Value Engineering Your Electrical Wiring System

Institute of Integrated Electrical Engineers

“IIEE AT 40: A JOURNEY OF SERVICE FOR EXCELLENCE”

November 25, 2015

QUESTI0NING AS ONE OF INNOVATIVE BEHAVIOR (HARVARD BUSINESS SCHOOL)…

Do you want to save up to 50 % of your electrical wiring cost without compromising Safety & Reliability?

PRESENTATION OUTLINE

phelps dodge
One time investment. Lifetime protection.

1. **CURRENT CHALLENGES IN ELECTRICAL CABLE INSTALLATION FOR CONDUIT WIRING METHOD**

2. **PD VALUE ENGINEERING SOLUTION:**

   METAL-CLAD CABLES (TYPE MC CABLE)

   - CHARACTERISTICS OF METAL-CLAD CABLES
   - ADVANTAGES OF MC CABLES
   - COST BENEFITS OF MC CABLES
   - INSTALLATION METHODS AND ITS ACCESSORIES

PRESENTATION OUTLINE

One time investment. Lifetime protection.

3. OTHER NEW PRODUCTS OFFERINGS & VALUE ENG'G SOLUTIONS:

- ALUMINUM BUILDING WIRE (ALUMILITE 8000 SERIES)
- FIRE-RATED CABLES
- LOW-SMOKE HALOGEN FREE CABLES
- VERSADUCT BUSWAY
- SOLAR CABLES
- MEDIUM & HIGH-VOLTAGE POWER CABLES
- SPACE AERIAL CABLES (SAC)

4. PHELPS DODGE TOTAL ENGINNERING SOLUTION "PD ENGAGE – ENGINEERING ADVANTAGE)

CURRENT CHALLENGES IN ELECTRICAL WIRING INSTALLATION FOR CONDUIT WIRING

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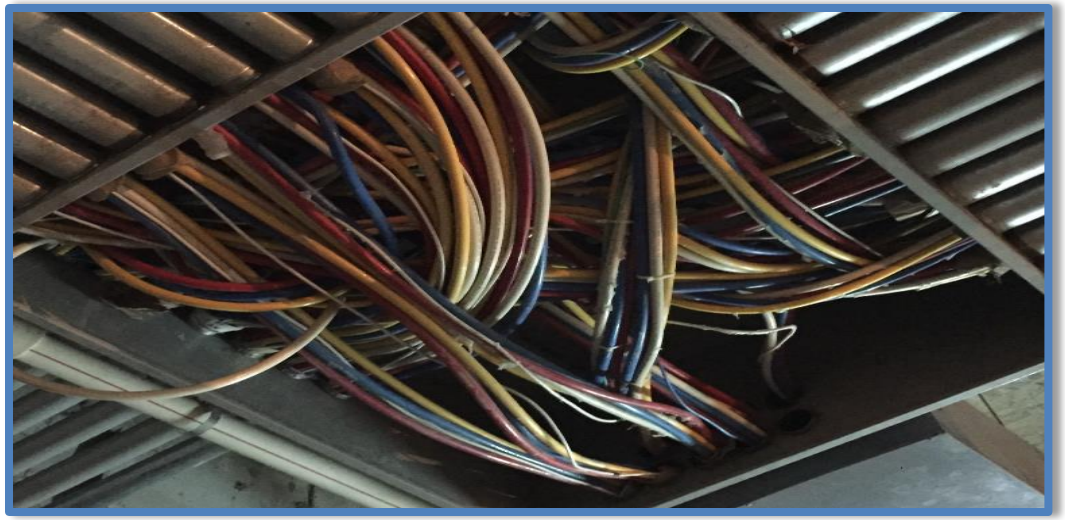
One time investment. Lifetime protection.

ISSUES ON CONDUIT WIRING METHODS



Cable congestion on pull boxes & need to use pull boxes for routes with 4x 90 bends

Overbending of cable on pull boxes

ISSUES ON CONDUIT WIRING METHODS

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One time investment. Lifetime protection.

Limited flexibility & requires bigger space for conduit bends

Occupies bigger installation space and requires more storage space

ISSUES ON CONDUIT WIRING METHODS

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Improper cable grouping & installation

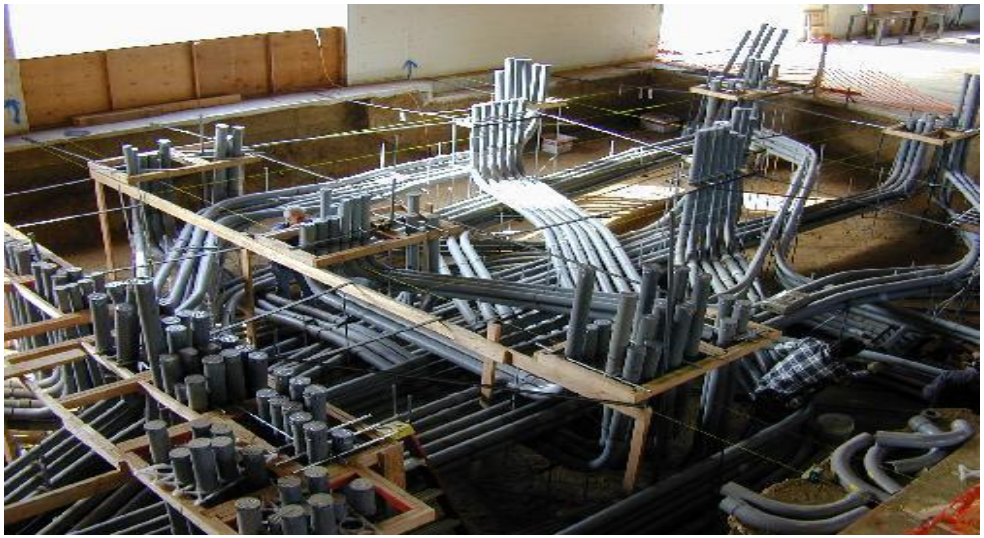
Cable damage during cable pulling and installation

ISSUES ON CONDUIT WIRING METHODS

One time investment. Lifetime protection.

Requires longer installation time

Resulting to higher cost of installation for Conduit wiring



CONDUIT

CABLE TRAY

WHY DO WE HAVE TO USE CONDUITS?

ARE THERE ALTERNATIVE WIRING METHODS FOR CONDUITS & CABLE TRAY?

THE GOOD NEWS --THESE CHALLENGES ARE OPPORTUNITIES TO INNOVATE & INTRODUCE

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PD VALUE ENGINEERING SOLUTION

METAL CLAD CABLE (TYPE MC CABLE)

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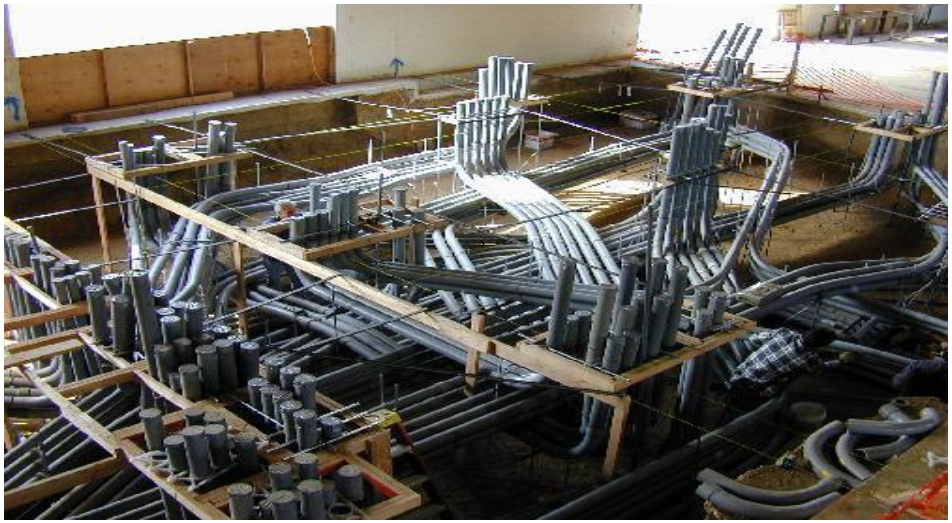

CONDUIT

CABLE TRAY

METAL CLAD CABLES

VALUE ENGINEERING SOLUTION

TECHNICAL DEFINITION OF TYPE MC CABLE

(NEC 330/PEC 3.30)

A factory assembly of insulated circuit conductors, enclosed in an armor of interlocking metal type.

MC CABLE CONSTRUCTION

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One time investment. Lifetime protection.

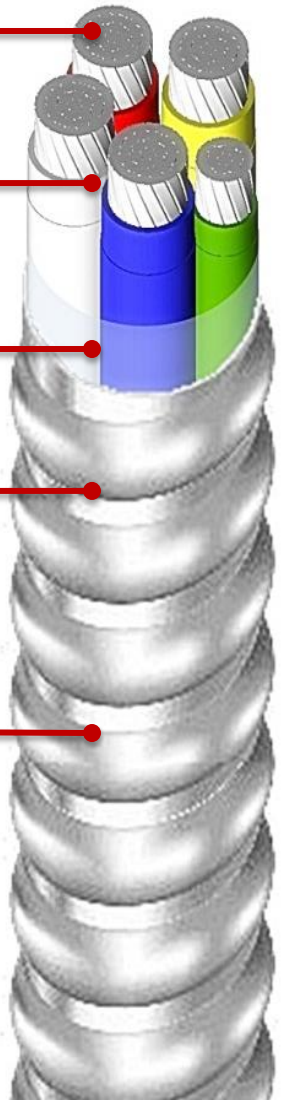
CONDUCTOR
COPPER OR ALUMINUM

INSULATION:
PVC, PVC/NYLON or XLPE

CORE WRAP:
MYLAR TAPE

ARMOR:
ALUMINUM STRIP ARMOR
or STEEL STRIP ARMOR

JACKET:
WITH (FOR OUTDOOR) or
WITHOUT (FOR INDOOR)
PVC OVERALL JACKET



CORE:
SINGLE CORE or
MULTICORE CABLE

VOLTAGE RATING:
LOW VOLTAGE or
MEDUIM VOLTAGE

With our MC Cables, easy does it is an understatement.

Electrical installations don't have to be a tedious, and time-consuming task.

Trust only Phelps Dodge Metal-Clad (MC) Cables, and you'll know how simple your life can be.

- One-step installation.
- Highly flexible, allows more bends
- Less space requirements
- Faster job turns at a lower cost

- ✓ MC Cable can be either Copper or Aluminum
- ✓ Clean-looking / No need to paint over
- ✓ High flexibility compared to conduits
- ✓ Less space requirements by up to 30% versus conduits
- ✓ Eliminates need for pull boxes
- ✓ Faster installation time by as much as 30% versus conduit installation
- ✓ Cabling costs reduced by up to 50% versus conventional wiring method*
- ✓ Corrosion, rodent and termite resistant

**for copper cable in IMC conduits versus aluminum MC cable*

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One-time investment. Lifetime protection.

General Manager: A. SORIANO CORPORATION · Q 0054 · CERTIFICATION INTERNATIONAL · Underwriters Laboratories

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Email: customercare@phelpsdodge.com.ph
Website: www.phelpsdodge.com.ph

METAL-CLAD CABLES

- *Available for both Copper and Aluminum Conductors*
- *PVC/Nylon (THHN/THWN-2), or XLPE or PVC Insulations*
- *With Aluminum Strip Armor*
- *With or without PVC Overall Jacket*
- *Single Core and Multi-core Cables*
- *Low voltage and Medium voltage*

Specifications and Special Features

- Easy to install: All-in-one factory assembled prefab cable, which results in reduced installation time up to 30%
- Strong, lightweight, and corrosion-resistant aluminum alloy armor protects conductors from damage during installation
- Rodent and termite resistant due to its aluminum armor
- Overall flexibility not available with a conduit
- Not limited to four of 90° bend rule, which eliminates the need for pull boxes
- Aesthetically clean-looking installed appearance; no need to paint
- Factory-tested Engineered Product
- Can be direct buried, used in wet locations, or encased in concrete*
- Eliminates the need for expensive tools such as pipe cutter, threader, and bender due to its built-in Al strip armoring

**for PVC Jacketed Phelps Dodge MC Cable*

phelps dodge

One-time investment. Lifetime protection.

Installation Parameters

Bending radius
- Minimum bending radius for interlocked armor: 7 x diameter of metallic sheath

Support
- Unless otherwise provided, cables shall be supported and secured horizontally and vertically at intervals not exceeding 1.8m (6 ft.)
- Support types
  - ✓ Strut
  - ✓ Trapeze
  - ✓ Laid and strapped down to joists or trusses
  - ✓ Cable Tray

Applications

Without Jacket
- For service entrance and feeders
- For power lighting and signal circuits
- Indoors
- Where exposed or concealed
- In cable tray
- In dry locations and embedded plaster finish on brick or other masonry except in damp or wet conditions

With Overall PVC Jacket
- Outdoors
- In wet locations
- Direct burial
- Encased in concrete

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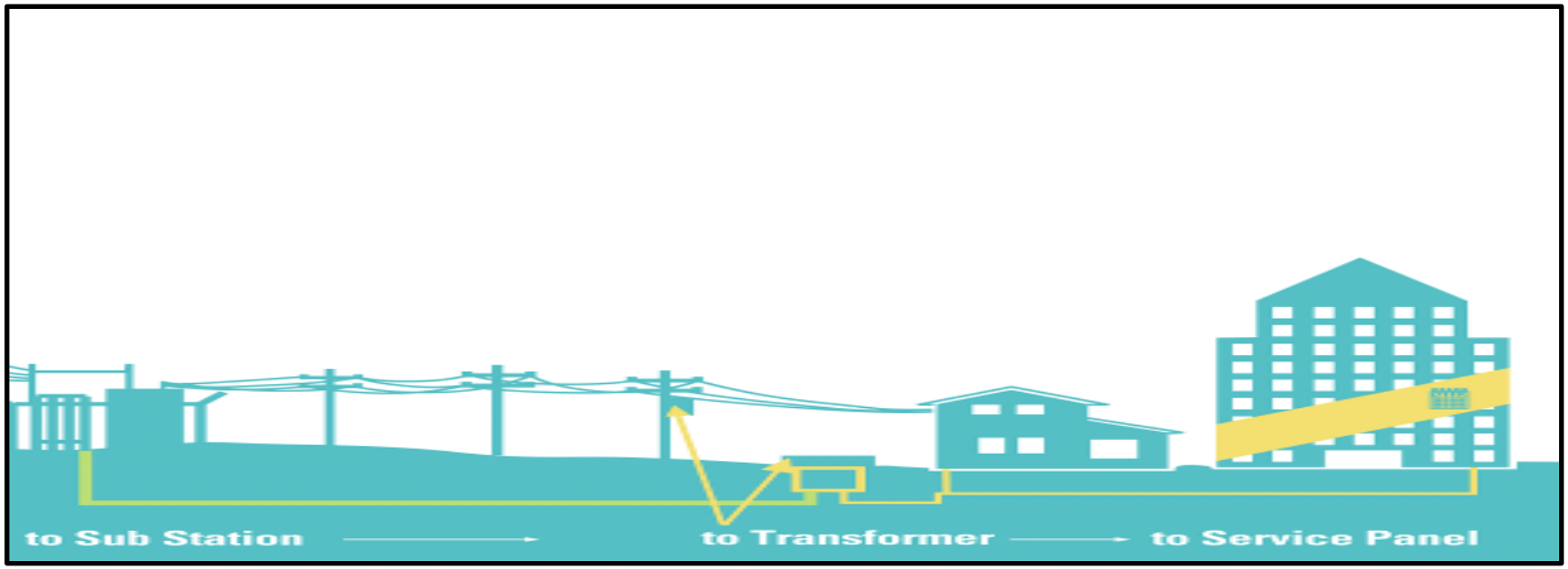
Manufacturing Plant Luisita Industrial Park, San Miguel, Tarlac City Tel (045) 985-1089 to 91 • Fax (045) 985-0076

APPLICATIONS PERMITTED IN ACCORDANCE TO PEC/NEC

- For services, feeders and branch circuits
  18 AWG (0.8 mm²) – 2000 kcmil (1000 mm²) for copper
  12 AWG (3.5 mm²) – 2000 kcmil (1000 mm²) for aluminum special alloy



APPLICATIONS PERMITTED IN ACCORDANCE TO PEC/NEC

- For power, lighting, control and signal circuits

- Direct burial application and concrete embedding

APPLICATIONS PERMITTED IN ACCORDANCE TO PEC/NEC

- For cable tray and raceway applications

- For applications both for dry/wet locations, indoor/outdoor and exposed/concealed locations

ADVANTAGES OF TYPE MC CABLES

- An **ALL-IN-ONE FACTORY ASSEMBLED, FACTORY TESTED PREFAB CABLE**

- Armor made up of **STRONG, LIGHTWEIGHT, DURABLE AND CORROSION, RODENT AND TERMITE RESISTANT ALUMINUM ALLOY**

ADVANTAGES OF TYPE MC CABLES

- Possesses **HIGH FLEXIBILITY** and is **NOT LIMITED TO FOUR (4) OF 90° BEND RULE** for pull boxes and conduits

ADVANTAGES OF TYPE MC CABLES

- **Meets or exceeds requirements of NEC, PEC and several cable standards**

NEC 330 Metal Clad Cables

UL 1569 Standard for Safety - Metal Clad Cables

PEC 3.30 Metal Clad Cables

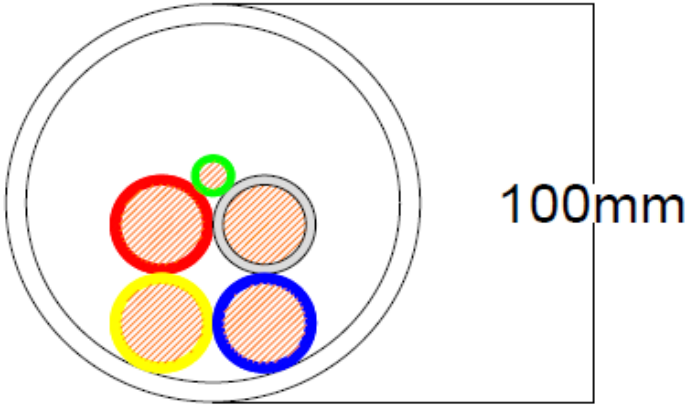
ADVANTAGES OF TYPE MC CABLES

- **Reduced installation steps by 30% to 50%**

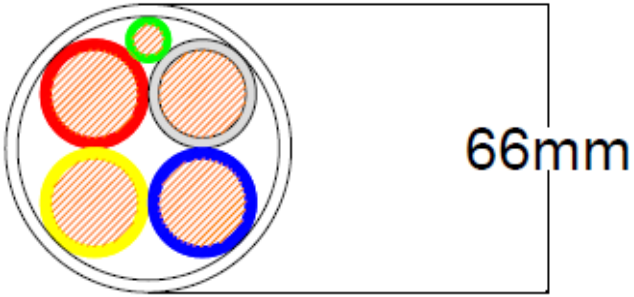
Conduit	Cable Tray	Type MC Cable
1. Conduit Support Installation 2. Conduit bending 3. Conduit installation 4. Sheaves & Lead wire threading 5. Cable Pulling 6. Cable Terminations 7. Testing	1. Cable tray support installation 2. Cable tray installation 3. Sheaves &Lead wire Threading 4. Cable Pulling 5. Fastening Cable 6. Terminating Cable 7. Testing	1. MC Cable support installation 2. Cable sheaves & Lead wire Threading 3. Pulling of MC Cable 4. Clamping of MC Cable 5. Terminating MC Cable 6. Testing

Faster installation due to simplified process.
*Metal clad cable **reduces risk of damage due to cable pulling.***

SAVES SPACE



VS.



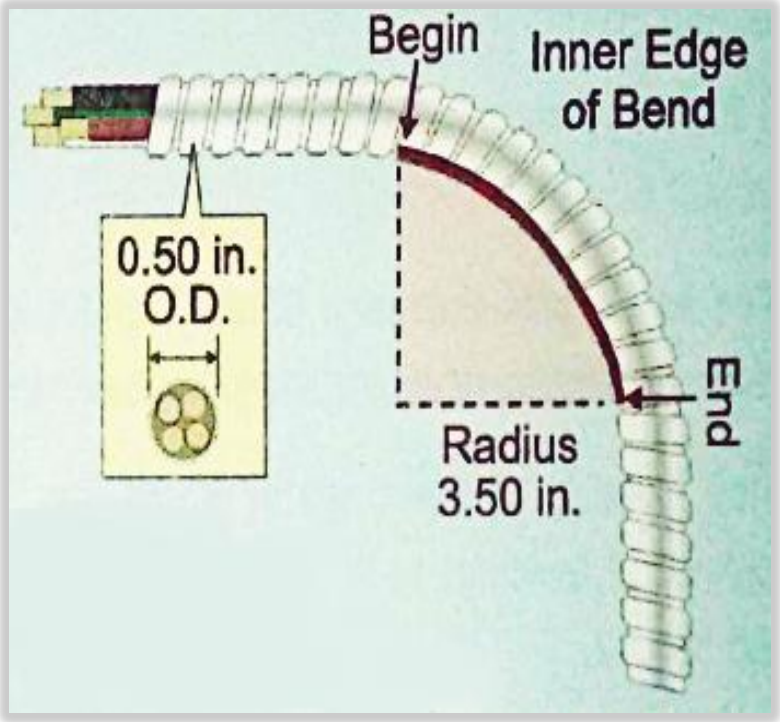
Copper Cable in 3 ½" Conduit (4x1C -500MCM + 1G 2AWG)

MC Copper Cable (4C -500MCM + 1G 2AWG)

SAVES SPACE from 20-30 % vs conduit

ADVANTAGES OF TYPE MC CABLES

- Takes up **lesser bending space (10-20 %)** as compared to conduit installation (6 x IMC diameter)



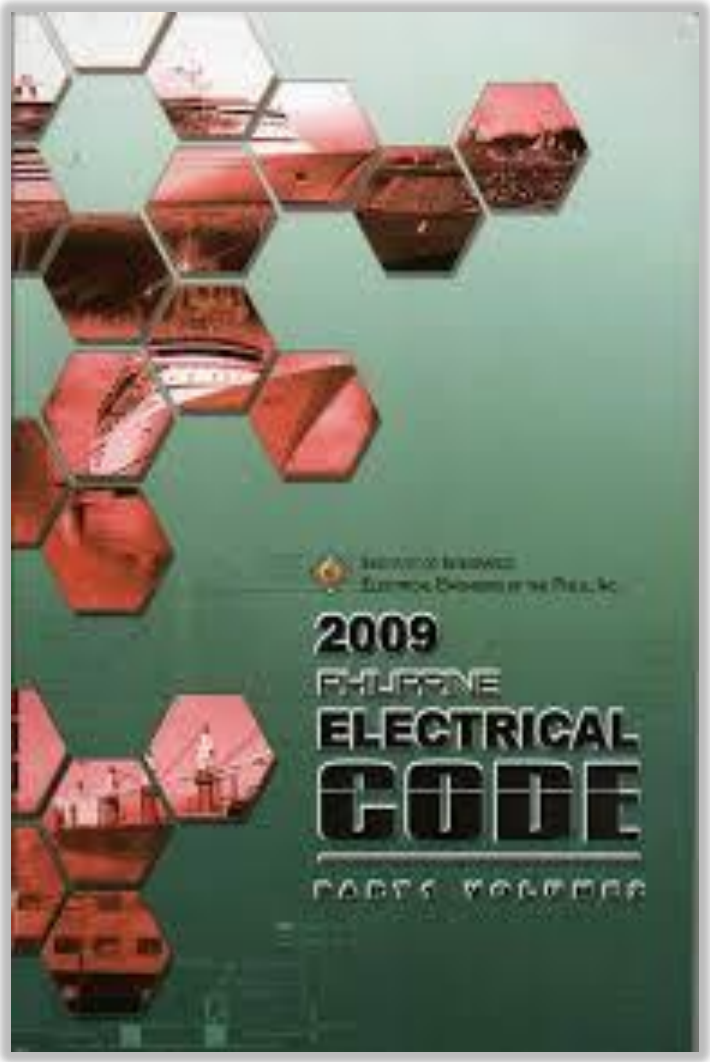
Bending radius required by the code should be **7 times the diameter of the cable.**

ADVANTAGES OF TYPE MC CABLES

- **Less susceptible for pilferage** for metal clad cables of aluminum conductors

- **Aesthetically clean looking, no need to paint.**

AMPACITY OF MC CABLE



The ampacity of type MC cables is the same as that of conductors arranged in raceways and conduits.

Stated in PEC Section 3.10.1.15/ Table 3.10.1.16 (Allowable Ampacities of Insulated Conductors Rated 0 through 2000 Volts Not More than Three-Current Carrying Conductor in Raceway, Cable or Earth).

AMPACITY OF MC CABLE

One time investment. Lifetime protection.

COPPER

Conductor Size	2-C + G AN 3-C +G Wet & Dry	4-C + G (Derated) Wet & Dry
3.5mm²	25	20
5.5 mm²	30	24
8.0mm²	50	40
14mm²	65	52
22mm²	85	68
30mm²	110	88
38mm²	125	100
50mm²	145	116
60mm²	160	128
80mm²	195	156
100mm²	220	175
125mm²	225	180
150mm²	280	224
200mm²	330	264
250mm²	375	300

ALUMINUM

Conductor Size	2-C + G AN 3-C +G Wet & Dry	4-C + G (Derated) Wet & Dry
6AWG	50	40
4AWG	65	52
2AWG	90	72
1AWG	100	80
1/0AWG	120	96
2/0AWG	135	108
3/0AWG	155	124
4/0AWG	180	144
250MCM	205	164
300MCM	230	184
350MCM	250	200
400MCM	270	216
500MCM	310	248
600MCM	340	272
700MCM	375	300
750MCM	385	308
800MCM	445	356

AMPACITY OF MC CABLE

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CONVERSION OF COPPER TO ALUMINUM WIRE SIZES

COPPER	ALUMINUM
8 mm^2	6 AWG
14 mm^2	4 AWG
22 mm^2	2 AWG
	1 AWG
30 mm^2	1/0 AWG
38 mm^2	2/0 AWG
50 mm^2	3/0 AWG
60 mm^2	4/0 AWG
80 mm^2	250 MCM
100 mm^2	300 MCM
125 mm^2	350 MCM
	400 MCM
150 mm^2	500 MCM
200 mm^2	600 MCM
250 mm^2	700 MCM
	750 MCM
325 mm^2	1000 MCM
400 mm^2	1250 MCM

EQUIVALENT AL CONDUCTOR SIZE- TWO AWG SIZES BIGGER

INSTALLATION METHODS

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1. Hanging the Support System

Type MC cable shall be **supported and secured at interval not exceeding 1.8 m (6 ft)**, vs. 3 m (10 ft) required for conduits.

Types of Support:

a) Strut and trapeze

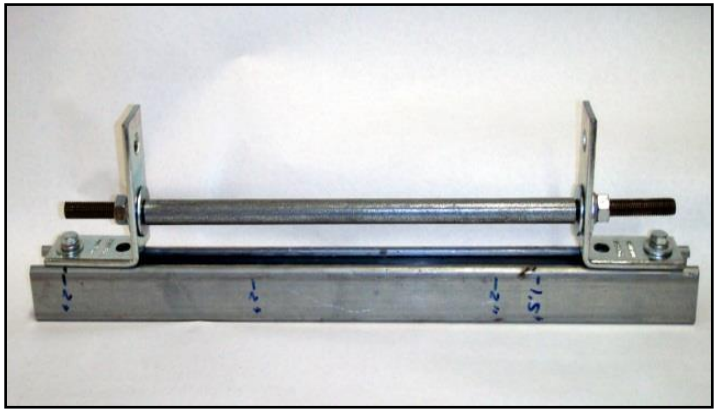
b) Cable tray

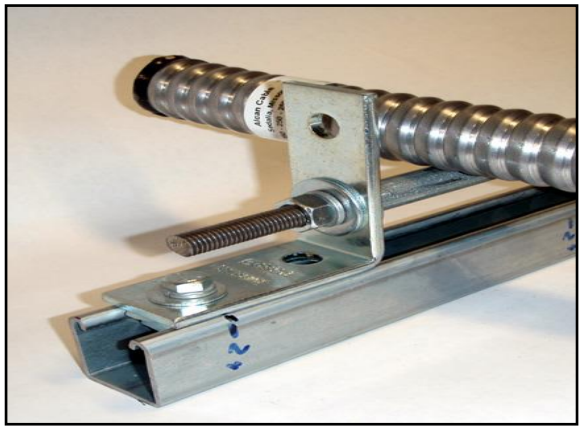
c) Straps and clamps

INSTALLATION METHODS

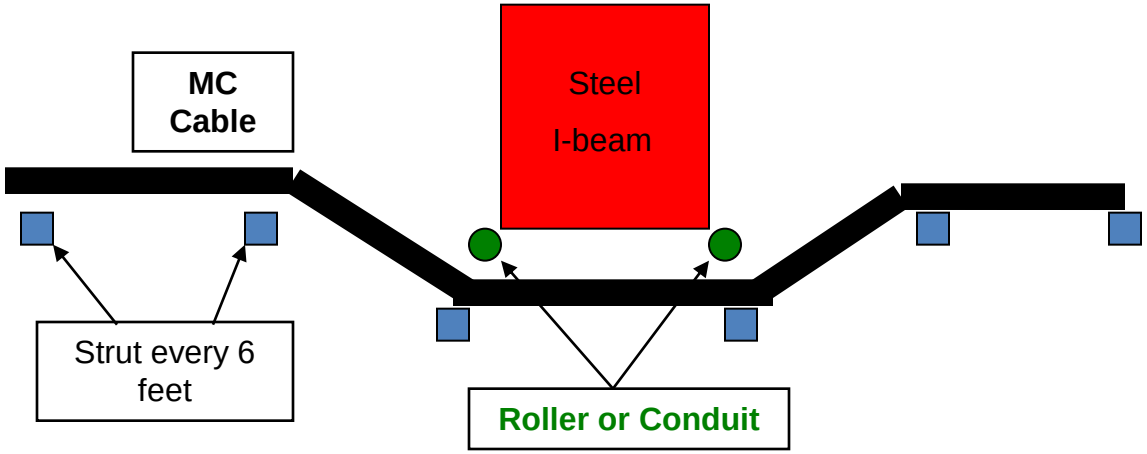
2. Installing Rollers and Sheaves

Single Wheel





½" conduit, ½" threaded rod, strut angles and hardware

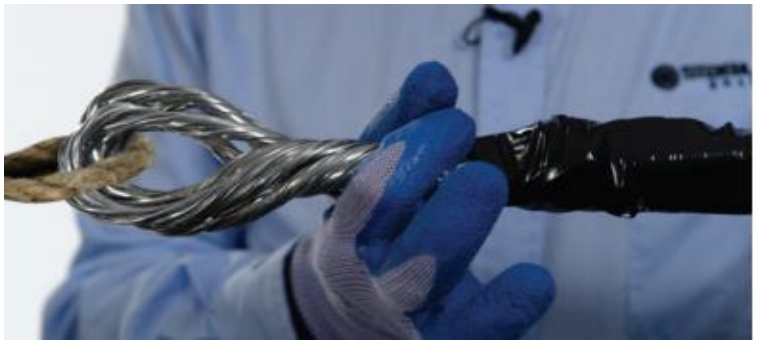


MC was going to go over steel I-beam or thru if possible, suggested to drop just under beam for less stress and pull on MC. May have to put a roller or conduit at beam to protect MC

INSTALLATION METHODS

3. Pulling MC Cables

Pulling Basket



4. Preparing MC Cables

Tools for cable cutting:

Rotary Cutter

Motorized Cutter

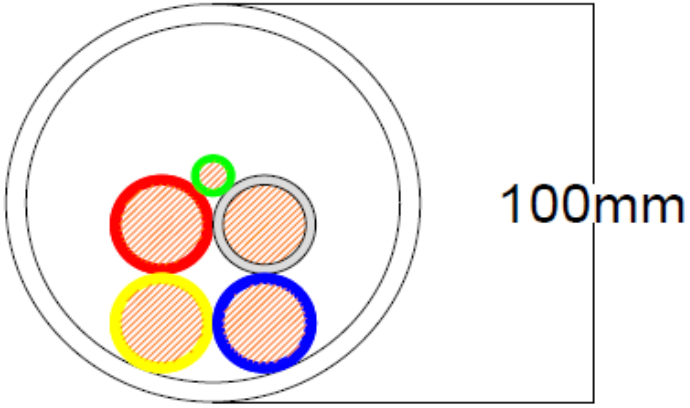
Hacksaw

INSTALLATION METHODS

5. Terminating MC Cables

MC Cable Fittings

COST COMPARISON



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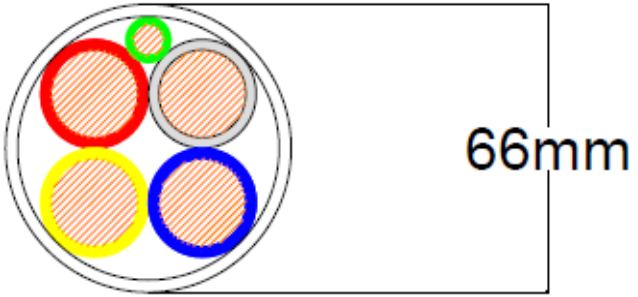


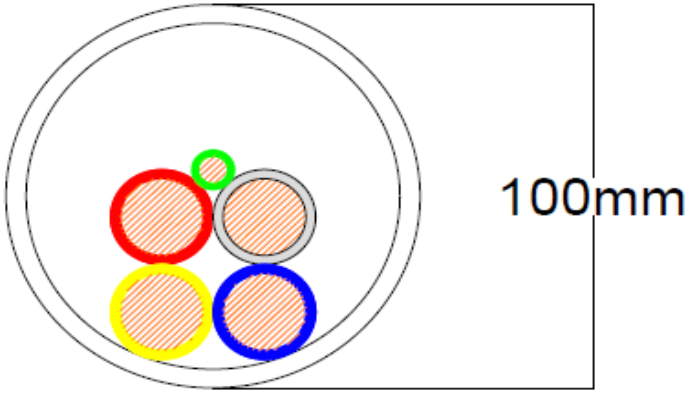
Copper Cable in 3 ½" Conduit
(4x1C -500MCM + 1G 2AWG)

MC Copper Cable
(4C -500MCM + 1G 2AWG)

Up to 19% SAVINGS

BY USING MC COPPER CABLE

COST COMPARISON



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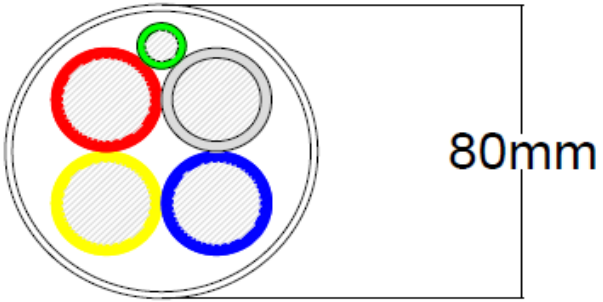

Copper Cable in 3 ½" Conduit
(4x1C -500MCM + 1G 2AWG)

MC Aluminum Cable
(4C -750MCM + 1G 1/0AWG)

Up to 46% SAVINGS

BY USING MC ALUMINUM CABLE

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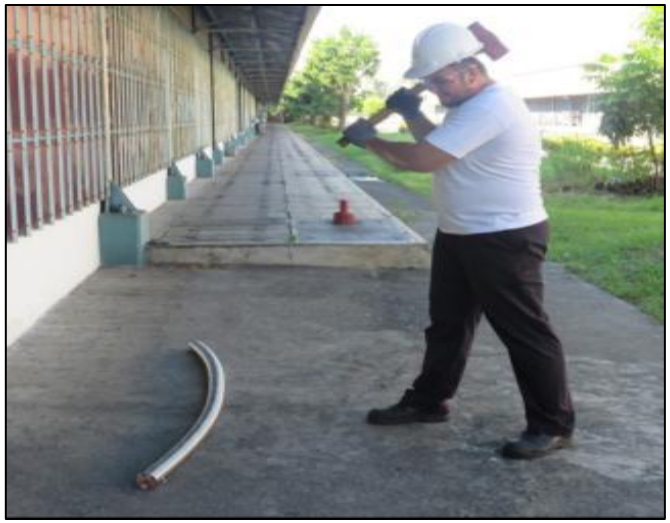
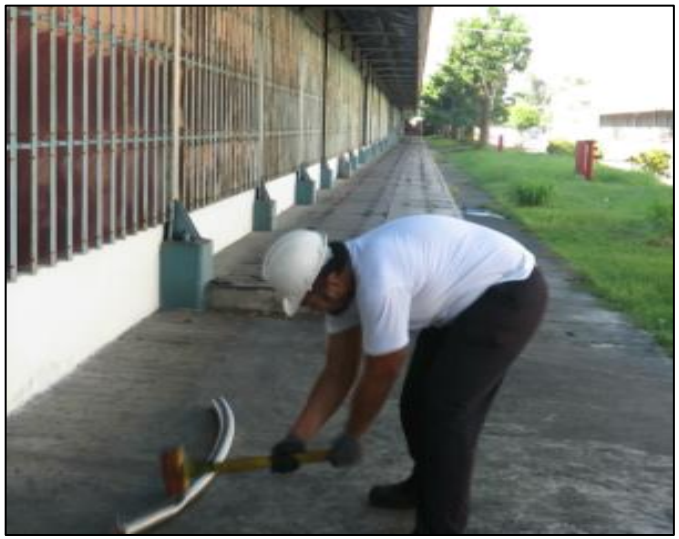
SAVINGS ON MC CABLES

CONDUIT	METAL CLAD CABLE

Metal clad cables are **ECONOMIC AND COST-EFFICIENT.**

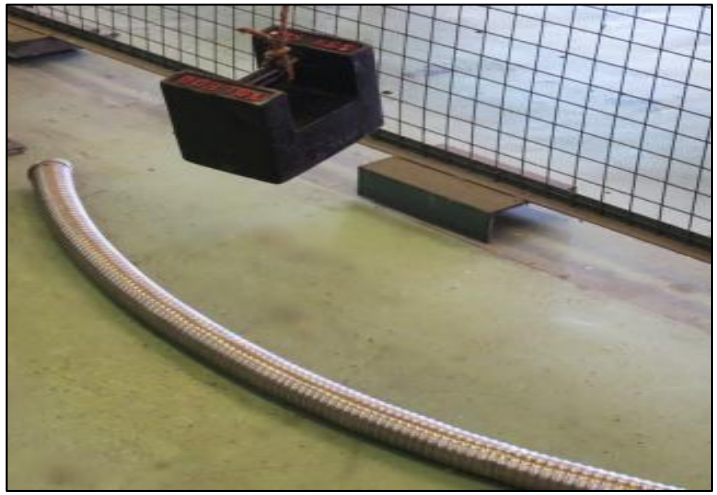
MC CABLE IMPACT TESTING





Metal clad cable able to withstand impact without losing performance

IMPACT TESTING (FREE FALL)

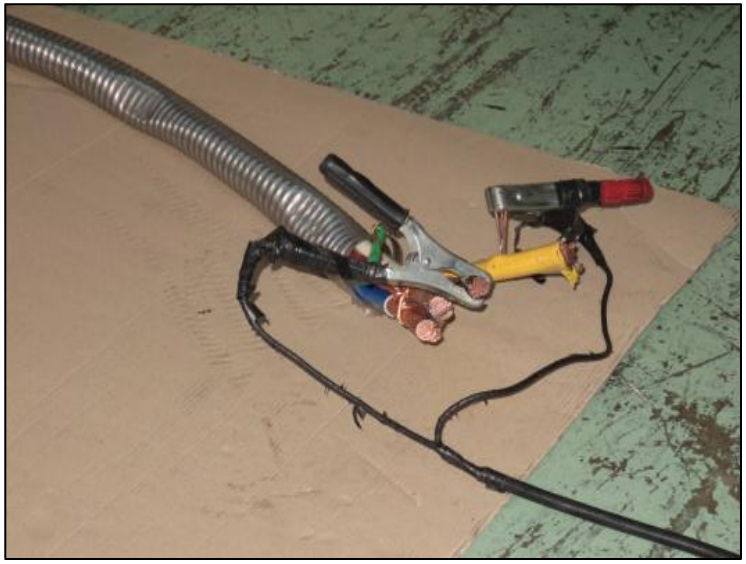


Metal clad cable able to withstand impact without losing performance

MECHANICAL TESTING

Metal clad cable able to withstand damage from dynamic load without losing performance

HIGH VOLTAGE TESTING



Metal clad cable remain functional even after mechanical testing as subjected to high voltage test.

BUILDING TYPE APPLICATIONS

- Stadiums
- Schools
- High Rise Building
- Hotels
- Malls
- Casino
- Office
- Industrial
- Plants
- Warehouses

GENERAL CABLE PROJECT REFERENCES

World Trade Center

Trump Hotel

Boeing Building

Cleveland Football

Palisades Center Mall

Phoenix Children Hospital

METAL CLAD CABLE INSTALLATION VIDEO

Courtesy of:

General Cable

OTHER NEW PRODUCTS

phelps dodge Philippines energy products corporation

One time investment. Lifetime protection.

PD ALUMILITE (ALUMINUM 8000 SERIES)

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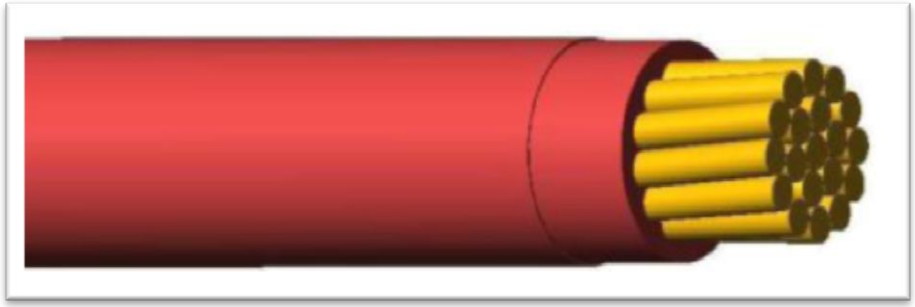
One time investment. Lifetime protection.

PD ALUMILITE



COPPER

PD ALUMILITE

	COPPER	ALUMINUM
Conductor	COMPRESS Stranded Copper Conductor	COMPACT Stranded AA 8000 Series Al. Conductor
Insulation	Lead Free PVC Insulation (THHN/THWN-2)	Lead Free PVC Insulation (THHN/THWN-2)
Jacket	Abrasion Resistant Nylon Jacket	Abrasion Resistant Nylon Jacket

For sizes 6AWG (14mm^2) & bigger.

ADVANTAGES OF PDP ALUMINUM BUILDING WIRES

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One time investment. Lifetime protection.

1. It is **COST EFFECTIVE** versus copper.
2. It is **LIGHTER** – it takes **ONE KILOGRAM OF ALUMINUM** to equal the current carrying capacity of **TWO KILOGRAMS OF COPPER.**
3. It is **SAFE and RELIABLE** as copper and it is widely used in **USA and Canada** since **1987**.
4. Insulation is made of **HIGH TEMPERATURE LEAD-FREE INSULATION TYPE THHN/THWN-2**

PROJECT REFERENCES

phelps dodge
One time investment. Lifetime protection.

MEGAWORLD

Ayala Land, Inc.

Rustan's
SINCE 1952

CÍRCULO VERDE

CSI

VISTA LAND

SM

KCC

PROJECT REFERENCES

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SM ARENA

SM AURA PREMIER

EASTWOOD MALL

PROJECT REFERENCES

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BASELINE RESIDENCES (Cebu)

CITYSCAPE TOWER CONDOMINIUM 2 (Cebu)

FILINVEST ALABANG BUILDING

FILINVEST PLAZA E

SOLAR CABLES

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One time investment. Lifetime protection.

SOLAR CABLES

EXZHELLENT® SOLAR

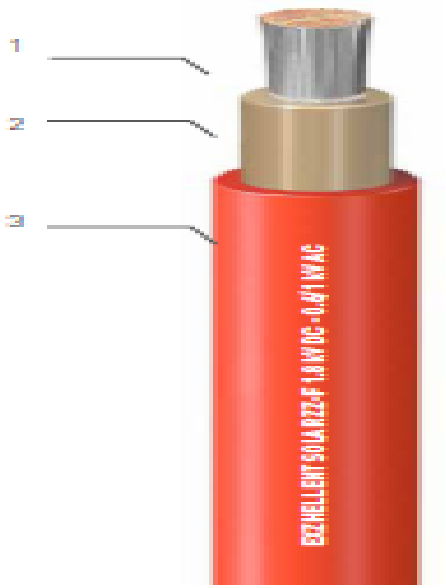
ZZ-F (PV1-F)

1.8 kV DC – 0.6/1 kV AC

APPLICATIONS:

Exzhellent® Solar ZZ-F (PV1-F) cables are designed to withstand the demanding environmental conditions that arise in any fixed, mobile, roof or architecturally integrated photovoltaic installation.
Not recommended for installation underground, whether in counduit or directly buried.
Exzhellent® Solar guarantees the maximum efficiency in the energy transmission throughout the full service life of your installation.

CONSTRUCTION:

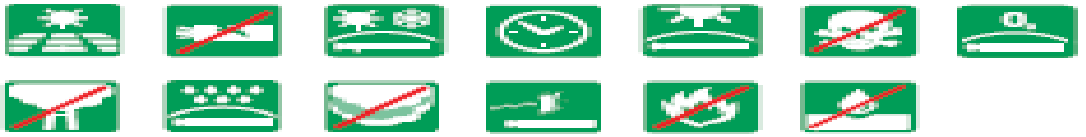


1. Conductor:
Tinned copper Class 5 for mobile installation (-F)
2. Insulation:
Halogen-free cross-linked elastomer (Z)
3. Jacket:
Halogen-free cross-linked elastomer (Z)

STANDARDS:
TÜV 2 Pfg 1169/08.2007
UTE C 32-502

VOLTAGE:
1.8 kV DC – 0.6/1 kV AC

FEATURES:

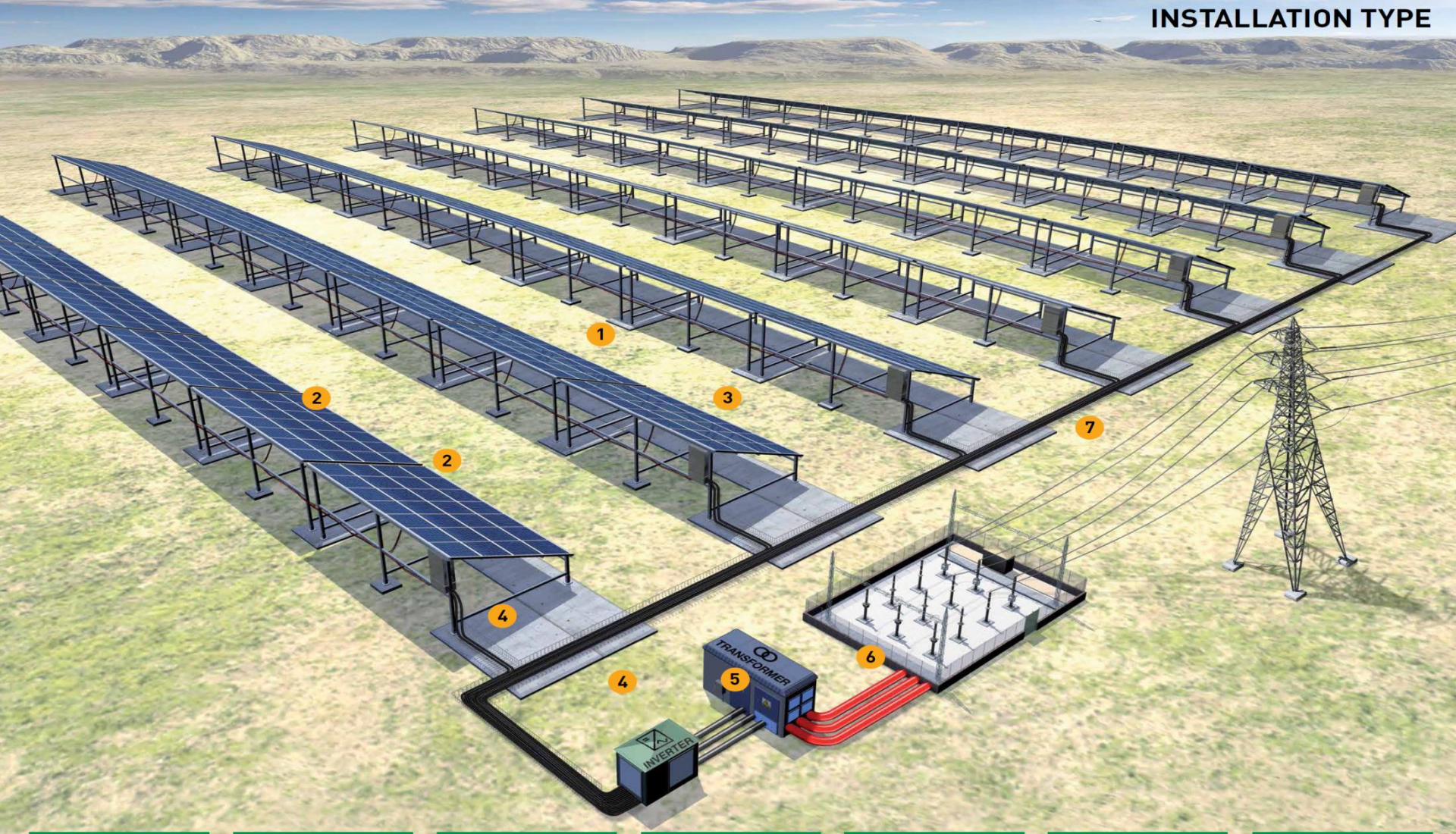


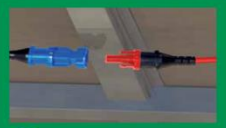
APPROVALS:

PDP VALUE ENGINEERING RECOMMENDATIONS FOR SOLAR CABLES

- ✓ Use of **ALUMINUM CONDUCTORS** for low voltage (LV) AC cables instead of copper conductors
- ✓ Use of **ALUMINUM CONDUCTORS** for medium voltage cables up to 13.8 kV
- ✓ Use of **TUV COMPLIANT SOLAR PV WIRES** (4 mm^2 -10 mm^2)
- ✓ Use of ACSR with **ALUMINUM CLAD STEEL** (corrosion resistant)
- ✓ **COPPER** for control and instrumentation cables

INSTALLATION TYPE

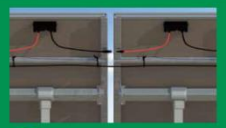




1 Easy pluggable system

ex*Zhellent* clickconnect

MC4 type • Amps 40A DC • contact resistance <1m Ω • -40 ºC to 105 ºC • IP68 • 2.5 to 10 mm² cross-sections Customised cable lengths



2 Connection between photovoltaic modules and panels

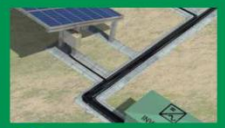
ex*Zhellent* SOLAR ZZ-F (PV1-F)
1.8 kV DC - 0.6/1 kV AC

Standard cross-sections from 1 x 2.5 to 1 x 35 mm² • Up to 240 mm² upon customer request • TÜV certificate

3 LV DC installation between panels and connection boxes

ex*Zhellent* SOLAR ZZ-F (PV1-F)
1.8 kV DC - 0.6/1 kV AC

Standard cross-sections from 1 x 2.5 to 1 x 35 mm² • Up to 240 mm² upon customer request • TÜV certificate



4 LV DC installation between the connection boxes and the inverter

energy RV-K PRC
1.8 kV DC – 0.6/1 kV AC

HARMOHNY XZ1 Al (S)
1.8 kV DC – 0.6/1 kV AC

Standard cross-sections from 1 x 16 to 1 x 300 mm²

5 LV AC installation to the transformer

energy RV-K PRC
0.6/1 kV AC

HARMOHNY XZ1 Al (S)
0.6/1 kV AC

Standard cross-sections from 1 x 16 to 1 x 300 mm²

6 MV instalations

MV XLPE or EPR insulated cables

Recommended MV cable up to 30 kV • HV cables from 45 kV to 400 kV in underground or overhead lines • Armoured Cable on request

7 Overhead lines

ACSR bare overhead conductors

In accordance with UNE-EN 50182 standards • HV cables from 45 kV to 400 kV • Cross-Sections from 30 mm² to 635 mm²

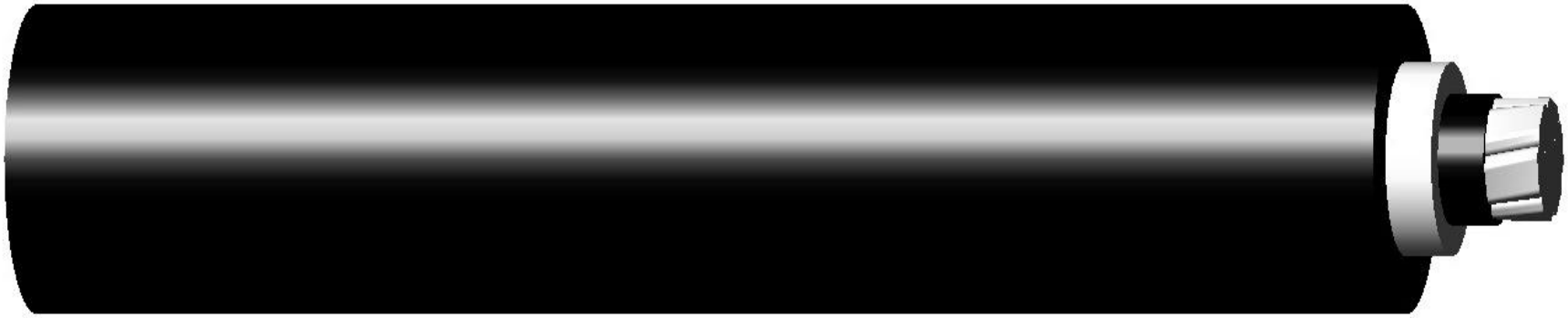
SPACE AERIAL CABLE SYSTEM (SAC)

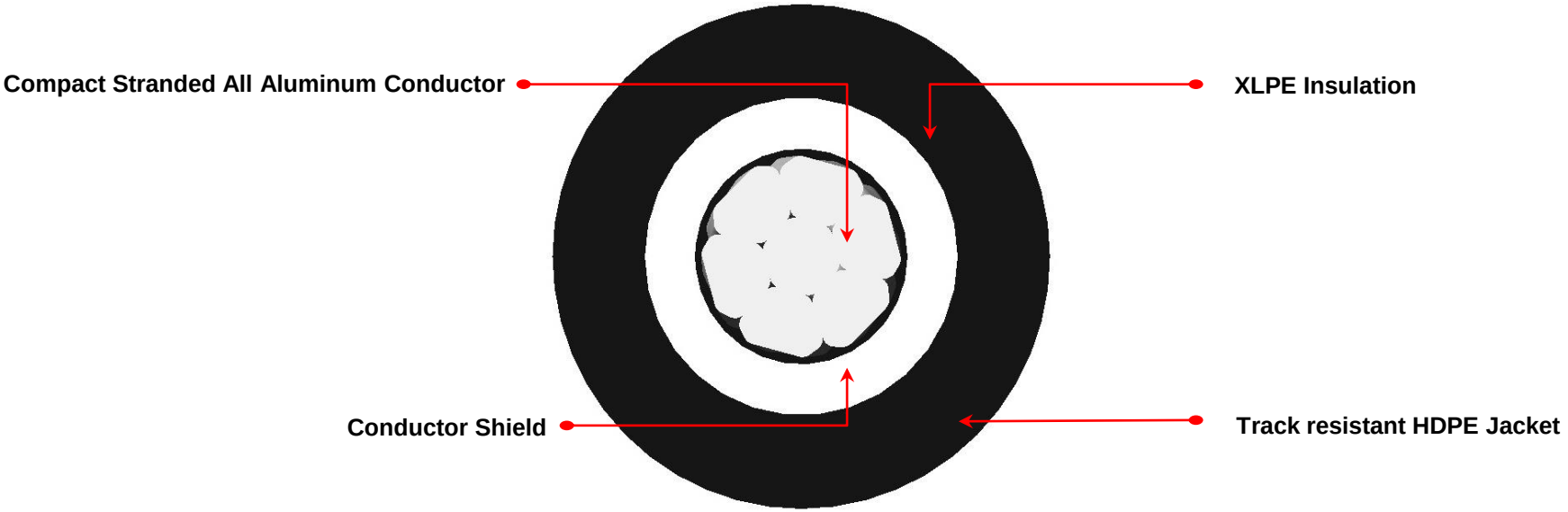
phelps dodge

One time investment. Lifetime protection.

SPACE AERIAL CABLES (SAC)

One time investment. Lifetime protection.





ADVANTAGES OF SPACE AERIAL CABLES

One time investment. Lifetime protection.

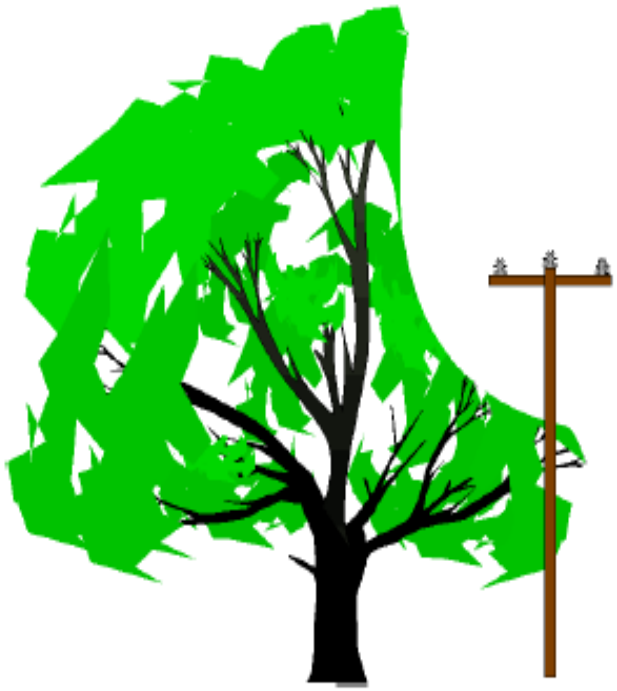
- ✓ **Reduced operating costs**
  - Less intervention on the network and reduced costs of corrective and preventive maintenance

- ✓ **Safety and security**
  - Presence of insulation provides better protection
  - Reduces risk of accidents on operating personnel and nearby people and living animals

- ✓ **Reliability**
  - Longer life span, lower power losses and higher reliability compared to bare conductors

ENVIRONMENTAL IMPACT

phelps dodge
One time investment. Lifetime protection.



Conventional Net

Spacer Cable Sistem

APPLICATIONS OF SPACE AERIAL CABLES

One time investment. Lifetime protection.

- ✓ In areas of difficult access
- ✓ Lines of large spans
- ✓ Areas of high interference of birds
- ✓ In places with high trees
- ✓ In areas of vegetation preserved by law
- ✓ In areas with narrow streets

UL-LISTED LAN CABLES
CATEGORY 5/5E AND CATEGORY 6

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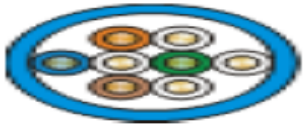
One time investment. Lifetime protection.

CATEGORY 5E LAN CABLES

One time investment. Lifetime protection.

DATA CABLE (CATEGORY 5E)

CMX/CMR LAN Cable for Horizontal and Vertical Wiring



APPLICATION	
Suitable for both voice and high speed data applications in Local Area Networks - 10 Base-T (IEEE 802.3) - 100 Base-T (IEEE 802.5) - 4/16 Mbps Token Ring (IEEE 802.5) - 52/155 Mbps ATM - 100 VG-AnyLAN - 100 Mbps TP-PMD (ANSI X3T9.5) - 1000 Base-T (Gigabit Ethernet) - Broadband and baseband analogue video - Digital video **Environmental Performance** Installation Temperature -10°C to 40°C Operating Temperature -20°C to 60°C	**COMPLIANCES** - AS/NZS 3080:2003 (Cat 5e) - ISO/IEC 11901 Ed.2 (Cat 5e) - ANSI/TIA 568-C.2 (Cat 5e) - AS/CA S008:2010 - UL Verified (Cat 5e) - UL Listed Type CMX - UL Listed Type CMR **CONDUCTOR** - Plain Annealed Copper Wire (24 AWG) **INSULATION** - High Speed Data Grade Polyolefin - Pair 1 - White/Blue & Blue - Pair 2 - White/Orange & Orange - Pair 3 - White/Green & Green - Pair 4 - White/Brown & Brown **SHEATH** - Flame Retardant PVC - Qualified to be used as riser cable - Cable printed with metre marking

TECHNICAL SPECIFICATIONS

ITEM NUMBER	NOMINAL OVERALL DIA. (mm)	CONDUCTOR		APPROX. MASS (kg/km)	MINIMUM BENDING RADIUS (mm)	STANDARD PACKING REELEX BOX
		Number of Pairs	Number & Diameter of Wires (No./mm)			
24170xxx	4.9	4	1/0.51	29	20	305m

xxx = 021 for Blue
xxx = 096 for Grey
xxx = 199 for White
Other colours available on request

VERIFIED

LISTED

CATEGORY 6E LAN CABLES

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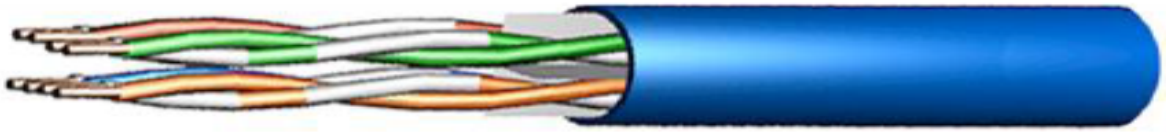
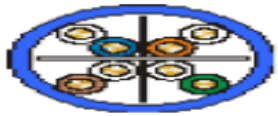
One time investment. Lifetime protection.

DATA CABLE (CATEGORY 6)

CMX/CMR LAN Cable for Horizontal and Vertical Wiring





APPLICATIONS	
Suitable for high speed date applications for Local Area Networks - 10 Base-T (IEEE 802.3) - Broadbank and baseband analog video - 155 Mbps / 1.2 Gbps ATM - IEEE 802.3af DTE Power (PoE) - 100 Base-TX - 1000 Base-T (Gigabit Ethernet) - Digital Video **Environmental Performance** Installation and Operating Temperature -20°C to 60°C	**COMPLIANCES** - AS/NZS 3080:2013 (Cat 6) - ISO/IEC 11801 Ed.2 (Cat 6) - ANSI/TIA 568-C.2 (Cat 6) - AS/CA S008:2010 - UL Listed Type CMX - UL Listed Type CMR - UL Verified Cat 6 **CONSTRUCTION** - Round cable, cross web design **CONDUCTOR** - Plain Annealed Copper Wire (24 AWG) **INSULATION** - High Speed Data Grade Polyolefin - Pair 1 - White/Blue & Blue - Pair 2 - White/Orange & Orange - Pair 3 - White/Green & Green - Pair 4 - White/Brown & Brown '- Core Diameter = 1.00mm Nom **SHEATH** - Flame Retardant PVC - Cable printed with metre marking.

TECHNICAL SPECIFICATIONS

ITEM NUMBER	NOMINAL OVERALL DIA. (mm)	CONDUCTOR		APPROX. MASS (kg/km)	MINIMUM BENDING RADIUS (mm)	STANDARD PACKING REELEX BOX
		Number of Pairs	Number & Diameter of Wires (No./mm)			
24143021	6	4	1/0.53	41	24	305m

VERIFIED LISTED

phelps dodge

VERSA DUCT

BUSWAY

BUSWAY SYSTEM

phelps dodge

One time investment. Lifetime protection.

PD VERSADUCT BUSWAY

phelps dodge
VERSADUCT
BUSWAY

COPPER

Rated Current: 250A up to 5000A

ALUMINUM

Rated Current: 250A up to 4000A

ADVANTAGES OF BUS DUCT SYSTEMS

One time investment. Lifetime protection.

1. **Compact** and **lesser space requirement**
2. **Fast** and **easy to install** compared to
3. **Lower installation costs**
4. **Easy to design** and **to maintain**
5. **Flexible** for future expansion
6. **No power pilferage** – a major power utility concern
7. **More saleable floor area** for property developers

VERSADUCT CERTIFICATIONS

CERTIFICATE

DEKRA

Issued to:
Applicant:
Phelps Dodge Philippines Energy Products Corporation
2nd Floor BCS Prime Building 2297 Pasong Tamo Extension, Makati City, Manila, Philippines

Product(s) : Low-voltage busbar trunking system (copper bar) with/without tap off unit outlet
Trade name(s) : Phelps Dodge
Type(s)/model(s) : PD Versa Duct Copper Busways - 250A/400A/630A/800A/800A(H)/1000A/1250A/1600A/2000A/2500A/3200A/4000A/4000A(H)/5000A/5000A(H)

The product and any acceptable variation thereto is specified in the Annex to this certificate and the documents therein referred to.

DEKRA hereby declares that the above-mentioned product has been certified on the basis of:
- a type test according to the standard EN 61439-6:2012/IEC 61439-6:2012;
- an inspection of the production location according to CENELEC Operational Document CIG 021
- a certification agreement with the number 2163160

DEKRA hereby grants the right to use the KEMA-KEUR certification mark.

The KEMA-KEUR certification mark may be applied to the product as specified in this certificate for the duration of the KEMA-KEUR certification agreement and under the conditions of the KEMA-KEUR certification agreement.

This certificate is issued on: 18 July 2014 and expires upon withdrawal of one of the above mentioned standards.

Certificate number: 3305984.01

DEKRA Certification B.V.

drs. G.J. Zoetbrood
Managing Director

F.S. Strikwerda
Certification Manager

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ACCREDITED BY THE DUTCH ACCREDITATION COUNCIL

KEMA KEUR

DEKRA Certification B.V. Meander 1051, 6825 MJ Arnhem P.O. Box 5185, 6802 ED Arnhem The Netherlands
T +31 88 96 83000 F +31 88 96 83100 www.dekra-certification.com Registered Arnhem 09085396

CERTIFICATE

DEKRA

Issued to:
Applicant:
Phelps Dodge Philippines Energy Products Corporation
2nd Floor BCS Prime Building 2297 Pasong Tamo Extension, Makati City, Manila, Philippines

Product(s) : Low-voltage busbar trunking system (aluminum bar) with/without tap off unit outlet
Trade name(s) : Phelps Dodge
Type(s)/model(s) : PD Versa Duct Aluminum Busways - 250A/400A/630A/800A/1000A/1250A/1600A/2000A/2500A/3200A/4000A

The product and any acceptable variation thereto is specified in the Annex to this certificate and the documents therein referred to.

DEKRA hereby declares that the above-mentioned product has been certified on the basis of:
- a type test according to the standard EN 61439-6:2012/IEC 61439-6:2012;
- an inspection of the production location according to CENELEC Operational Document CIG 021
- a certification agreement with the number 2163160

DEKRA hereby grants the right to use the KEMA-KEUR certification mark.

The KEMA-KEUR certification mark may be applied to the product as specified in this certificate for the duration of the KEMA-KEUR certification agreement and under the conditions of the KEMA-KEUR certification agreement.

This certificate is issued on: 18 July 2014 and expires upon withdrawal of one of the above mentioned standards.

Certificate number: 3305984.02

DEKRA Certification B.V.

drs. G.J. Zoetbrood
Managing Director

F.S. Strikwerda
Certification Manager

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KEMA KEUR

DEKRA Certification B.V. Meander 1051, 6825 MJ Arnhem P.O. Box 5185, 6802 ED Arnhem The Netherlands
T +31 88 96 83000 F +31 88 96 83100 www.dekra-certification.com Registered Arnhem 09085396

- **UL** and **KEMA** certified for both copper and aluminum bus duct systems

FIRE-RATED CABLES

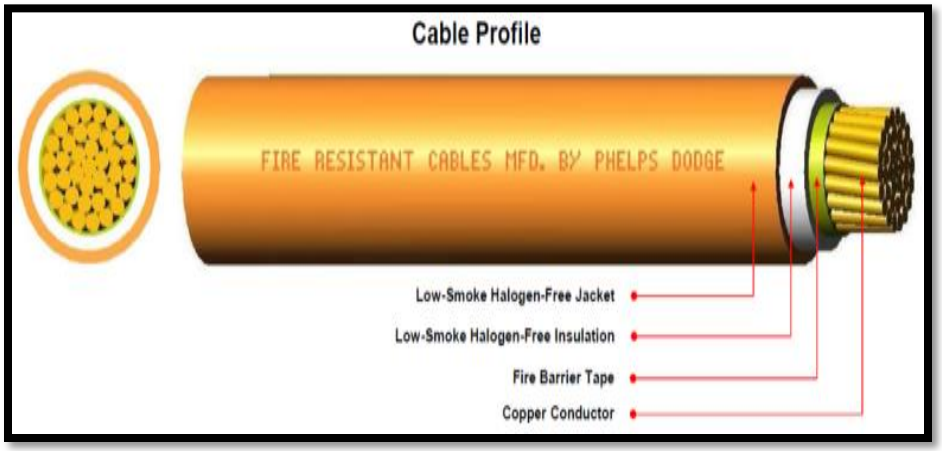
phelps dodge

One time investment. Lifetime protection.

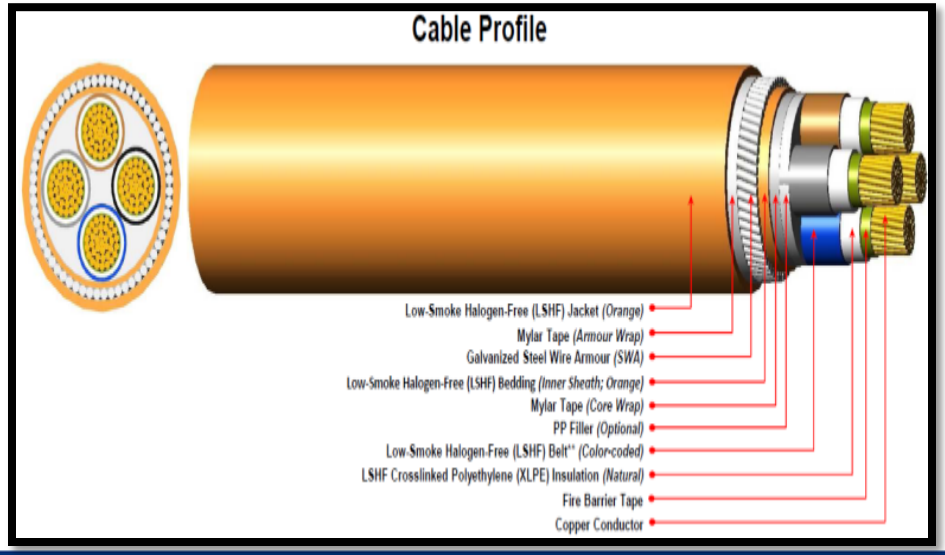
FIRE-RATED CABLES

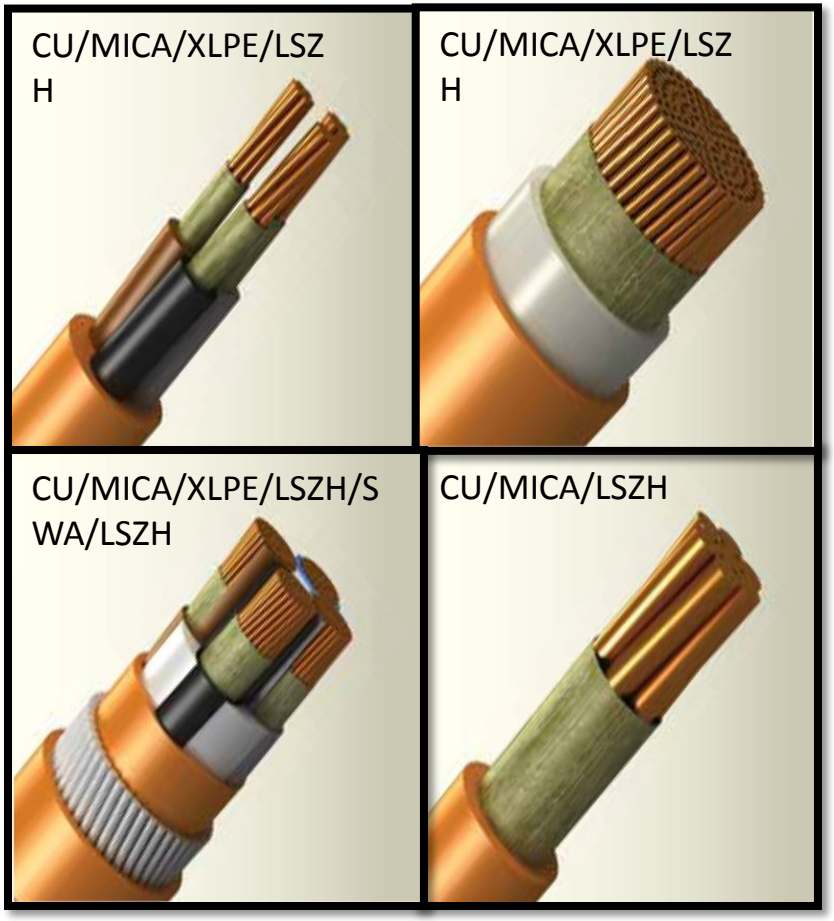
One time investment. Lifetime protection.

Single Core



Multicore





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PROJECT REFERENCES

The Philippine Arena

Solaire Resort and Casino

PROJECT REFERENCES

- Waltermart Tanauan
- Abenson Inc.
- Posh Properties Development Corporation
- Echo Electrical Supply Corporation
- Vicsal Development Corporation
- Willimson Inc.
- Willin Sales Inc.

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

TÜV SÜD PSB Singapore

TEST CERTIFICATE

This Certificate is issued to

Phelps Dodge Energy Products Corporation
Luisita Industrial Park,
San Miguel,
Tarlac City,
Philippines 2301

FOR

Product:	Fire Resistant Cable
Brand/Model:	PHELPS DODGE
Detail:	Size: 1C x 50 mm²; Voltage: 600/1000V; Conductor: Circular stranded plain annealed copper wires; Fire resistant layer: Mica tape; Insulation: XLPE (White); Sheath: LSHF (Black)
Specification:	BS 6387 : 1994* *BS 6387 : 1994 does not cover cables having one insulated conductor but no other metallic element. Tests were conducted by adopting the test methods of BS 6387 : 1994 as requested by the client. BS 6387: 1994 is applicable to cables rated at voltages not exceeding 450/750V. The voltage applied to the tests was based on 600/1000V as requested by the client.
Test Report:	719187801-EEC10

Summary

A sample of the product has been tested and is found to meet with the requirements of the above standards.

Vice President (Electrical & Electronics)
TÜV SÜD PSB Pte Ltd

Certificate No:	Date of Original Issue:	Date of Last Revision:	Date of Expiry:
02419	07/12/2010	-	06/12/2012

This Certificate is part of a full report and should be read in conjunction with it. This Certificate remains the property of TÜV SÜD PSB Pte Ltd and shall be returned upon request. The use of this Certificate is subjected to the terms and conditions of the Test Certification Scheme.
Note: This Certificate is not a Certificate of Conformity.

TÜV SÜD PSB Pte Ltd • 1 Science Park Drive , Singapore 118221 TÜV

TÜV SÜD PSB Singapore

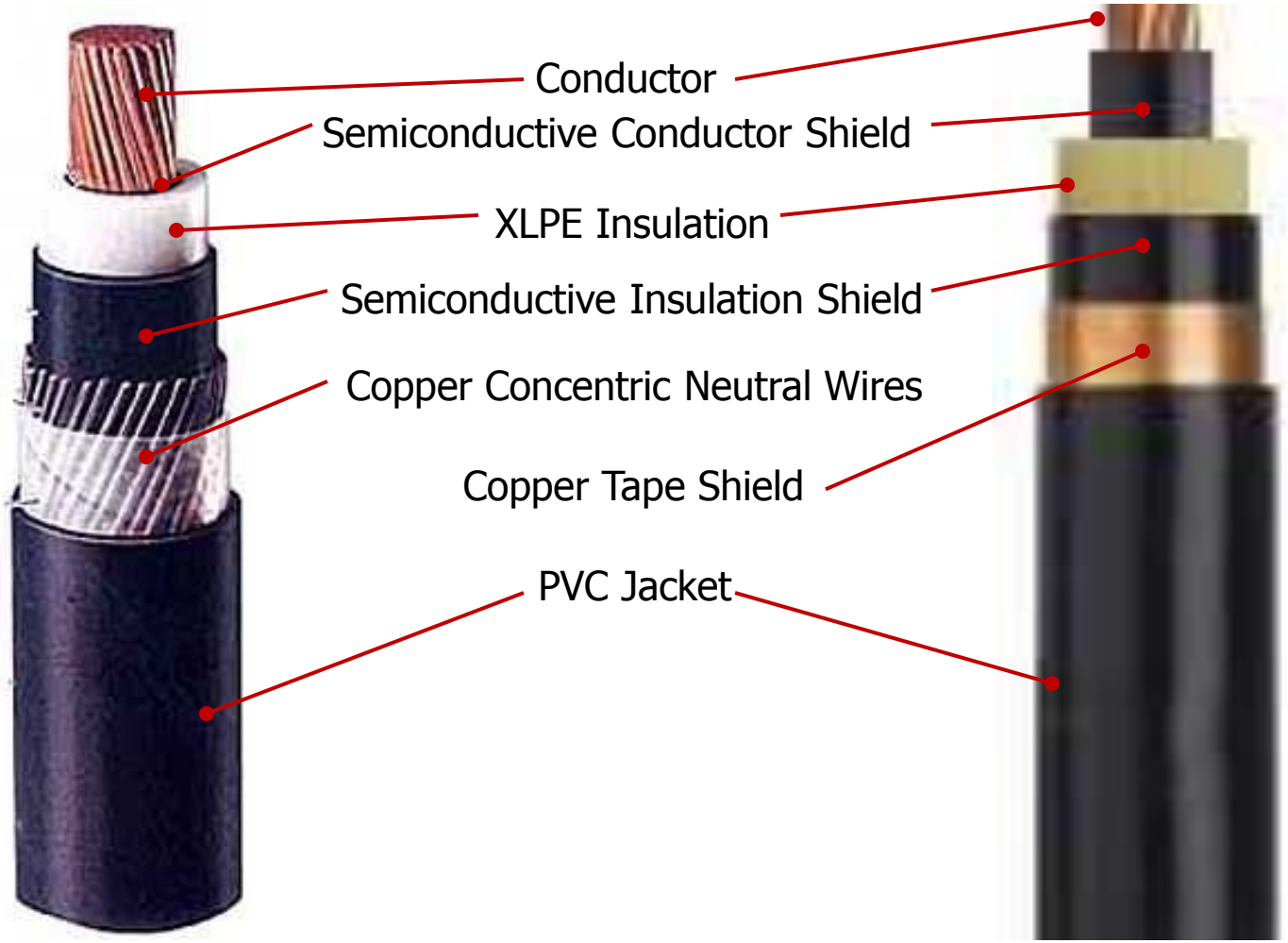
PDP's Certification for Fire Rated Cables

MEDIUM VOLTAGE POWER CABLE UP TO 35KV

phelps dodge

One time investment. Lifetime protection.

MEDIUM VOLTAGE CABLES



Concentric Neutral Cable

Tape Shielded Cable

HIGH-VOLTAGE CABLES (69KV UP TO 230KV)

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One time investment. Lifetime protection.

HIGH VOLTAGE CABLES (69 KV UP TO 230 KV)

phelps dodge
One time investment. Lifetime protection.

- **Termination of High-Voltage Power Cables**

- **Testing & Commissioning**

PROJECT REFERENCES

Nasulo Geothermal Power Plant (115kV)

Navotas Power Barge Project (115kV)

Supplied HV Cable to:

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One time investment. Lifetime protection.

MERALCO

DAVAO LIGHT
an Aboitiz company

MECO Mactan Electric Company Inc.

VECO
VISAYAN ELECTRIC COMPANY

energy
DEVELOPMENT CORPORATION

phelps dodge International Corp
a General Cable company

ENGAGE
TOTAL ENGINEERING ADVANTAGE

PD ENGAGE (TOTAL ENGINEERING ADVANTAGE)

One time investment. Lifetime protection.

ADVANTAGE OF PD ENGAGE

PD ENGAGE offers a **ONE STOP SOLUTION** to cable and wiring needs of every industry.

- ✓ Supply of carefully chosen electrical supply and accessories

- ✓ Intensive seminar and on-site pre-installation training
- ✓ Plant tours and visits to PDP facilities

- ✓ Cable and electrical system design
- ✓ Help on customers for their installation services.

- ✓ Regular site audit
- ✓ Technical visits
- ✓ Thermal scanning.

PD ENGAGE PROGRAMS

1. Value Engineering Design and Product Presentation
2. Technical Assistance in the Evaluation and Study of New Product Solutions

PD ENGAGE PROGRAMS

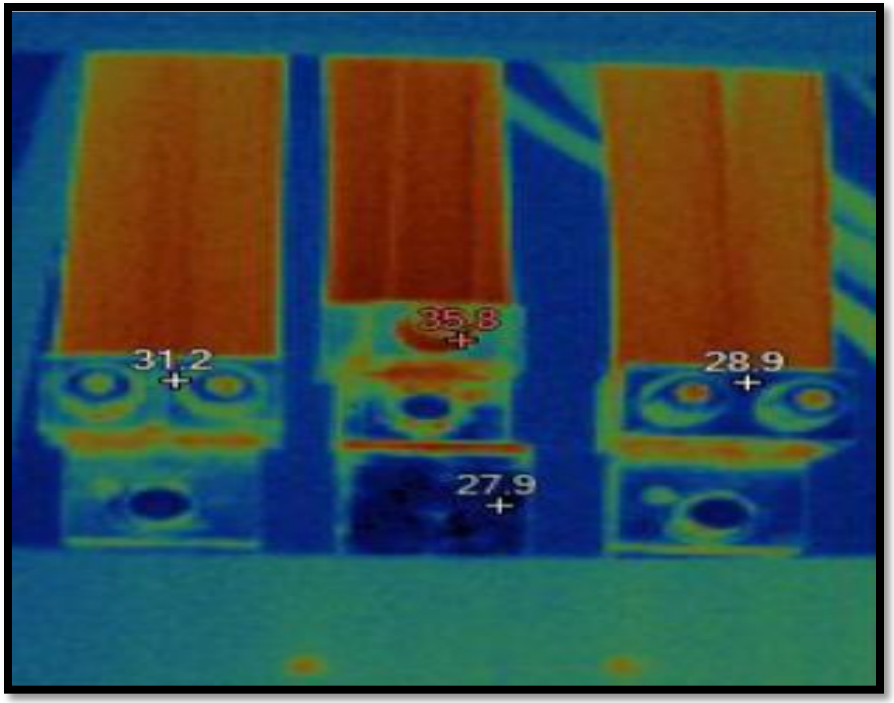
3. Technical Presentations / Seminars
4. Onsite Pre-installation Trainings for Contractors





PD ENGAGE PROGRAMS

5. Technical Visits
6. Site Audit & Inspections
7. Thermal Scanning Services



PDP MANUFACTURING PLANT

For inquiries AND FURTHER INFORMATION, PLEASE VISIT OUR BOOTH OR contact us at (02) 813 2529 or at customercare@phelpsdodge.com.ph.

THANK YOU!

FOR INQUIRIES AND FURTHER INFORMATION, PLEASE VISIT OUR BOOTH OR CONTACT US AT (02) 813 2529 OR AT CUSTOMERCARE@PHELPSDODGE.COM.PH.

THANK YOU!

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phelps dodge

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