

# SPECIFICATION

## For

### 12/20KV-CE-CWS (0370)

12/20(24)kV XLPE Insulated

Copper Wire Screened

With Synthetic Water Blocking and Cushioning Tape

PE Sheathed Power Cable

(12/20(24)kV, Cu/XLPE/CWS/PE)


BY



(Wachara Sangsomritphon)

MANAGER, Cable Design Section

APP.



(Winai Ariyasakulsap)

MANAGER, Development Department

APP.

( )

CUSTOMER

Rev.	Date	Description
0	21/10/2020	Issued specification

Customer Document	Rev.
-	

**Remark:**

This document is based on the Customer Document for the structure and properties of electric wire and cable only. If there are different points, will be shown in deviation table.

## 1. Scope

This specification covers 22000V copper conductor cross-linked polyethylene (XLPE) insulated copper wire screened with synthetic water blocking and cushioning tape polyethylene (PE) sheathed power cable.

The cable shall be in accordance with TIS 2143-2546. (Same IEC 60502-2 : 2014).  
(Reference PEA's specification No. RCBL-035/2554 Rev.No.1).

## 2. Conductor

The conductor shall be compacted concentric stranded uncoated annealed copper conductor in accordance with TIS 2427-2552, Class 2 (Same IEC 60228 : 2004, Class 2).

The direction of lay shall be left-hand (S) lay in the outermost layer.

## 3. Conductor Shield

The conductor shield shall be a semi-conducting nylon tape and shall be applied helically with a wrap over the conductor and a layer of extruded semi-conducting compound.

Size  $\leq 150 \text{ mm}^2$  : Applied extruded semi-conducting compound

Size  $\geq 185 \text{ mm}^2$  : Applied semi-conducting nylon tape and extruded semi-conducting compound

The thickness of the conductor shield shall be approximate 0.5 mm.

## 4. Insulation

The insulation shall be cross-linked polyethylene (XLPE) compound meet the requirements of TIS 2143-2546. (Same IEC 60502-2 : 2014).

The average thickness of the insulation shall be not less than the nominal value specified in Table 2.

The minimum thickness of the insulation shall be not less than 90% of the nominal value.

The thickness of insulation shall not be included that of conductor shield.

## 5. Insulation Shield

The insulation shield shall be a layer of extruded semi-conducting compound and shall be free stripping.

The thickness of the insulation shield shall be approximate 0.5 mm.

## 6. Copper Wire Screen

The copper wire screen shall consist of plain annealed round copper wires applied helically over the insulation shield.

The contact tape shall be an uncoated annealed copper tape and shall be applied helically with a gap over the copper wire screen.

The thickness of the copper tape shall be approximate 0.1 mm.

## 7. Synthetic Water Blocking and Cushioning Tape

A non-conductive non-biodegradable water blocking tape shall be applied over the contact tape to provided a continuous longitudinal watertight throughout the cable length.

## 8. Sheath

The sheath shall be polyethylene (PE/ST7) compound meet the requirements of TIS 2143-2546. (Same IEC 60502-2 : 2014).

The average thickness of the sheath shall be not less than the nominal value specified in Table 2.

The minimum thickness of the sheath shall be not less than 80% of the nominal value.

The color of the sheath shall be black.

## 9. Marking on Cable

The surface of sheath shall be marked legibly and durably in Thai language, at the interval of about 50 cm, as follows :

“การไฟฟ้าส่วนภูมิภาค สายเคเบิลใต้ดินทองแดงหุ้มด้วยฉนวนครอสลิงค์โพลีเอทิลีน สำหรับใช้กับระบบ A โวลต์, ขนาด B ตร.มม., สัญลักษณ์ที่ C, D, E, F, G”

Where

A : Rated voltage

B : Nominal cross-sectional area

C : -

D : Manufacturer's name and/or Trade-mark

E : PEA trade-mark, as the figure below



F : Year of manufacture

G : Others according to manufacturer's design

The cable length markings shall be made on the sheath through whole length started from “0” with 1 meter increment

## 10. Test and Properties


The cable shall meet the requirements in Table 1 and Table 2, when tested in accordance with TIS 2143-2546, TIS 2427-2552 (Same IEC 60502-2 : 2014 and IEC 60228 : 2004) and PEA's specification No. RCBL-035/2554 Rev.No.1.

## 11. Packing

The cable shall be placed on non-returnable wooden reels.

The reels shall be covered with suitable covering to provide the cable with physical protection during transportation and during ordinary storage and handling operations.

Each reel shall be clearly marked as follows.

1. Designation "12/20KV-CE-CWS (0370)"
2. Type of insulation and sheath "XLPE/PE"
3. Number of core and size of conductor
4. Cable length
5. Net and gross weight
6. Year of manufacture
7. Manufacturer's name and trade mark "  **YAZAKI** "
8. Rolling direction of reel and cable end position

**Table 1**

**Routine Test**

- Maximum conductor resistance, Ohm/km..... specified in Table 2
- AC test voltage for 5 minutes, kV ..... 42
- # Maximum partial discharge level ..... 10 pC or better, at 20.76 kV
- Electrical test on over sheath..... No breakdown
- The number of length to be tested shall be decided by agreement between the purchasers (or its representative) and the manufacturer or shall be 10 % of the number of lengths in the contract.
- # The partial discharge level shall be no detectable discharge exceeding the declared sensitivity.

**Sample Test**

- \* Construction .....specified in Table 2
- \*\* AC test voltage for 4 hours, kV.....48
- \*\* Hot set test at 200 °C  $\pm$  3 °C for XLPE
- Maximum elongation under load (%) .....175
- Maximum permanent elongation after cooling (%) .....15
- \* The test shall be made on one length from each manufacturing series of the same size of cable, but shall be limited to not more than 10% of the number of lengths in the contract, as specified in TIS 2143-2546.
- \*\* The test shall be made on samples taken from cables manufactured for the contract, on the following basis, as specified in TIS 2143-2546.

Cable Length		Number of samples
Above (km)	Up to and including (km)	
4	20	1
20	40	2
40	60	3
etc.		etc.

**Table 1 (continued)**

**Properties of Conductor Shield**

Maximum volume resistivity at room temperature and at 90 °C

Ohm-m..... 1000

**Properties of Insulation Shield**

Maximum volume resistivity at room temperature and at 90 °C

Ohm-m..... 500.

**Table 2**

No. of core	Size  (mm <sup>2</sup> )	Conductor  (wires/type)	Conductor diameter  (mm)	Insulation thickness nominal  (mm)	Copper wire area  (mm <sup>2</sup> )	Sheath thickness nominal  (mm)	Overall diameter approx.  (mm)	Conductor resistance at 20 °C maximum (Ohm/km)	Weight of cable approx.  (kg/km)	Standard packing length  (m)
1	35/10	7/Compacted	6.95±1%	5.5	10	1.8	28.0	0.524	850	500
1	50/10	19/Compacted	8.33±1%	5.5	10	1.8	30.0	0.387	1000	500
1	70/10	19/Compacted	9.80±1%	5.5	10	1.9	30.0	0.268	1300	500
1	95/10	19/Compacted	11.45±1%	5.5	10	1.9	33.0	0.193	1500	500
1	120/10	37/Compacted	12.95±1%	5.5	10	2.0	34.0	0.153	1800	500
1	150/25	37/Compacted	14.50±1%	5.5	25	2.1	36.0	0.124	2300	500
1	185/25	37/Compacted	15.98±1%	5.5	25	2.1	38.0	0.0991	2600	500
1	240/25	61/Compacted	18.47±1%	5.5	25	2.2	42.0	0.0754	3200	500
1	300/25	61/Compacted	20.80±1%	5.5	25	2.3	43.0	0.0601	3900	500
1	400/25	61/Compacted	23.39±1%	5.5	25	2.4	48.0	0.0470	4700	500
1	500/25	61/Compacted	26.67±1%	5.5	25	2.6	52.0	0.0366	6000	500
1	630/25	61/Compacted	30.20±1%	5.5	25	2.7	54.0	0.0283	7500	500
1	800/25	61/Compacted	34.00±1%	5.5	25	2.8	58.0	0.0221	9000	500

12/20(24)kV XLPE Insulated Copper Wire Screened with Synthetic Water Blocking and Cushioning Tape

PE Sheathed Power Cable

(12/20KV-CE-CWS (0370))

