety of the system, BEL supplies these bolts as part of the total system. Exposed portion of the stud/nuts and washers are hot-dipped galvanised to increase resistance against corrosion.



## FEEDER PILLAR / ENERGY SAVING PANEL / SCADA CONTROL (OPTIONAL)

Various options are available in feeder pillar for operation of luminaires depending on customer requirement for automatic switching of the luminaires in one, two or three groups through analogue, electronic or astronomical time switch. Another option is to provide energy saving panel with or without SCADA control. Feeder pillar will have reversing starter for raising and lowering application. For hazardous areas, flame-proof feeder pillars are to be used.



## MAINTENANCE CAGE (OPTIONAL)

Hot-dipped galvanised maintenance cage is designed to carry two persons with maintenance equipment to perform maintenance at masthead or for painting the mast for special applications. Suspension ropes have safety factor of more than 10 (supply of maintenance cage is against separate order only).

## STANDARD MAST DIMENSIONS

High Mast Code	High Mast Height (m)	Mast Details			Anchor Bolt Details		Luminaire Capacity (nos.)					
		Top A/F (mm)	bottom A/F (mm)	Plate Thickness (mm)	PCD (mm)	Dia. x Length (mm)	Nos	55m/s	50m/s	47m/s	44m/s	39m/s
BHMRL11A	11	100	310	3	385	M24x850	4	4	4	4	4	4
BHMRL12A	12	100	310	3	385	M24x850	4	4	4	4	4	4
BHMRL12.5A	12.5	100	310	3,3	385	M24x850	4	4	4	4	4	4
BHMRL12.5B	12.5	100	360	3,3	445	M24x850	4	12	12	12	12	12
BHMRL16A	16	150	360	3,3	445	M24x850	6	12	16	16	16	16
BHMRL16C	16	150	410	3,3	490	M30x850	8	16	16	16	16	16
BHMRL16D	16	150	410	3,4	490	M30x850	8	16	16	16	16	16
BHMRL16E	16	150	460	3,4	590	M30x850	8	16	16	16	16	16
BHMRL20A	20	150	360	3,3	445	M24x850	6	-	-	-	12	16
BHMRL20C	20	150	410	3,3	490	M30x850	8	-	12	16	16	16
BHMRL20D	20	150	410	3,4	490	M30x850	8	16	16	16	16	16
BHMRL20F	20	150	460	3,4	590	M30x850	8	16	16	16	16	16
BHMRL25A	25	150	460	3,4,4	590	M30x850	12	12	18	20	24	24
BHMRL25D	25	150	540	3,4,5	650	M30x850	12	24	24	24	24	24
BHMRL30A	30	150	460	3,4,5	590	M30x850	12	-	8	10	12	20
BHMRL30B	30	150	540	3,4,5	650	M30x850	12	-	20	20	20	20
BHMRL30C	30	150	540	4,4,5	650	M30x850	12	12	20	20	20	24
BHMRL30F	30	150	610	3,4,5	740	M30x850	12	-	24	24	24	24
BHMRL30G	30	150	610	4,4,5	740	M30x850	12	-	24	24	24	24

List gives only the details of few standard masts for guidance. BEL has designed mast of height more than 60m with various combinations of luminaires and wind speeds for Indian and international market. BEL ensures that it provides the most economical solution, for each of your requirements.

\*Use with anchor plate of appropriate dimensions. Exposed nuts, washers and portion of the bolt is galvanised.

\*This is with our BJFL 350W LED luminaires in symmetrical arrangement and the maximum capacity for regular loading, and for a design life of 25 years. Suitable operating system to be used depending on number of luminaires.

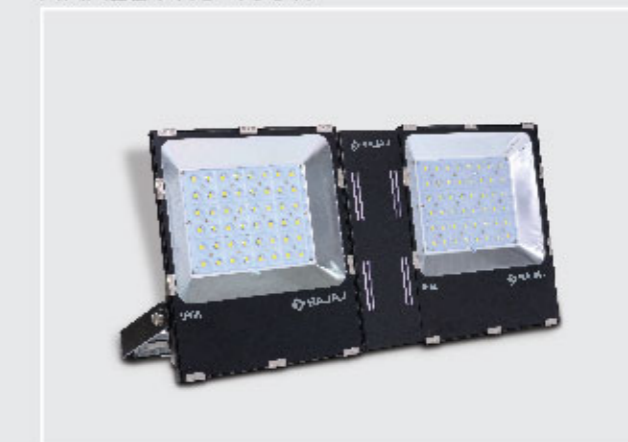
### LUMINAIRES FOR HIGHMAST

Following are the most frequently used Bajaj Luminaires on highmasts.

AMAZE PREMIUM 800W - 1000W



AMAZE PRO 400W



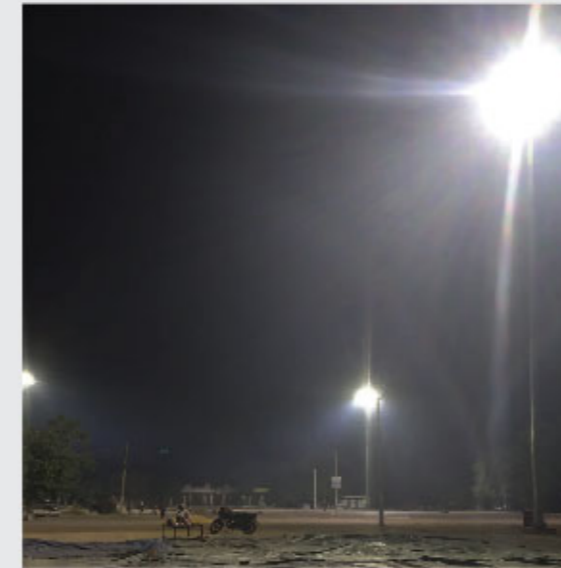
AMAZE PLUS 400W - 500W



Amaze 180W - 200W



## LATCHING HIGH MAST



Our latching raising and lowering system is the new addition in the Bajaj High Mast operating system. In this system, the luminaire carriage is latched to the head frame, thus enabling the release of the load on the wire ropes during the static period as opposed to the tension system where the ropes always remain in tension.

Bajaj High Mast Latching system comprises of head arrangement, luminaire carriage, guiding system and wire ropes.

The luminaire carriage, prefabricated out of MS sections or pipes in two sections facilitates the installation of the carriage after the erection of the Mast, finished with hot dipped galvanization. The carriage on the other hand is fabricated with suitable number of arms to mount the required luminaires.

Three latching pins are then fixed at the top of the luminaire carriage at equal distance. These can further be moved along the latching barrels to fix the luminaire carriage with the head frame. These pins can be rotated independently, are spring loaded and wire ropes can pass through them towards the end termination. There are indicators on all three latching pins to indicate the correct latching of the luminaire carriage. Each latching pin can support the weight of the entire luminaire carriage.

Connected to the bottom of the luminaire carriage, the rollers made of PVC or nylon guide the movement of the luminaire carriage along the high mast shaft while raising and lowering.

While the latching head frame system has been designed to take the load off the wire ropes once the luminaire carriage is latched on to the head frame. This system ensures the lateral movement of the luminaire carriage and is considerably arrested.

The latching head frame fabricated out of MS sections and finished with hot dipped galvanization protects it from environmental factors. The head frame house pulleys, made of non-corrosive aluminium alloy, gunmetal bush bearing, and stainless-steel shaft keeps the pulley operation free from maintenance for a long time. These pulleys have a diameter large enough to accommodate stainless steel wires and trailing cables.

The bottom of the head frame has three latching barrels through which the latching pins from the luminaire carriage move and latch. The cam profiles built in these barrels guide the movement of the latching pins. Once the latching pins are fixed in these barrels, the load is taken off the wire ropes.

The stainless-steel wire ropes are 7/19 in construction with the core being in the same grade of material, diameter and breaking load as per the load.

One end of the rope with the drum is constructed with copper talurit and the other end with stainless steel thimble and stainless steel bulldogs grip which are terminated at a transmission plate through which three ropes are taken through the three pulleys each on the head frame and are terminated at latching carriage with stainless steel thimble and stainless steel bulldog grips.

The rest of the items like the winch, the motor, the stainless-steel wire ropes and the hardware remain the same.



## MASTS FOR SPECIAL APPLICATIONS

BEL has designed masts for the installation of Flags, Panoramic applications, Umbrellas, Lighting and Lightning, Lighting and Advertising, and Raising and Lowering systems.

BEL has also designed, supplied, erected and commissioned India's tallest flag mast at 82m, and the largest flag (105x70 ft.) at various locations.

Umbrella masts come with fixed or raising and lowering system, that are designed and supplied to NHAI, JNS, Municipalities, with GRP or steel canopy. It is appropriate to have a GRP Umbrella in view of its aesthetics.

In addition, BEL has designed special masts to provide illumination and lightening protection for switchyards where illumination is provided at intermediate height. This aims to facilitate easy maintenance, save space and also, enhance the aesthetics of the installation.

Furthermore, BEL also has masts for illumination and advertising which can be used in city junctions, dividers, open areas, public, places, etc.

Another application of BEL's masts come in road lighting with decorative carriages/brackets. While providing uniform illumination during the night, these masts elevate the aesthetics during the day time as well. In this direction, BEL has executed a project for CIDCO as well as Surat Municipal Corporation.



## FIXED HEAD MASTS FOR SPORTS LIGHTING

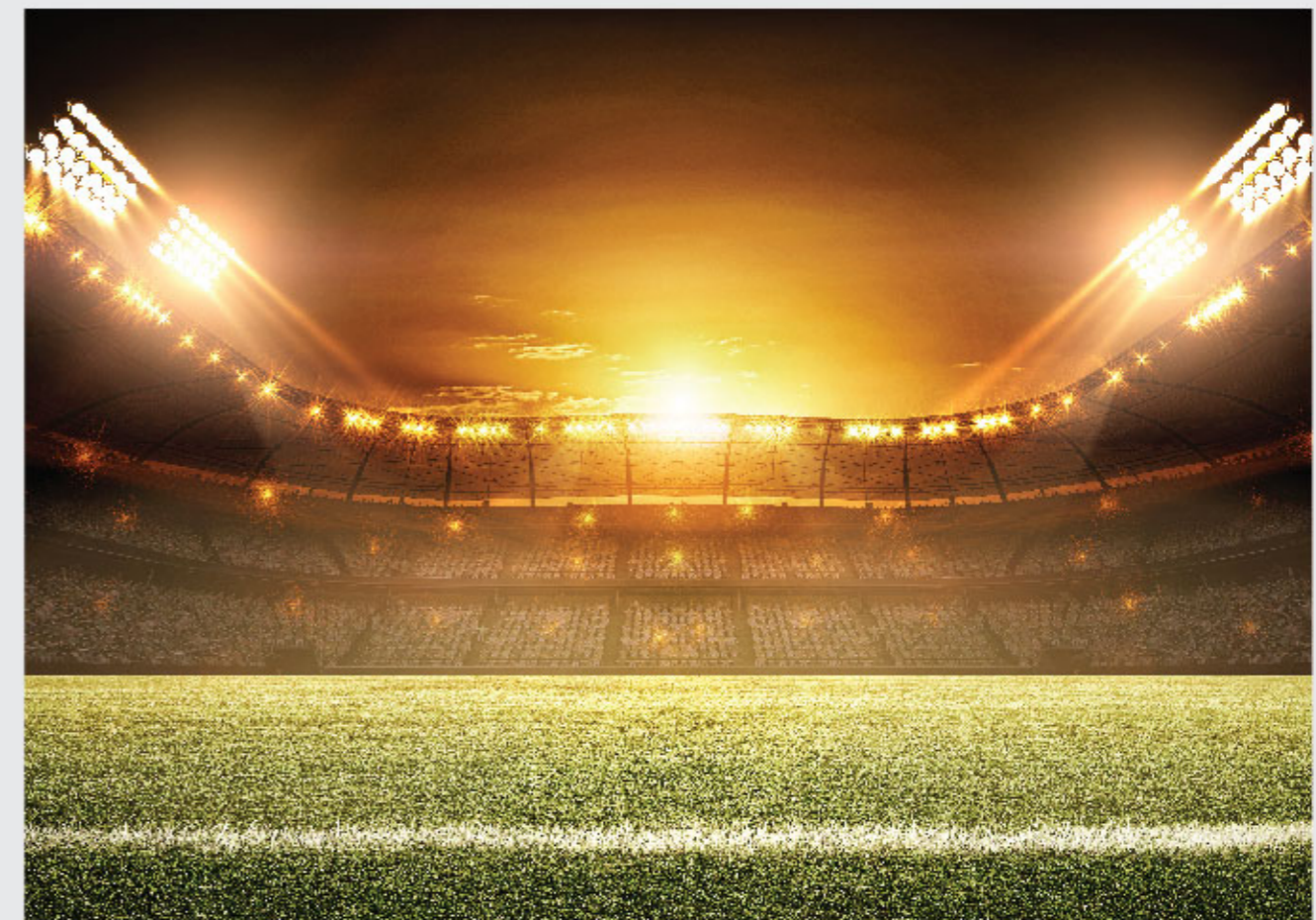
### STADIUM LIGHTING

Technological advancements have changed the way of life in the sports arena as well. Matches are being played during the night, with the same ease as during the day. Efficient floodlighting has made this possible.

Fixed head polygonal masts are the ideal means to illuminate stadiums, as per international standards. These masts are normally manufactured in the polygonal tapered sections and assembled on-site. The top platform and the masts are designed to carry required number of floodlight luminaires.

BEL is the market leader in India, having illuminated more than 100 indoor and outdoor stadiums, lighting them with fixed head polygonal structures. With all in-house facilities for lighting design, structural design, manufacturing and installation, BEL offers floodlighting solutions for all sports activities.

BEL has executed sports lighting work in Mumbai, Delhi, Chandigarh, Hyderabad, Jaipur, Ranchi, Guwahati, Kanpur, Bangalore, Chennai, Dubai, Ras-al-Khaima (UAE), Hatta (UAE), Seeb in Mascut, Football stadium in Mauritius, Belize-South America, among many more locations.



## SIGNAGE MASTS AND MID-HINGED LIGHTING MASTS

### SIGNAGE MASTS

Utility of raising and lowering winch masts in advertising was also introduced in the Indian market by BEL. This innovative idea, mooted by BEL gathered momentum very fast.

Today, all petroleum companies like IOCL, BPCL and HPCL use these masts as their main medium for advertising on highways and other strategic outlets.

### MID-HINGED TYPE MASTS

These masts are fitted with a heavy duty hinging arrangement at the middle. The luminaires mounted at the top can be lowered down using this hinge for installation/maintenance.

Mid-hinged masts have a jacket extending from the middle to the bottom. The operator can tie a rope at the end of this jacket and raise/lower the luminaires. These masts can be operated manually by a single operator. Due to operational limitations, these masts are normally designed to accommodate up to four/six/eight luminaires only.

Mid-hinged masts are suitable for illuminating open areas, parks, high ways, car parking, etc.



## ROAD SIGNAGE AND HOARDING



BEL was the first to introduce innovative polygonal hot-dipped galvanised road signage structures for MMRDA in Mumbai. Since then, similar projects have been executed for various clients in India. BEL has also executed jobs for PWD, Delhi, CPWD Patna, RSVY in Gaya and Patna circle for various sign boards, gantries and cantilevers as per their specifications with painted pipe and angle structures.

In-house state-of-the-art manufacturing facilities with hot-dipped galvanised polygonal structures and advanced sign-shops at Chaman, ensure the highest quality of products.

### THE UNIQUE FEATURES

- In-house civil, structural and graphic designing
- State-of-the-art manufacturing facilities
- State-of-the-art sign shop
- Full-fledged marketing, project management and execution team
- After-sales service



Hot-dip galvanised polygonal hoarding structures are extensively used in developed countries. BEL has supplied these structures to some customers in India. The unique advantage is that it doesn't require any maintenance due to hot-dipped galvanisation apart from aesthetics. Moreover, as it is mounted on the foundation using bolts and has a modular design, it is very easy to relocate.



## TUNNEL LIGHTING DESIGN, ENGINEERING AND EXECUTION



Tunnel lighting is a complex and specialised job. Visual comfort of the vehicle drivers is the most important aspect of tunnel lighting. This is due to the fact that at daytime, the levels of lighting on the exterior road surface is very high, whereas the interior of a tunnel is very dark. Human visual system is unable to adapt to such high differences in lighting levels, that too, in a short time span. This, in turn, creates a 'black hole' effect, i.e. a temporary blindness, for drivers while approaching a tunnel in daytime. This further leads to accidents and hazards. A similar phenomenon occurs while exiting a tunnel towards bright exteriors. Thus, lighting systems of a tunnel are always suitably designed to counter these situations.



The CIE guideline (CIE 88:2004) states the methodology for calculating the lighting level of the tunnel according to the environmental lighting conditions, driving speed, etc. Each tunnel is divided into four major lighting zones according to length, viz. threshold, transition, interior and exit zones. Each zone has different and gradually changing lighting level to provide a comfortable and smooth visual transition from brighter to darker zone and vice-versa.

During night time, the problem of such high levels of visual adaptation does not occur, which is why, the lighting requirements also change completely. At night, there should also be uniform lighting levels throughout the tunnel that match with the external road lighting.



Therefore, a suitable switching system is designed for each tunnel based on the photo-sensor and timer controllers. This system adjusts the lighting levels during various times of the day and different environmental conditions, by dimming or switching appropriate circuits.

Corrosive atmosphere is common in tunnels, hence, selecting appropriate materials is important. Furthermore, a tunnel is a place where maintenance accessibility is limited. The entire system is designed keeping these in mind. BEL has an in-house design, engineering and execution cell to execute such a complex job with perfection and reliability. BEL has already completed APLR twin tunnels in Mumbai and a total of 8 tunnels on Jammu-Udhampur section of National Highway.

## STREET FURNITURE



BEL's hot-dipped galvanised smart polygonal and conical poles are in use for illumination, power transmission and distribution, signalling, etc., for various prestigious installations in India and abroad, for the last 18 years. Poles are supplied with regular or ornamental brackets and customised attachments depending on the application and specific requirement of the customers. The poles are designed as per BSEN 40-3-3:2003 to withstand the maximum wind speed as per IS 875 or as specified by client, whichever is higher, for the actual loading of the fixtures.

The pole shaft shall have polygonal (octagonal, hexagonal or as required) or conical section, continuously tapered with one longitudinal submerged arc welding. Each shaft will be provided with base plate, fillet-welded from inside and outside. The shaft is constructed from high tensile steel having minimum yield strength of 355 N/sq.mm conforming to BSEN 10025, base flange as per IS 2062 and entire structure galvanised as per BS EN ISO 1461 through single dip process.

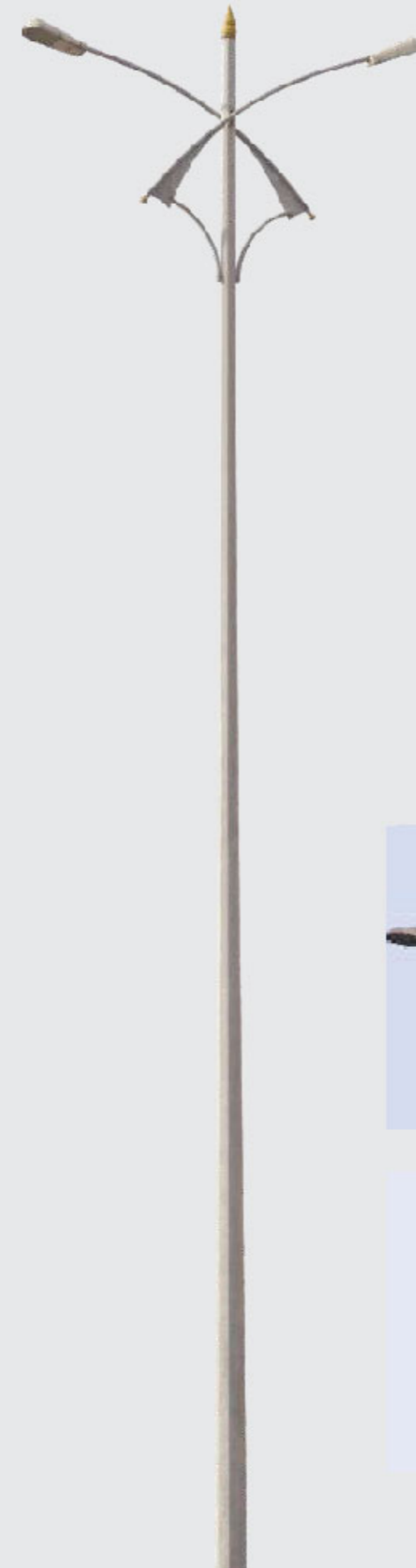
Wherever required, each pole is provided with door at a height of 500mm from bottom or at a higher height as required by client to have access for cable termination and control MCB. The door opening is reinforced from inside to guard against buckling. Poles are fixed on precast or cast-in-situ RCC block foundations on studs with nuts and washers. This arrangement facilitates easy relocation of pole along with foundation, if required. The bracket will have a sleeve as cap of suitable diameter to suit with top A/F of pole and the arm length designed as per the illumination design. We can provide decorative brackets galvanised or galvanised and painted to match with ambience of the road for aesthetics. We have a facility to test the pole as per BS EN 40-3-2-2000 part 3-2.

### BEL TURNKEY PROJECT SOLUTION

BEL provides turnkey solutions from concept to commissioning for street lighting, sports lighting, industrial electrification, etc. We have in-house facilities for illumination, civil, structural and system design for above projects. Over a decade, BEL has designed and executed energy efficient projects for various clients across India ensuring optimum utilisation of installation and lower power consumption. BEL provides SCADA controlled panels, which facilitates monitoring of the installation, locating and maintaining the luminaires. Such systems are successfully in operation at PWD Delhi, MADC Nagpur and other locations for several years now.



## DECORATIVE BRACKETS



### STANDARD OCTAGONAL POLES (TECHNICAL DATA SHEET)

Pole Type	Height (m)	Top Dia. (A/F) (mm)	Bottom Dia. (A/F) (mm)	Sheet Thickness (mm)	Base Plate Dimensions (LxBxT) (mm)	Bolt Size (No. x Dia) (mm)	Foundation Bolt		
							Pitch Circle Dia (PCD) (mm)	Bolt Length (mm)	Projected Bolt Length (mm)
BOP-3030	3	70	130	3	200x200x12	4x16 Dia	200	450	80
BOP-4030	4	70	130	3	200x200x12	4x16 Dia	200	450	80
BOP-5030	5	70	130	3	200x200x12	4x16 Dia	200	450	80
BOP-6030	6	70	130	3	200x200x12	4x20 Dia	200	600	100
BOP-7030	7	70	130	3	200x200x12	4x20 Dia	200	600	100
BOP-8030	8	70	130	3	200x200x16	4x20 Dia	200	600	100
BOP-9030	9	70	155	3	250x250x16	4x24 Dia	250	750	125
BOP-9031	9	70	130	3	200x200x16	4x20 Dia	200	600	100
BOP-1030	10	70	175	3	275x275x16	4x24 Dia	275	750	125
BOP-1031	10	70	155	3	250x250x16	4x24 Dia	250	750	125
BOP-1130	11	90	210	3	300x300x16	4x24 Dia	300	750	125
BOP-1230	12	90	240	3	320x320x16	4x24 Dia	320	750	125
BOP-1231	12	90	210	3	300x300x16	4x24 Dia	300	750	125

### STANDARD CONICAL POLES (TECHNICAL DATA SHEET)

Pole Type	Height (m)	Top Dia. (mm)	Bottom (mm)	Sheet Thickness (mm)	Base Plate Dimensions (LxBxT) (mm)	Bolt Size (No. x Dia) (mm)	Foundation Bolt		
							Pitch Circle Dia (PCD) (mm)	Bolt Length (mm)	Projected Bolt Length (mm)
BOP-3030	3	75	107	3	200x200x12	4x16 Dia	200	450	80
BOP-4030	4	75	118	3	200x200x12	4x16 Dia	200	600	80
BOP-5030	5	75	129	3	200x200x12	4x16 Dia	200	600	80
BOP-6030	6	75	140	3	200x200x16	4x20 Dia	210	600	100
BOP-7030	7	75	151	3	250x250x16	4x20 Dia	235	700	100
BOP-8030	8	75	162	3	250x250x16	4x20 Dia	235	750	100
BOP-9030	9	75	173	3	275x275x16	4x24 Dia	270	750	125
BOP-1030	10	75	184	3	275x275x16	4x24 Dia	270	750	125
BOP-1130	11	85	206	3	300x300x16	4x24 Dia	300	750	125
BOP-1131	11	75	195	3	300x300x16	4x24 Dia	300	750	125
BOP-1230	12	96	228	3	320x320x16	4x24 Dia	320	850	125
BOP-1231	12	75	206	3	300x300x16	4x24 Dia	320	750	125





## GLASS FIBRE REINFORCED POLYMER COMPOSITE POLES

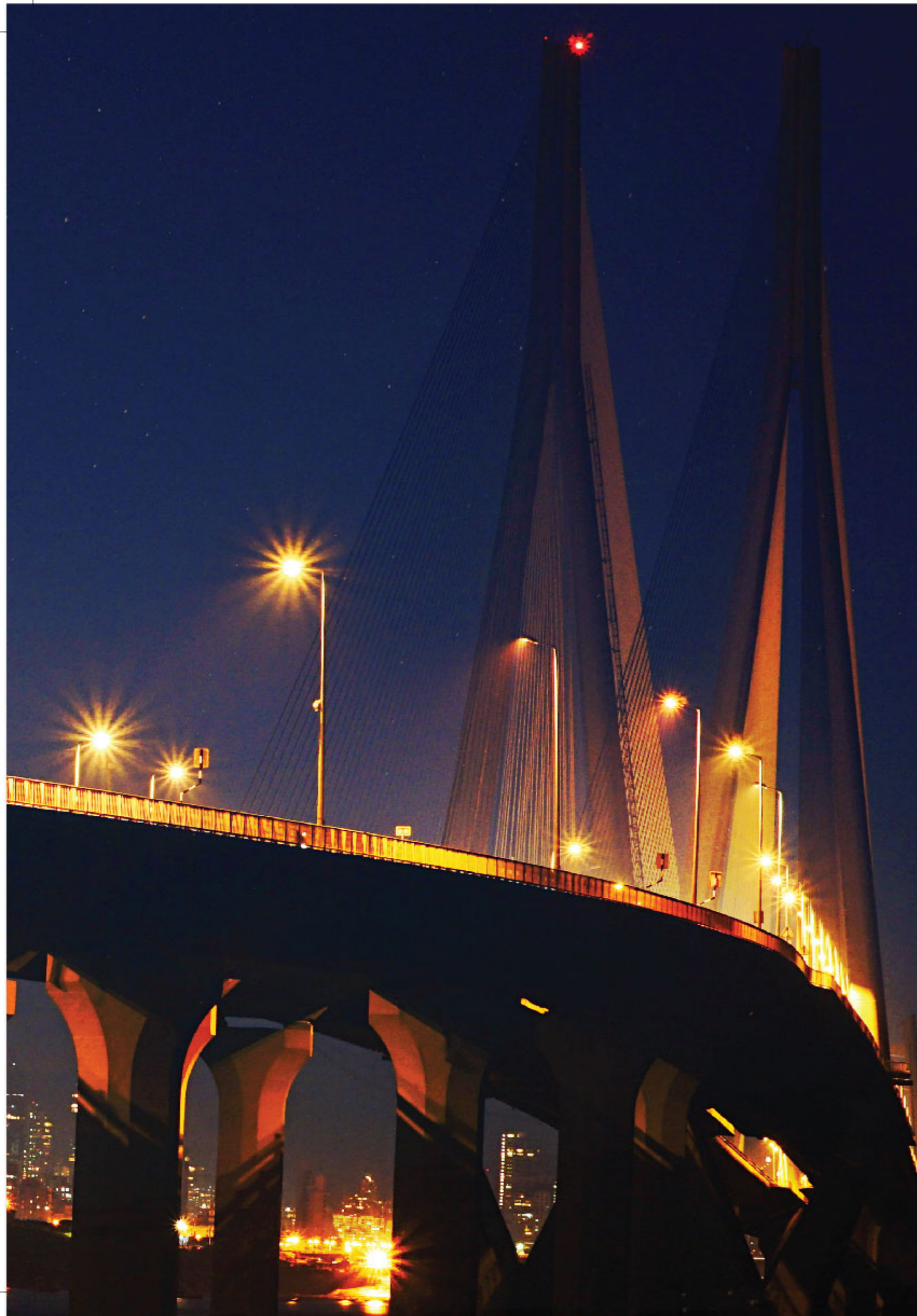


BEL's EPC Segment deals in high masts, poles, transmission line projects, and industrial and rural electrification. BEL is the undisputed leader and a pioneer in the field of high mast lighting systems and lighting poles in India. All activities of EPC BU are ISO:9001 Certified. The manufacturing unit is ISO:14001 and ISO 45001 Certified. BEL got into the high mast business in 1983, in collaboration with CU Lighting Ltd., UK. Initially, complete systems were imported. However, subsequently, technology was transferred to develop and manufacture high mast operating systems in India. BEL set up its in-house facilities in 2001 to design and develop the operating systems for various high mast applications. In order to cater to the needs of architecture and special applications, BEL introduced a decorative range in the market for the following applications:

- Streetscapes
- Parks & Recreation Centres
- Hospitality & Retail
- Industrial & Corrosive Environments, Amusement & Ecological Parks
- IT Campuses & Universities, Government & PSUs (Public Sector Units), Development Authorities
- Heritage & Monuments, Historic Sites

### GRP FOR MULTIPLE SOLUTIONS

Our wide portfolio of decorative products includes GRP (Glass Reinforced Polymer) Poles, Polysteel Lamp Posts, Gazebos, Benches as well as Cast Iron & Decorative Poles offering landscaping solutions. Our fully-trained and experienced team is available across the country for installations. They use the latest technology to come up with superior, environment-friendly solutions.



# GLASS FIBRE REINFORCED POLYMER STREET LIGHTING POLES

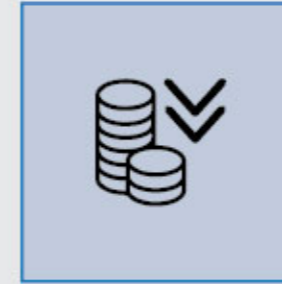
Aesthetically pleasing GRP poles are manufactured from polyester or epoxy resin systems and fibreglass woven rovings. They are manufactured through helical winding or centrifugal casting processes, depending on the application and load. GRP poles are designed to withstand wind load as per IS 875 Part-3 and are available in heights from 3-12 mtrs. GRP poles, with their features and benefits, have many applications that help meet Smart City requirements, promote LED and solar street lighting, etc.

## KEY APPLICATIONS

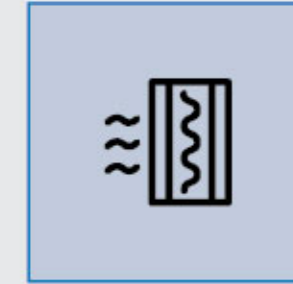
- Street lighting for roads, highways and in areas prone to corrosion
- Landscaping & Housing
- Solar Applications
- Smart City



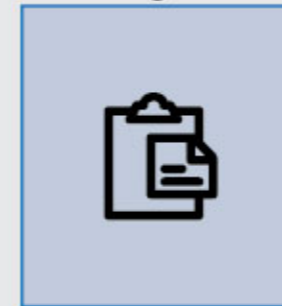
# GLASS FIBRE REINFORCED POLYMER POLES



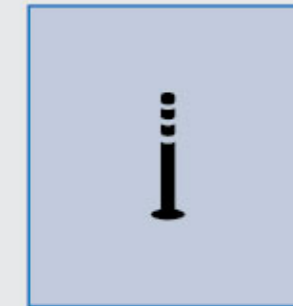
**Lightweight and Cost-Effective** - The lightweight nature of these poles saves the handling, transportation and erection costs during distribution and installation



**Non-Conductive** - The property of electrical insulation of the material helps prevent accidental electrocution by faulty wiring



**Variants** - Generally available in two variants



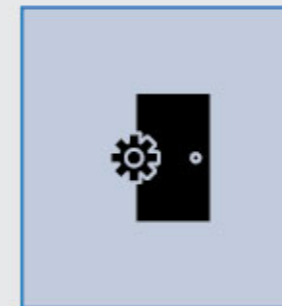
**Direct Burial Type** - This pole will be directly embedded in the ground without any foundation bolts. However, concrete filling is done to ensure that the pole is sturdy and steady



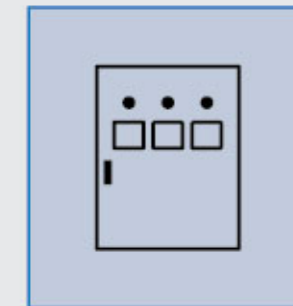
**Non-Corrosive** - Corrosion resistance in salty climate or alkaline/acidic soil conditions, above and below the ground



**High Strength** - Glass fibres are stronger than steel. GFRP materials gain their strength when fibres are set within a resin matrix. Fibres carry the load while the resin spreads the load imposed on the GFRP composite



**Service Door** - Moulded GRP door is provided at a suitable height to give access to cable termination in the base compartment



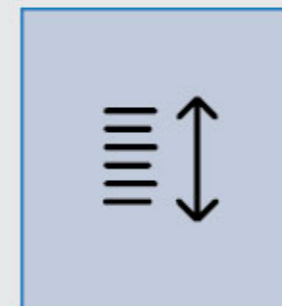
**Pole Accessories** - Junction boxes (internal or external) and brackets (single arm or double arm with length of 500mm/1000mm/1500mm as standard)



**Low Maintenance** - Non-corrosiveness and the ability to be pre-pigmented reduces overall maintenance cost



**Impact Resistance** - GRP poles have the inherent property of absorbing high-impact energy, thus, minimising probabilities of personal injury and vehicular damage, in case of road accidents



**Typical Height** - 3-12 mtrs.

**LIGHTWEIGHT**



**LESS SPACE FOR STORAGE**



**EASY TO HANDLE**



**LOW TRANSPORTATION COST**



**ROBUST FOUNDATION**



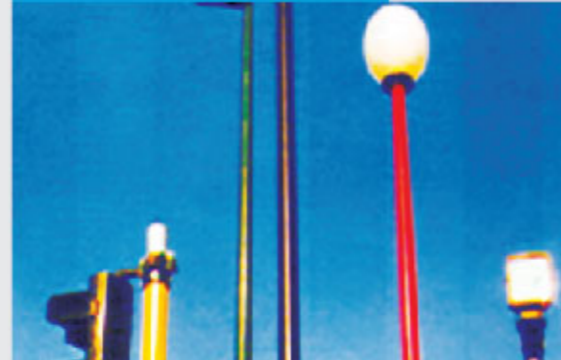
**PERFECT FOR STREET LIGHTING**



**GLASS FIBRE REINFORCED POLYMER**



**AESTHETICALLY PLEASING**



**Cylindrical**  
3-6 MTRS.



**Conical**  
3-12 MTRS.

**TYPES OF POLES**

BAJAJ GRP poles are available for various applications and come in various shapes and lengths.

- Cylindrical
- Conical



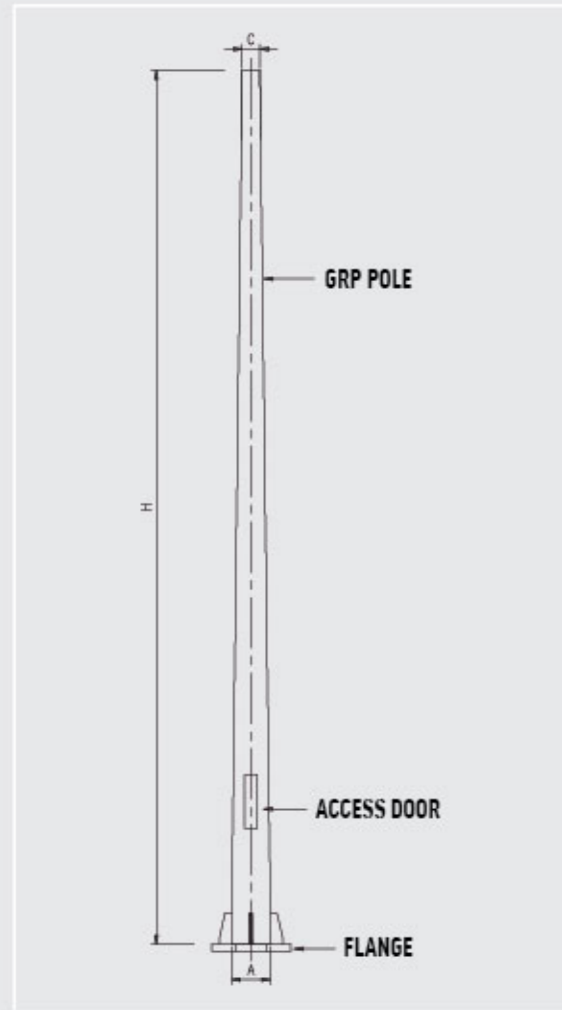
**COLOURS**

BAJAJ GRP poles are available in a wide range of aesthetically pleasing colour options.

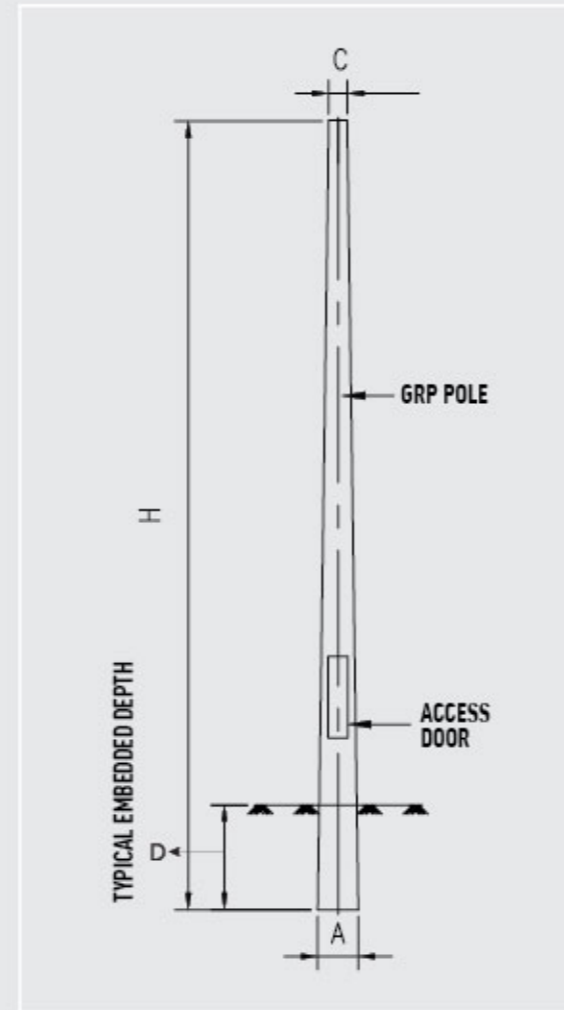
- The material is pre-pigmented & therefore, scratch-resistant
- GRP poles are available in white/black/red/orange/green/yellow/blue colours\*
- Grey is the standard colour
- The surface finish is UV-protected

\*To place the order, minimum quantity required is 100 nos.

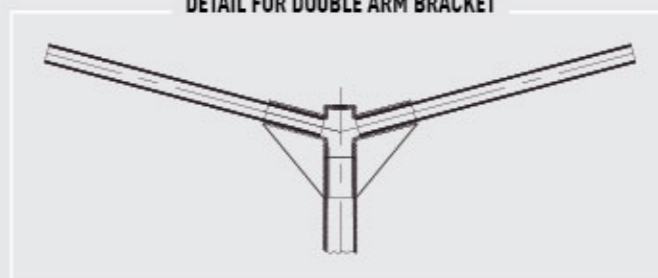
## FLANGE POLES



## EMBEDDED POLES



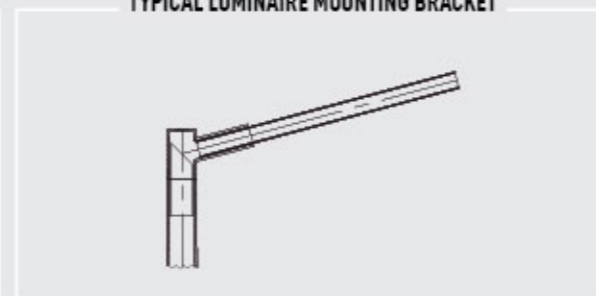
DETAIL FOR DOUBLE ARM BRACKET



BASE PLATE DETAILS



TYPICAL LUMINAIRE MOUNTING BRACKET



## CONTINUOUS FILAMENT WINDING MANUFACTURING PROCESS RANGE

### EMBEDDED CONICAL POLE

POLE HEIGHT [In Mtrs.]	EMBEDDED LENGTH [In mm]	POLE HEIGHT ABOVE GROUND LEVEL [In Mtrs.]	TOP OD [In mm]	BOTTOM OD [In mm]	THICKNESS [In mm]
3	500	2.5	70	94	5
4	700	3.3	70	102	5
5	850	4.15	70	110	5
6	1000	5	85	163	5
7	1150	5.85	85	176	5
8	1250	6.75	85	201	6
9	1400	7.6	85	216	7
10	1500	8.5	85	230	8
11	1650	9.35	85	245	9
12	1700	10.3	85	260	9

### FLANGE MOUNTED CONICAL POLE

POLE HEIGHT [In Mtrs.]	EMBEDDED LENGTH [In mm]	POLE HEIGHT ABOVE GROUND LEVEL [In Mtrs.]	TOP OD [In mm]	BOTTOM OD [In mm]	THICKNESS [In mm]
3	N/A	3	70	94	5
4	N/A	4	70	102	5
5	N/A	5	70	110	5
6	N/A	6	85	163	5
7	N/A	7	85	176	5
8	N/A	8	85	201	6
9	N/A	9	85	216	7
10	N/A	10	85	230	8
11	N/A	11	85	245	9
12	N/A	12	85	260	9

### CYLINDRICAL POLE

POLE HEIGHT [In Mtrs.]	EMBEDDED LENGTH [In mm]	POLE HEIGHT ABOVE GROUND LEVEL [In Mtrs.]	POLE DIAMETER [In mm]	THICKNESS [In mm]
3	500	2.5	Ø 80	5
3	500	2.5	Ø 100	5
4	700	3.3	Ø 80	5
4	700	3.3	Ø 100	5
5	850	4.15	Ø 80	5
5	850	4.15	Ø 100	5
6	1000	5	Ø 100	5

## CENTRIFUGAL CASTING MANUFACTURING PROCESS RANGE

### EMBEDDED CONICAL POLE

POLE HEIGHT IN METERS	POLE HEIGHT (In mtrs)	EMBEDDED LENGTH (In mm)	POLE HEIGHT ABOVE GROUND LEVEL (In Mtrs.)	TOP OD (mm)	BOTTOM OD (mm)	TOP THICKNESS	BOTTOM THICKNESS
3 METERS	3	500	2.5	76	126	5	6
4 METERS	4	700	3.3	76	143	6	7
5 METERS	5	850	4.15	76	160	6	7
6 METERS	6	1000	5	76	176	6	7
7 METERS	7	1150	5.85	76	193	6	7
8 METERS	8	1250	6.75	76	210	6	7
9 METERS	9	1400	7.6	76	227	6	8
10 METERS	10	1500	8.5	76	243	6	8
11 METERS	11	1650	9.35	76	260	6	9
12 METERS	12	1700	10.3	76	277	6	9

### FLANGE MOUNTED CONICAL POLE

POLE HEIGHT IN METERS	EMBEDDED LENGTH (mm)	POLE HEIGHT ABOVE GROUND (M)	TOP OD (mm)	BOTTOM OD (mm)	TOP THICKNESS	BOTTOM THICKNESS
3 METERS	NA	3	76	126	5	6
4 METERS	NA	4	76	143	6	7
5 METERS	NA	5	76	160	6	7
6 METERS	NA	6	76	176	6	7
7 METERS	NA	7	76	193	6	7
8 METERS	NA	8	76	210	6	7
9 METERS	NA	9	76	227	6	8
10 METERS	NA	10	76	243	6	8
11 METERS	NA	11	76	260	6	9
12 METERS	NA	12	76	277	6	9

## APPLICATIONS



SIGNAGE POLES



GRP POLE LIGHTING



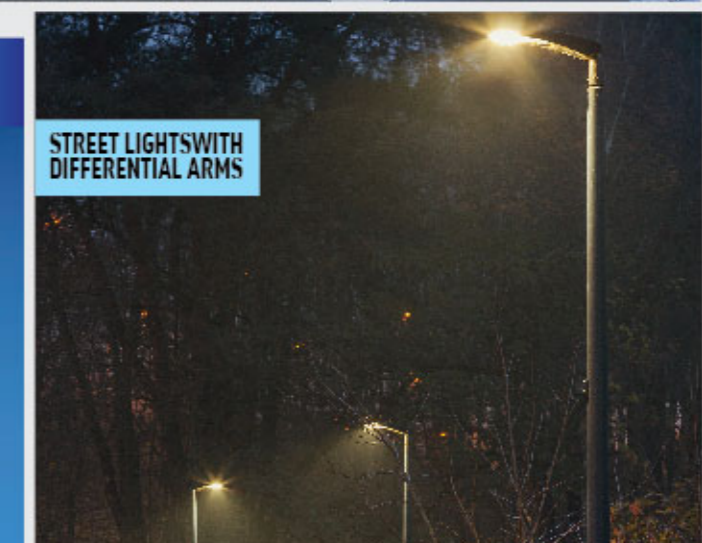
AREA LIGHTING



STREET LIGHTING WITH DECORATIVE POLES



FLAG POLES



STREET LIGHTS WITH DIFFERENTIAL ARMS

## CLIENT PROFILE

BEL entered into the field of raising and lowering winch masts more than 30 years ago. Since then, BEL has been the undisputed leader in the Indian market.

During the period, over 45,000 masts and 8,00,000 poles of different designs were installed in India and abroad. The list of our esteemed clientele is exhaustive but include\*

- ABB Ltd.
- Adani Power Ltd./Mundra Port & SEZ Ltd.
- Alstom T&D India Limited
- Bengaluru International Airport
- Bharat Heavy Electricals Ltd.
- Bharat Petroleum Corporation Ltd.
- Chennai Port Trust
- CIDCO
- Coal India
- Container Corporation of India
- CPWD & PWD
- Damodar Valley Corporation
- Delhi International Airport Ltd. T-3
- Essar Oil Ltd./Essar Steel Ltd.
- GMR Group
- GVK Group of Companies
- Haldia Dock Complex
- Hindalco
- Hindustan Mittal Pipeline Ltd.
- Hindustan Petroleum Corporation Ltd.
- Indian Oil Corporation Ltd.
- Indian Railways
- Jawaharlal Nehru Port Trust
- JAYPEE
- Jindal Steel & Power Ltd.
- JSW
- Kochi International Airport
- L&T
- MMRDA
- Mumbai International Airport Ltd.
- National Highway Authority of India
- National Thermal Power Corporation Ltd.
- NCC Ltd.
- New Mangalore Port Trust
- Neyveli Lignite Corporation Ltd.
- Oil & Natural Gas Corporation Ltd.
- Oriental Structures Engineers (P) Ltd.
- P&O Ports (India) Ltd.
- Reliance Industries Ltd.
- Shapoorji Pallonji & Co. Ltd.
- Steel Authority of India
- Surat Municipal Corporation
- Tata Steel Ltd.
- Various Municipal Corporations
- Vedanta Group
- Visakhapatnam Port Trust
- West Bengal Power Development Corporation Ltd.

We are proud that BEL's raising and lowering masts are leading the way for industrial and infrastructural development of India.

## EXPORTS

Apart from the Indian market, BEL caters to international markets as well. BEL has exported high mast systems to the following countries till date:

OMAN



TOGO



NIGERIA



ZAMBIA



MAURITIUS



FIJI



UNITED ARAB EMIRATES



INDONESIA



QATAR



GABON



