

POLYCAB

Flame Retardant (FR)

Flame Retardant Low Smoke & Halogen (FRLS-H)

Fire Resistant (Fire Survival) &

Low Smoke Halogen Free Cables

Introduction

Cables are the source of carrying power and signal in power plants, refineries, process industries. Cable network can carry fire from one place to another in the event of fire caused due to external sources or due to short circuit.

Experience reveals that electrical cables are the prime source of propagation of fire. It is also experienced that damage to property and human life due to this phenomenon needs to be given due importance and the cables shall be selected considering fire and safety requirements of circuit integrity during fire conditions. It includes emergency Power Supply, Alarm Power Supply and other critical applications.

Cables used in enclosed areas such as Power Plants, Buildings, Housing Complex, Multiplexes, Underground Railways, Road Tunnels, Hospitals shall be Flame Retardant. Flame Retardant Low Smoke & Halogen or Low Smoke & Halogen Free or Fire Resistant (Fire Survival Cables) used for critical applications.

POLYCAB manufactures these types of cables having constructions as per standard specifications – IS:1554, IS:7098, IEC:60502, BS:5467, BS:6746, BS:6622 & BS:7835 up to 33 kV.

POLYCAB FR CABLES meets standard requirements of

- ❖ IS-10810 Pt. 62 All categories/IS-1554-FR
- ❖ IS-10810 Part 61 / IS-1554, IS-694
- ❖ IEEE – 383
- ❖ ASTM-D-2863

- ❖ IEC-60332 Part 1 & 3
- ❖ SS-4241417

Flame Retardant Cables are those which retards flame in the event of fire. These are normally used in buildings, process plants, refineries and substations.

ADVANTAGES OF POLYCAB F R CABLES

- Does not allow fire propagation in single cable.
- Does not propagate fire when cables are laid in bunch or in trays
- Extinguishes flame immediately after fire temperature goes down

CONSTRUCTION – F R CABLES

1. **Conductor:** Annealed Plain / Annealed Tinned Copper / Aluminium - IS:8130 / IEC 60228 / BS 6360.
2. **Insulation:** PVC as per IS:1554, IEC-60502/BS 6746 OR XLPE as per IS:7098, IEC-60502/BS 5467, BS 6622.
3. **Inner Sheath/Bedding:** ST1/ST2 PVC, FR PVC, IS / IEC 60502.
4. **Armouring:** Unarmoured / Galvanized Steel (*or Aluminium* for Single Core) Round / Strip Armoured to IS:3975/IEC-60502, BS 6746/5467/6622.
5. **Outer Sheath:** FR PVC ST1/FR PVC ST2.
6. **FR Properties:** IEC-60332-1 & 3 SS-4241417, IEEE-383, ASTM-D-2863.



POLYCAB FRLS CABLES

meets standard requirements of

- ❖ IS-10810 Part 62 / IS-1554
- ❖ IS-10810 Part 61 / IS-1554
- ❖ IEC-60332 Part 1 & 3
- ❖ SS-4241417
- ❖ IEEE – 383
- ❖ ASTM-D-2843 & D-2863
- ❖ IEC – 60754 - 1

Flame Retardant Low Smoke Cables are designed specially for Power Plants, public premises such as Cinemas, Multiplexes, theaters, Airports, Hospitals, Super Markets and underground railway, where risk to human life due to fire and smoke is high.

Human life gets endangered due to smoke and suffocation in the event of fire.

Polycab FRLS-H cables are manufactured with special PVC outer sheath which is formulated for Lower smoke and Halogen content.

ADVANTAGES OF POLYCAB FRLS - H CABLES

- Does not allow fire propagation in single and multi layered or bunched cables.
- Does emit limited smoke in case of fire.
- Does emit limited toxic and halogen gases
- Does have high temperature index.

CONSTRUCTION – FRLS CABLES

1. **Conductor:** Annealed Plain / Annealed Tinned Copper / Aluminium - IS:8130 / IEC 60228 / BS 6360.
2. **Insulation:** PVC as per IS:1554, BS IEC-60502/BS 6746 OR XLPE as per IS:7098, IEC-60502/BS 5467.
3. **Inner Sheath/Bedding:** ST1/ST2 PVC, FRLS PVC, IS/IEC.
4. **Armouring:** Unarmoured / Galvanized Steel (*or Aluminium* for Single Core) Round / Strip Wire Armouring to IS:3975/IEC-60502, BS 6746/5467.
5. **Outer Sheath:** FRLS PVC ST1 / FRLS PVC ST2, IS/IEC.
6. **FRLS Properties:** IEC-60332-1 & 3, IEC-60754-1, SS-4241417, IEEE-383, ASTM-D-2863, ASTM-D-2843.



POLYCAB HALOGEN FREE CABLES meets standard requirements of

- ❖ IS-9968-1, 7098
- ❖ BS-6724, 7655
- ❖ IEC-60502-1, 60332-1,2,3, 60754-2
- ❖ SS-4241417
- ❖ IEEE – 383
- ❖ ASTM-D-2843 & D-2863

LSZH (Low Smoke Zero Halogen), LSOH (Low Smoke Zero Halogen), ZHFR (Zero Halogen, Flame Retardant) are the common nomenclature of cables which are latest in the design and are invariably recommended by various consultants and users for high human safety requirement in case of fire.

These Halogen Free Cables does not emit toxic gases and hence does not suffocate human beings during fire, causing fire fighting easy and reducing risk to human life.

These cables are invariably used in underground transport / Railway, and are recommended of all such areas where fire associated risk to human life is more.

ADVANTAGES OF POLYCAB LSZH / LSOH / ZHFR CABLES

- Does not allow fire propagation in single and multi layered or bunched cables.
- Does emit limited smoke in case of fire.
- Does not emit toxic gases hence safe to human and electronic equipments
- Low and white smoke does not effect visibility in enclosed areas
- All cable components are non-toxic, having low emission of smoke and acidic nature.

CONSTRUCTION – LSZH / LSOH / ZHFR CABLES

1. **Conductor:** Annealed Plain / Annealed Tinned Copper / Aluminium - IS:8130 / IEC 60228 / BS 6360.
2. **Insulation:** XLPE, EPR, Silicon as per IS:9968-1, IS 7098, BS:6724 & IEC – 60502, BS - 7846
3. **Inner Sheath/Bedding:** Low smoke Zero Halogen / Flame Retardant Compound.
4. **Armouring:** Unarmoured / Galvanized Steel (*or Aluminium* for Single Core) Round / Strip Wire Armoured to IS:3975/IEC-60502, BS 6724.
5. **Outer Sheath:** Low smoke Zero Halogen / Flame Retardant Compound.
6. **Properties:** IEC-60332-1 & 3, SS-4241475, IEEE-383, ASTM-D-2863, ASTM-D-2843, IEC-60754-1, BS:7655.



POLYCAB FIRE RESISTANT / FIRE SUR-VIVAL CABLES meets Standard Requirements of

- ❖ BS-7846, 7655
- ❖ BS-6387 Category ABC & XYZ
- ❖ IEC-60331, 60332 Part 1 & 60332 Part 3

The cables which are used in the Power, Control or Signal Circuit of emergency equipments shall be Fire Resistant to ensure higher safety and performance in the event of fire.

These critical equipments connected with the cable such as Alarm, Lift Power Supply, Emergency, Lights, exit lights, water spray system and other important functions.

**ADVANTAGES OF POLYCAB
FIRE RESISTANT (FIRE SURVIVAL)
– FS CABLE**

- Maintains the circuit in operation for few hours to ensure emergency operation in the event of fire.
- Ensures Power availability during fire.
- Can save life and damages in the event of fire.
- Does not emit toxic gases hence safe to human and electronic equipments
- Low and white smoke does not effect visibility in enclosed areas
- All cable components are non-toxic, having low emission of smoke and acidic nature.

**CONSTRUCTION – FIRE RESISTANT /
FIRE SURVIVAL CABLES**

1. **Conductor:** Annealed Plain / Tinned Copper / Aluminium - IS:8130 / IEC 60228/ BS 6360.
2. **Fire Barrier:** Layers of Glass Mica Tape.
3. **Insulation:** EPR or XLPE or Silicone Rubber.
4. **Fire Barrier Tape:** Glass Tape
5. **Inner sheath:** FRLS / LSZH
6. **Armour :** IS: 3975, BS: 7846
7. **Outer Sheath:** FRLS PVC ST 2, LSZH / LSOH.

Fire Resistant or Fire Survival Cables shall be with LSZH / LSOH / ZHFR sheathing for better performance under fire.

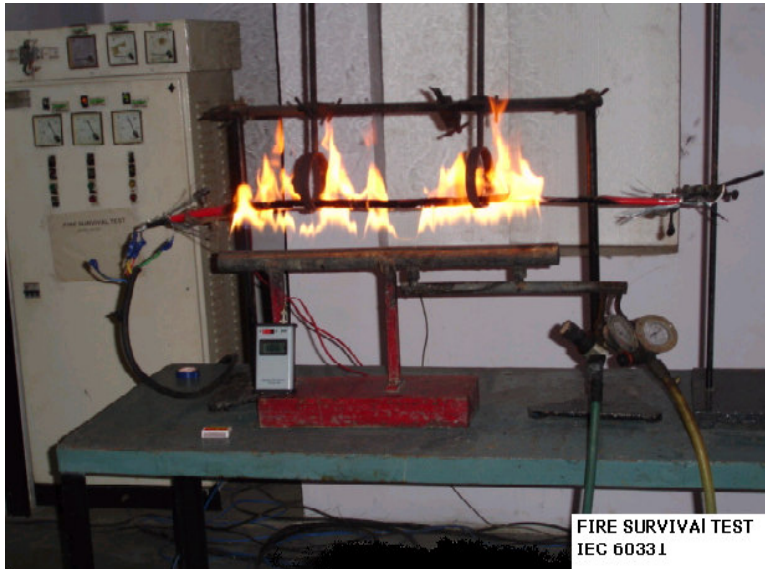


Performance Characteristics of Different Types of Cables under Fire

Sl. No.	Cable Type	Fire Characteristics	Application	Properties
01	PVC Cables XLPE Cable	Flame Retardant (FR)	Where flame retardance is desirable, but smoke and acid gas evolution is not considered to pose a serious hazard.	IEC – 60332 – 1, 332 – 3 SS-4241417, ASTM-D-2863 – Limiting Oxygen Index – Min. 29%
02	Low emission PVC Cables, XLPE Cables	Flame Retardant, Low Smoke & Reduced Halogen (FRLS-H)	In situations where reduced levels of smoke and corrosive gases are needed, compared to ordinary PVC or chlorinated polymer based cables.	IEC – 60332 – 1, 60332 – 3, SS – 424 – 1417 ASTM-D-2843, Smoke Density Rating:Max. 60% ASTM-D-2863,Limiting Oxygen Index:Min.29% IEEE-60754-1 (Max. HCL Gas Emission): 20%)
03	Low Fire Hazard Low Smoke, Zero Halogen. (LSOH)	Flame Retardant Low smoke & Acid Gas Emission.	For installation in areas where smoke and acid gas evolution could pose a hazard to personnel or sensitive equipment, but where circuit integrity is not needed.	IEC – 60332 – 1, 60332 – 3, SS – 424 – 1417 ASTM-D-2843, Smoke Density Rating: Max.20% IEC-61034, Min. Light Transmission: 70% ASTMD-2863,Limiting Oxygen Index:Min. 30% IEC-60754-2, Max. HCL : 0.5% Toxicity Index: Less than 5 NES 713, BS – 6724
04	Limited Circuit Integrity reduced hazard - Halogen contents (FRLS, FS)	Fire Resistance / Fire Survival / Flame Retardant Low Smoke (FRLS-H) & Reduced Halogen	For maintaining essential circuits such as emergency lighting and fire alarms for shorter time periods. Increased hazard from smoke and acid gas emission.	IEC – 60331, 60332 – 1, 60332 – 3, SS – 424 – 1417 ASTM-D-2843, Smoke Density Rating: 60% ASTM-D-2863, Limiting Oxygen Index: Min. 29% IEEE-60754-1 (Max. HCL Gas Emission): 20%)
05	Limited Circuit Integrity – Low Fire & Gas Hazards. (FS Cable, (LSOH)	Fire Resistant / Fire Survival / Flame Retardant Low Smoke & Zero Halogen.	For maintaining essential circuits such as emergency lighting and fire alarms for shorter time periods. Reduced hazard from cable combustion.	IEC – 60331, 60332 – 1, 60332 – 3, SS – 424 – 1417 ASTM-D-2843, Smoke Density Rating: Max.20% IEC-61034, Min. Light Transmission: 70% ASTMD-2863, Limiting Oxygen Index: Min. 30% IEC-60754-2, Max. HCL : 0.5% Toxicity Index: Less than 5 NES 713, BS – 7846, BS – 6387

IMPORTANT TESTS

TESTS TO ENSURE CIRCUIT INTEGRITY AS PER IEC - 60331



Test Procedure:

The test sample is exposed to flame for 3 hrs. at 750 °C with rated voltage being applied to cable.

3 Amps. fuses shall not blow off.

Test Equipment:

Horizontal burner (Flame source) with sample support arrangement.

SMOKE DENSITY TEST AS PER ASTM D-2843



Test Procedure:

The test sample is exposed to flame at a 40 psi pressure for 4 minute, the light absorption data are plotted on a graph as time versus smoke density (%).

Test Equipment:

Smoke density Chamber with specimen holder, Ignition system and photometric system complete.



SWEDISH CHIMNEY TEST AS PER SS – 424 1417

Test Procedure:

Measured quantity of ethanol is used to create flame which is applied on 850 mm. long cable for a calculated time and the un-burnt lengths from the top is measured.

Test Equipment:

Vertical Steel Tube with rectangular openings, lid and conical tray for ignition fluid.



OXYGEN INDEX TEST AS PER ASTM-D-2863

Test Procedure:

Test sample 7 to 15 cm long by 6.5 ± 0.5 mm wide over 3 ± 0.5 mm thick in a minimum concentration of oxygen in a $N_2 + O_2$ mixture just support candle like burning at room temperature.

Test Equipment:

Oxygen Analyser, Flame source, Oxygen & Nitrogen gas supply and measuring flow meter.