

# **Aerial Fibre Optics**

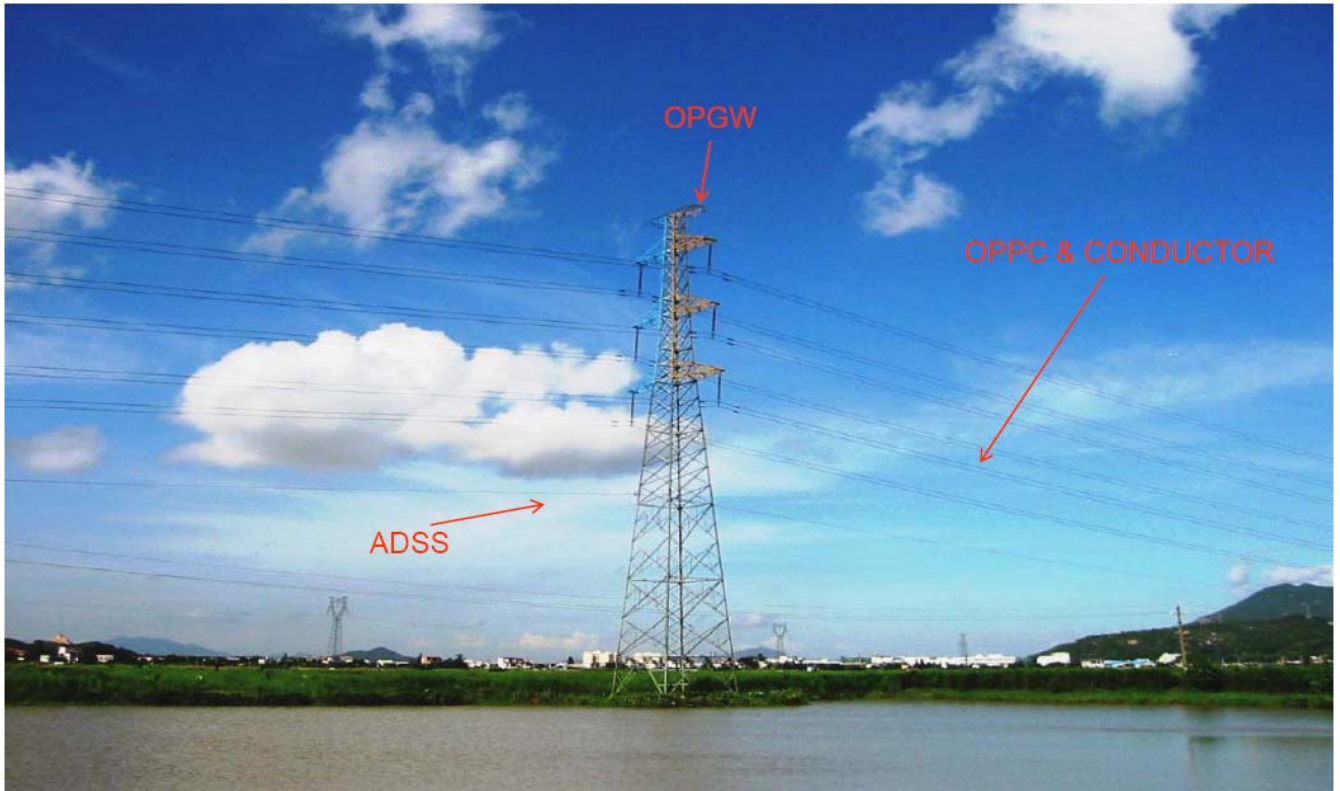
*Complete One Stop Solution for  
Aerial Fibre Optics*

**OPGW Cable and  
Fittings for OPGW**

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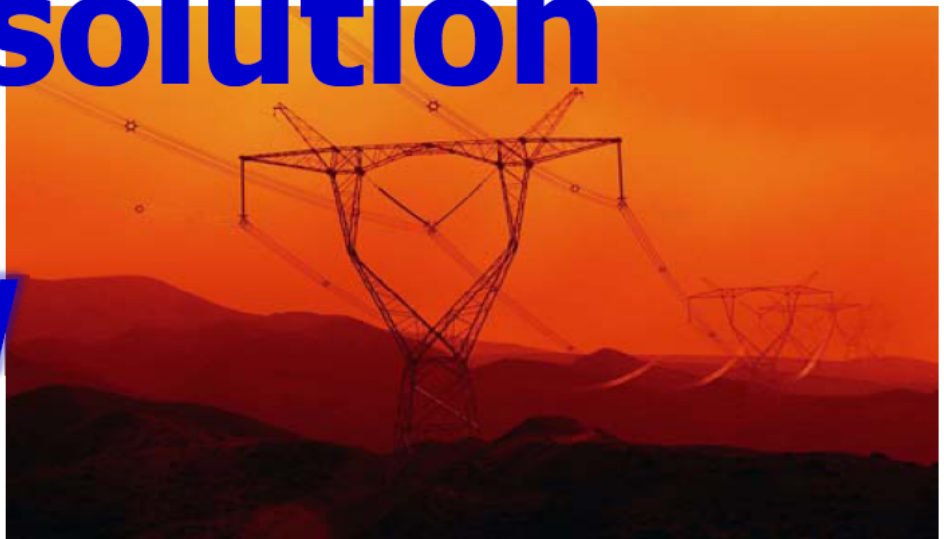
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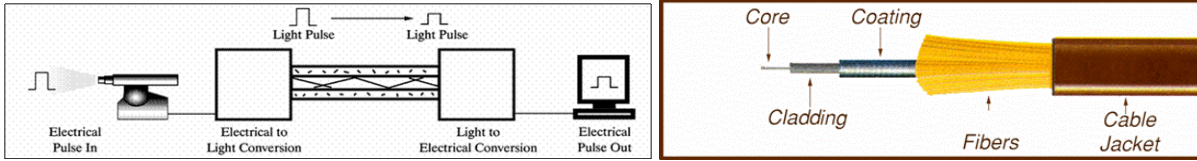
# The Reliable solution

**OPGW**



## Aerial Fibre Optics : Concept, Application & Safeguards

An optical Fibre is a thin, long, transparent material (usually made of glass or plastic) that confines and propagates light waves. Fibre optics use light pulses to transmit information down fibre lines. At one end of the system is a transmitter. This is the place of origin for information coming on to fibre optic lines. The transmitter accepts coded electronic pulse information coming from copper wire.



<u><b>OPGW -</b></u> <u><b>[Optical Power Ground Wire]</b></u>	<u><b>WRAP</b></u>	<u><b>ADSS -</b></u> <u><b>[Aerial Dielectric Self-Supported]</b></u>
<ul style="list-style-type: none"> <li>➤ Provides grounding &amp; protection form lightning stroke</li> <li>➤ Used in SCADA network</li> <li>➤ Requires long term outage</li> <li>➤ Expensive</li> </ul>	<ul style="list-style-type: none"> <li>➤ Hot line installation is difficult</li> <li>➤ Cost more than ADSS, but less than OPGW</li> <li>➤ Need Shield Wire</li> <li>➤ No operational problem is observed</li> </ul>	<ul style="list-style-type: none"> <li>➤ Installed at the center of Pylons/ Poles/ Structures</li> <li>➤ Cost much less than OPGW or WRAP type</li> <li>➤ Suitable for hot line installation without deenergization of line</li> <li>➤ Large Fibre capacity</li> </ul>

### Advantages of Fibre Optic Cables over Traditional Wire Cables

<ul style="list-style-type: none"> <li>■ Easier and Cheaper installation</li> <li>■ Many more fibres and channels per cable</li> <li>■ Uses light signals</li> <li>■ Consumes low power</li> <li>■ Carries digital signals</li> <li>■ Non-Inflammable</li> <li>■ Flexible</li> </ul>	<ul style="list-style-type: none"> <li>■ Does not cause EMI effect (Electro Magnetic Interference)</li> <li>■ Easier to access without transmission circuit outage</li> <li>■ Easier and faster to repair and ideal for using in existing network</li> <li>■ Does not experience temperature rise in the event of lightning strike.</li> <li>■ Quick installation with no R.O.W. clearance required</li> <li>■ Can be easily installed on road/ river crossing and hilly areas.</li> </ul>
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### Overview of ADSS Cable

ADSS is a self-supporting optical fibre cable. It has no metal component and can be installed on live lines with no outages. Hundreds of thousands of miles of ADSS have been installed all over the world, on power lines rated up to 500kV.

### Area of Application

- On Power Lines
- On Street Light Pole
- From Pole to building

### Cable Selection

These cables can be designed for almost any combination of environmental and sag/ tension requirements. Based on our detailed survey of site conditions, we supply an optimal choice of ADSS cable with other accessories.

### ADSS Installation Technique

The lifetime of ADSS on power lines will depend on the following factors

#### Electrical

1. Space Potential Effect
2. Corona Effect
3. Dry-Band Arching

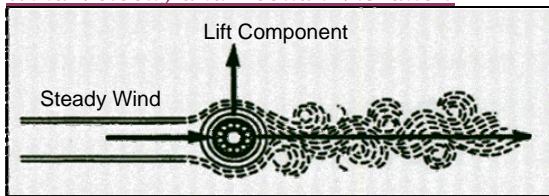
#### Mechanical

1. Span Lengths and Sag
2. Tension on Cable

#### Environmental

1. Wind Velocity and Aeolian Vibration
2. Sheath Composition for UV Resistance
3. Temperature and Pollution Level

**Wind Velocity and Aeolian Vibration**



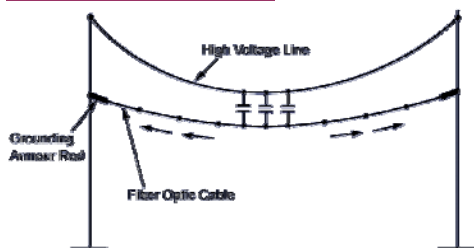
Aeolian Vibration is caused by low velocity wind blowing across a cylindrical conductor under tension. Vibration dampers help controlling Aeolian vibrations and ice induced galloping effects.

**Corona Effect**



Corona discharge on ADSS cable generally occurs due to generates of high electrical field and in the long run causes puncture and failure of cable jacket. For protection of the cable we provide corona rings/ coils.

**Space Potential Effect**



- High voltage conductor induces space potential on fiber optic cable
- The voltage difference between the grounded armor rod and cable generates a longitudinal field along the cable jacket
- If the jacket is covered by a conductive layer, the voltage drives a surface current along the cable

**Dry-Band Arcing**

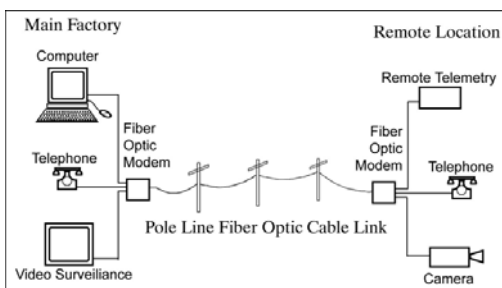


Installation of fiber optic cable on transmission line structure at a distance of 3-6 meter below the high voltage line is a general practice, which is considered to be a major cost saving installation process. Due to this relative geometric position of the cable and high voltage line, there is a capacitive coupling between the HV line (which is at phase

potential) & fiber optic cable (Which is at earth potential due to grounding of armour rod used for gripping the cable). The electric field caused by the high voltage line is considered to be the driving force to the flow of electron through the contaminated layer that accumulates on the fiber optic cable as a result of its exposure to the polluted atmosphere in a long run. The electron flows towards the grounded armour rod and generates certain amount of heat, which may dry the wet contaminated layer if there is no rain fall or small quantity of moisture in the atmosphere, resulting formation of small dry-band near the armour rod causing an obstruction to the flow of electrons. When voltage difference across this band crosses the threshold level, electric arcs known as dry-band arcing gets generated causing degradation to the outer sheath and eventually the load carrying layer of the cable. The continuation of such effect in a long run can cause the cable to tear under its own weight.

To remove Dry-band Arcing suspended armor rod assemblies with non-ceramic insulator is being used to break the arc current paths.

**Fiber optics in an industrial environment**



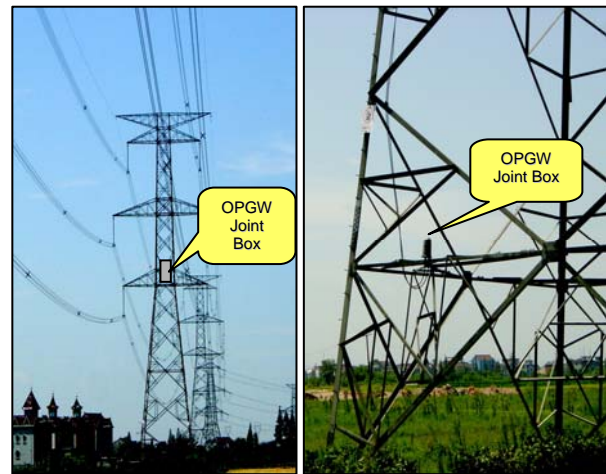
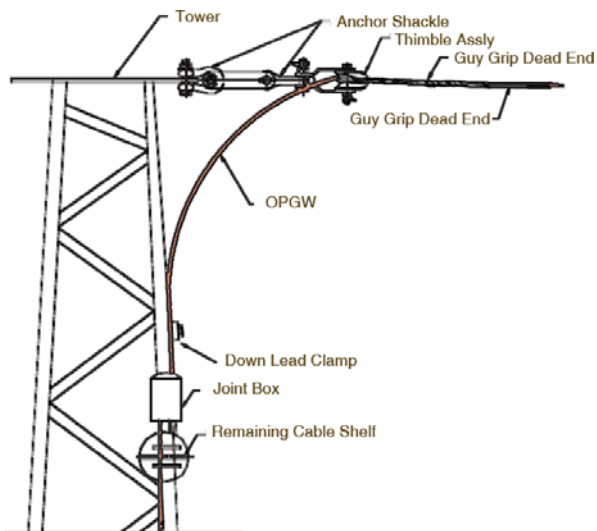
**Few Fibre Optics & ADSS Accessories**



## Fitting for Optical Fiber Ground Wire

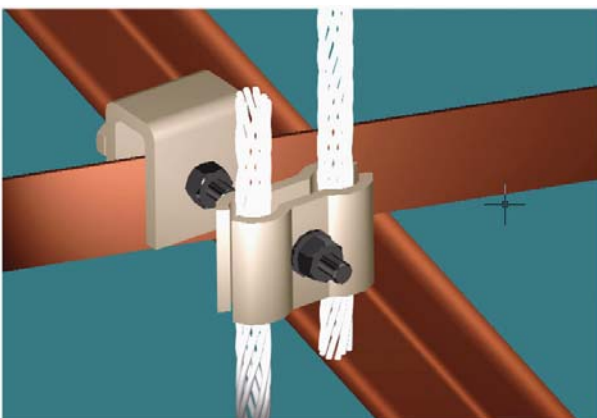
**Optical fiber overhead ground wire** is a type of cable that is used in the construction of electric power transmission and distribution lines. Such cable combines the functions of grounding and communications. An OPGW cable contains a tubular structure with one or more optical fibers in it, surrounded by layers of steel and aluminum wire. The OPGW cable is run between the tops of high-voltage electricity pylons. The conductive part of the cable serves to bond adjacent towers to earth ground, and shields the high-voltage conductors from lightning strikes. The optical fibers within the cable can be used for high-speed transmission of data, either for the electrical utility's own purposes of protection and control of the transmission line, for the utility's own voice and data communication. The interior of these conductors is quite sensitive. This is why it is not advisable to use standard suspension and dead end fittings as they apply radial forces that are inadmissibly high to the conductor. For this reason, spiral fittings or specially adapted end clamps are used. These fittings distribute radial forces over a longer length of cable. Optical overhead line cables that are free from metal and covered can not be used as earth wires due to their dielectric structure. Lower-voltage distribution lines may also carry OPGW wires for bonding and communications; however, utilities may also install all-dielectric self-supporting cables on distribution pole lines.

**1. OPGW JOINT BOX MOUNTING:** The joint box for OPGW is used to protect and fix the spliced fiber. It is made of aluminum alloy. The aluminum alloy outer keep the cables firmer. It is waterproof dustproof and antirust. It is also tensile stressed.

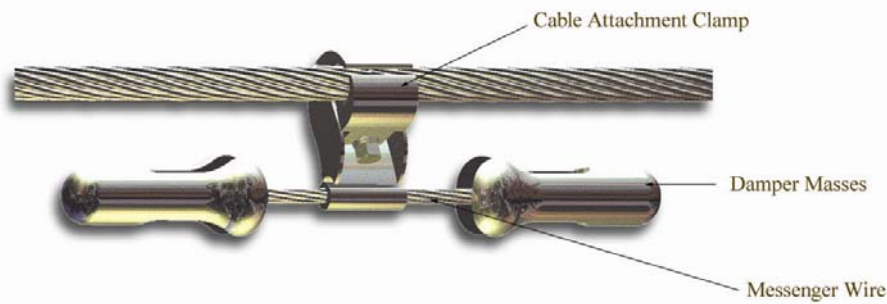


Location of Joint box fixed on tower

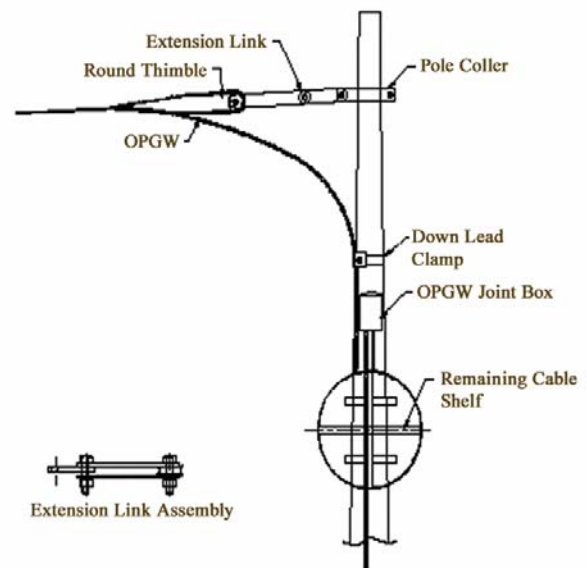
**2. DOWNLEAD CLAMP:** The down lead clamps are used to fix the cable to the tower in the down lead to the joint box. Fiber optic down lead clamps is designed to attach fiber cables to structures without causing undue stress to the optical fibers. The down lead clamp consists of two parts; the clamp base and keeper. Every clamp contains two grooves which accommodates a specific range of cable diameters.



**3. VIBRATION DAMPER:** The dampers are used to damp the cable vibrations. The number of dampers is determined by the environmental conditions, the distance between towers, the type of OPGW cable and the installation parameters. Vibration at clamp location. Create alternate bending stress on cable strands which may result in breaking of the strand. To reduce vibration, damper masses are attached to the cable to damp the vibration by transferring the vibration energy to heat energy generated by the inter strand friction in the messenger wire of the damper.



**4. OPGW SUSPENSION ASSEMBLY:** Suspension assembly especially designed for OPGW cables that Includes grounding clamps for tower connection. According to requirement we can use different brackets.



**5. OPGW DEAD END ASSEMBLY:** The dead-end's helically formed rods transfer the load from the structure. Attachment to the structure is provided with the convenient built-in loop of the dead-end. The dead-end component transfers the axial tensile forces without distortion to the structure and cable.

## OPTICAL FIBER GROUND WIRE ENCLOSURE

An optical fiber enclosure system having storage and splicing enclosure and one or more termination enclosures. The storage and splicing enclosure contains ports on all four of its sides that allow external fiber optic cables to access the interior of the enclosure. The storage and splicing enclosure includes hardware for storage of excess optical fiber and outer protective cabling components, grounding and securing spliced optical fibers. The termination enclosure includes hardware for mounting modules for terminating optical fibers. Attached to the termination modules are optical fibers that extend from the termination enclosure through ports in the termination enclosure and storage and splicing enclosure and into the storage and splicing enclosure. Those optical fibers are spliced to optical fibers forming the fiber optic cables in the storage and splicing enclosure. Additional fiber optic cables attached to the termination modules exit the termination enclosure through ports and run to an equipment rack at the customer premises where the optical fibers can be attached to customer equipment.

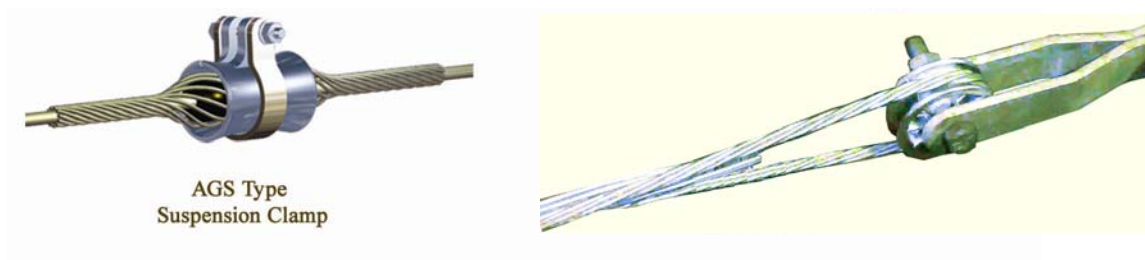


Figure:-Types of Optical fiber enclosure

### OPTICAL JOINT BOX

The joint closure can be used for both outdoor and indoor installations. It can be used as a line joint, butt joint, for mid-span access or as a termination box. The joint closure can be mounted on walls, in manholes, cabinets, racks or be buried directly in the ground.

Joint closure made of stainless steel for mechanical protection of optical fiber joints. The closure comprises a bottom, a cover and separate cable bushings. The cover is mounted with screws.

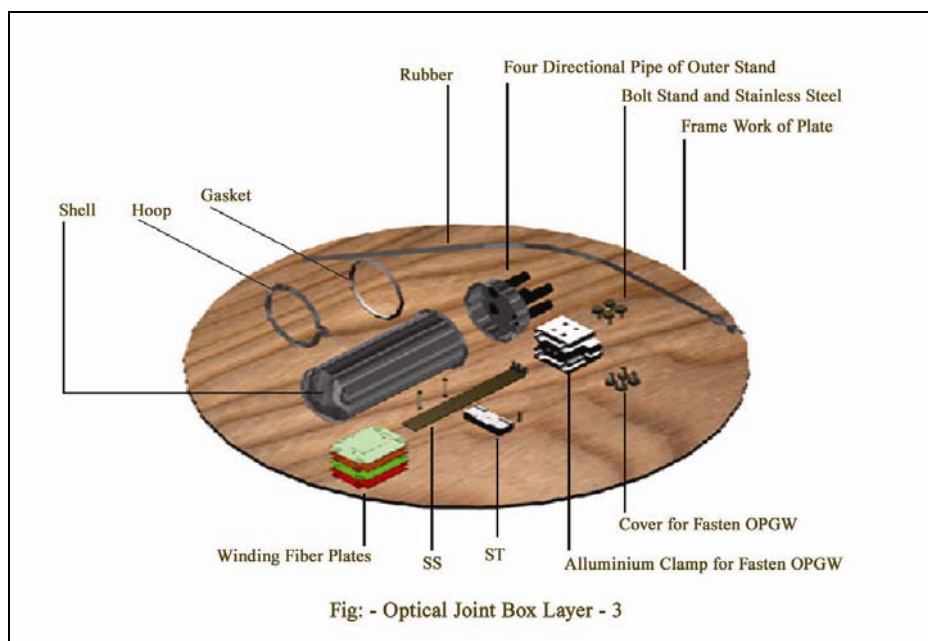


AGS Type  
Suspension Clamp

### Properties of OPGW Joint Box

\* Optical fiber ground wire joint box has excellent mechanical and protective property from external adversities.

- Suitable for different types of diameter trunk and distributing optical cables
  - \* Good for grounding system
  - \* reliable sealing measurement.



## Outdoor Optical Joint Box

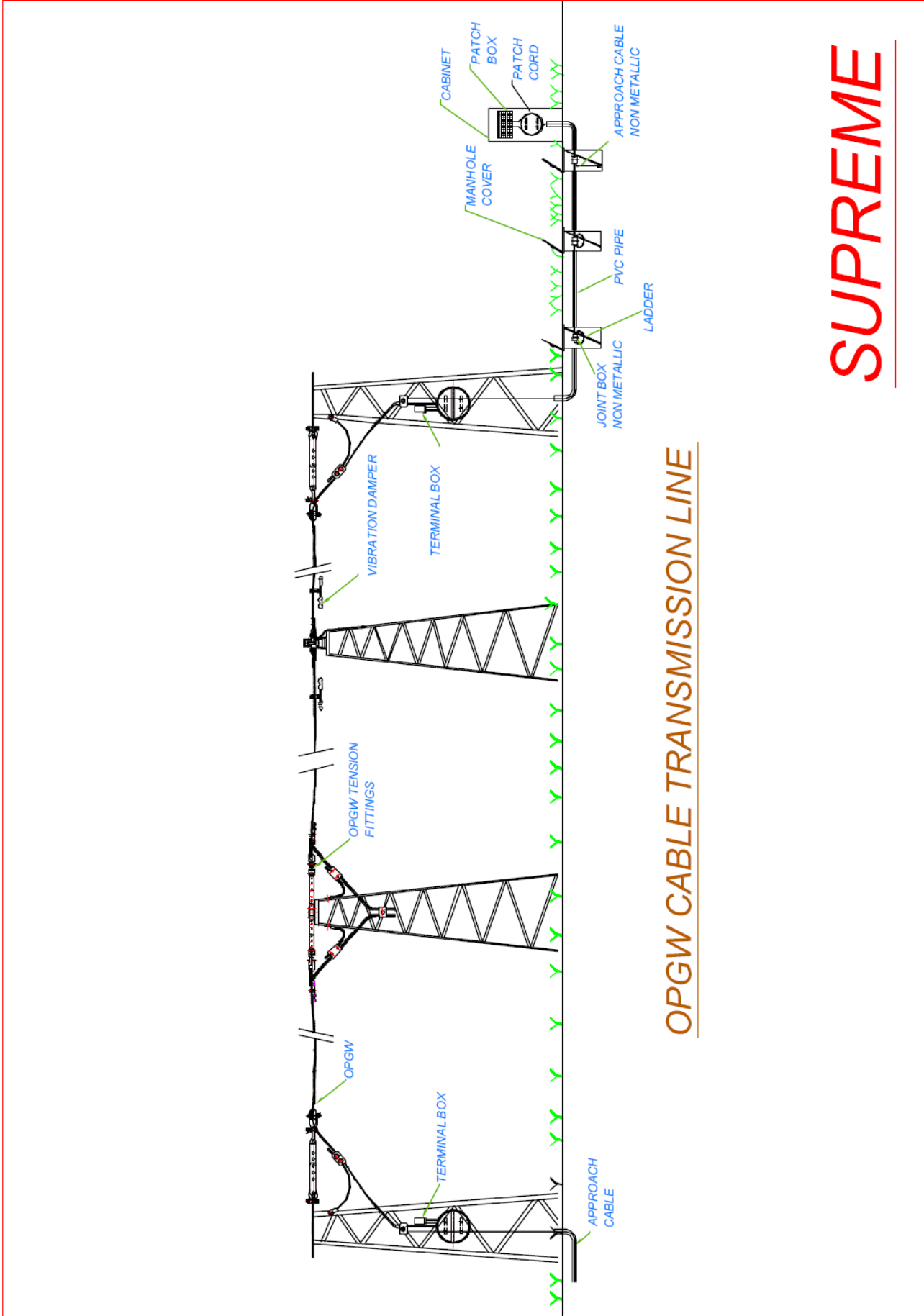


### Application

The outdoor optical joint box can be applied for jointing metallic optical cables (such as OPGW, Underground Metallic Optical Cable), non-metallic optical cables (such as ADSS, Non-metallic dust optical cable) in the open air. The spliced fibers are well protected in a closed, air-tight box.

### Features

1. The main composing metal parts are made of stainless steel. They are excellent in corrosion-resistance.
2. The main parts include case and end plate, splicing trays, fiber protect tube, seal washer (i.e. O-ring), sealant which insure waterproof, moisture-proof and resistance of high current.
3. The number of splice tray is according to the number of fibers to be fused. A optical joint box can host up to 144 fibers.
4. The end plate can be disassembled repeatedly for maintenance.



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