MVA POWER INC

FLEXIBLE CATENARY

INDEX

MVA POWER INC

TOURIST TRAM

- Equipped with trolley or pantograph
- Low speeds (Max. 30 km/h)
- Adapted old vehicles
- Layout with many curves
- In general not compensated lines

URBAN TRAMWAY

- Equipped with pantograph
- Average speeds (Max. 60 km/h)
- In general compensated lines
- Cross curves and rounds without brackets
- Distance between stops ≤ 500 m

LIGHT METRO

- Equipped with Pantograph
- High speeds (Max. 80 km/h)
- Completely compensated lines.
- Larger radius curves.
- Always suspension with poles.
- Distance between stops ≥ 500 m

TECHNICAL SERVICES

MVA Power together with our partners and certified manufacturers with 25 years of experience, is highly qualified to provide the following services:

- Analysis and design the overhead catenary systems and assemblies included in the scope of work below as per the applicable codes and standards, and customer requirements.
- Shop drawings, workbooks, and all technical information of each item, approved and certified by professional engineers with Canada jurisdiction.
- Calculations and design reports.
- Inspection and test reports as required of OCS systems.
- Installation training, technical assistance, and supervision of OCS systems.
- Installation, inspection, and certification of OCS systems.
- Installation, operation, and maintenance of OCS systems.
- Other special project analyses such as Energy Flow Simulation, and RAMs studies.

SCOPE OF WORKS

MVA Power scope of works includes, but is not limited to the design, manufacturing, and/or supplying of the following items:

- OCS poles and other HDG steel supports
- Contact wires, messenger wires, and other electrical and ground wires
- OCS arms/ cantilevers including brackets
- Fixed termination equipment
- Spring termination equipment
- Weight tensioning devices (balance weight)
- Mid-point dead ends
- Head-span assembly
- Surge arrestors and feeder pole assemblies
- Insulators and section insulators
- Disconnect and transfer switches
- Pole guys (down and head guys) assemblies
- Contact wire bonds (jumpers and contact bridges
- Galvanized steel wires
- Stainless steel wires
- Rigid rails/conductor and assemblies
- Droppers
- Spare parts

MATERIAL SUSPENSION AND SUPPORTS

- Using metal wire with insulators
- Using synthetics insulated cables

PARAFIL TYPE A

- Terilen fibres (white polyester)
- Acceptable mechanical resistance
- Halogen-free
- Without nucles of NH
- Not dangerous in case of fire
- Generates water vapour and CO_2

PARAFIL TYPE F (KEVLAR)

- Aramid fibres (yellow)
- High mechanical resistance
- Halogen-free
- Without nucles of NH
- Dangerous in case of fire
- Formation of toxins (cyanide and oxygen of nitrogen)

ADVANTAGE OF SYNTHETIC ROPE PARAFIL TYPE A

- Isolante
- Reduction in number of components
- Lab our-saving
- Reduced visual impact
- Resistance to ice formation
- Resistance to corrosion
- Increased useful life of the contact wire.
- Temperature insensitive
- Not dangerous in the event of breakage

MECHANICAL CHARACTERISTICS

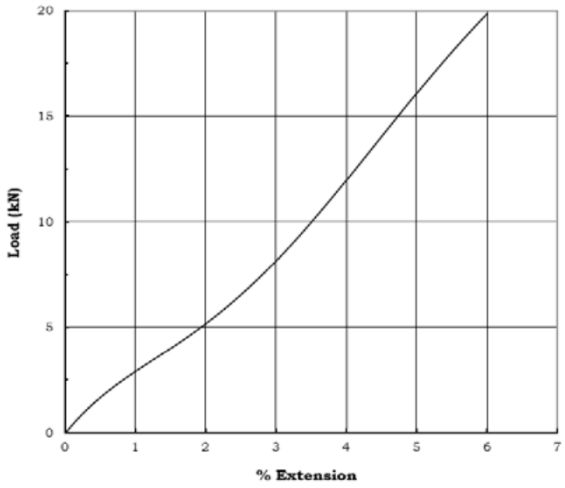
Ref.	Nominal Diameter (mm)	Mechanical nucles nominal diameter (mm)	Characteristics cone section (mm^2)	Weight in air (kg/m)	Breaking load (daN)	Elongation (%)
PA 7 T0.5	7	3.7	7.97	3.7	500	5.2
PA 8.5 T1	8.5	5.3	15.94	5.4	1000	
PA 11 T2	11	7.5	31.88	9.4	2000	
PA 14 T4	13.5	10	55.8	14.5	3500	

ELECTRICAL CHARACTERISTICS

- Electric resistance: 6 x 108 ohm.cm
- Result of the test fibres from 17 to 31 mm diameter until obtain the electric jump

Electrovoltage KV electric jump	Cable length (m)	
	5 ton. fibre	20 ton. fibre
123	0.66	0.72
245	1.38	1.39
420	2.00	2.05

EXTENSION DIAGRAM OF PARAFIL TYPE A



CANTILEVER MATERIALS AND TYPES

METAL BRACKETS

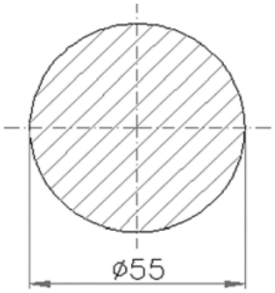
- Manufactured with galvanized steel pipe
- High rigidity
- They admit to be painted
- Suitable for continental climates (low humidity)
- Economic price
- All lengths

INSULATING BRACKETS

- Manufactured with isophthalic polyester bars reinforces with fiberglass and UV protection
- Good rigidity
- Resin painted in origin (not painted later)
- Suitable for continental climates (low humidity)
- All lengths
- Higher price than metallic for lengths above 3m
- Φ of 42 mm and 55 mm

MECHANICAL FEATURES OF INSULATING BRACKETS

- Material: fiberglass and isophthalic polyester with UV protection
- Colour: green or grey RAL7036
- Weight: 4.5 kg/m



1. DESCRIPTION

- 55 mm ϕ bar

2. MATERIALS

- Isophthalic polyester resin (particularly suitable for outdoors) reinforced with fiberglass with a stabilizer to resist UV radiation

3. GEOMETRIC FEATURES

- Bar ϕ: 55mm
- Standard length: 4 y 8 m
- Weight: 4.5 kg/m

4. ANTI-MOISTURE FEATURES

- The glass fibre reinforcement is 0.3 mm outer surface, so own polyester surface forms layer of self-protective varnish that tends to crack and disappear after a few years

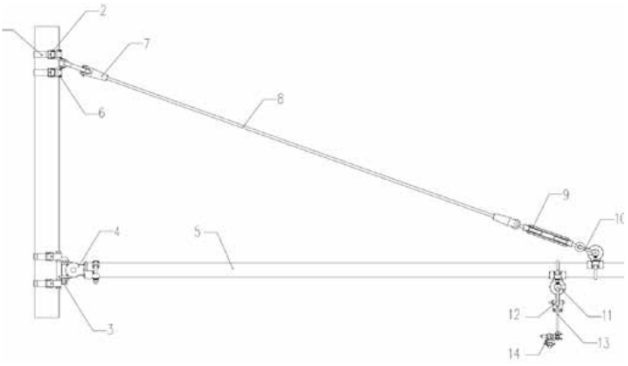
5. DEFORMATION RESISTANCE

- Deformation by compression of 4 m length bar scope of the single and double bracket

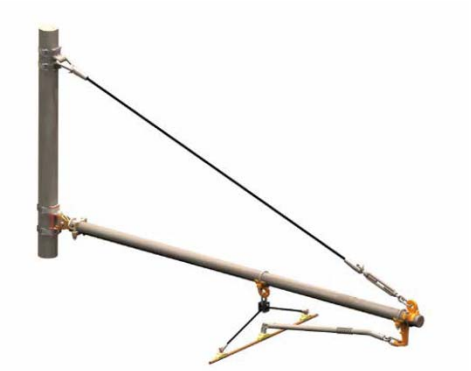
TYPICAL MOUNTS OF TRAMWAY CATENARY

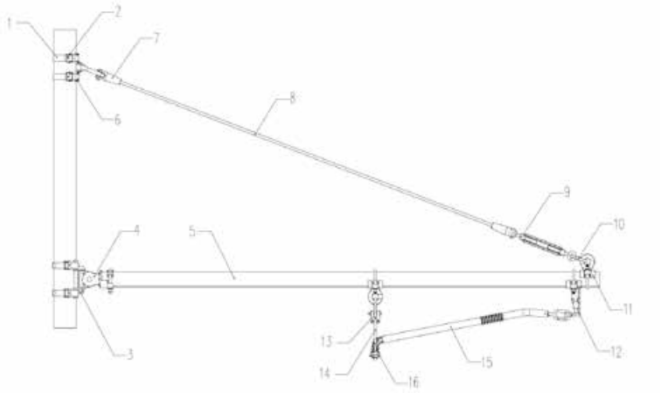
MVA POWER INC

SIDE POST SIMPLE WAY

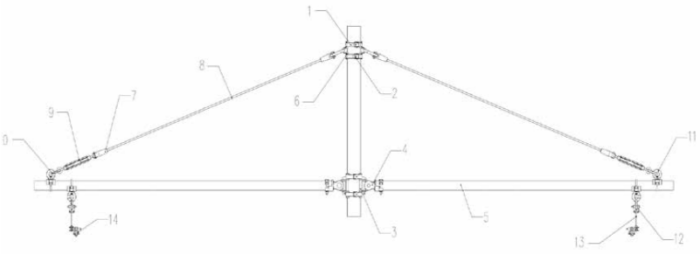


SIDE POST CURVE SIMPLE WAY

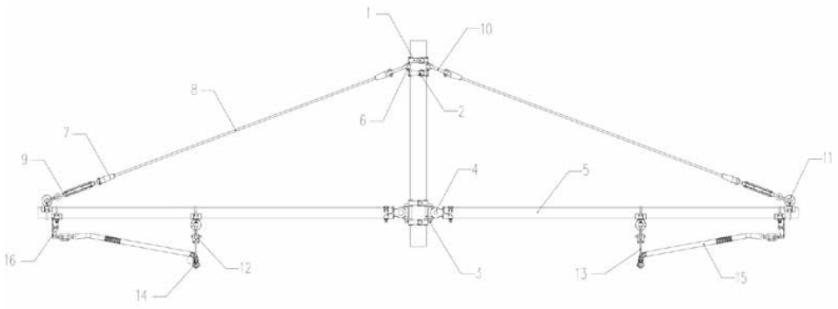




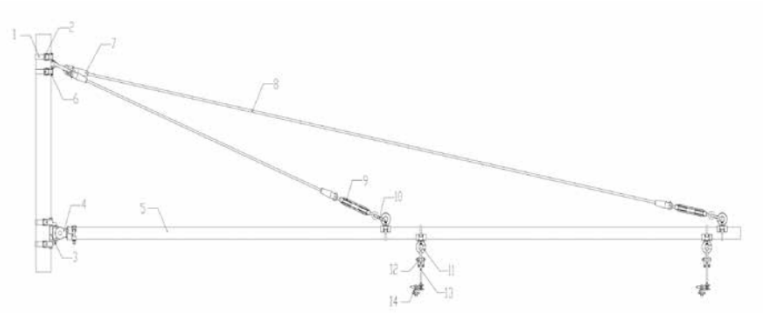
POLE IN RALLWAY GAUGE TWO BRACKETS



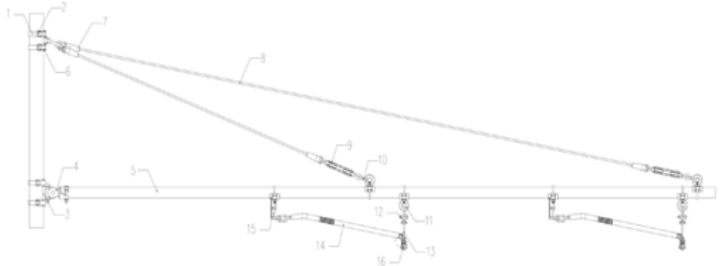
POLE IN RALLWAY GAUGE TWO BRACKETS



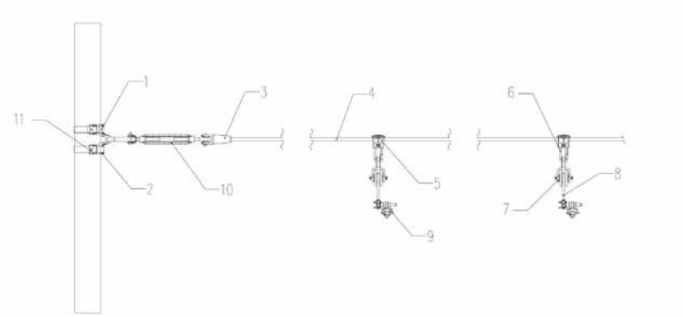
SIDE POST STRAIGHT FOR TWO WAYS



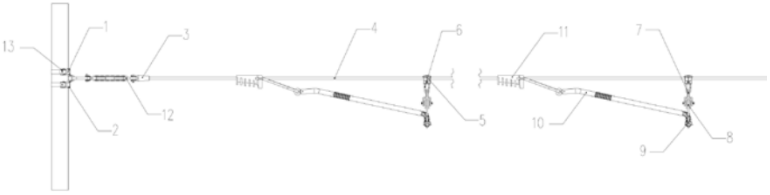
SIDE POST STRAIGHT FOR TWO WAYS



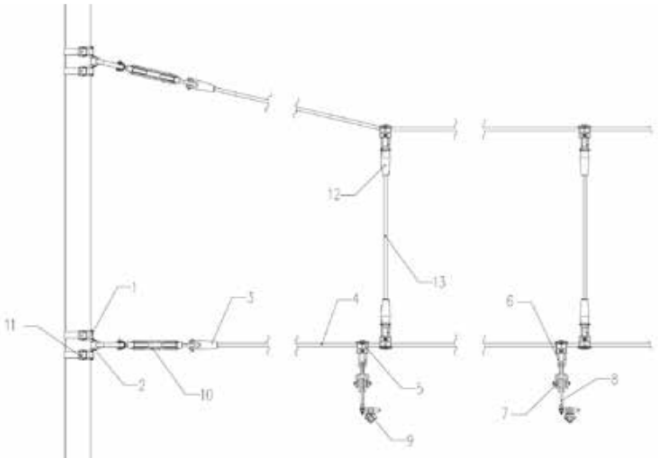
TRANSVERSE STRAIGHT TWO WAYS



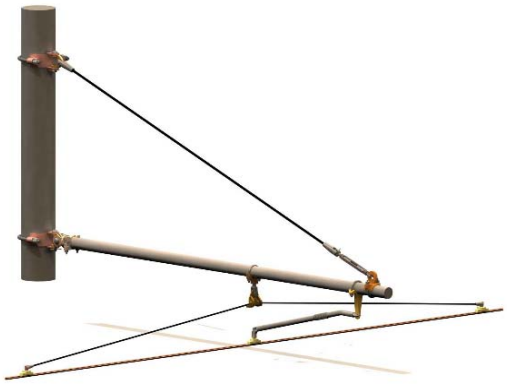
TRANSVERSE STRAIGHT TWO WAYS



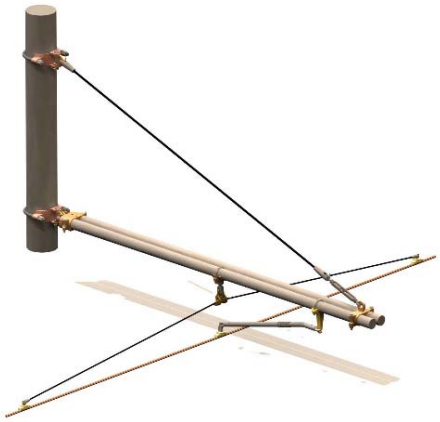
FUNICULAR PORCH TWO WAYS



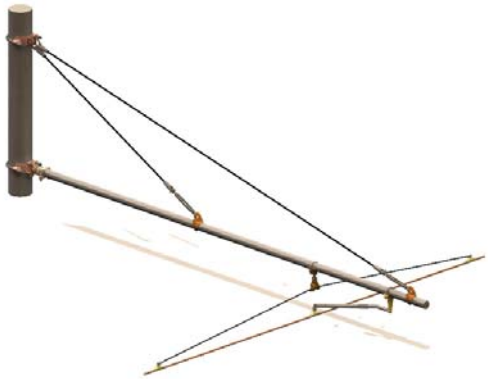
SINGLE TRACK – CURVE LINE – POLE OUTSIDE



Single Cantilever

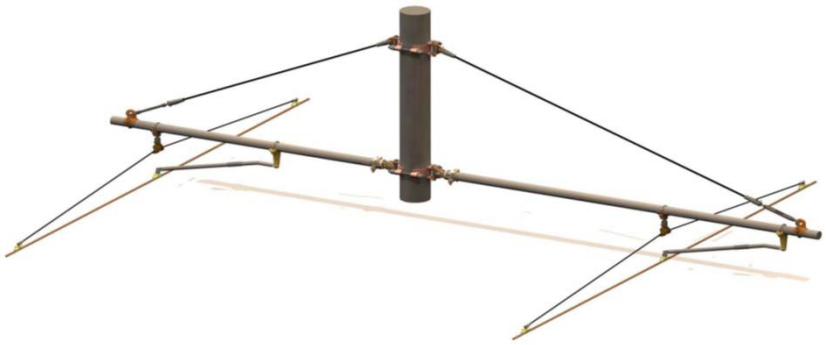


Double Cantilever



Single Cantilever – Big Length

2 TRACKS - CURVE LINE - POLE



2 TRACKS – CURVE LINE – HEAD SPAN

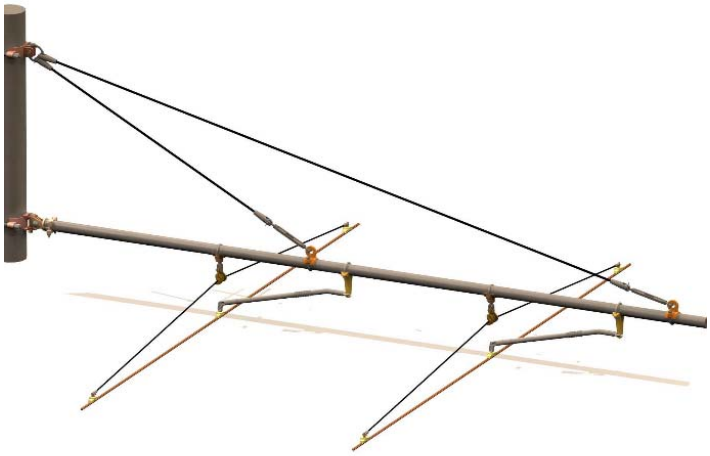
2 TRACKS – HEAD SPAN

2 TRACKS – CURVE LINE – SECTIONING (AXIS)

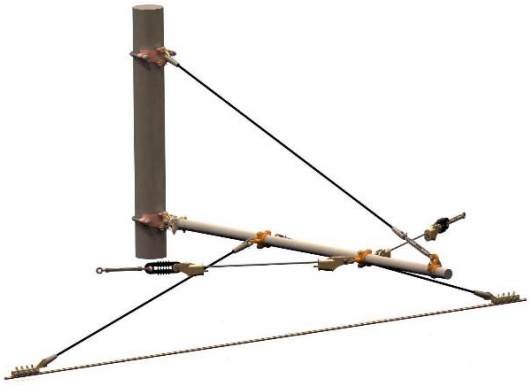
2 TRACKS – STRAIGHT LINE – SECTIONING (AXIS)

2 TRACKS – CURVE LINE – HEAD SPAN

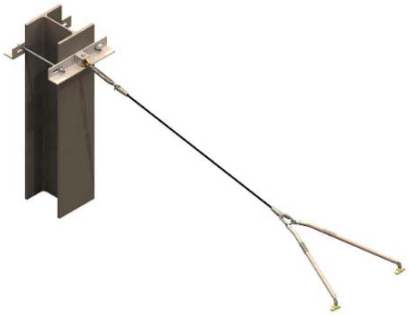
2 TRACKS – CURVE LINE – POLE OUTSIDE



FIX POINT

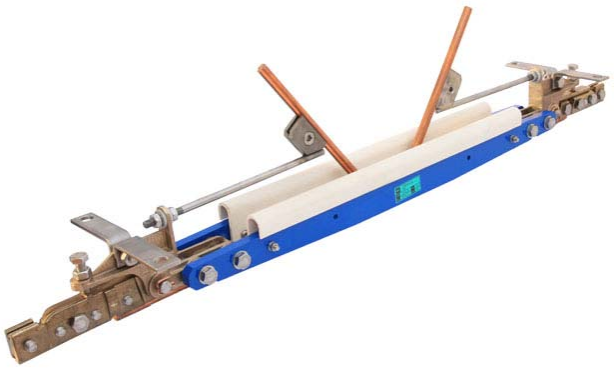


SMALL RADIUS CURVE



Depot Installation

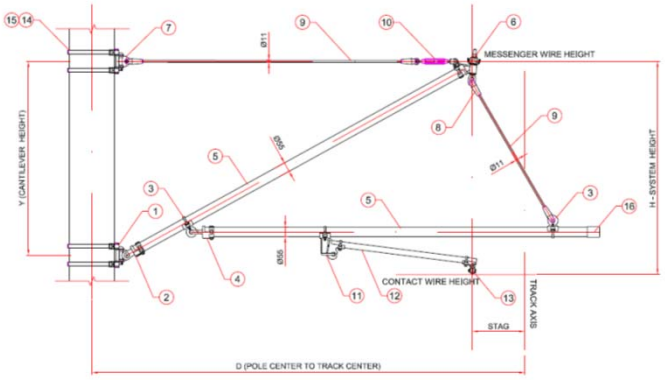
SECTION INSULATOR



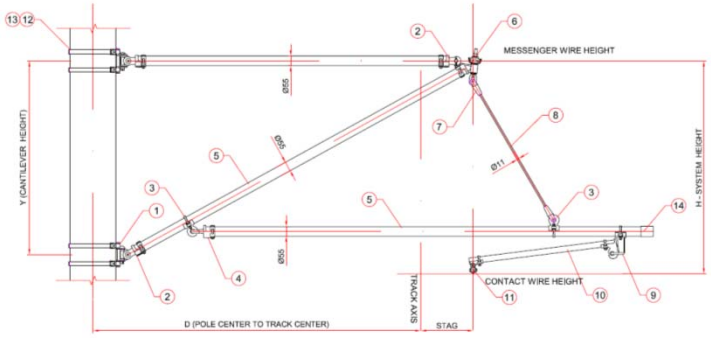
Asymmetrical

Symmetrical

PULL-OFF-CANTILEVER



PUSH-OFF CANTILEVER



COMPONENTS

ROUND POLE ANCHORAGE

BRACKET FOOT

EYE FIXATION

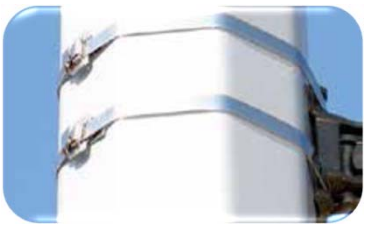
SUSPENSION PULLEY

SUPPORT ARM

PARAFIL STAY

TURNBUCKLE

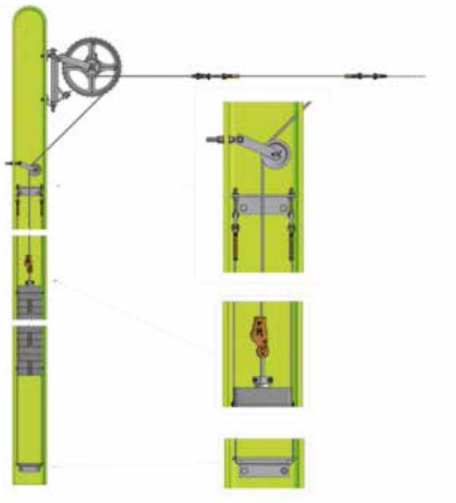
INSULATED BRACKET



ANCHOR POLE DETAIL

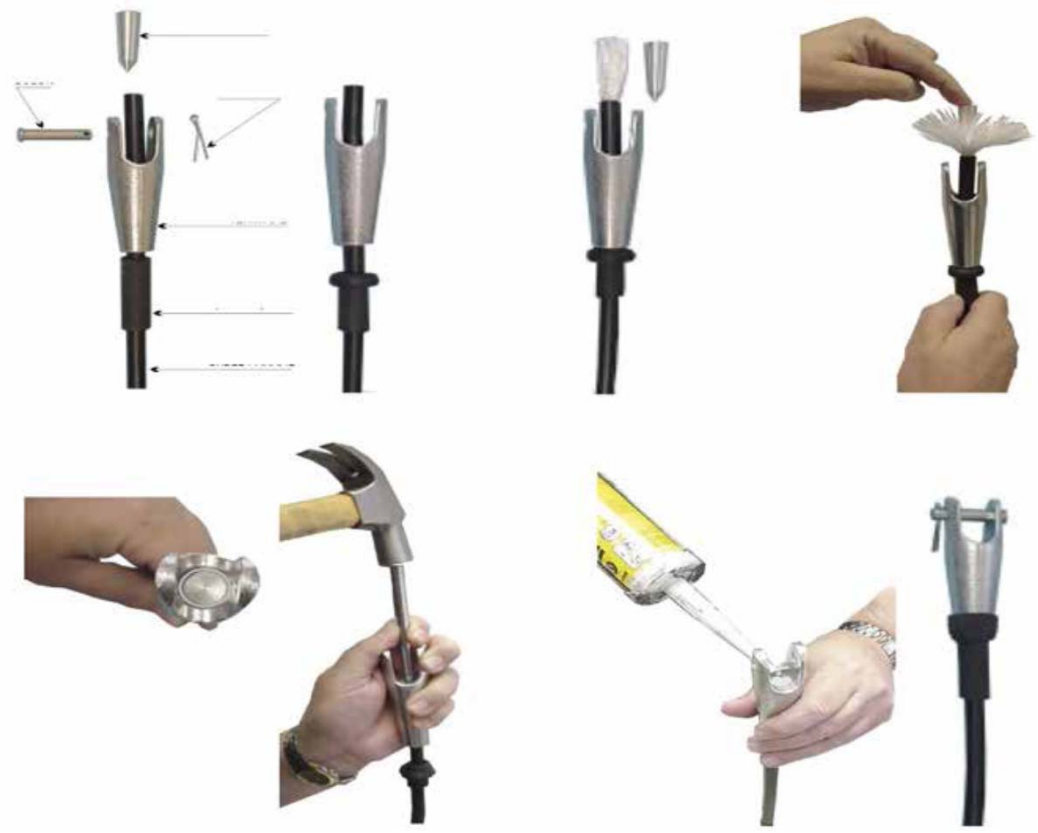
DELTA SUSPENSION

STAYED ARM



COMPENSATION ASSEMBLY

END ANCHOR WITHOUT COMPENSATION



MOUNTING OF TERMINALS IN THE SYNTHETIC ROPE