Invitation to Bid No. :

Specification No. : R-652/2538

C Material, equipment, and specifications for CONNECTORS AND ELECTRICAL CONTACT COMPOUND

C1 General material and packing instructions

Additional to the general instructions, the following shall be observed :

1a Scope

These specifications cover mechanical, compression and wedge type connectors to connect conductors, and electrical contact compound.

1b Standard

The connectors shall be manufactured and tested in accordance with the latest IEEE, ANSI, EEI-NEMA, ASTM, VDE Regulations and DIN, or equivalent; unless otherwise specified in these specifications.

The bodies of connectors shall be of aluminium-alloy according to manufacturer's standards, unless otherwise specified in these specifications.

1c Principal requirement

1c.1 General

The connectors shall be suitable for connecting stranded and/or solid conductors according to DIN, TIS, or equivalent; unless otherwise specified in these specifications.

1c.2 Bolted type connector

For the purpose of against self loosening, each bolt shall be furnished with at least of one (1) locknut. The bolts shall be designed for single-wrench installation. Each U-bolt is counted as two (2) bolts. The bolts shall be tightened to torque levels according to these shown in the table below or according to manufacturer's recommendation; the technical details of tightening torque levels shall be submitted on request.

All ferrous materials shall be hot-dip galvanized after manufacturing; except bolts, lockwashers, washers, and nuts up to M6 shall be electro galvanized; according to the relevant standards or having the thickness or zinc coating shown in the table below.

Sizes of Bolts, Lockwashers, Washers, and Nuts	Tightening Torque Level of Galvanized Steel Bolts kgf-m	Minimum Thickness of Zinc Coating mm.
M 6 (1/4")	-	0.010
M 8 (5/16")	2.0	0.040
M 10 (3/8")	2.7	0.040
M 12 (1/2")	5.5	0.040
M 14 (9/16")	6.5	0.040
M 16 (5/8")	7.5	0.040
M 20 (3/4")	11.0	0.045

1c.3 Compression type connector

Full tension sleeves and partial tension sleeves shall withstand at least 90% and 40%, respectively, of the minimum breaking strength of the conductors for which they are designed. Each sleeve shall be prefilled with electrical contact compound and closed both ends by plastic caps.

Conductor barrel of each terminal lug shall be prefilled with electrical contact compound and closed by a plastic cap.

Tap connectors shall be prefilled with electrical contact compound and packed in suitable packages, one (1) or two (2) pieces per package.

1c.4 Compression deadend assembly set

The aluminium body and aluminium jumper terminal shall accommodate aluminium conductor which is according to TIS; and the conductor barrel shall be prefilled with electrical contact compound and closed by a plastic cap.

1c.5 Wedge type connector

The wedge type connector shall consists of C-shaped member and wedge, and made of aluminium alloys which shall be described.

The wedge type connector shall pass the current cycle tests Class A (500 cycles) in accordance with the latest EEI-TDJ-162/NEMA C3, ANSI C 119.4 or equivalent.

Bidders who have never submitted the test reports of current cycle tests shall submit either prior to receipt of bids or within fifteen (15) days of the bid closing date, for saving bid consideration time, the Item without submitting the report shall be rejected.

1c.6 Marking

Each connector shall be marked, on the body, at least as follows :

(1) Applicable conductor type and size.

(2) Manufacturer's symbol.

(3) Marks to press, for compression type only.

(4) Words "FULL TENSION" and "PARTIAL TENSION", on full tension sleeves and partial tension sleeves, respectively.

Except for compression type tap connectors for main line size less than 10 mm^2 (not including size 10 mm^2), if the applicable conductor type and size can not be marked on the bodies, the marks shall be marked on individual packages.

1c.7 Sample

Free samples shall be supplied on request. The samples will not be returned.

1d Packing

Each item shall be packed separately in suitable packages in sets or pieces of 1, 2, 100, 200, 250, or 300 .

Packages of same item may be packed together in suitable cases.

C2 **Material and packing data to be given by bidder**

2a For each item offered, the following details shall be submitted with the bid :

Catalogue number.

Specifications of materials used for the component parts (body, bolts, nuts, screws, lockwashers, washers, etc.) .

Surface finishing of the component parts.

Nominal cross-sectional area in mm^2 of conductor for which the connector is designed.

Diameter in mm of conductor for which the connector is designed.

Material of conductors for which the connector can be used (Al, ACSR, Cu, etc.) .

Recommended tightening torques for bolts in kgf-m .

Weight in kg/100 sets or pieces.

2b It shall be advised whether the connectors should be protected by armour tape or preformed line guards, etc.

2c For each item offered, a drawing with dimensions in mm and marking details shall be submitted with the bid. For compression type connector, a drawing with the dimensions including inside and outside diameters and marking details shall be submitted.

2d Number of aluminium-alloy copper-alloy, and/or the chemical compositions of the bodies of connectors.

2e **Packing details**

Packing method.

Number of sets or pieces in each package (maximum 300 sets or pieces in one package)

Principal dimensions of each package in cm .

Volume of each package in m^3 .

Gross weight of each package in kg .

Net weight of each package in kg .

Number of packages.

If several packages are contained in one big case, further details are required :

Number of packages in each case.

Principal dimensions of each case in cm .

Volume of each case in m^3 .

Gross weight of each case in kg .

Number of cases.

Table

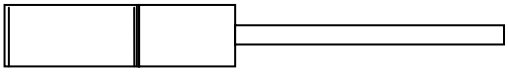
Packing Details for Connectors

PEA Material No.	Quantity Per Package	Packing Method
02300101, 02300102, 02310000	250	Sack
02300103	75	Sack
02310001	200	Sack
02310002	100	Sack
-	1,000	Sack

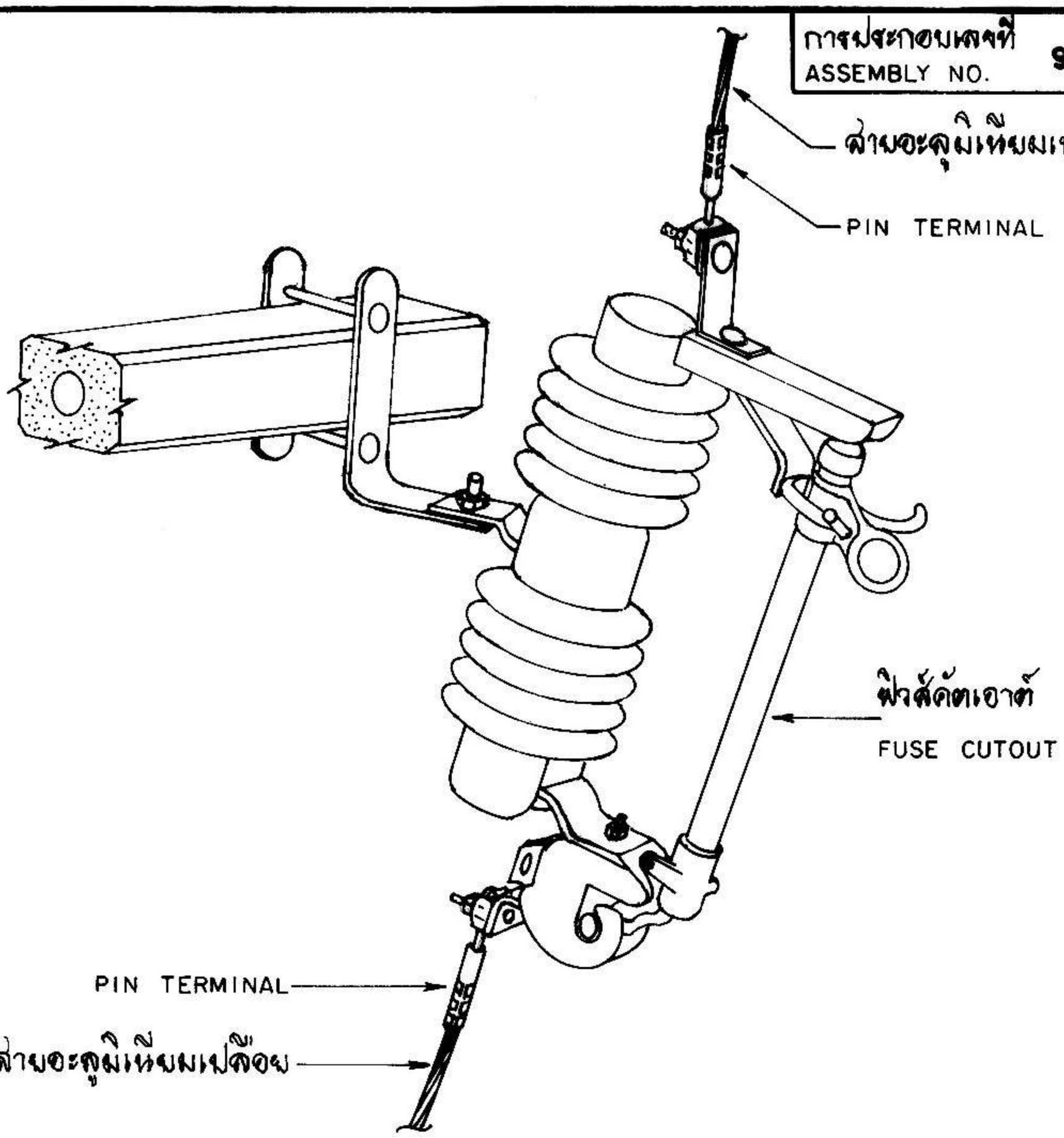
Invitation to Bid No.:

Specification No.: R-652/2538

C3 Schedule of detailed requirement

Item	PEA Material No.	Quantity	Description
1	-	pcs	Pin terminal, made of aluminium sleeve bonded to copper stud, for making termination of aluminium conductor according to TIS 85-2522 : size 50 mm^2 (dia. 9.06 mm) to copper alloy terminal clamp of equipment. The copper stud shall be tin-plated, if necessary The aluminium sleeve shall be pre-filled with electrical contact aid compound and capped. See figure below : The installation tool shall be ANDERSON VC-6 .  Note : 1. Enclosed Drawing No. SA4-015/37009 2. The bidder has to supply three (3) pieces of pin terminal as samples, within fifteen (15) days, counted from the Committee's request. The samples will not be returned.
	III		

การประกอบเลขที่ ASSEMBLY NO. 9569



การใช้ PIN TERMINAL

ใช้เป็นอุปกรณ์สำหรับต่อปลายสายอะลูมิเนียม ต่อเข้าขั้วของอุปกรณ์ไฟฟ้า เช่น ฟิวส์คัตเอาต์, ซี.ที., ขั้วบุชชิ่งแรงต่ำของหม้อแปลง 1 เฟส, คิสคอนเนคติ้งสวิตช์ ที่มีขั้วต่อสายแบบ BOLT TYPE เพื่อซ่อมแก้ปัญหาจุดเข้าสายอุปกรณ์ไฟฟ้าร้อน และอาจหลุดได้

ข้อแนะนำในการใช้งาน

1. เลือกขนาด PIN TERMINAL ให้เหมาะสมกับขนาดของสายที่ใช้ต่อเข้าอุปกรณ์ไฟฟ้า
2. ทำความสะอาดปลายสาย และขั้วต่อสายของอุปกรณ์ไฟฟ้าด้วยแปรงลวดเหล็ก
3. สอดปลายสายเข้าปลายข้างหนึ่งของ PIN TERMINAL บีบด้วยคีมบีบย้ำ ไฮดรอลิค
4. สอดปลายด้านที่เป็นทองแดงสุดมุมเข้าขั้วต่อสายของอุปกรณ์ไฟฟ้ากวดให้แน่นพอประมาณ

กองวิศวกรรมไฟฟ้าและเครื่องกล ฝ่ายวิศวกรรม	การไฟฟ้าส่วนภูมิภาค	ใช้แทนแบบ ..... ถูกแทนโดยแบบ ..... เริ่มใช้ครั้งที่ 18 มี.ค. 37 แก้แบบครั้งที่ ..... มีผลเป็น ..... มาตราส่วน .....
ผู้เขียน ..... ผู้ตรวจ ..... วิศวกร ..... หัวหน้าแผนก ..... ผู้อำนวยการกอง ..... ผู้อำนวยการฝ่าย	ผู้ว่าการ ..... 4/4/37 การใช้ PIN TERMINAL สำหรับต่อสายเข้าอุปกรณ์ไฟฟ้า USE OF PIN TERMINAL FOR MAKING TERMINATIONS OF CONDUCTORS IN TERMINALS OF EQUIPMENT	แบบเลขที่ SA4-015/37009 แผ่นที่ 1 ของจำนวน 1 แผ่น
ของผู้ว่าการฝ่ายเทคนิค		

Invitation to Bid No.:

Specification No.: R-652/2538

Manufacturer :

Trade-mark :

Country of origin :

Bidder :

Bid No.:

Date :

C4 Price schedule

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
1	-		Pin terminal, for making termination of aluminium conductor size ..... mm^2 .	pcs		
	III					

เอกสารเพิ่มเติมแนบท้ายรายละเอียดสเปค

(ADDENDUM)

เอกสารเพิ่มเติม (ADDENDUM) นี้ ให้ถือเป็นส่วนหนึ่งของรายละเอียดสเปคที่เอกสารฯ นี้ได้แนบอยู่ด้วย

1. **การกำหนดระยะเวลาในการส่งรายงานผลการทดสอบเฉพาะแบบ (Type test report)**

   หากรายละเอียดสเปคกำหนดให้ผู้เสนอราคาจะต้องจัดส่งรายงานผลการทดสอบเฉพาะแบบ (Type test report) หรือหนังสือรับรองผลการทดสอบเฉพาะแบบ (Type test certificates) “ให้ผู้เสนอราคาจะต้องจัดส่งรายงานผลการทดสอบเฉพาะแบบ หรือหนังสือรับรองผลการทดสอบเฉพาะแบบมาพร้อมกับการยื่นเอกสารทางเทคนิค” แทนการกำหนดระยะเวลาจัดส่งรายงานฯ ที่ได้ระบุไว้ในรายละเอียดสเปค

   ทั้งนี้ ยกเว้นบางพัสดุอุปกรณ์ที่ กฟภ. กำหนดยอมรับให้ทำการทดสอบเฉพาะแบบภายหลังจากที่ทำสัญญากับ กฟภ. แล้ว โดยคู่สัญญาจะต้องจัดส่งรายงานผลการทดสอบฯ ดังกล่าว ก่อนการส่งของนั้น ให้คงรายละเอียดไว้ตามเดิม

2. **การกำหนดระยะเวลาในการจัดส่งตัวอย่าง (Sample) เพื่อประกอบการพิจารณาจัดหา**

   หากรายละเอียดสเปคกำหนดให้ผู้เสนอราคาจะต้องจัดส่งตัวอย่างพัสดุอุปกรณ์ (Sample) เพื่อประกอบการพิจารณาจัดหา “ให้ผู้เสนอราคาจะต้องจัดส่งตัวอย่างพัสดุอุปกรณ์ ภายใน 5 วันทำการ นับถัดจากวันเสนอราคา” แทนการกำหนดระยะเวลาจัดส่งตัวอย่างที่ได้ระบุไว้ในรายละเอียดสเปค

COPY

Invitation to Bid No. :

Specification No. : R-686/2540

C Material, equipment, and specifications for ELECTRICAL TAPES

C1 General material and packing instructions

Additional to the general instructions, the following shall be observed :

1a Scope

These specifications cover electrical tapes for use in electrical service.

1b Standard

The electrical tapes shall be manufactured and tested in accordance with the latest ASTM, IEC, JIS, TIS, or equivalent; unless otherwise specified in these specifications.

1c Principal requirement

One (1) sample, for each item offered, shall be supplied on the bid closing date; the sample(s) will not be returned.

The bidder has to quote the unit cost of each item offered.

1d Packing

The individual rolls of tapes shall be packed in such a manner that they can easily be separated.

C2 **Material and packing data to be given by bidder**

For each offered item, the following data shall be submitted .

2a Properties

Note :

(H) = High-voltage insulating tape, EPR (S) = Electrical protecting tape, Silicone

(P) = Plastic electrical tape, PVC (E) = Electrical insulation putty tape, Elastic

Properties \ Tapes	(H)	(P)	(S)	(E)
Standard (IEC, ASTM, UL, JIS, TIS, etc.)				
Dimensions :				
Thickness ..... (mm)				
Width ..... (mm)				
Length ..... (m)				
Operating temperature ..... (°C)				
Electrolytic corrosion or Insulation resistance ..... (Ω)				
Volume resistivity ..... (Ω-cm)				
Ultimate elongation ..... (%)				
Water absorption ..... (%)				
Dielectric constant				
Dissipation factor				
Penetration at elevated temperature ..... (°C)				
Flammability				
Exposure to heat ..... ( )				
Tensile strength, per 10 mm width, per 1 mm thickness ..... (N)				
Adhesion :				
- to steel ..... (N)				
- to backing ..... (N)				
Shear adhesion ..... (N)				
Electric strength ..... (kV/mm)				
Colour				
Other properties, give details				

2b Packing details

Number of rolls in one package.

Dimensions of each package in cm

Gross weight of each package in kg .

Net weight of each package in kg

Number of packages.

If several packages are contained in one big case, further details are required :

Number of packages in each case.

Dimensions of each case in cm .

Volume of each case in m^3 .

Gross weight of each case in kg .

Number of cases.

Invitation to Bid No.:

Specification No.: R-486/2540

C3 Schedule of detailed requirement

Item	PEA Material No.	Quantity	Description
1	02180003		High-voltage insulating tape, self-fusing EPR (Ethylene Propylene Rubber) based, for outdoor use on insulation and jacketing of splices and terminations of cables up to 69 kV, with :
			Standard : ASTM or equivalent
			Thickness : 0.76 mm (0.030")
			Width : 19 mm (3/4")
			Length (per roll) : approximately 9 m (30')
			Operating temperature : up to 90°C, or more
2	02180000		PVC plastic electrical tape, for outdoor use, with :
			Standard : TIS 386
			Thickness : 0.125 mm
			Width : 19 mm
			Length (per roll) : approximately 10 m
			Operating temperature : up to 80°C, or more
			Colour : black
			See the enclosed Table "Properties of PVC Plastic Electrical Tape, TIS 386".
3	02180001		PVC plastic electrical tape, for outdoor use, with :
			Standard : TIS 386
			Thickness : 0.18 mm
			Width : 19 mm
			Length (per roll) : approximately 10 m
			Operating temperature : up to 80°C, or more
			Colour : black
			See the enclosed Table "Properties of PVC Plastic Electrical Tape, TIS 385".

Item 1
ให้ใช้สเปคอ้างอิงเลขที่ RMIS-105/2560
ประกอบการจัดหาแทน

Invitation to Bid No.:

Specification No.: R-086/2540

C3 Schedule of detailed requirement

Item	PEA Material No.	Quantity	Description
4	02180002		PVC plastic electrical tape, for outdoor use, with Standard : TIS 386 Thickness : 0.18 mm Width : 19 mm Length (per roll) : approximately 20 m Operating temperature : up to 80°C. or more Colour : black See the enclosed Table "Properties of PVC Plastic Electrical Tape, TIS 386".
5	02180004		Electrical protecting tape, self-fusing silicone rubber based, for outdoor use on protecting splices and end sealing cables from contaminations such as oil, dust, moisture, weather, or sunlight, etc., with Standard : ASTM or equivalent Thickness : 0.30 mm - 0.60 mm (0.012" - 0.024") Width : 25 mm (1") Length (per roll) : approximately 9 m (30') Operating temperature : up to 180°C. or more

III

Invitation to Bid No.:
Specification No.: R-686/2540

Manufacturer :
Trade-mark :
Country of origin
Bidder :
Bid No.
Date :

C4 Price schedule

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
1	02180003		High-voltage insulating tape, self-fusing, EPR based, with : Standard : .... Thickness : .... mm Width : .... mm Length per roll : .... m Operating temperature :			
2	02180000		PVC plastic electrical tape, with : Standard : .... Thickness : .... mm Width : .... mm Length per roll : .... m Operating temperature :			

III

Invitation to Bid No.:

Specification No.: IE-868/2540

Manufacturer :

Trade-mark :

Country of origin :

Bidder :

Bid No.:

Date :

C4 Price schedule

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
3	02180001		PVC plastic electrical tape, for outdoor use, with :			
			Standard :			
			Thickness : ..... mm			
			Width : ..... mm			
			Length per roll : ..... m			
			Operating temperature :			
			Colour :			
4	02180002		PVC plastic electrical tape, for outdoor use, with :			
			Standard :			
			Thickness : ..... mm			
			Width : ..... mm			
			Length per roll : ..... m			
			Operating temperature :			
			Colour :			

]]]

Invitation to Bid No.:

Specification No.: B-686/2640

Manufacturer :

Trade-mark :

Country of origin :

Bidder :

Bid No.:

Date :

C4 Price schedule

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
5	021800004		Electrical protecting tape, self-fusing silicone rubber based, with . Standard : ..... Thickness : ..... mm Width : ..... mm Length per roll : ..... m Operating temperature :			

เอกสารเพิ่มเติมแนบท้ายรายละเอียดสเปค

(ADDENDUM)

เอกสารเพิ่มเติม (ADDENDUM) นี้ ให้ถือเป็นส่วนหนึ่งของรายละเอียดสเปคที่เอกสารฯ นี้ได้แนบอยู่ด้วย

1. **การกำหนดระยะเวลาในการส่งรายงานผลการทดสอบเฉพาะแบบ (Type test report)**

   หากรายละเอียดสเปคกำหนดให้ผู้เสนอราคาจะต้องจัดส่งรายงานผลการทดสอบเฉพาะแบบ (Type test report) หรือหนังสือรับรองผลการทดสอบเฉพาะแบบ (Type test certificates) “ให้ผู้เสนอราคาจะต้องจัดส่งรายงานผลการทดสอบเฉพาะแบบ หรือหนังสือรับรองผลการทดสอบเฉพาะแบบมาพร้อมกับการยื่นเอกสารทางเทคนิค” แทนการกำหนดระยะเวลาจัดส่งรายงานฯ ที่ได้ระบุไว้ในรายละเอียดสเปค

   ทั้งนี้ ยกเว้นบางพัสดุอุปกรณ์ที่ กฟภ. กำหนดยอมรับให้ทำการทดสอบเฉพาะแบบภายหลังจากที่ทำสัญญากับ กฟภ. แล้ว โดยคู่สัญญาจะต้องจัดส่งรายงานผลการทดสอบฯ ดังกล่าว ก่อนการส่งของนั้น ให้คงรายละเอียดไว้ตามเดิม

2. **การกำหนดระยะเวลาในการจัดส่งตัวอย่าง (Sample) เพื่อประกอบการพิจารณาจัดหา**

   หากรายละเอียดสเปคกำหนดให้ผู้เสนอราคาจะต้องจัดส่งตัวอย่างพัสดุอุปกรณ์ (Sample) เพื่อประกอบการพิจารณาจัดหา “ให้ผู้เสนอราคาจะต้องจัดส่งตัวอย่างพัสดุอุปกรณ์ ภายใน 5 วันทำการ นับถัดจากวันเสนอราคา” แทนการกำหนดระยะเวลาจัดส่งตัวอย่างที่ได้ระบุไว้ในรายละเอียดสเปค

Invitation to Bid No:

C Material, equipment, and specification for H-TYPE COMPRSSION TAP CONNECTORS

C1 General material and packing instructions

Additional to the general instructions, the following shall be observed:

1a Scope

These specifications describe requirements for design, manufacture, tests and supply of H-type compression tap connectors used in low-voltage distribution system.

1b Standards

Except otherwise specified elsewhere in the specification, the connectors shall be manufactured and tested in accordance with the following standards

ANSI/NEMA CC1-2009	Electric power connection for substations
ANSI C119.4-2016	Connectors for use between aluminum-to-aluminum and aluminum-to-copper conductors designed for normal operation at or below 93°C and copper-to-copper conductors designed for normal operation at or below 100°C

PEA will also accept connector tested in accordance with the later edition of the above standards.

PEA will also accept the design test report in accordance with the previous edition of the above standards, if there is no significant change in any test items or no additional test item(s) compared with the above standards. On the other hand, if there is significant change in any test items or there are any additional test items, the previous edition design test report with the additional test report(s) of the significant change test item(s) and/or additional test item(s) will be also accepted.

1c Principal requirement

1c.1 Service conditions and installation

The H-type compression tap connector shall be designed and constructed for outdoor installation, and suitable for operation under the following conditions:

Altitude	:	up to 1,000 m above sea level
Ambient air temperature	:	up to 50°C
Average relative humidity in any one year	:	up to 94%
Climatic condition	:	tropical climate

EME PEA

1.c.2 General

The H-type compression tap connectors shall be suitable for connection between LV main aluminium conductor and tap copper conductor which sizes as specified in "**C3 Schedule of detailed requirement**". The dimensions of the connectors shall be according to Drawing **No.SA2-015/25001**.

Entire contact surface of the connectors shall be thoroughly filled with oxide inhibiting contact grease, the minimum thickness of the grease shall be 0.5 mm.

Surface of the connectors shall be smooth, consistent, no dirt, no blemishes, no cracks and no rust.

1.c.3 Construction and characteristics

The finished product of the proposed H-type compression tap connector shall be of aluminum grade 1050, 1100 or 1350, which shall be standard grade or designation in accordance with international standards, i.e. SAE, AISI, JIS, ASTM, ANSI, UNS, ISO or BS. It shall be suitable for using with both aluminum to aluminum connection and aluminum to copper connection.

1c.4 Marking

Each connector shall be marked by mean of engraving, knurling, hot stamping or laser marking on the body at least data listed below, which is clearly visible and durable foil-coated marking. i.e. printing with toner or laser toner with foil-coated, is not accepted.

(1) Manufacturer's name or Trademark
(2) Model or catalog/drawing number
(3) Type and size of conductor to be used with
(4) Purchase order number

1c.5 Samples

The bidders shall submit at least one (1) sample for each proposal item within five (5) working days counted from bid closing date for consideration; otherwise, the proposal will be rejected.

PEA's bids committee will initially check the sample by comparing with the color photograph in the proposed type test report and PEA's specification. PEA's bid committee will reject a proposal if there are any parts of sample differing from the color photograph in the type test report and PEA's specification.

PEA reserves the right to test the sample in visual and dimension check and hardness test according to **1e.3 Acceptance tests,** in case of the failing test results, the proposal will be rejected.

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The sample will not be returned after consideration, the sample of the successful bidder will be used as a reference sample in acceptance process. The supplied connectors with a different design compared with the reference sample shall be rejected.

1d Packing

The supplied connectors shall be packed in a seal plastic envelope, by quantity of 1, 5, 10, 20, or appropriate per envelope, for protection the connectors and its compound from dust and moisture.

The envelopes shall be packed in paper box and each paper box shall be marked with purchase order number, contractor's name, manufacturer' s name or trademark, model or catalog/drawing number type and size of conductor to be used with, number of connectors in the box and net weight. The box shall be wrapped and sealed with a moisture-proof material.

1e Test and Test report

1e.1 Type tests

The proposed H-type compression tap connector shall be passed all type test items with reference standards and test method as specified in **Table 1.**

Table 1

Type test items of H-type compression tap connector

No.	Test items	Reference standard/Test method	Description
1	Visual and dimension check	PEA's specification	See (1)
2	Chemical composition test	Optical emission spectrometer	See (2)
3	Temperature rise test	ANSI/NEMA CC1	See (3)
4	Conductor damage test	ANSI C119.4	See (4)
5	Hardness test	Brinell hardness test	See (5)

Before the type tests are proceeded, manufacturer shall submit following detail to PEA for approval:

- Ten (10) samples of H-type compression tap connector (All sample shall be signed by PEA's representative)
- Drawing showing specified dimensions and all information according to Drawing **No.SA4-015/25001.**
- Standard to be used as a reference of grade or designation of the H-type compression tap connector
- The details of tools and compression dies used for compressing the h-type-compression tap connector shall be submitted as following:
  - The catalogue of tools and compression die which specify the model and the name of manufacturer.
  - The dimensions of compression die are required in case of the manufacturer of h-type-compression tap connector uses his own compression die in the type test processes

One sample of H-type compression tap connector will be kept by PEA (by Electrical Equipment Standard and Quality Control Division) and will be used as a reference sample for bid consideration and acceptance processes.

The other samples will be sent to acknowledged independent testing laboratories/institutes, which have qualification mentioned below, for type tests in accordance with the test items specified in **Table 1**.

(1) Visual and dimension check

Four (4) samples are required for the test. Each sample shall have markings in accordance with clause **1c.4 Marking**, except purchase order number is not required. Dimensions of each sample shall be measured and recorded. The dimensions of all samples shall be according to Drawing **No.SA2-015/25001** and according to manufacturer's drawing.

(2) Chemical composition test

One (1) sample is required for the test. The H-type compression tap connector shall be tested by means of optical emission spectrometer for verification grade or designation of aluminium alloy, which shall be aluminium grade or designation specified in accordance with **1.c.3 Construction and characteristics.**

Note: PEA will accept result of the chemical composition test with tolerance of -10% of minimum value of each substance specified in reference standard, except aluminium shall have a minimum value according to the reference standard.

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(3) Temperature rise test

Four (4) samples are required for the test. The temperature rise test shall be according to ANSI/NEMA CC1. Temperature rise of all connectors shall not exceed the temperature rise of tested conductor.

(4) Conductor damage test

Two (2) samples are required for the test. The conductor damage test shall be according to ANSI C119.4.

(5) Hardness test

Two (2) samples are required for the test.

The type tests of the H-type compression tap connectors shall be conducted or inspected by the acknowledged independent testing laboratories/institutes as follows:

(1) Independent at laboratories/institutes which are members of the Short-circuit Testing Liaison (STL) or independent laboratories/institutes which are accredited according to TIS 17025 or ISO/IEC 17025 with the scope of accreditation covered the relevant test items, standard and equipment. The certification and scope of accreditation of the independent laboratories/institutes shall be submitted with the bid for consideration.

(2) Laboratories, institutes, universities and electric utilities, as follows:

- NSTDA Characterization and testing service center (NCTC)
- Thailand Institute of Scientific and Technological Research (TISTR)
- National Metal and Materials Technology Center (MTEC)
- Electrical and Electronic Products Testing Center (PTEC)
- Thai Industrial Standards Institute (TISI)
- Electrical and Electronics Institute (EEI)
- Department of Science Service (DSS)
- Testing Laboratory, Electrical Engineering Department, Faculty of Engineering, Chulalongkorn University
- Electricity Generating Authority of Thailand (EGAT)
- Metropolitan Electricity Authority (MEA)
- Provincial Electricity Authority (PEA)
- Laboratory of manufacturers approved by PEA

(3) Other laboratories as follow:

- In case the foreign manufacturers have experience of more than twenty (20) years in design, manufactures and sell H-type compression tap connector, PEA will accept type test report(s) conducted by the manufacturer's laboratory or other independent laboratories without

qualification mentioned in (1) or (2). Documents showing the manufacturer's experience such as reference list shall be submitted with the bid for consideration.

- The bidders or manufacturers who prefer to carry out the type tests of H-type compression tap connector with other laboratories without the qualification mentioned above, the detail of laboratory and the test facilities shall be submitted to PEA for approval before proceeding the tests and before the bid closing date. PEA reserves the right to send representatives to inspect or witness the tests.

The type test reports conducted by the laboratories/institutes in Thailand or local manufacturers shall be valid within five (5) years counted from the issued date in the test report to the bid closing date. The type test reports conducted by the laboratories/institutes in other countries shall be valid within ten (10) years counted from the issued date in the test report to the bid closing date.

The cost of all tests and report shall be borne by the Bidders or manufacturers.

The type test reports shall be submitted with the bid.

PEA will also accept other documents instead of the type test reports in the following cases:

(1) In case the proposed connectors have been sold to PEA at PEA's Procurement Department (from PEA's head office). The bidder can submit the Purchase Order (PO) on the bid closing date, or

(2) In case the proposed connectors have been registered for PEA Product Acceptance[1], the Bidder can submit the valid registration certificate on the bid closing date, or

(3) In case the proposed connectors have been registered for Product lists for transmission and substation turnkey project[2], the Bidder can submit the valid registration certificate on the bid closing date.

However the document in case (1), (2) and (3) mentioned above shall be proved by the bidding committee that connectors specified in the PO or registration certificate is the same product, type model and all ratings as the proposed connectors for this bid.

Note: [1] PEA Product Acceptance (PPA) is the process for enhancing quality of electrical apparatus which PEA procure by making quality control system and certification of product's quality by reliable Certification Body (CB). PPA is taken responsibility by Electrical Equipment Standard and Quality Control Division.

[2] Product lists for transmission and substation turnkey project is the process of registration of electrical apparatus used in PEA's power system. Product lists is taken responsibility by Substation Project Management Division.

The type test reports shall consist of the necessary as follow; otherwise, it is not accepted by PEA

(1) The test results of all test items as specified in **Table 1**.

(2) The details of tools and compression dies used for compressing the H-type compression tap connector in the type test processes shall be declared as following:

- Catalogue of tools and compression die which specify the model and the name of manufacturer, or
- Dimensions of compression die are required in case of the manufacturer of the connectors uses his own compression die in the type test processes.

(3) Outline drawing of the H-type compression tap connector, showing dimensions according to Drawing **No.SA2-015/25001**

(4) The color photographs of H-type compression tap connector as following:

- Manufacturer's name or Trademark
- Size of conductor to be used with
- Model or catalog/drawing number H-type compression tap connector
- Oxide inhibiting contact grease

1.e.2 Routine tests

Each H-type compression tap connector shall pass visual and dimension check and other tests according to manufacturer's standard.

1e.3 Acceptance tests

PEA reserves the right to have acceptance tests, conducted by PEA's laboratory or acknowledge independent testing laboratories as mentioned in **1e.1** or by manufacturer's factory qualified by PEA.

The cost of all tests shall be borne by the Contractor.

PEA's acceptance committee will randomly select the samples of connector for each delivery lot with the number as specified in **Table 2**.

Table 2

Number of samples for acceptance tests

Number of H-type compression tap connector for each delivery lot (sets)	Number of samples (sets)
Up to 100	2
101 – 500	3
501 – 1,000	4
More than 1,000	5

Note: - The samples shall not be returned and shall not be used in the system.

- After the tests, the additional H-type compression tap connectors, with the equal number of the samples specified in **Table 2**, shall be supplied by the contractor with free of charge to complete the number of connectors in the purchase contract.

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All sample(s) shall pass acceptance test items No. 1 – 5 sequentially, with reference standards and test method as specified in **Table 3**. PEA reserve the right not to continue the tests if the sample is failed the test in any test items.

Table 3

Acceptance test items of H-Type compression tap connectors

No	Test Items	Reference standard /Test method	Acceptance criteria
1	Visual check	PEA's specification	- Surface of all samples shall be smooth, consistent, no dirt, no blemishes, no cracks and no rust - All sample shall have markings in accordance with clause **1c.4 Marking** - Entire contact surface of all samples shall be thoroughly filled with oxide inhibiting contact grease, the minimum thickness of the grease shall be 0.5 mm
2	Dimension check	PEA's specification	Dimension of all sample shall be according to manufacturer's drawing and shall be according to Drawing **No. SA2-015/25001**
3	Chemical composition test	Optical emission spectrometer	According to Chemical composition test specified in **Table 1**. **Note:** Testing only one (1) sample per lot
4	Hardness test	Brinell hardness test	The test result shall be within 10% tolerance of the hardness test result in the type test report. **Note:** Testing only one (1) sample per lot
5	Assembly test	PEA's specification	The samples shall be suitable to assemble with the conductor to be used with.

C2 Material and packing data shall be submitted with the bid:

The following critical documents and details shall be submitted with the bid:

Critical documents of the proposed h-type compression tap connector shall be submitted with the bid for each item offered:

(The bidders shall fill the table below; otherwise, the proposal shall be rejected

No.	Required technical document	Proposed Technical document	Reference document (Page No.)
1	Type test report (see **1e.1**) or	❑ YES ❑ No	
	Purchase Order (PO) from PEA's Procurement Department (from PEA's head office) (see **1e.1**) or	❑ YES ❑ No	
	Product acceptance certificate (see **1e.1**)	❑ YES ❑ No	
	Product lists certificate (see **1e.1**)	❑ YES ❑ No	
2	Drawing(s) of the proposed H-type compression tap connectors, showing dimensions (see **1c.2**) (Drawing(s) by using PEA's drawings shall not be accepted)	❑ YES ❑ No	
3	Packing detail (see **1d**)	❑ YES ❑ No	

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C3 Schedule of detailed requirement

Invitation to Bid No.:

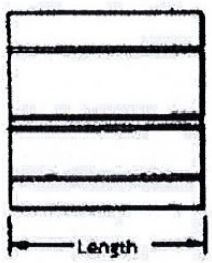
Item	PEA Material No.	Quantity	Description
1	1020320009	pc(s)	Connector, compression tap, H-type, connection of main aluminium conductor to tap copper conductor and main aluminium conductor to tap aluminium conductor, see Drawing No. **SA2-015/25001**, with : Main : diameter range of 3.57 mm to 4.50 mm (size 10 mm^2 to 16 mm^2) Tap : diameter range of 2.25 mm to 3.57 mm (size 4 mm^2 to 10 mm^2) Minimum Length : 25 mm
2	1020320010	pc(s)	Connector, compression tap, H-type, connection of main aluminium conductor to tap copper conductor and main aluminium conductor to tap aluminium conductor, see Drawing No. **SA2-015/25001**, with : Main : diameter range of 5.90 mm to 9.06 mm (size 25 mm^2 to 50 mm^2) Tap : diameter range of 1.78 mm to 2.76 mm (size 2.5 mm^2 to 6 mm^2) Minimum Length : 30 mm
3	1020320011	pc(s)	Connector, compression tap, H-type, connection of main aluminium conductor to tap copper conductor and main aluminium conductor to tap aluminium conductor, see Drawing No**. SA2-015/25001**, with : Main : diameter range of 5.90 mm to 9.06 mm (size 25 mm^2 to 50 mm^2) Tap : diameter range of 4.50 mm to 7.56 mm (size 16 mm^2 to 35 mm^2) Minimum Length : 40 mm
4	1020320012	pc(s)	Connector, compression tap, H-type, connection of main aluminium conductor to tap copper conductor and main aluminium conductor to tap aluminium conductor, see Drawing No. **SA2-015/25001**, with : Main : diameter range of 8.33 mm to 12.60 mm (size 50 mm^2 to 95 mm^2) Tap : diameter range of 8.33 mm to 12.60 mm (size 50 mm^2 to 95 mm^2) Minimum Length : 55 mm

C3 Schedule of detailed requirement

Invitation to Bid No.:

Item	PEA Material No.	Quantity	Description
5	1020320013	pc(s)	Connector, compression tap, H-type, connection of main aluminium conductor to tap copper conductor, see Drawing No. **SA2-015/25001**, with : Main : diameter range of 9.73 mm to 11.45 mm (size 70 mm^2 to 95 mm^2) Tap : diameter range of 5.10 mm to 7.56 mm (size 16 mm^2 to 35 mm^2) Minimum Length : 40 mm
6	1020320014	pc(s)	Connector, compression tap, H-type, connection of main aluminium conductor to tap copper conductor, see Drawing No. **SA2-015/25001**, with : Main : diameter range of 6.95 mm to 8.33 mm (size 35 mm^2 to 50 mm^2) Tap : diameter range of 3.12 mm to 4.05 mm (size 6 mm^2 to 10 mm^2) Minimum Length : 30 mm
7	1020320015	pc(s)	Connector, compression tap, H-type, connection of main aluminium conductor to tap copper conductor, see Drawing No. **SA2-015/25001**, with : Main : diameter range of 9.73 mm to 11.45 mm (size 70 mm^2 to 95 mm^2) Tap : diameter range of 3.12 mm to 4.05 mm (size 6 mm^2 to 10 mm^2) Minimum Length : 30 mm
			Note : Enclosed Drawing No. **SA2-015/25001**.

Cross section



Side view

PEA MATERIAL No.	CONDUCTOR RANGE		MINIMUM LENGTH (mm)	SIMILAR TO							
	MAIN SIZES (mm^2)	TAP SIZES (mm^2)		BURNDY		KEARNEY		HOMAC		PENN-UNION	
				CATALOGUE NO.	DIE INDEX	CATALOGUE NO.	DIE INDEX	CATALOGUE NO.	DIE INDEX	CATALOGUE NO.	DIE INDEX
1020320009	10-16	4-10	25	YPC2A8U	BG	421-82	5/8"	UB 214	5/8"	-	-
1020320010	25-50	2.5-6	30	-	-	424-82	O	OB 2014	O	KO-R24	O
1020320011	25-50	16-35	40	YHO-150	O	508-82	O	OB 103	O	KO-R06	O
1020320012	50-95	50-95	55	YHD-300	D3	504-82	O	DB 2020	D	KD-R04	D
1020320013	70-95	16-35	40	YHD-200	D3	502-82	O	DB 202	O	KD-R02	D
1020320014	35-50	6-10	30	YPC26R 8U	O	428-82	O	-	-	KO-R24	O
1020320015	70-95	6-10	30	YPC26R 8U	O	-	-	-	-	-	-

กองวิศวกรรมไฟฟ้าและเครื่องกล ฝ่ายวิศวกรรม การไฟฟ้าส่วนภูมิภาค

มิติเป็น -
วันที่ 13 ธ.ค. 2564

H-TYPE COMPRESSION TAP CONNECTORS

แบบเลขที่ SA2-015/25001
แผ่นที่ 1 ของจำนวน 1 แผ่น

PROVINCIAL ELECTRICITY AUTHORITY

ELECTRICAL AND MECHANICAL ENGINEERING DIVISION

Specification No.: RCBL-026/2564 : H-TYPE COMPRESSION TAP CONNECTORS

C4 Price schedule

Invitation to Bid No.:

Manufacturer :

Country of origin :

Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
1	1020320009		Connector, compression tap, H-type, connection of main aluminium conductor to tap copper conductor, see Drawing No. SA2-015/25001, with : Main : diameter range of ..... mm to ..... mm. Tap : diameter range of ..... mm to ..... mm. Minimum length …….. mm.	pc(s)		
2	1020320010		Connector, compression tap, H-type, connection of main aluminium conductor to tap copper conductor, see Drawing No. SA2-015/25001, with : Main : diameter range of ..... mm to ..... mm. Tap : diameter range of ..... mm to ..... mm. Minimum length …….. mm.	pc(s)		
3	1020320011		Connector, compression tap, H-type, connection of main aluminium conductor to tap copper conductor, see Drawing No. SA2-015/25001, with : Main : diameter range of ..... mm to ..... mm. Tap : diameter range of ..... mm to ..... mm. Minimum length …….. mm.	pc(s)		

C4 Price schedule

Invitation to Bid No.:

Manufacturer :

Country of origin :

Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
4	1020320012		Connector, compression tap, H-type, connection of main aluminium conductor to tap copper conductor and main aluminium conductor to tap aluminium conductor, see Drawing No. SA2-015/25001, with : Main : diameter range of ..... mm to ..... mm. Tap : diameter range of ..... mm to ..... mm. Minimum length …….. mm.	pc(s)		
5	1020320013		Connector, compression tap, H-type, connection of main aluminium conductor to tap copper conductor and main aluminium conductor to tap aluminium conductor, see Drawing No. SA2-015/25001, with : Main : diameter range of ..... mm to ..... mm. Tap : diameter range of ..... mm to ..... mm. Minimum length …….. mm.	pc(s) pc(s)		

C4 Price schedule

Invitation to Bid No.:

Manufacturer :

Country of origin :

Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
6	1020320014		Connector, compression tap, H-type, connection of main aluminium conductor to tap copper conductor and main aluminium conductor to tap aluminium conductor, see Drawing No. SA2-015/25001, with : Main : diameter range of ..... mm to ..... mm. Tap : diameter range of ..... mm to ..... mm. Minimum length …….. mm.	pc(s)		
7	1020320015		Connector, compression tap, H-type, connection of main aluminium conductor to tap copper conductor and main aluminium conductor to tap aluminium conductor, see Drawing No. SA2-015/25001, with : Main : diameter range of ..... mm to ..... mm. Tap : diameter range of ..... mm to ..... mm. Minimum length …….. mm.			

เอกสารเพิ่มเติมแนบรายละเอียดสเปค
(Addendum)

เอกสารเพิ่มเติมแนบรายละเอียดสเปคนี้ ถือเป็นส่วนหนึ่งของสเปคดังต่อไปนี้

ที่	สเปคอ้างอิงเลขที่	รายละเอียด
1	RCBL-015/2552	Underground power cable of rated voltage 115 kV
2	RCBL-028/2548	Self-supporting aerial cables of rated voltages 22 kV and 33 kV
3	RCBL-029/2548	Copper stranded conductor
4	RCBL-030/2551	LV cables with copper conductor, for use as power cables and control cables
5	RCBL-032/2563	LV cables with copper conductor, XLPE insulation and PVC jacket, for service drop
6	RCBL-035/2554	Underground power cables of rated voltages 22 kV and 33 kV
7	RCBL-038/2560	Spaced aerial cables for rated voltages of 22 kV and 33 kV
8	RCBL-039/2551	AL, AL-alloy, ACSR, armour tape, and tie wire
9	RCBL-043/2554	Underground power cables of rated voltage 0.6/1 kV
10	RCBL-064/2561	Underground power cables for 115 kV systems
11	RCBL-068/2563	LV insulated aerial bundled conductors (ABC) for overhead distribution line
12	R-167/2542	Galvanized steel wire
13	R-828/2544	L.T. cables with aluminium conductor and PVC insulation, for overhead line

ยกเลิกการกำหนดให้ล้อไม้บรรจุสายไฟฟ้า (Wooden reels) ที่เสนอจะต้องใช้ยารักษาเนื้อไม้ชนิด Chromated Copper Arsenate (CCA) ตาม มอก. 515 กลุ่มที่ 3 ตามที่ระบุไว้ในข้อ 1d Packing และให้ใช้ข้อความดังต่อไปนี้แทน

สำหรับการจัดหาสายไฟฟ้าก่อนวันที่ 1 กรกฎาคม 2565 ล้อไม้บรรจุสายไฟฟ้า (Wooden reels) ที่เสนอจะต้องมีการรักษาเนื้อไม้ด้วยยารักษาเนื้อไม้ตาม มอก.515-2539 หรือฉบับที่ใหม่กว่า

สำหรับการจัดหาสายไฟฟ้าตั้งแต่วันที่ 1 กรกฎาคม 2565 เป็นต้นไป ล้อไม้บรรจุสายไฟฟ้า (Wooden reels) ที่เสนอจะต้องมีการรักษาเนื้อไม้ด้วยยารักษาเนื้อไม้ตาม มอก.515-2539 หรือฉบับที่ใหม่กว่า โดยจะต้องเป็นยารักษาเนื้อไม้ชนิดที่ไม่มีสารหนู (Arsenate (As_2O_5)) เป็นส่วนประกอบเท่านั้น

ทั้งนี้ ผู้ยื่นข้อเสนอจะต้องจัดส่งรายละเอียดการรักษาเนื้อไม้ของล้อไม้บรรจุสายไฟฟ้า (Wooden reels) มาพร้อมกับการยื่นข้อเสนอ

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PEA

เอกสารเพิ่มเติมแนบท้ายรายละเอียดสเปค

(ADDENDUM)

เอกสารเพิ่มเติม (ADDENDUM) นี้ ให้ถือเป็นส่วนหนึ่งของรายละเอียดสเปคที่เอกสารฯ นี้ได้แนบอยู่ด้วย

คุณสมบัติของสถาบันทดสอบ สำหรับการทดสอบเฉพาะแบบ (Type or Design tests)

หากรายละเอียดสเปคกำหนดรายชื่อ หรือคุณสมบัติของสถาบันทดสอบสำหรับการทดสอบเฉพาะแบบ ให้ใช้รายละเอียดคุณสมบัติดังต่อไปนี้ แทนการกำหนดรายชื่อ หรือคุณสมบัติของสถาบันทดสอบฯ ที่ได้กำหนดไว้ในรายละเอียดสเปค

All items of the type or design tests shall be conducted or inspected by the acknowledged testing laboratories/institutes as following:

(1) Laboratories/institutes which are members of the Short-circuit Testing Liaison (STL) or independent laboratories/institutes which are accredited according to TIS 17025 or ISO/IEC 17025 with the scope of accreditation covered the relevant test items, standards and equipment. The certification and scope of accreditation of the independent laboratories/institutes shall be submitted with the bid for consideration.

(2) Thailand's national laboratories, institutes, universities and electric utilities, as follows:
- National Metal and Materials Technology Center (MTEC)
- Electrical and Electronic Products Testing Center (PTEC)
- Thai Industrial Standards Institute (TISI)
- Electrical and Electronics Institute (EEI)
- Department of Science Service (DSS)
- Testing Laboratory, Electrical Engineering Department, Faculty of Engineering, Chulalongkorn University
- Electricity Generating Authority of Thailand (EGAT)
- Metropolitan Electricity Authority (MEA)
- Provincial Electricity Authority (PEA)
- Other laboratories, institutes, universities or electric utilities approved by PEA

In case of the foreign manufacturers have experience of more than twenty (20) years in design, manufacture and sell such the proposed equipment for using in equal to or higher than system voltages of the proposed equipment, PEA will accept type or design test reports conducted by the manufacturer's laboratory or other independent laboratories without qualification mentioned in (1) or (2). Documents showing the manufacturer's experience such as reference list shall be submitted with the bid for consideration.

The bidders or manufacturers who prefer to carry out the type or design tests of the proposed equipment by the laboratories or by the manufacturer themselves without the qualification mentioned above, the detail of the test facilities of the laboratories or the manufacturer shall be submitted to PEA for approval before proceeding the tests and before the bid closing date. PEA reserves the right to send representatives to inspect and witness the tests with the cost of the bidders or manufacturers.

The type or design test reports done by the laboratories in Thailand or local manufacturers shall be valid within five (5) years counted from the issued date in the test report to the bid closing date.

เอกสารเพิ่มเติมแนบท้ายรายละเอียดสเปค

(ADDENDUM)

เอกสารเพิ่มเติม (ADDENDUM) นี้ ให้ถือเป็นส่วนหนึ่งของรายละเอียดสเปคที่เอกสารฯ นี้ได้แนบอยู่ด้วย

1. **การกำหนดระยะเวลาในการส่งรายงานผลการทดสอบเฉพาะแบบ (Type test report)**

   หากรายละเอียดสเปคกำหนดให้ผู้เสนอราคาจะต้องจัดส่งรายงานผลการทดสอบเฉพาะแบบ (Type test report) หรือหนังสือรับรองผลการทดสอบเฉพาะแบบ (Type test certificates) “ให้ผู้เสนอราคาจะต้องจัดส่งรายงานผลการทดสอบเฉพาะแบบ หรือหนังสือรับรองผลการทดสอบเฉพาะแบบมาพร้อมกับการยื่นเอกสารทางเทคนิค” แทนการกำหนดระยะเวลาจัดส่งรายงานฯ ที่ได้ระบุไว้ในรายละเอียดสเปค

   ทั้งนี้ ยกเว้นบางพัสดุอุปกรณ์ที่ กฟภ. กำหนดยอมรับให้ทำการทดสอบเฉพาะแบบภายหลังจากที่ทำสัญญากับ กฟภ. แล้ว โดยคู่สัญญาจะต้องจัดส่งรายงานผลการทดสอบฯ ดังกล่าว ก่อนการส่งของนั้น ให้คงรายละเอียดไว้ตามเดิม

2. **การกำหนดระยะเวลาในการจัดส่งตัวอย่าง (Sample) เพื่อประกอบการพิจารณาจัดหา**

   หากรายละเอียดสเปคกำหนดให้ผู้เสนอราคาจะต้องจัดส่งตัวอย่างพัสดุอุปกรณ์ (Sample) เพื่อประกอบการพิจารณาจัดหา “ให้ผู้เสนอราคาจะต้องจัดส่งตัวอย่างพัสดุอุปกรณ์ ภายใน 5 วันทำการ นับถัดจากวันเสนอราคา” แทนการกำหนดระยะเวลาจัดส่งตัวอย่างที่ได้ระบุไว้ในรายละเอียดสเปค

เอกสารเพิ่มเติมแนบท้ายรายละเอียดสเปค

(ADDENDUM)

เอกสารเพิ่มเติม (ADDENDUM) นี้ ให้ถือเป็นส่วนหนึ่งของรายละเอียดสเปคที่เอกสารฯ นี้ได้แนบอยู่ด้วย

การกำหนดการส่งรายงานผลการทดสอบเฉพาะแบบ (Type test report)

ผู้ยื่นข้อเสนอสามารถยื่นเอกสาร หรือหลักฐานอื่นเพื่อประกอบการพิจารณาจัดซื้อ จัดจ้าง หรือจ้างก่อสร้าง แทนการยื่นรายงานผลการทดสอบเฉพาะแบบ (Type test report) หรือหนังสือรับรองผลการทดสอบเฉพาะแบบ (Type test certificate) ได้ ดังนี้:

(1) กรณีที่เป็นอุปกรณ์ที่การไฟฟ้าส่วนภูมิภาคสำนักงานใหญ่ โดยฝ่ายจัดหา หรือฝ่ายงานสถานีไฟฟ้า หรือฝ่ายงานระบบไฟฟ้า เคยรับไว้ใช้งานจากการจัดซื้อ จัดจ้าง หรืองานจ้างก่อสร้างแล้ว ผู้ยื่นข้อเสนอสามารถยื่นสำเนาหนังสือสั่งซื้อ/จ้าง (Purchase order) หรือสำเนาหนังสือสัญญาจ้างก่อสร้างพร้อมบัญชีแสดงปริมาณวัสดุ (Bill of Quantities: BOQ) ที่ออกโดยการไฟฟ้าส่วนภูมิภาค แทนได้ หรือ

(2) กรณีที่อุปกรณ์ที่เสนอได้รับการขึ้นทะเบียน และควบคุมคุณภาพผลิตภัณฑ์ (PEA Product Acceptance) แล้ว ผู้ยื่นข้อเสนอสามารถยื่นเอกสารรับรองการขึ้นทะเบียนฯ ที่ยังไม่หมดอายุในวันที่ยื่นเอกสาร แทนได้ หรือ

(3) กรณีที่อุปกรณ์ที่เสนอราคาได้รับการขึ้นทะเบียนอุปกรณ์หลักในงานจ้างก่อสร้างสถานีไฟฟ้า (Product list) แล้ว ผู้ยื่นข้อเสนอสามารถยื่นเอกสารรับรองการขึ้นทะเบียนฯ ที่ยังไม่หมดอายุในวันที่ยื่นเอกสารแทนได้

ทั้งนี้ เอกสาร หรือหลักฐานที่ระบุไว้ในข้อ (1) ข้อ (2) และข้อ (3) ดังกล่าวข้างต้น จะสามารถใช้แทนการยื่นรายงานผลการทดสอบเฉพาะแบบ (Type test report) หรือหนังสือรับรองผลการทดสอบเฉพาะแบบ (Type test certificate) ได้ ต้องเป็นเอกสาร หรือหลักฐานที่ตรวจสอบแล้วพบว่าเป็นของอุปกรณ์ที่เป็นผลิตภัณฑ์รุ่น และพิกัดเดียวกันกับอุปกรณ์ที่จัดซื้อ หรือจัดจ้าง หรือจ้างก่อสร้างในครั้งนี้

Invitation to Bid No. :

C Material, equipment, and specifications for ALUMINIUM STRANDED CONDUCTOR, ALUMINIUM-ALLOY STRANDED CONDUCTOR, ALUMINIUM CONDUCTOR STEEL REINFORCED, ARMOUR TAPE, AND TIE WIRE

C1 General material and packing instructions

Additional to the general instructions, the following shall be observed :

1a Scope

These specifications cover aluminium stranded conductor, aluminium-alloy stranded conductor, aluminium conductor steel reinforced, armour tape, and tie wire.

1b Standard

Aluminium stranded conductor, aluminium-alloy stranded conductor, aluminium conductor steel reinforced, shall be manufactured and tested in accordance with the latest edition of the following standard :

TIS 85 : Round wire concentric lay overhead electrical stranded conductors

Aluminium used for the armour tape, and tie wire shall be manufactured and tested in accordance with the latest edition of the following standard :

ASTM B 609 : Specifications for aluminium 1350 round wire, annealed and intermediate tempers, for electrical purposes

or equivalent, and all other relevant standard, unless otherwise specified in these specifications.

1c Principal requirement

Aluminium conductor steel reinforced shall be applied a neutral grease on all steel wires.

The conductor sizes and characteristics of aluminium stranded conductor, aluminium-alloy stranded conductor, aluminium conductor steel reinforced shall be according to Table 1, Table 2 and Table 3 respectively.

Armour tape shall be rounded at the edges and soft-drawn.

Tie wire shall be round and soft-drawn.

Test : Besides manufacturer's test certificate, PEA shall test the properties of conductors according to the above-mentioned standard at PEA's testing laboratory before acceptance as well.

Table 1 Characteristics of Aluminium Stranded Conductor (A1 conductor)

Code Number	Area	Number Of wires	Diameter		Linear mass	Rated strength	D.C. resistance
			Wire	Cond.			
	mm^2		mm	mm	kg/km	kN	Ohm/km
35	34.91	7	2.52	7.56	96	5.94	0.8202
50	50.14	7	3.02	9.06	137	8.27	0.5711
95	94.76	19	2.52	12.60	261	16.11	0.3036
120	121.21	19	2.85	14.25	333	20.61	0.2374
185	184.54	37	2.52	17.64	509	31.37	0.1563
240	242.54	61	2.25	20.25	670	43.66	0.1191
400	389.14	61	2.85	25.65	1075	66.15	0.0742

Table 2 Characteristics of Aluminium-alloy Stranded Conductor (A3 conductor)

Code Number	Area	Number Of wires	Diameter		Linear mass	Rated strength	D.C. resistance
			Wire	Cond.			
	mm^2		mm	mm	kg/km	kN	Ohm/km
35	34.36	7	2.50	7.5	94	11.17	0.9682
50	49.48	7	3.00	9.0	135	16.08	0.6724
95	93.27	19	2.50	12.5	256	30.31	0.3584

Table 3 Characteristics of Aluminium Conductor Steel Reinforced (A1/S1A conductor)

Code number	Steel ratio	Area			Number of wire		Wire diam.		Diameter		Linear mass	Rated strength	D.C. resistance
		Alum.	steel	Total	Al	St	Alum.	steel	Core	Cond.			
	%	mm^2	mm^2	mm^2			mm	mm	mm	mm	kg/km	kN	Ohm/km
35	17	34.3	5.7	40.0	6	1	2.70	2.70	2.70	8.1	139	12.37	0.8352
50	17	48.3	8.0	56.3	6	1	3.20	3.20	3.20	9.6	195	16.81	0.5946
95	16	94.4	15.3	109.7	26	7	2.15	1.67	5.01	13.6	381	34.93	0.3059
120	16	121.6	19.8	141.4	26	7	2.44	1.90	5.70	15.5	491	44.50	0.2375
185	16	183.8	29.8	213.6	26	7	3.00	2.33	6.99	19.0	741	65.27	0.1571
380	13	382.0	49.5	431.5	54	7	3.00	3.00	9.00	27.0	1443	121.30	0.0757

1d Packing

1d.1 The conductors shall be packed on non-returnable wooden reels with hub reinforcements. Reels shall be lagged with suitable wooden battens to protect the conductors against damage. After lagging, the galvanized steel wire or steel strap shall be fitted to the battens over each flange of the reel. Overall outside diameter of reel for conductor sizes up to 400 mm^2 shall not exceed 2.0 meters.

The wooden parts of reels shall be treated with water-borne wood preservatives, Chromated Copper Arsenate (CCA), according to Group 3 of the latest TIS 515, see Table 4 to a dry net salt retention of 12.0 kg/m^3 .

Table 4

Active Ingredients of CCA

Description	TIS 515 - 2527		
	Group 3		
	Type 1	Type 2	Type 3
Copper, as CuO %	16.0 - 20.9	18.0 - 22.0	17.0 - 21.0
Chromium, as CrO_3 %	59.4 - 69.3	33.0 - 38.0	44.5 - 50.5
Arsenic, as, As_2O_5 %	14.7 - 19.7	42.0 - 48.0	30.0 - 38.0

The conductor in each reel shall be supplied in production length as mentioned in Table 5, Table 6 and Table 7 with variation of $\pm$ 5% .

For aluminium stranded conductor sizes up to 400 mm^2, aluminium-alloy stranded conductor sizes up to 95 mm^2, and aluminium conductor steel reinforced sizes up to 380/50 mm^2 shall be supplied in reels as shown in Page 7 of 7 and in production lengths specified in the Table 5, Table 6, and Table 7 (see Page 6 of 7).

Both terminals of conductor in each reel shall be permanently marked with manufacturer's symbol, for checking the original length.

An amount not exceeding 10% of the total length may be delivered in random lengths, but any such length shall not be less than 50% of the production length on one reel.

On acceptance, the measured length of conductor in each reel shall not be less than the packing length shown on the reel.

1d.2 The armour tape shall be supplied in coil, preferably 10 kg per coil.

The dimensions of coil shall be as follows :

- Inside diameter : 18 cm, approximately
- Height : 10 cm, approximately

1d.3 The tie wire shall be supplied in coil, preferably 25 kg per coil, or in manufacturer's standard weights which shall be round figure.

C2 Material and packing data to be given by bidder

2a Aluminium stranded conductor and aluminium-alloy stranded conductor details

Nominal cross-sectional area of conductor in mm^2 .
Actual cross-sectional area of conductor in mm^2 .
Number of wires.
Diameter of wire in mm .
Overall diameter of conductor in mm .
Construction of conductor.
Minimum calculated strength in N or kgf .
Maximum resistance at 20^oC in ohm/km .
Weight resistivity of aluminium wire at 20^oC in ohm-g/m^2 .
Weight of conductor in kg/km .

2b Aluminium conductor steel reinforced details

Nominal cross-sectional area of conductor in mm^2 .
Actual cross-sectional area of conductor in mm^2 .
Number of wires (A1/S1A) .
Diameter of wire (A1/S1A) in mm .
Overall diameter of conductor in mm .
Construction of conductor.
Minimum calculated strength in N or kgf .
Maximum resistance at 20^oC in ohm/km .
Weight resistivity of aluminium wire at 20^oC in ohm-g/m^2 .
Weight of conductor in kg/km .

2c Armour tape details

Dimension (cross-section) in mm x mm .
Breaking strength in N or kgf .
Weight of armour tape in kg/km .

2d Tie wire details

Diameter (cross-section) in mm .
Cross-sectional area in mm^2 .
Breaking strength in N or kgf .
Weight of tie wire in kg/km .

2e Packing details

2e.1 Packing details for conductor

Packing method (shown by drawing(s), describe packing materials, details of wood treatment, name and composition of preservatives and details of conductor terminal marking) .

Number of reels .

Principal dimensions of reel in mm .

Gross weight of one reel in kg .

Net weight of one reel in kg .

Length of uncut conductor per reel in m .

2e.2 Packing details for armour tape and tie wire

Packing method.

Dimensions (cross-section) of armour tape in mm x mm .

Diameter (cross-section) of tie wire in mm .

Cross-section area of tie wire in mm^2 .

Principal dimensions of each coil in mm .

Net weight of each coil in kg .

Length of uncut armour tape or tie wire per coil in m .

Table 5

Packing Details for Aluminium Stranded Conductor

PEA Material No.	Code number	Nominal cross-sectional area (mm^2)	Reel size (mm)	Production length per reel (m)
1020010001	35	35 (35-A1-7)	1,000	4,500
1020010002	50	50 (50-A1-7)	1,000	3,100
1020010004	95	95 (95-A1-19)	1,400	4,500
1020010005	120	120 (120-A1-19)	1,400	3,500
1020010007	185	185 (185-A1-37)	1,400	2,400
1020010008	240	240 (240-A1-61)	1,400	1,500
1020010009	400	400 (400-A1-61)	1,800	1,500

Table 6

Packing Details for Aluminium-alloy Stranded Conductor

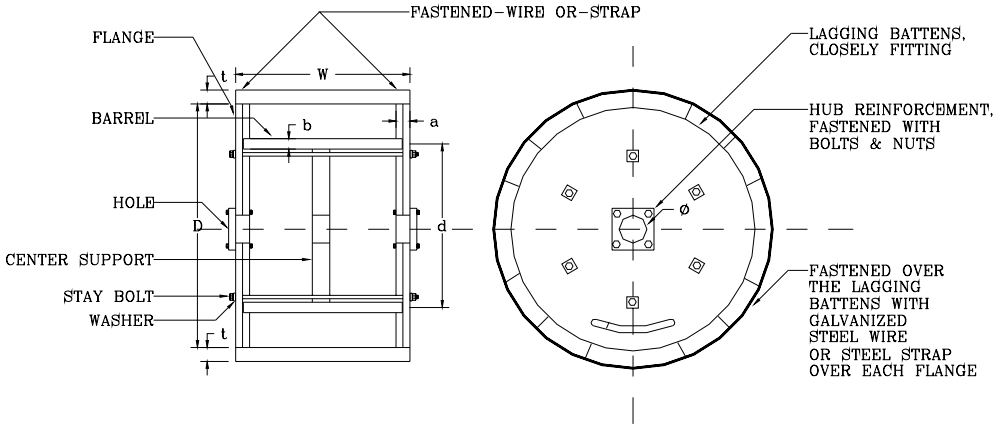
PEA Material No.	Code number	Nominal cross-sectional area (mm^2)	Reel size (mm)	Production length per reel (m)
1020030001	35	35 (35-A3-7)	1,000	4,500
1020030002	50	50 (50-A3-7)	1,000	3,100
1020030004	95	95 (95-A3-19)	1,400	4,500

Table 7

Packing Details for Aluminium Conductor Steel Reinforced

PEA Material No.	Code number	Nominal cross-sectional area (mm^2)	Reel size (mm)	Production length per reel (m)
1020020001	35	35/6 (35-A1/S1A-6/1)	1,000	3,500
1020020002	50	50/8 (50-A1/S1A-6/1)	1,000	3,000
1020020004	95	95/15 (95-A1/S1A-26/7)	1,400	3,500
1020020005	120	120/20 (120-A1/S1A-26/7)	1,400	3,000
1020020007	185	185/30 (185-A1/S1A-26/7)	1,400	2,000
1020020008	380	380/50 (380-A1/S1A-54/7)	1,400	1,000

WOODEN REELS



REEL SIZE mm	D mm	d (min) mm	W mm	a (min) mm	b (min) mm	t (min) mm	∅ mm	NUMBER OF STAY BOLTS (min)
-	-	-	-	-	-	-	-	-
1,000	980-1,020	500	660-700	50	19	25	75-100	6
1,400	1,380-1,420	710	875-915	63	25	38	75-100	6
1,800	1,780-1,820	965	880-920	75	35	38	75-100	6

Note :

1. Minimum clearance between cable and the lagging battens shall not be less than 25 mm .
2. Both ends of barrel battens shall be embedded in the flanges.
3. If PEA requests, the bidder has to state the reel manufacturer's name; and PEA reserves the right to observe the manufacturing process from time to time.

C3 Schedule of detailed requirement

Invitation to Bid No.:

Item	PEA Material No.	Quantity	Description
1	1020010001		Aluminium stranded conductors, 35 mm^2 (35-A1-7).
2	1020010002		Aluminium stranded conductors, 50 mm^2 (50-A1-7).
3	1020010004		Aluminium stranded conductors, 95 mm^2 (95-A1-19).
4	1020010005		Aluminium stranded conductors, 120 mm^2 (120-A1-19).
5	1020010007		Aluminium stranded conductors, 185 mm^2 (185-A1-37).
6	1020010008		Aluminium stranded conductors, 240 mm^2 (240-A1-61).
7	1020010009		Aluminium stranded conductors, 400 mm^2 (400-A1-61).
8	1020020001		Aluminium conductors steel reinforced, 35/6 mm^2 (35-A1/S1A-6/1).
9	1020020002		Aluminium conductors steel reinforced, 50/8 mm^2 (50-A1/S1A-6/1).
10	1020020004		Aluminium conductors steel reinforced, 95/15 mm^2 (95-A1/S1A-26/7).
11	1020020005		Aluminium conductors steel reinforced, 120/20 mm^2 (120-A1/S1A-26/7).
12	1020020007		Aluminium conductors steel reinforced, 185/30 mm^2 (185-A1/S1A-26/7).
13	1020020008		Aluminium conductors steel reinforced, 380/50 mm^2 (380-A1/S1A-54/7).
14	1020030001		Aluminium-alloy stranded conductors, 35 mm^2 (35-A3-7).
15	1020030002		Aluminium-alloy stranded conductors, 50 mm^2 (50-A3-7).
16	1020030004		Aluminium-alloy stranded conductors, 95 mm^2 (95-A3-19).
17	1020200000		Armour tape, aluminium, cross-section 1 ± 0.1 mm x 10 ± 0.3 mm.
18	1020200002		Tie wire, aluminium, diameter 4 ± 0.04 mm.

PROVINCIAL ELECTRICITY AUTHORITY

POWER SYSTEM STANDARD DIVISION

C4 Price schedule

Invitation to Bid No.

Manufacturer :

Country of origin :

Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
1	1020010001		Aluminium stranded conductors, 35 mm^2 (35-A1-7).			
2	1020010002		Aluminium stranded conductors, 50 mm^2 (50-A1-7).			
3	1020010004		Aluminium stranded conductors, 95 mm^2 (95-A1-19).			
4	1020010005		Aluminium stranded conductors, 120 mm^2 (120-A1-19).			
5	1020010007		Aluminium stranded conductors, 185 mm^2 (185-A1-37).			
6	1020010008		Aluminium stranded conductors, 240 mm^2 (240-A1-61).			
7	1020010009		Aluminium stranded conductors, 400 mm^2 (400-A1-61).			
8	1020020001		Aluminium conductors steel reinforced, 35/6 mm^2 (35-A1/S1A-6/1).			
9	1020020002		Aluminium conductors steel reinforced, 50/8 mm^2 (50-A1/S1A-6/1).			
10	1020020004		Aluminium conductors steel reinforced, 95/15 mm^2 (95-A1/S1A-26/7).			

C4 Price schedule
Invitation to Bid No.

Manufacturer :
Country of origin :
Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
11	1020020005		Aluminium conductors steel reinforced, 120/20 mm^2 (120-A1/S1A-26/7).			
12	1020020007		Aluminium conductors steel reinforced, 185/30 mm^2 (185-A1/S1A-26/7).			
13	1020020008		Aluminium conductors steel reinforced, 380/50 mm^2 (380-A1/S1A-54/7).			
14	1020030001		Aluminium-alloy stranded conductors, 35 mm^2 (35-A3-7).			
15	1020030002		Aluminium-alloy stranded conductors, 50 mm^2 (50-A3-7).			
16	1020030004		Aluminium-alloy stranded conductors, 95 mm^2 (95-A3-19).			
17	1020200000		Armour tape, aluminium, cross-section 1 ± 0.1 mm x 10 ± 0.3 mm.			
18	1020200002		Tie wire, aluminium, diameter 4 ± 0.04 mm.			

PROVINCIAL ELECTRICITY AUTHORITY

POWER SYSTEM STANDARD DIVISION

Spec. No. RCBL-050/2551 : Covered tie wire for SAC and PIC cable | **Page 1 of 1**

C3 Schedule of detailed requirement

Invitation to Bid No.:

Item	PEA Material No.	Quantity	Description
1	1020200003		Covered tie wire, 1-core, solid aluminium conductor, having PE insulation for attachment Space aerial cable (SAC) and Partially insulated cable (PIC); with : Conductor : - standard of test method : ASTM B557/B557M - diameter : 4 ± 0.04 mm - ultimate tensile strength : 87 - 138 kgf Insulation : - material : Polyethylene (PE) - average thickness : 1.0 mm - thickness, at any point : not less than 0.9 mm Length : 100 (+20, -0) m per coil Package : plastic cover **Note :** 1) Marking on the surface of the sheath, it shall be marked at the interval of about 50 cm, by printing in white as manufacturer's name and/or trade mark, month/year of manufacture and others according to manufacturer's design. 2) The bidders, have to submit test reports shall be submitted with the bid or within fifteen (15) calendar days after of the bid closing date. The item offered without submitting the type test reports shall be rejected.

PROVINCIAL ELECTRICITY AUTHORITY

POWER SYSTEM STANDARD DIVISION

Specification No. RCBL-050/2551 : Covered tie wire for SAC and PIC cable | **Page 1 of 1**

C4 Price schedule

Invitation to Bid No.

Manufacturer :

Country of origin :

Trade-mark :

Ite	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
1	1020200003		Covered tie wire, 1-core, solid aluminium conductor, having PE insulation for attachment Space aerial cable (SAC) and Partially insulated cable (PIC); with : Conductor : - standard of test method : ……. - diameter : ……. - ultimate tensile strength : ……. Insulation : - material : ……. - average thickness : ……. - thickness, at any point : ……. Length : ……. Package : …….			

เอกสารเพิ่มเติมแนบท้ายรายละเอียดสเปค

(ADDENDUM)

เอกสารเพิ่มเติม (ADDENDUM) นี้ ให้ถือเป็นส่วนหนึ่งของรายละเอียดสเปคที่เอกสารฯ นี้ได้แนบอยู่ด้วย

การกำหนดการส่งรายงานผลการทดสอบเฉพาะแบบ (Type test report)

ผู้ยื่นข้อเสนอสามารถยื่นเอกสาร หรือหลักฐานอื่นเพื่อประกอบการพิจารณาจัดซื้อ จัดจ้าง หรือจ้างก่อสร้าง แทนการยื่นรายงานผลการทดสอบเฉพาะแบบ (Type test report) หรือหนังสือรับรองผลการทดสอบเฉพาะแบบ (Type test certificate) ได้ ดังนี้:

(1) กรณีที่เป็นอุปกรณ์ที่การไฟฟ้าส่วนภูมิภาคสำนักงานใหญ่ โดยฝ่ายจัดหา หรือฝ่ายงานสถานีไฟฟ้า หรือฝ่ายงานระบบไฟฟ้า เคยรับไว้ใช้งานจากการจัดซื้อ จัดจ้าง หรืองานจ้างก่อสร้างแล้ว ผู้ยื่นข้อเสนอสามารถยื่นสำเนาหนังสือสั่งซื้อ/จ้าง (Purchase order) หรือสำเนาหนังสือสัญญาจ้างก่อสร้างพร้อมบัญชีแสดงปริมาณวัสดุ (Bill of Quantities: BOQ) ที่ออกโดยการไฟฟ้าส่วนภูมิภาค แทนได้ หรือ

(2) กรณีที่อุปกรณ์ที่เสนอได้รับการขึ้นทะเบียน และควบคุมคุณภาพผลิตภัณฑ์ (PEA Product Acceptance) แล้ว ผู้ยื่นข้อเสนอสามารถยื่นเอกสารรับรองการขึ้นทะเบียนฯ ที่ยังไม่หมดอายุในวันที่ยื่นเอกสาร แทนได้ หรือ

(3) กรณีที่อุปกรณ์ที่เสนอราคาได้รับการขึ้นทะเบียนอุปกรณ์หลักในงานจ้างก่อสร้างสถานีไฟฟ้า (Product list) แล้ว ผู้ยื่นข้อเสนอสามารถยื่นเอกสารรับรองการขึ้นทะเบียนฯ ที่ยังไม่หมดอายุในวันที่ยื่นเอกสารแทนได้

ทั้งนี้ เอกสาร หรือหลักฐานที่ระบุไว้ในข้อ (1) ข้อ (2) และข้อ (3) ดังกล่าวข้างต้น จะสามารถใช้แทนการยื่นรายงานผลการทดสอบเฉพาะแบบ (Type test report) หรือหนังสือรับรองผลการทดสอบเฉพาะแบบ (Type test certificate) ได้ ต้องเป็นเอกสาร หรือหลักฐานที่ตรวจสอบแล้วพบว่าเป็นของอุปกรณ์ที่เป็นผลิตภัณฑ์รุ่น และพิกัดเดียวกันกับอุปกรณ์ที่จัดซื้อ หรือจัดจ้าง หรือจ้างก่อสร้างในครั้งนี้

เอกสารเพิ่มเติมแนบท้ายรายละเอียดสเปค

(ADDENDUM)

เอกสารเพิ่มเติม (ADDENDUM) นี้ ให้ถือเป็นส่วนหนึ่งของรายละเอียดสเปคที่เอกสารฯ นี้ได้แนบอยู่ด้วย

1. **การกำหนดระยะเวลาในการส่งรายงานผลการทดสอบเฉพาะแบบ (Type test report)**

   หากรายละเอียดสเปคกำหนดให้ผู้เสนอราคาจะต้องจัดส่งรายงานผลการทดสอบเฉพาะแบบ (Type test report) หรือหนังสือรับรองผลการทดสอบเฉพาะแบบ (Type test certificates) “ให้ผู้เสนอราคาจะต้องจัดส่งรายงานผลการทดสอบเฉพาะแบบ หรือหนังสือรับรองผลการทดสอบเฉพาะแบบมาพร้อมกับการยื่นเอกสารทางเทคนิค” แทนการกำหนดระยะเวลาจัดส่งรายงานฯ ที่ได้ระบุไว้ในรายละเอียดสเปค

   ทั้งนี้ ยกเว้นบางพัสดุอุปกรณ์ที่ กฟภ. กำหนดยอมรับให้ทำการทดสอบเฉพาะแบบภายหลังจากที่ทำสัญญากับ กฟภ. แล้ว โดยคู่สัญญาจะต้องจัดส่งรายงานผลการทดสอบฯ ดังกล่าว ก่อนการส่งของนั้น ให้คงรายละเอียดไว้ตามเดิม

2. **การกำหนดระยะเวลาในการจัดส่งตัวอย่าง (Sample) เพื่อประกอบการพิจารณาจัดหา**

   หากรายละเอียดสเปคกำหนดให้ผู้เสนอราคาจะต้องจัดส่งตัวอย่างพัสดุอุปกรณ์ (Sample) เพื่อประกอบการพิจารณาจัดหา “ให้ผู้เสนอราคาจะต้องจัดส่งตัวอย่างพัสดุอุปกรณ์ ภายใน 5 วันทำการ นับถัดจากวันเสนอราคา” แทนการกำหนดระยะเวลาจัดส่งตัวอย่างที่ได้ระบุไว้ในรายละเอียดสเปค

เอกสารเพิ่มเติมแนบท้ายรายละเอียดสเปค

(ADDENDUM)

เอกสารเพิ่มเติม (ADDENDUM) นี้ ให้ถือเป็นส่วนหนึ่งของรายละเอียดสเปคที่เอกสารฯ นี้ได้แนบอยู่ด้วย

การกำหนดการส่งรายงานผลการทดสอบเฉพาะแบบ (Type test report)

ผู้ยื่นข้อเสนอสามารถยื่นเอกสาร หรือหลักฐานอื่นเพื่อประกอบการพิจารณาจัดซื้อ จัดจ้าง หรือจ้างก่อสร้าง แทนการยื่นรายงานผลการทดสอบเฉพาะแบบ (Type test report) หรือหนังสือรับรองผลการทดสอบเฉพาะแบบ (Type test certificate) ได้ ดังนี้:

(1) กรณีที่เป็นอุปกรณ์ที่การไฟฟ้าส่วนภูมิภาคสำนักงานใหญ่ โดยฝ่ายจัดหา หรือฝ่ายงานสถานีไฟฟ้า หรือฝ่ายงานระบบไฟฟ้า เคยรับไว้ใช้งานจากการจัดซื้อ จัดจ้าง หรืองานจ้างก่อสร้างแล้ว ผู้ยื่นข้อเสนอสามารถยื่นสำเนาหนังสือสั่งซื้อ/จ้าง (Purchase order) หรือสำเนาหนังสือสัญญาจ้างก่อสร้างพร้อมบัญชีแสดงปริมาณวัสดุ (Bill of Quantities: BOQ) ที่ออกโดยการไฟฟ้าส่วนภูมิภาค แทนได้ หรือ

(2) กรณีที่อุปกรณ์ที่เสนอได้รับการขึ้นทะเบียน และควบคุมคุณภาพผลิตภัณฑ์ (PEA Product Acceptance) แล้ว ผู้ยื่นข้อเสนอสามารถยื่นเอกสารรับรองการขึ้นทะเบียนฯ ที่ยังไม่หมดอายุในวันที่ยื่นเอกสาร แทนได้ หรือ

(3) กรณีที่อุปกรณ์ที่เสนอราคาได้รับการขึ้นทะเบียนอุปกรณ์หลักในงานจ้างก่อสร้างสถานีไฟฟ้า (Product list) แล้ว ผู้ยื่นข้อเสนอสามารถยื่นเอกสารรับรองการขึ้นทะเบียนฯ ที่ยังไม่หมดอายุในวันที่ยื่นเอกสารแทนได้

ทั้งนี้ เอกสาร หรือหลักฐานที่ระบุไว้ในข้อ (1) ข้อ (2) และข้อ (3) ดังกล่าวข้างต้น จะสามารถใช้แทนการยื่นรายงานผลการทดสอบเฉพาะแบบ (Type test report) หรือหนังสือรับรองผลการทดสอบเฉพาะแบบ (Type test certificate) ได้ ต้องเป็นเอกสาร หรือหลักฐานที่ตรวจสอบแล้วพบว่าเป็นของอุปกรณ์ที่เป็นผลิตภัณฑ์รุ่น และพิกัดเดียวกันกับอุปกรณ์ที่จัดซื้อ หรือจัดจ้าง หรือจ้างก่อสร้างในครั้งนี้

C Material, equipment, and specifications for PREFORMED DEAD-END

C1 General material and packing instructions

Additional to the general instructions, the following shall be observed:

1a Scope

These specifications cover preformed dead-end designed for direct application over jacket of space aerial cable in 22 kV and 33 kV overhead distribution construction.

1b Standards

The preformed dead-end shall be made of heat-treated aluminium-alloy 6061 according to standard below.

ASTM B 211-05: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

PEA will also accept the preformed dead-end made of heat-treated aluminium-alloy 6061 in accordance with the later edition of the above standards.

1c Principal requirement

1c.1 Preform dead-end

The preform dead-end shall be designed for direct application over conductors jacketed with polyethylene (PE), polyvinyl-chloride (PVC), cross-linked polyethylene (XLPE), or rubber. The dead-end legs shall be gritted and neoprene coated (black colour), and cross-over marked with colour code to indicate starting point for application.

1c.2 Marking

Each preform dead-end shall have a weather-resistance plastic identification tape showing at least following information:

(1) Manufacturer's name or Trademark
(2) Catalog number or model
(3) Overall cable diameter range with which preformed dead-end is used
(4) Holding strength
(5) Purchase order number (PO)

1c.3 Samples

The bidders have to submit one (1) sample for each proposed item of the preform dead-end free of charge, within five (5) working days counted from bid closing date, for consideration; otherwise, the proposal will

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be rejected. PEA reserves the right to test the sample according to PEA's testing procedure. In case of the failing test results, the bidders will be rejected.

The samples will not be returned.

1d Packing

The delivered preformed dead-end shall be packed in carton box or in suitable package. Number of preformed dead-end shall not more than 100 pieces per carton box or package.

Each carton box or package shall be securely wrapped and sealed with a moisture-proof material to protect the contents and shall be marked with the name of manufacturer and gross weight.

1e Test and test reports

1e.1 Type tests

The preformed rods and the proposed preformed dead-end shall pass the type test items specified in Table 1.

Table 1

Type test items of preformed rods and preformed dead-end

No.	Test items	Test method and requirement
Preformed rods		
1	Chemical composition	according to ASTM B 911-05, or later edition
2	Tensile properties	
Preformed dead-end		
1	Visual and dimension test	According to PEA's specification and **C3 Schedule of detailed requirement**
2	Tensile test	According to **Drawing No. SB2-015/60001**

Note: For the preformed rods, PEA will accept the test report or test certificate from third party laboratory or manufacturer.

The type test of preformed dead-end shall be conducted or inspected by the acknowledged independent testing laboratories/institutes as follows:

(1) Independent laboratories/institutes which are members of the Short circuit Testing Liaison (STL) or independent laboratories/institutes which are accredited according to TIS 17025 or ISO/IEC 17025 with the scope of accreditation covered the relevant test items, standards and equipment. The certification and scope of accreditation of the independent laboratories/institutes shall be submitted with the bid for consideration.

(2) Laboratories, institutes, universities and electric utilities, as follows:

National Metal and Materials Technology Center (MTEC)

- Electrical and Electronic Products Testing Center (PTEC)
- Thai Industrial Standards Institute (TISI)
- Electrical and Electronics Institute (EEI)
- Department of Science Service (DSS)
- Testing Laboratory, Electrical Engineering Department, Faculty of Engineering, Chulalongkorn University
- Electricity Generating Authority of Thailand (EGAT)
- Metropolitan Electricity Authority (MEA)
- Provincial Electricity Authority (PEA)
- Other laboratories, institutes, universities or electric utilities approved by PEA

The bidders or manufacturers who prefer to carry out the type tests of the preformed dead-end with laboratories or by manufacturers themselves without the qualification mentioned above, the detail of the test facilities of the laboratories or the manufacturer shall be submitted to PEA for approval before proceeding the tests and before the bid closing date. PEA reserves the right to send representatives to inspect and witness the tests.

The type test report of preformed dead-end conducted by the laboratories/institutes in Thailand or local manufacturers shall be valid within five (5) years counted from the issued date in the test report to the bid closing date.

The type test report of preformed dead-end conducted by the laboratories/institutes in other countries shall be valid within ten (10) years counted from the issued date in the test report to the bid closing date.

The cost of all type tests and report shall be borne by the Bidders/Manufacturers.

The type report or test certificate of the preform rods and type test report of the proposed preformed dead-end shall be submitted with the bid.

PEA will also accept other documents instead of the type test reports in the following conditions:

(1) In case the proposed preformed dead-end has been supplied to PEA and get the order from PEA's Procurement Department (from PEA's head office), The bidder can submit the Purchase Order (PO) on the bid closing date, or

(2) In case the proposed preformed dead-end has been registered for PEA Product Acceptance, the Bidder can submit the valid registration certificate on the bid closing date, or

(3) In case the proposed preformed dead-end has been registered for Product lists for substation turnkey project, the Bidder can submit the valid registration certificate on the bid closing date.

However the document in case (1), (2) and (3) mentioned above shall be proved that the preformed dead-end specified in the PO or registration certificate is the same product, type/model and all ratings as the proposed preformed dead-end for this bid.

1e.2 **Acceptance tests**

PEA reserves the right to have an acceptance test conducted by PEA's laboratory or by manufacturer's factory or by acknowledge independent testing laboratories as mentioned in **1e.1.**

In case the tests made by manufacturer's factory or by acknowledge independent testing laboratories, PEA reserves the right to send representatives to witness the tests

The cost of the acceptance tests and report shall be borne by the Contractor.

PEA will randomly choose the samples of preformed dead-end per delivery lot for testing with the number specified in **Table 2.**

Table 2

Number of samples for acceptance test

Number of preformed dead-end per delivery lot (pcs)	Number of samples for acceptance test (sets)
not more than 500	3
more than 500	5

Note: • The samples shall not be returned and shall not be used in the system.

• After the tests, the additional preformed dead-end, with the equal number of the samples for acceptance test, shall be supplied by the contractor with free of charge to complete the number of preformed dead-end in the purchase contract.

The samples of preformed dead-end shall pass the acceptance test items as specified in **Table 3.**

Table 3

Acceptance test items of preformed dead-end

No.	Test items	Test method and requirement
1	Chemical composition	Optical emission spectrometer**
2	Visual and dimension test	According to PEA's specification and C3 Schedule of detailed requirement
3	Tensile test	According to **Drawing No. SB2-015/60002**

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Noted: * Only one sample shall be tested with test item No. 1 and the other samples shall be tested with test item No. 2 and 3.

** The test result shall be conformed to aluminium-alloy 6061 according to ASTM B 211-05, or later edition.

The samples shall pass the acceptance tests item No. 1, 2 and 3 as specified in **Table 3** sequentially. If any samples have failed in any test sequence, the tests shall not continue to the next test sequence and all preformed dead-end in that delivery lot will be reject.

11 Guarantee

The Contractor shall guarantee the quality for one (1) year commencing from the date PEA receive the above-mentioned preformed dead-end in the condition as specified in note below.

Note:

ภายในกำหนดระยะเวลารับประกันคุณภาพ หากการไฟฟ้าส่วนภูมิภาคนำ Preformed dead-end ไปใช้งานตามปกติแล้วปรากฏว่าชำรุด ขัดข้อง หรือบกพร่อง คู่สัญญาจะต้องนำ Preformed dead-end ตัวใหม่มาเปลี่ยนทดแทนของที่ชำรุด ภายใน 30 วัน นับถัดจากวันที่ได้รับแจ้งจากการไฟฟ้าส่วนภูมิภาค และหากการชำรุด ขัดข้อง หรือบกพร่องดังกล่าว มีสาเหตุมาจากคุณสมบัติที่ไม่เป็นไปตามสเปคของการไฟฟ้าส่วนภูมิภาค คู่สัญญาจะต้องเปลี่ยนสิ่งของที่ส่งมอบตามสัญญาทั้งหมดให้แก่การไฟฟ้าส่วนภูมิภาค โดยไม่คิดค่าใช้จ่ายใดๆ ทั้งสิ้น และในกรณีการชำรุด ขัดข้อง หรือบกพร่องดังกล่าว เกิดขึ้นกับ Preformed dead-end ที่ได้ถูกติดตั้งใช้งานแล้ว คู่สัญญาจะต้องยินยอมชดเชยค่าใช้จ่ายให้แก่การไฟฟ้าส่วนภูมิภาค ในส่วนของการดำเนินการรื้อถอนเป็นจำนวนเงิน 114.-บาทต่อชุด การติดตั้งใหม่เป็นจำนวนเงิน 186.-บาทต่อชุด รวมถึงค่าใช้จ่ายในการติดตั้งใหม่ ประกอบด้วยค่ารถกระเช้าระบบ 22-33 kV เป็นจำนวน 5,300.-บาทต่อวัน และค่าเบี้ยเลี้ยงพนักงานขอทไลน์เป็นจำนวน 2,000.- บาทต่อวัน พร้อมทั้งยินยอมรับผิดชอบค่าเสียหายอื่นที่อาจเกิดขึ้นอันสืบเนื่องมาจาก การชำรุด ขัดข้อง หรือบกพร่อง และคู่สัญญาจะต้องรับประกันคุณภาพ Preformed dead-end ตัวใหม่ที่นำมาเปลี่ยนทดแทนของที่ชำรุดเป็นระยะเวลา 1 ปี นับจากวันที่การไฟฟ้าส่วนภูมิภาคได้ทำการตรวจรับ Preformed dead-end ที่คู่สัญญานำมาเปลี่ยนให้ใหม่เสร็จเรียบร้อยแล้ว และในกรณีที่คู่สัญญาต้องเปลี่ยนทดแทน Preformed dead-end ที่ส่งมอบตามสัญญาทั้งหมดให้แก่การไฟฟ้าส่วนภูมิภาค Preformed dead-end เหล่านี้ต้องผ่านกระบวนการทดสอบเพื่อการตรวจรับใหม่ด้วย

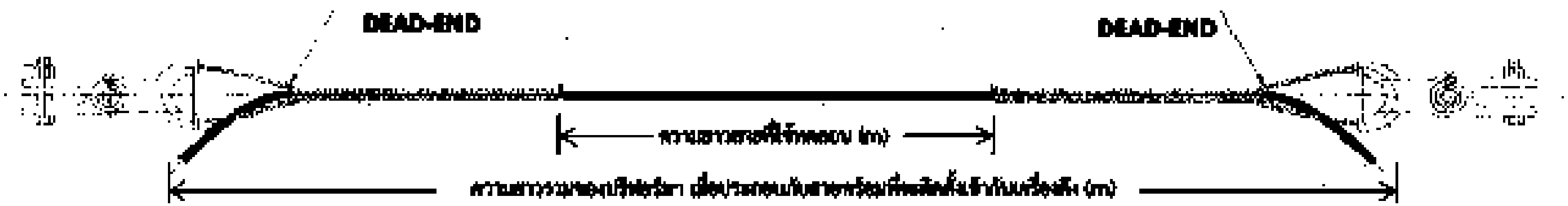
C2 Material and packing data of the proposed preform dead-end shall be submitted with the bid

2a Critical documents of the proposed preformed dead-end

Required technical document	Proposed technical document	Reference document (Page/Item)
1. The type report or test certificate of the preform rods and type test report of the proposed preformed dead-end (see **1e.1**), or	☐ YES ☐ No	
Purchase Order (PO) from PEA's Procurement Department (from PEA's head office), or	☐ YES ☐ No	
PEA Product Acceptance registration certificate, or	☐ YES ☐ No	
Product lists for substation turnkey project registration certificate	☐ YES ☐ No	
2. Catalogues and/or drawings showing dimensions in mm and necessary information as follow: - Manufacturer's name or trade-mark - Diameter range in mm of cable for which the preformed dead-end are designed - Rods per set - Diameter of rods - Overall length - Holding strength - Colour code	☐ YES ☐ No	
3. Packing details	☐ YES ☐ No	

Note:

Critical documents shall be submitted with the bid; otherwise, the proposal shall be rejected.



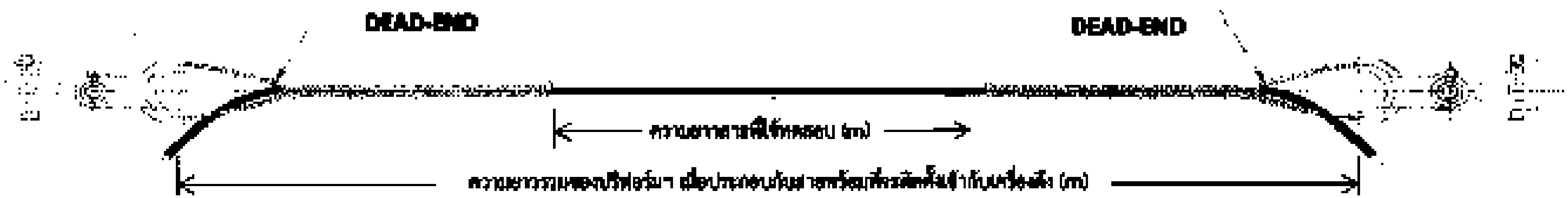
Item	PEA Mat No	สายที่ใช้ทดสอบ				ความยาวสายที่ใช้ทดสอบ (m) (*1)	ความยาวปริฟอร์มา (m)	ความยาวรวมน้อยที่สุดของปริฟอร์มาเมื่อประกอบกับสายพร้อมที่จะติดตั้งเข้ากับเครื่องดึง (m) (ปริฟอร์ม+สาย+ปริฟอร์ม) (*2)	Minimum breaking strength of conductor (kgf) (*3) or Load for testing preformed deand-end (kgf) for PEA Mat No 1020260209 (*4)				
		ชนิด	ขนาด (mm^2)	แรงดัน (kV)	overall cable diameter (mm)				100%	40%	50%	90%	95%
1	1020260202	SAC	50	22	21.7-23.8	≥ 2.18	≥ 0.95	0.95+2.17+0.95 = 4.07m	745	298	373	671	708
2	1020260203	SAC	95	22	25.1-27.1	≥ 2.53	≥ 1.00	1.00+2.51+1.00 = 4.51m	1437	575	719	1293	1366
3	1020260204	SAC	120	22	26.5-28.5	≥ 2.68	≥ 1.10	1.10+2.65+1.10 = 4.85m	1888	755	944	1699	1794
4	1020260205	SAC	185	22	29.6-31.8	≥ 2.98	≥ 1.20	1.20+2.96+1.20 = 5.36m	2954	1182	1477	2659	2806
5	1020260206	SAC	50	33	26.3-28.3	≥ 2.65	≥ 0.95	0.95+2.63+0.95 = 4.53m	745	298	373	671	708
6	1020260207	SAC	95	33	29.7-31.7	≥ 2.99	≥ 1.00	1.00+2.97+1.00 = 4.97m	1437	575	719	1293	1366
7	1020260208	SAC	120	33	31.1-33.1	≥ 3.14	≥ 1.10	1.10+3.11+1.10 = 5.31m	1888	755	944	1699	1794
8	1020260209	SAC	185	33	34.2-36.2	≥ 3.44	≥ 1.20	1.20+3.42+1.20 = 5.82m	1966	786	983	1770	1868

หมายเหตุ

1. ปริฟอร์มเข้าปลายสายจะต้องผ่านการทดสอบแรงดึง ดังนี้
   - ปริฟอร์มเข้าปลายสายต้องประกอบเข้ากับสายที่ใช้ทดสอบตามคำแนะนำของผู้ผลิต และนำไปติดตั้งในเครื่องทดสอบแรงดึง โดยความยาวสายที่ใช้ทดสอบระหว่างปริฟอร์มเข้าปลายสายจะต้องไม่น้อยกว่า 100 เท่าของเส้นผ่านศูนย์กลางรวมของสายที่ใช้ทดสอบ
   - โหลดด้วยแรง 40% ของค่า minimum breaking strength of conductor คงไว้เป็นเวลา 1 นาที นำโหลดออก และถอดปริฟอร์มเข้าปลายสายออกจากสายที่ใช้ทดสอบตามคำแนะนำของผู้ผลิต
   - นำปริฟอร์มเข้าปลายสายมาประกอบเข้ากับสายที่ใช้ทดสอบที่ตำแหน่งเดิมอีกครั้ง และทำขั้นตอนการทดสอบซ้ำตามรายละเอียดในวรรคก่อน
   - นำปริฟอร์มเข้าปลายสายมาประกอบเข้ากับสายที่ใช้ทดสอบที่ตำแหน่งเดิมอีกครั้ง และโหลดด้วยแรงประมาณ 50% ของค่า minimum breaking strength of conductor ทำเครื่องหมายที่สายที่ใช้ทดสอบ ในลักษณะที่หากปริฟอร์มเข้าปลายสายที่ประกอบเข้ากับสายที่ใช้ทดสอบเกิดการเลื่อน แล้วสามารถตรวจพบได้โดยง่าย
   - จากนั้นเพิ่มโหลดขึ้นอย่างต่อเนื่องไปจนถึง 95% ของค่า minimum breaking strength of conductor แล้วลดลงเหลือ 90% ของค่า minimum breaking strength of conductor และคงไว้เป็นเวลา 1 นาที
   - ในสภาพนั้น ปริฟอร์มเข้าปลายสายที่ประกอบเข้ากับสายที่ใช้ทดสอบจะต้องไม่เกิดการเลื่อน ในระหว่างช่วงเวลา 1 นาที และปริฟอร์มเข้าปลายสายจะต้องไม่เกิดความเสียหาย
2. (*1) ความยาวสายที่ใช้ทดสอบไม่น้อยกว่า 100 เท่าของ Overall cable diameter
3. (*2) ความยาวรวมน้อยที่สุดของปริฟอร์มา เมื่อประกอบกับสายพร้อมที่จะติดตั้งเข้ากับเครื่องดึง
4. (*3) ค่า Minimum breaking strength of conductor ที่ 100% เป็นค่าที่ระบุไว้ตามสเปคสายไฟฟ้าของ กฟภ.
5. (*4) กรณีการทดสอบปริฟอร์มเข้าปลายสายเคเบิลอากาศ รหัส 1020260209 ตามข้อ 1. ค่าโหลดในการทดสอบ ให้ใช้ค่า Load for testing preformed deand-end แทน minimum breaking strength of conductor
6. สถาบันทดสอบสำหรับการทดสอบเฉพาะแบบ (Type test) ปริฟอร์มเข้าปลายสายฯ ให้เป็นไปตามรายละเอียดสเปค กฟภ. สเปคเลขที่ RCBL-058/2563 หัวข้อ 18.1

TSP PEA

กองข้อกำหนดทางเทคนิค ฝ่ายวิศวกรรม การไฟฟ้าส่วนภูมิภาค		
อนุมัติ.................. วันที่..................	รายละเอียดการทดสอบเฉพาะแบบ (Type test) ปริฟอร์มเข้าปลายสายเคเบิลอากาศ	แบบเลขที่ SB2-015/60001 แผ่นที่ 1 ของจำนวน 1 แผ่น



Item	PEA Mat No	สายที่ใช้ทดสอบ				ความยาวสายที่ใช้ทดสอบ (m) (1)	ความยาวพรีฟอร์ม (m)	ความยาวรวมน้อยที่สุดของพรีฟอร์ม เมื่อประกอบกับสายพร้อมที่จะติดตั้งเข้ากับเครื่องดึง (m) (พรีฟอร์ม+สาย+พรีฟอร์ม) (2)	Minimum breaking strength of conductor (kgf) (3) or Load for testing preformed deand-end (kgf) for PEA Mat No 1020260209 (4)		
		ชนิด	ขนาด (mm²)	แรงดัน (kV)	overall cable diameter (mm)				100%	40%	50%
1	1020260202	SAC	50	22	21.7-23.8	≥ 2.18	≥ 0.95	0.95+2.17+0.95 = 4.07m	745	298	373
2	1020260203	SAC	95	22	25.1-27.1	≥ 2.53	≥ 1.00	1.00+2.51+1.00 = 4.51m	1437	575	719
3	1020260204	SAC	120	22	26.5-28.5	≥ 2.68	≥ 1.10	1.10+2.65+1.10 = 4.85m	1888	755	944
4	1020260205	SAC	185	22	29.6-31.8	≥ 2.98	≥ 1.20	1.20+2.96+1.20 = 5.36m	2954	1182	1477
5	1020260206	SAC	50	33	26.3-28.3	≥ 2.65	≥ 0.95	0.95+2.63+0.95 = 4.53m	745	298	373
6	1020260207	SAC	95	33	29.7-31.7	≥ 2.99	≥ 1.00	1.00+2.97+1.00 = 4.97m	1437	575	719
7	1020260208	SAC	120	33	31.1-33.1	≥ 3.14	≥ 1.10	1.10+3.11+1.10 = 5.31m	1888	755	944
8	1020260209	SAC	185	33	34.2-36.2	≥ 3.44	≥ 1.20	1.20+3.42+1.20 = 5.82m	1966	786	983

หมายเหตุ

1. พรีฟอร์มเข้าปลายสายจะต้องผ่านการทดสอบแรงดึง ดังนี้
   - พรีฟอร์มเข้าปลายสายต้องประกอบเข้ากับสายที่ใช้ทดสอบตามคำแนะนำของผู้ผลิต และนำไปติดตั้งในเครื่องทดสอบแรงดึง โดยความยาวสายที่ใช้ทดสอบระหว่างพรีฟอร์มเข้าปลายสายจะต้องไม่น้อยกว่า 100 เท่าของเส้นผ่านศูนย์กลางรวมของสายที่ใช้ทดสอบ ใส่โหลดดึงแรง 40% ของค่า minimum breaking strength of conductor ค้างไว้เป็นเวลา 1 นาที
   - ทำเครื่องหมายที่สายที่ใช้ทดสอบ ในลักษณะที่หากพรีฟอร์มเข้าปลายสายที่ประกอบเข้ากับสายที่ใช้ทดสอบเกิดการเลื่อน แล้วสามารถตรวจพบได้โดยง่าย
   - จากนั้นเพิ่มโหลดขึ้นอย่างต่อเนื่องไปจนถึง 50% ของค่า minimum breaking strength of conductor และค้างไว้เป็นเวลา 1 นาที
   - ในสภาวะนั้น พรีฟอร์มเข้าปลายสายที่ประกอบเข้ากับสายที่ใช้ทดสอบจะต้องไม่เกิดการเลื่อน ในระหว่างช่วงเวลา 1 นาที และพรีฟอร์มเข้าปลายสายจะต้องไม่เกิดความเสียหาย
2. (1) ความยาวสายที่ใช้ทดสอบไม่น้อยกว่า 100 เท่าของ Overall cable diameter หรือน้อยกว่าตามความสามารถของเครื่องทดสอบที่ใช้ทดสอบ
3. (2) ความยาวรวมน้อยที่สุดของพรีฟอร์ม เมื่อประกอบกับสายพร้อมที่จะติดตั้งเข้ากับเครื่องดึง หรือน้อยกว่าตามความสามารถของเครื่องทดสอบที่ใช้ทดสอบ
4. (3) ค่า Minimum breaking strength of conductor ที่ 100% เป็นค่าที่ระบุไว้ตามสเปคสายไฟฟ้าของ กฟภ.
5. (4) กรณีการทดสอบพรีฟอร์มเข้าปลายสายเคเบิลอากาศ รหัส 1020260209 ตามข้อ 1 ค่าโหลดในการทดสอบ ให้ใช้ค่า Load for testing preformed deand-end แทน minimum breaking strength of conductor
6. ตารางทดสอบสำหรับการทดสอบเพื่อการตรวจรับ (Acceptance test) พรีฟอร์มเข้าปลายสาย ให้เป็นไปตามรายละเอียดสเปค กฟภ. สเปคเลขที่ RDS-058/2563 ข้อ 1.2

TSP

กองข้อกำหนดทางเทคนิค ฝ่ายวิศวกรรม การไฟฟ้าส่วนภูมิภาค		
อนุมัติ.......... วันที่..........	รายละเอียดการทดสอบตรวจรับ (Acceptance test) พรีฟอร์มเข้าปลายสายเคเบิลอากาศ	แบบเลขที่ SB2-015/60002 แผ่นที่ 1 ของจำนวน 1 แผ่น

C3 Schedule of detailed requirement

Invitation to Bid No.:

Item	PEA Material No.	Quantity	Description
1	1020260202	set(s)	Preformed dead-end, gritted and neoprene coated, for use with single-core space aerial cable, aluminium conductors size 50 mm^2/22 kV (Overall cable diameter range 21.7-23.8 mm) with ; Standard : the preformed rods of dead-end shall be made of heat-treated aluminium-alloy 6061 as specified in ASTM B 211 Rods per set : not less than 5 rods Diameter of rods : not less than 2.5 mm Overall length : not less than 930 mm Holding strength : not less than 670 kgf Complete with: Cross over marked with red colour to indicate starting point.
2	1020260203	set(s)	Preformed dead-end, gritted and neoprene coated, for use with single-core space aerial cable, aluminium conductors size 95 mm^2/22 kV (Overall cable diameter range 25.1-27.1 mm) with ; Standard : the preformed rods of dead-end shall be made of heat-treated aluminium-alloy 6061 as specified in ASTM B 211 Rods per set : not less than 6 rods Diameter of rods : not less than 3 mm Overall length : not less than 1,000 mm Holding strength : not less than 1,290 kgf Complete with: Cross over marked with orange colour to indicate starting point.

C3 Schedule of detailed requirement

Invitation to Bid No.:

Item	PEA Material No.	Quantity	Description
3	1020260204	set(s)	Preformed dead-end, gritted and neoprene coated, for use with single-core space aerial cable, aluminium conductors size 120 mm^2/22 kV (Overall cable diameter range 26.5-28.5 mm) with ; Standard : the preformed rods of dead-end shall be made of heat-treated aluminium-alloy 6061 as specified in ASTM B 211 Rods per set : not less than 6 rods Diameter of rods : not less than 3 mm Overall length : not less than 1,100 mm Holding strength : not less than 1,700 kgf Complete with: Cross over marked with yellow colour to indicate starting point.
4	1020260205	set(s)	Preformed dead-end, gritted and neoprene coated, for use with single-core space aerial cable, aluminium conductors size 185 mm^2/22 kV (Overall cable diameter range 29.6-31.8 mm) with ; Standard : the preformed rods of dead-end shall be made of heat-treated aluminium-alloy 6061 as specified in ASTM B 211 Rods per set : not less than 7 rods Diameter of rods : not less than 4 mm Overall length : not less than 1,200 mm Holding strength : not less than 2,660 kgf Complete with: Cross over marked with green colour to indicate starting point.

TSP

C3 Schedule of detailed requirement

Invitation to Bid No.:

Item	PEA Material No.	Quantity	Description
5	1020260206	set(s)	Preformed dead-end, gritted and neoprene coated, for use with single-core space aerial cable, aluminium conductors size 50 mm^2/33 kV (Overall cable diameter range 26.3-28.3 mm) with : Standard : the preformed rods of dead-end shall be made of heat-treated aluminium-alloy 6061 as specified in ASTM B 211 Rods per set : not less than 5 rods Diameter of rods : not less than 2.5 mm Overall length : not less than 950 mm Holding strength : not less than 670 kgf Complete with: Cross over marked with pink colour to indicate starting point.
6	1020260207	set(s)	Preformed dead-end, gritted and neoprene coated, for use with single-core space aerial cable, aluminium conductors size 95 mm^2/33 kV (Overall cable diameter range 29.7-31.7 mm) with : Standard : the preformed rods of dead-end shall be made of heat-treated aluminium-alloy 6061 as specified in ASTM B 211 Rods per set : not less than 6 rods Diameter of rods : not less than 3 mm Overall length : not less than 1,000 mm Holding strength : not less than 1,290 kgf Complete with: Cross over marked with blue colour to indicate starting point.

C3 Schedule of detailed requirement

Invitation to Bid No.:

Item	PEA Material No.	Quantity	Description
7	1020260208	set(s)	Preformed dead-end, gritted and neoprene coated, for use with single-core space aerial cable, aluminium conductors size 120 mm^2/33 kV (Overall cable diameter range 31.1-33.1 mm) with ; Standard : the preformed rods of dead-end shall be made of heat-treated aluminium-alloy 6061 as specified in ASTM B 211 Rods per set : not less than 6 rods Diameter of rods : not less than 3 mm Overall length : not less than 1,100 mm Holding strength : not less than 1,700 kgf Complete with: Cross over marked with black colour to indicate starting point.
8	1020260209	set(s)	Preformed dead-end, gritted and neoprene coated, for use with single-core space aerial cable, aluminium conductors size 185 mm^2/33 kV (Overall cable diameter range 34.2-36.2 mm) with ; Standard : the preformed rods of dead-end shall be made of heat-treated aluminium-alloy 6061 as specified in ASTM B 211 Rods per set : not less than 7 rods Diameter of rods : not less than 4 mm Overall length : not less than 1,200 mm Holding strength : not less than 1,770 kgf Complete with: Cross over marked with white colour to indicate starting point.

TSP PEA

PROVINCIAL ELECTRICITY AUTHORITY

TECHNICAL SPECIFICATION DIVISION

C4 Price schedule

Invitation to Bid No.:

Manufacturer :

Country of origin :

Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
1	1020260202		Preformed dead end, gritted and neoprene coated, for use with single-core space aerial cable, aluminium conductors size 50 mm^2/22 kV (approximate overall cable diameter 21.7-23.8 mm)	set(s)		
2	1020260203		Preformed dead-end, gritted and neoprene coated, for use with single-core space aerial cable, aluminium conductors size 95 mm^2/22 kV (approximate overall cable diameter 25.1-27.1 mm)	set(s)		
3	1020260204		Preformed dead-end, gritted and neoprene coated, for use with single-core space aerial cable, aluminium conductors size 120 mm^2/22 kV (approximate overall cable diameter 26.5-28.5 mm)	set(s)		

TSP

C4 Price schedule

Invitation to Bid No.:

Manufacturer :

Country of origin :

Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
4	1020260205		Preformed dead-end, gritted and neoprene coated, for use with single-core space aerial cable, aluminium conductors size 185 mm^2/22 kV (approximate overall cable diameter 29.6-31.8 mm)	set(s)		
5	1020260206		Preformed dead-end, gritted and neoprene coated, for use with single-core space aerial cable, aluminium conductors size 50 mm^2/33 kV (approximate overall cable diameter 26.3-28.3 mm)	set(s)		
6	1020260207		Preformed dead-end, gritted and neoprene coated, for use with single-core space aerial cable, aluminium conductors size 95 mm^2/33 kV (approximate overall cable diameter 29.7-31.7 mm)	set(s)		

TSP PEA

C4 Price schedule

Invitation to Bid No.:

Manufacturer :

Country of origin :

Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
7	1020260208		Preformed dead-end, gritted and neoprene coated, for use with single-core space aerial cable, aluminium conductors size 120 mm^2/33 kV (approximate overall cable diameter 31.1-33.1 mm)	set(s)		
8	1020260209		Preformed dead-end, gritted and neoprene coated, for use with single-core space aerial cable, aluminium conductors size 185 mm^2/33 kV (approximate overall cable diameter 34.2-36.2 mm)	set(s)		

TSP

เอกสารเพิ่มเติมแนบท้ายรายละเอียดสเปค

(ADDENDUM)

เอกสารเพิ่มเติม (ADDENDUM) นี้ ให้ถือเป็นส่วนหนึ่งของรายละเอียดสเปคที่เอกสารฯ นี้ได้แนบอยู่ด้วย

คุณสมบัติของสถาบันทดสอบ สำหรับการทดสอบเฉพาะแบบ (Type or Design tests)

หากรายละเอียดสเปคกำหนดรายชื่อ หรือคุณสมบัติของสถาบันทดสอบสำหรับการทดสอบเฉพาะแบบ ให้ใช้รายละเอียดคุณสมบัติดังต่อไปนี้ แทนการกำหนดรายชื่อ หรือคุณสมบัติของสถาบันทดสอบฯ ที่ได้กำหนดไว้ในรายละเอียดสเปค

All items of the type or design tests shall be conducted or inspected by the acknowledged testing laboratories/institutes as following:

(1) Laboratories/institutes which are members of the Short-circuit Testing Liaison (STL) or independent laboratories/institutes which are accredited according to TIS 17025 or ISO/IEC 17025 with the scope of accreditation covered the relevant test items, standards and equipment. The certification and scope of accreditation of the independent laboratories/institutes shall be submitted with the bid for consideration.

(2) Thailand's national laboratories, institutes, universities and electric utilities, as follows:
- National Metal and Materials Technology Center (MTEC)
- Electrical and Electronic Products Testing Center (PTEC)
- Thai Industrial Standards Institute (TISI)
- Electrical and Electronics Institute (EEI)
- Department of Science Service (DSS)
- Testing Laboratory, Electrical Engineering Department, Faculty of Engineering, Chulalongkorn University
- Electricity Generating Authority of Thailand (EGAT)
- Metropolitan Electricity Authority (MEA)
- Provincial Electricity Authority (PEA)
- Other laboratories, institutes, universities or electric utilities approved by PEA

In case of the foreign manufacturers have experience of more than twenty (20) years in design, manufacture and sell such the proposed equipment for using in equal to or higher than system voltages of the proposed equipment, PEA will accept type or design test reports conducted by the manufacturer's laboratory or other independent laboratories without qualification mentioned in (1) or (2). Documents showing the manufacturer's experience such as reference list shall be submitted with the bid for consideration.

The bidders or manufacturers who prefer to carry out the type or design tests of the proposed equipment by the laboratories or by the manufacturer themselves without the qualification mentioned above, the detail of the test facilities of the laboratories or the manufacturer shall be submitted to PEA for approval before proceeding the tests and before the bid closing date. PEA reserves the right to send representatives to inspect and witness the tests with the cost of the bidders or manufacturers.

The type or design test reports done by the laboratories in Thailand or local manufacturers shall be valid within five (5) years counted from the issued date in the test report to the bid closing date.

เอกสารเพิ่มเติมแนบท้ายรายละเอียดสเปค

(ADDENDUM)

เอกสารเพิ่มเติม (ADDENDUM) นี้ ให้ถือเป็นส่วนหนึ่งของรายละเอียดสเปคที่เอกสารฯ นี้ได้แนบอยู่ด้วย

การกำหนดการส่งรายงานผลการทดสอบเฉพาะแบบ (Type test report)

ผู้ยื่นข้อเสนอสามารถยื่นเอกสาร หรือหลักฐานอื่นเพื่อประกอบการพิจารณาจัดซื้อ จัดจ้าง หรือจ้างก่อสร้าง แทนการยื่นรายงานผลการทดสอบเฉพาะแบบ (Type test report) หรือหนังสือรับรองผลการทดสอบเฉพาะแบบ (Type test certificate) ได้ ดังนี้:

(1) กรณีที่เป็นอุปกรณ์ที่การไฟฟ้าส่วนภูมิภาคสำนักงานใหญ่ โดยฝ่ายจัดหา หรือฝ่ายงานสถานีไฟฟ้า หรือฝ่ายงานระบบไฟฟ้า เคยรับไว้ใช้งานจากการจัดซื้อ จัดจ้าง หรืองานจ้างก่อสร้างแล้ว ผู้ยื่นข้อเสนอสามารถยื่นสำเนาหนังสือสั่งซื้อ/จ้าง (Purchase order) หรือสำเนาหนังสือสัญญาจ้างก่อสร้างพร้อมบัญชีแสดงปริมาณวัสดุ (Bill of Quantities: BOQ) ที่ออกโดยการไฟฟ้าส่วนภูมิภาค แทนได้ หรือ

(2) กรณีที่อุปกรณ์ที่เสนอได้รับการขึ้นทะเบียน และควบคุมคุณภาพผลิตภัณฑ์ (PEA Product Acceptance) แล้ว ผู้ยื่นข้อเสนอสามารถยื่นเอกสารรับรองการขึ้นทะเบียนฯ ที่ยังไม่หมดอายุในวันที่ยื่นเอกสาร แทนได้ หรือ

(3) กรณีที่อุปกรณ์ที่เสนอราคาได้รับการขึ้นทะเบียนอุปกรณ์หลักในงานจ้างก่อสร้างสถานีไฟฟ้า (Product list) แล้ว ผู้ยื่นข้อเสนอสามารถยื่นเอกสารรับรองการขึ้นทะเบียนฯ ที่ยังไม่หมดอายุในวันที่ยื่นเอกสารแทนได้

ทั้งนี้ เอกสาร หรือหลักฐานที่ระบุไว้ในข้อ (1) ข้อ (2) และข้อ (3) ดังกล่าวข้างต้น จะสามารถใช้แทนการยื่นรายงานผลการทดสอบเฉพาะแบบ (Type test report) หรือหนังสือรับรองผลการทดสอบเฉพาะแบบ (Type test certificate) ได้ ต้องเป็นเอกสาร หรือหลักฐานที่ตรวจสอบแล้วพบว่าเป็นของอุปกรณ์ที่เป็นผลิตภัณฑ์รุ่น และพิกัดเดียวกันกับอุปกรณ์ที่จัดซื้อ หรือจัดจ้าง หรือจ้างก่อสร้างในครั้งนี้

C Material, equipment, and specifications for PREFORMED DEAD-END FOR LOW VOLTAGE PVC INSULATED ALUMINIUM CABLES

C1 General material and packing instructions

Additional to the general instructions, the following shall be observed:

1a Scope

These specifications cover preformed dead-end designed for direct application over jacket of low voltage PVC insulated aluminium cables according to TIS 293.

1b Standards

The preformed dead-end shall be made of heat-treated aluminium-alloy 6061 completed with temper in accordance with standard below.

ASTM B 211/B211M – 19 : Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire

PEA will also accept the preformed dead-end made of heat-treated aluminium-alloy 6061 in accordance with the later edition of the above standards.

1c Principal requirement

1c.1 Preform dead-end

The preform dead-end shall be designed for direct application over jacket of low voltage PVC insulated aluminium cables according to TIS 293. The dead-end legs shall be gritted and neoprene coated (black colour), and cross-over marked with colour code to indicate starting point for application.

1c.2 Marking

Each preform dead-end shall have a weather-resistance plastic identification tape showing at least following information:

(1) Manufacturer's name or Trademark
(2) Catalog number or model
(3) Overall cable diameter range with which preformed dead-end is used
(4) Holding strength
(5) Purchase order number (PO)

1c.3 Samples

The bidders have to submit one (1) sample for each proposed item of the preform dead-end free of charge, within five (5) working days counted from bid closing date, for consideration; otherwise, the proposal will

be rejected. PEA reserves the right to test the sample according to PEA's testing procedure. In case of the failing test results, the bidders will be rejected.

The samples will not be returned.

1d Packing

The delivered preformed dead-end shall be packed in carton box or in suitable package. Number of preformed dead-end shall not more than 100 pieces per carton box or package.

Each carton box or package shall be securely wrapped and sealed with a moisture-proof material to protect the consents and shall be marked with the name of manufacturer and gross weight.

1e Test and test reports

1e.1 Type tests

The preformed rods and the proposed preformed dead-end shall pass the type test items specified in **Table 1**.

Table 1

Type test items of preformed rods and preformed dead-end

No.	Test items	Test method and requirement
Preformed rods		
1	Chemical composition test	Aluminium-alloy 6061 in accordance with ASTM B 211/B211M – 19: Table 1 or later edition
2	Tensile properties test	Mechanical Property in accordance with ASTM B 211/B211M – 19: Table 2 or Table 3 (Temper designation shall be declared)
Preformed dead-end		
1	Visual and dimension test	In accordance with PEA's specification and **C3 Schedule of detailed requirement**
2	Tensile test	In accordance with **Drawing No. SB2-015/63004**
3	Chemical composition test	Aluminium-alloy 6061 in accordance with ASTM B 211/B211M - 19: **Table 1** or later edition

Before the type tests are proceeded, at least four (4) samples of the preformed dead-end and preformed rods, drawing showing specified dimensions and all information as required by this specification and testing plans will be submitted to PEA for approval and the samples shall be signed by PEA's representative with marker pen.

One sample of the submitted preformed dead-end will be kept by PEA (by Electrical Equipment Standard and Quality Control Division) to be used as a reference sample for bid consideration and acceptance processes.

Another one (1) sample and preformed rods will be sent to acknowledged independent testing laboratories/institutes, which have qualification mentioned below for testing preformed rods with test item No. 1-2 and for testing preformed dead-end with test item No. 3 as specified in **Table 1** for verification grade or designation of aluminium alloy.

The other samples will be also sent to acknowledged independent testing laboratories/institutes, which have qualification mentioned below for testing preformed dead-end with test items No. 1-2 as specified in **Table 1**.

The type test of preformed dead-end shall be conducted or inspected by the acknowledged independent testing laboratories/institutes as follows:

(1) Independent laboratories/institutes which are members of the Short-circuit Testing Liaison (STL) or independent laboratories/institutes which are accredited according to TIS 17025 or ISO/IEC 17025 with the scope of accreditation covered the relevant test items, standards and equipment. The certificate and scope of accreditation of the independent laboratories/institutes shall be submitted with the bid for consideration.

(2) Laboratories, institutes, universities and electric utilities, as follows:
- National Metal and Materials Technology Center (MTEC)
- Electrical and Electronic Products Testing Center (PTEC)
- Thai Industrial Standards Institute (TISI)
- Electrical and Electronics Institute (EEI)
- Department of Science Service (DSS)
- Testing Laboratory, Electrical Engineering Department, Faculty of Engineering, Chulalongkorn University
- Electricity Generating Authority of Thailand (EGAT)
- Metropolitan Electricity Authority (MEA)
- Provincial Electricity Authority (PEA)

(3) Other laboratories

The bidders or manufacturers who prefer to carry out the type tests of the preformed dead-end with other laboratories without the qualification mentioned above, the detail of laboratory and the test facilities shall be submitted to PEA for approval before proceeding the tests and before the bid closing date. PEA reserves the right to send representatives to inspect or witness the tests.

The type test report shall be valid within five (5) years counted from the issued date in the test report to the bid closing date.

The cost of all type tests and report shall be borne by the Bidders/Manufacturers.

The type test report of the preform rods and type test report of the proposed preformed dead-end shall be submitted with the bid.

PEA will also accept other documents instead of the type test reports in the following cases:

(1) In case the proposed preformed dead-end has been sold to PEA at PEA's Procurement Department (from PEA's head office), The bidder can submit the Purchase Order (PO) on the bid closing date, or

(2) In case the proposed preformed dead-end has been registered for PEA Product Acceptance[1], the Bidder can submit the valid registration certificate on the bid closing date, or

(3) In case the proposed preformed dead-end has been registered for Product lists for transmission and substation turnkey project[2], the Bidder can submit the valid registration certificate on the bid closing date.

However the document in case (1), (2) and (3) mentioned above shall be proved by the bidding committee that the preformed dead-end specified in the PO or registration certificate is the same product, type/model and all ratings as the proposed preformed dead-end for this bid.

Note: [1] PEA Product Acceptance (PPA) is the process for enhancing quality of electrical apparatus which PEA procure by making quality control system and certification of product's quality by reliable Certification Body (CB). PPA is taken responsibility by Electrical Equipment Standard and Quality Control Division.

[2] Product lists for transmission and substation turnkey project is the process of registration of electrical apparatus used in PEA's power system. Product lists is taken responsibility by Substation Project Management Division.

1e.2 Acceptance tests

PEA reserves the right to have acceptance tests conducted by PEA's laboratory or by manufacturer's factory or by acknowledge independent testing laboratories as mentioned in **1e.1**

In case the tests made by manufacturer's factory or by acknowledge independent testing laboratories, PEA reserves the right to send representatives to witness the tests.

The cost of the acceptance tests and report shall be borne by the Contractor(ผู้รับจ้าง).

PEA will randomly choose the samples of preformed dead-end per delivery lot for testing with the number specified in **Table 2**.

Table 2

Number of samples for acceptance test

Number of preformed dead-end per delivery lot (sets)	Number of samples for acceptance test (sets)
not more than 500	3
more than 500	5

Note: - The samples shall not be returned and shall not be used in the system.

- After the tests, the additional preformed dead-end, with the equal number of the samples for acceptance test, shall be supplied by the contractor with free of charge to complete the number of preformed dead-end in the purchase contract

The samples of preformed dead-end shall be passed the acceptance test items as specified in **Table 3**.

Table 3

Acceptance test items of preformed dead-end

No.	Test-items	Test method and requirement
1	Chemical composition	Aluminium-alloy 6061 in accordance with ASTM B 211/B211M – 19: Table 1 or later edition
2	Visual and dimension test	In accordance with PEA's specification and **C3 Schedule of detailed requirement**
3	Tensile test	In accordance with **Drawing No.** SB2-015/63004

Noted: Only one sample shall be tested with test item No. 1 and the other samples shall be tested with test item No.2 and No.3.

The samples shall pass the acceptance test items No. 1, 2 and 3 as specified in **Table 3** sequentially. If any samples fail in any test sequences, the tests shall not continue to the next test sequence and all preformed dead-end in that delivery lot will be reject.

1f **Guarantee**

The Contractor shall guarantee the quality for three (1) years commencing from the date PEA receive the above-mentioned preformed dead-end in the condition as specified in note below.

Note:

ภายในกำหนดระยะเวลารับประกันคุณภาพ หากการไฟฟ้าส่วนภูมิภาคนำ Preformed dead-end ไปใช้งานตามปกติแล้วปรากฏว่าชำรุด ขัดข้อง หรือบกพร่อง คู่สัญญาจะต้องนำ Preformed dead-end อันใหม่มาเปลี่ยนทดแทนของที่ชำรุด ภายใน 30 วัน นับถัดจากวันที่ได้รับแจ้งจากการไฟฟ้าส่วนภูมิภาค และหากการชำรุด ขัดข้อง หรือบกพร่องดังกล่าว มีสาเหตุมาจากคุณสมบัติที่ไม่เป็นไปตามสเปคของการไฟฟ้าส่วนภูมิภาค คู่สัญญาจะต้องเปลี่ยนสิ่งของที่ส่งมอบตามสัญญาทั้งหมดให้แก่การไฟฟ้าส่วนภูมิภาค โดยไม่คิดค่าใช้จ่ายใดๆ ทั้งสิ้น

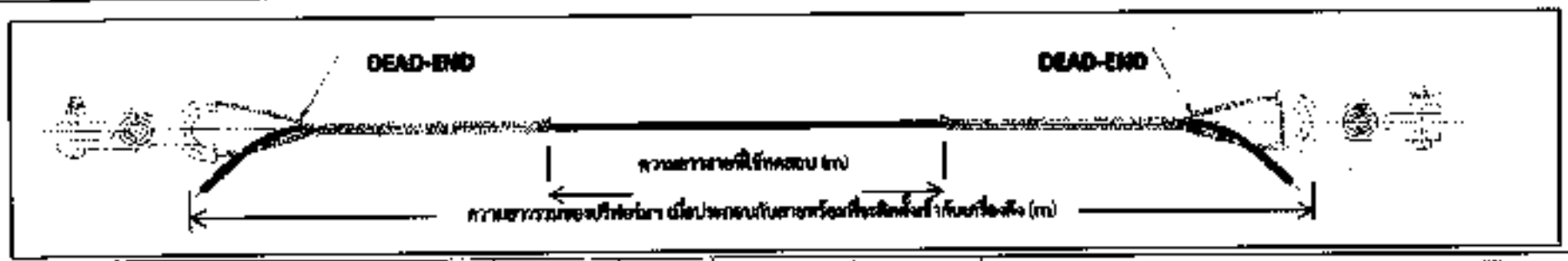
C2 Material and packing data of the proposed preform dead-end shall be submitted with the bid

2a Critical documents of the proposed preformed dead-end

Required technical document	Proposed technical document	Reference document (Page/Item)
1. The type report or test certificate of the preform rods and type test report of the proposed preformed dead-end (see 1e.1), or	☐ YES ☐ No	
Purchase Order (PO) from PEA's Procurement Department (from PEA's head office), or	☐ YES ☐ No	
PEA Product Acceptance registration certificate, or	☐ YES ☐ No	
Product lists registration certificate	☐ YES ☐ No	
2. Catalogues and/or drawings showing dimensions in mm and necessary information as follow: - Manufacturer's name or trade-mark - Diameter range in mm of cable for which the preformed dead-end are designed - Rods per set - Diameter of rods - Overall length - Holding strength - Colour code	☐ YES ☐ No	
3. Packing details	☐ YES ☐ No	

Note:

Critical documents shall be submitted with the bid; otherwise, the proposal shall be rejected.



Item	PEA Mat No.	สายที่ใช้ทดสอบ: ชนิด	สายที่ใช้ทดสอบ: ขนาด (mm²)	ความยาวสายที่ใช้ทดสอบ (m) [1]	ความยาวปรีฟอร์มฯ (m)	ความยาวรวมน้อยที่สุดของปรีฟอร์มฯ เมื่อประกอบกับสายพร้อมที่จะยึดสิ้นสุดเข้ากับเครื่องยึด (m) (ปรีฟอร์ม–สาย–ปรีฟอร์ม) [2]	Minimum breaking strength of conductor (kgf) [3] or Load for testing preformed deand-end (kgf) for PEA Mat No 1020260302 [4]				
							100%	40%	50%	90%	95%
1	1020260300	PVC insulated aluminium cables TIS 293	25	≥ 2.18	≥ 0.5	1.91	420	170	210	380	399
2	1020260301	PVC insulated aluminium cables TIS 293	50	≥ 2.53	≥ 0.7	2.56	745	298	372	670	720
3	1020260302	PVC insulated aluminium cables TIS 293	95	≥ 2.68	≥ 0.9	3.34	1210	485	605	1090	1150

หมายเหตุ

1. ปรีฟอร์มเข้าปลายสายจะต้องผ่านการทดสอบแรงดึง ดังนี้
   - ปรีฟอร์มเข้าปลายสายต้องประกอบเข้ากับสายที่ใช้ทดสอบตามคำแนะนำของผู้ผลิต และนำไปยึดตั้งในเครื่องทดสอบแรงดึง โดยความยาวสายที่ใช้ทดสอบระหว่างปรีฟอร์มเข้าปลายสายจะต้องไม่น้อยกว่า 100 เท่าของเส้นผ่านศูนย์กลางรวมของสายที่ใช้ทดสอบ
   - ให้แรงดึงแรง 40% ของค่า minimum breaking strength of conductor คงไว้เป็นเวลา 1 นาที นำน้ำหนักออก และถอดปรีฟอร์มเข้าปลายสายออกจากสายที่ใช้ทดสอบตามคำแนะนำของผู้ผลิต
   - นำปรีฟอร์มเข้าปลายสายมาประกอบเข้ากับสายที่ใช้ทดสอบที่ตำแหน่งเดิมอีกครั้ง และทำขั้นตอนการทดสอบซ้ำตามวรรคแรกข้างต้น
   - นำปรีฟอร์มเข้าปลายสายมาประกอบเข้ากับสายที่ใช้ทดสอบที่ตำแหน่งเดิมอีกครั้ง และให้แรงดึงประมาณ 50% ของค่า minimum breaking strength of conductor ห่างจากจุดที่สายที่ใช้ทดสอบ ในลักษณะที่ทำให้ปรีฟอร์มเข้าปลายสายที่ประกอบเข้ากับสายที่ใช้ทดสอบมีความลื่นคลาย แล้วสามารถตรวจพบได้โดยง่าย
   - จากนั้นเพิ่มโหลดขึ้นอย่างต่อเนื่องไปจนถึง 95% ของค่า minimum breaking strength of conductor แล้วคลายเหลือ 90% ของค่า minimum breaking strength of conductor และคงไว้เป็นเวลา 1 นาที
   - ในขณะนั้น ปรีฟอร์มเข้าปลายสายที่ประกอบเข้ากับสายที่ใช้ทดสอบจะต้องไม่มีความลื่นคลาย ในระหว่างช่วงเวลา 1 นาที และปรีฟอร์มเข้าปลายสายจะต้องไม่เสียหายจากการทดสอบ
2. [1] ความยาวสายที่ใช้ทดสอบไม่น้อยกว่า 100 เท่าของ Overall cable diameter
3. [2] ความยาวรวมน้อยที่สุดของปรีฟอร์มฯ เมื่อประกอบกับสายพร้อมที่จะยึดสิ้นสุดเข้ากับเครื่องยึด
4. [3] ค่า Minimum breaking strength of conductor ที่ 100% เป็นค่าที่ระบุไว้ตามมาตรฐานสายไฟฟ้าของ กฟภ.
5. [4] กรณีการทดสอบปรีฟอร์มเข้าปลายสาย PVC insulated aluminium cables TIS 293 รหัส (1020260302) ตามข้อ 1 ค่าโหลดในการทดสอบ ให้ใช้ค่า Load for testing preformed deand-end แทน minimum breaking strength of conductor

กองวิศวกรรมไฟฟ้าและเครื่องกล ฝ่ายวิศวกรรม การไฟฟ้าส่วนภูมิภาค		
ฉบับที่..... วันที่..... EME PEA	รายละเอียดการทดสอบแบบเฉพาะแบบ (Type test) และการทดสอบที่สถานตรวจรับ (Acceptance test) ปรีฟอร์มเข้าปลายสาย PVC Insulated aluminium cables TIS 293	แบบแสดงที่ SB2-015/63004 แผ่นที่ 1 ของจำนวน 1 แผ่น

PROVINCIAL ELECTRICITY AUTHORITY

ELECTRICAL AND MECHANICAL ENGINEERING DIVISION

Specification No. : RCBL-070/2563 PREFORMED DEAD-END FOR LOW VOLTAGE PVC INSULATED ALUMINIUM CABLES

C3 Schedule of detailed requirement

Invitation to Bid No. :

Item	PEA Material No.	Quantity	Description
1	1020260300	set(s)	Preformed Dead-End for low voltage PVC insulated aluminium cables, aluminium conductors size 25 mm^2 with; Rods per set : not less than 4 rods Diameter of rods : 2.34 ± 0.1 mm Overall length : not less than 500 mm Holding strength : not less than 380 kgf Cross over marked with yellow colour to indicate starting point.
2	1020260301	set(s)	Preformed Dead-End for low voltage PVC insulated aluminium cables, aluminium conductors size 50 mm^2 with; Rods per set : not less than 5 rods Diameter of rods : 2.64 ± 0.1 mm Overall length : not less than 700 mm Holding strength : not less than 670 kgf Cross over marked with blue colour to indicate starting point.
3	1020260302	set(s)	Preformed Dead-End for low voltage PVC insulated aluminium cables, aluminium conductors size 95 mm^2 with; Rods per set : not less than 5 rods Diameter of rods : 3.25 ± 0.1 mm Overall length : not less than 900 mm Holding strength : not less than 1,090 kgf Complete with: Cross over marked with orange colour to indicate starting point.

EME PEA

PROVINCIAL ELECTRICITY AUTHORITY

ELECTRICAL AND MECHANICAL ENGINEERING DIVISION

Specification No.: RCBL-070/2563 : PREFORMED DEAD-END FOR LOW VOLTAGE PVC INSULATED ALUMINIUM CABLES

C4 Price schedule

Invitation to Bid No.:

Manufacturer.:

Country of origin :

Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
1	1020260300		Preformed Dead-End for low voltage PVC insulated aluminium cables, aluminium conductors size 25 mm^2	set(s)		
2	1020260301		Preformed Dead-End for low voltage PVC insulated aluminium cables, aluminium conductors size 50 mm^2	set(s)		
3	1020260302		Preformed Dead-End for low voltage PVC insulated aluminium cables, aluminium conductors size 95 mm^2	set(s)		

EME
PEA

Invitation to Bid No.:

C **Material, equipment, and specifications for COMPRESSION SPLICING SLEEVE FOR ALUMINIUM CONDUCTOR**

C1 **General material and packing instructions**

Additional to the general instructions, the following shall be observed:

1a **Scope**

These specifications cover compression splicing sleeve for aluminium conductor used in overhead transmission and distribution lines.

1b **Standards**

Unless otherwise specified in these specifications, the compression splicing sleeve shall be manufactured and tested in accordance with the following standards:

ANSI/NEMA CC1: 2009	Electric power connection for substations
BS 3288-1: 2014	Insulator and conductor fitting for overhead power lines – Part 1: Performance and general requirements
ASTM D2265: 2020	Standard test method for dropping point of lubricating grease over wide temperature range

PEA will accept compression splicing sleeve manufactured and tested in accordance with the later edition of the above standards.

PEA will also accept compression splicing sleeve manufactured and tested in accordance with the previous edition of the above standards, if there is no significant change in any test items or no additional test item(s) compared with the above standards. On the other hand, if there is significant change in any test items or any additional test items, the previous edition type test report with the additional test report(s) of the significant change test item(s) and/or additional test item(s) will be also accepted.

1c **Principal requirement**

1c.1 **Service conditions and installation**

The compression splicing sleeve shall be designed and constructed for outdoor installation, and suitable for operation under the following conditions:

Altitude	:	up to 1,000 m above sea level
Ambient air temperature	:	up to 50°C
Average relative humidity in any one year	:	up to 94%
Climatic condition	:	tropical climate

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1c.2 Construction and characteristics

The finished product of the proposed compression splicing sleeve shall be of aluminium grade 1050, 1070, 1100 or 1350, which shall be standard grade or designation in accordance with international standards, i.e. SAE, AISI, JIS, ASTM, ANSI or BS. It shall be suitable for using with aluminium stranded conductor in accordance with ANNEX attached, Table A and Table B.

The full tension sleeves and partial tension sleeves shall withstand at least 90% and 10% respectively, of the minimum breaking strength of the conductors which they are designed for using with.

Dimension of compression splicing sleeve shall be according to **Drawing No. SB2-015/64002**.

1c.3 Oxide inhibiting contact grease

The contact surface of the proposed compression splicing sleeve shall be thoroughly filled with oxide inhibiting contact grease the minimum thickness of which shall not be less than 0.5 mm.

Characteristics of the contact grease shall be as follows:

- The contact grease shall be used to improve electrical conductivity and to provide continuous protection against corrosion of electrical joint in outdoor service environment.
- Color of the contact grease shall be dark gray.
- The contact grease shall have a dropping point/melting point of not less than 150°C.
- The contact grease shall consist of at least 15% zinc particles. The zinc particles shall be less than 65 microns in size and shall act as multi-contact current carrying bridges between the surfaces of the electrical connections.

The bidders shall submit detail and/or catalogue of the contact grease with the above characteristics with the bid.

1c.4 Marking

The proposed compression splicing sleeve shall be marked by mean of engraving, knurling, hot stamping or laser marking on the body at least data listed below, which is clearly visible and durable; foil-coated marking, i.e. printing with toner or laser toner with foil-coated, is not accepted.

(1) Manufacturer's name or Trademark
(2) Size of conductor to be used with
(3) Model or catalog/drawing number
(4) Marking reference at the center of sleeve: marking width not less than 6 mm
(5) Purchase order number

Marking's alphabets shall not be less than 3 mm in height.

1c.5 Samples

The bidders shall submit at least one (1) sample for each proposal item within five (5) working days counted from bid closing date for consideration; otherwise, the proposal will be rejected.

PEA's bids committee will initially check the sample by comparing with the color photograph in the proposed type test report and PEA's specification. PEA's bid committee will reject a proposal if there are any parts of compression splicing sleeve differing from the color photograph in the type test report and PEA's specification.

The sample will be returned after consideration, except sample of the successful bidder will be used as a reference sample in acceptance process. The supplied compression splicing sleeve with a different design compared with the reference sample shall be rejected.

1d Packing

Both ends of each Compression splicing sleeve shall be closed by plastic caps and shall be packed in suitable carton. Number of compression splicing sleeves in each carton shall not more than twenty-five (25) pieces. Each carton box shall be marked with the name of manufacturer, details of compression splicing sleeve such as size of conductor to be used with, gross weight and net weight.

1e Tests and test report

1e.1 Type tests

The proposed compression splicing sleeve shall pass all type test items with reference standards and test method as specified in **Table 1**.

Table 1

Type test items of the compression splicing sleeve

Item	Test Items	Reference standards/Test method
1	Visual and dimension check	PEA's specification, see **(1)**
2	Chemical composition tests	Optical emission spectrometer, see **(2)**
3	Temperature rise tests	ANSI/NEMA CC1, see **(3)**
4	Tensile strength tests	BS 3288-1, see **(4)**
5	Test for oxide inhibiting contact grease	
	5.1 Content in percentage of zinc particles in oxide inhibiting contact grease	Thermogravimetric analysis (TGA), see **(5)**
	5.2 Zinc particles size	Microscope, see **(6)**
	5.3 Dropping point	ASTM D2265, see **(7)**

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(1) Visual and dimension check

At least four (4) samples are required for the type test.

Each sample shall have markings in accordance with clause **1c.4,** except purchase order number is not necessary to be marked at this stage.

Dimensions of each sample shall be measured and recorded in the test report. The dimensions of all samples shall be according to **Drawing No. SB2-015/64002** and drawings of manufacturer.

(2) Chemical composition test

One (1) sample is required for the type test. The compression splicing sleeve shall be tested by means of optical emission spectrometer for verification grade* or designation* of aluminium alloy, which shall be grade or designation as mentioned in clause **1c.2**.

Note:

* PEA will also accept result of the chemical composition test of the compression splicing sleeve with tolerance of -10% of minimum value of each substance specified in reference standard.

(3) Temperature rise tests

At least two (2) samples are required for the type test. The temperature rise tests shall be according to ANSI/NEMA CC1 and during the test, mechanical tension of 10-20% of the rated tensile strength of the conductor shall be applied to the assembly of compression splicing sleeve.

(4) Tensile test

At least two (2) samples are required for the type test. The tensile test shall be according to BS 3288: 2014 or later edition.

(5) Contents in percentage of zinc particles in oxide inhibiting contact grease

At least 50 grams of oxide inhibiting contact grease are required for the type test. The contact grease shall be tested by means of thermogravimetric analysis (TGA) for verification of the content in percentage of zinc particles, which shall be in accordance with clause **1c.3**.

(6) Zinc particles size

At least 50 grams of oxide inhibiting contact grease are required for the type test. The contact grease shall be tested by means of microscope for verification of the size of zinc particle, which shall be in accordance with clause **1c.3**.

(7) Dropping point

At least 50 grams of oxide inhibiting contact grease are required for the type test. The contact grease shall be tested by means of microscope for verification of dropping point of oxide inhibiting contact grease which shall be in accordance with clause **1c.3**.

The test shall be according to ASTM D2265: 2020 or later edition.

Note: For the dropping point test, Innovation Institute PTT's laboratory is accepted by PEA.

1c.1.1 Type test procedure

Before the type tests are proceeded, manufacturer shall submit following samples to PEA for approval

- Seven (7) samples of compression splicing sleeve (All sample will be signed by PEA's representative)
- Drawing showing specified dimensions and all information according to **Drawing No. SB2-015/64002**; the total length of compression splicing sleeve shall be declare in nominal value.
- Standard to be used as a reference of grade or designation of compression splicing sleeve.
- One hundred fifty (150) grams of oxide inhibiting contact grease
  (If manufacture of compression splicing sleeve do not use his own product, the catalog of oxide inhibiting contact grease to be used shall be also submitted.)
- The details of tools and compression dies used for compressing the compression splicing sleeve shall be submitted as following:
  - The catalogue of tools and compression die which specify the model and the name of manufacturer.
  - The dimensions of compression die are required in case of the manufacturer of compression splicing sleeve uses his own compression die in the type test processes.

Two (2) samples will be sent to Electrical Equipment Standard and Quality Control Division; One (1) sample shall be tested by means of Brinell hardness tester. the hardness test value and the other sample shall be kept at Electrical Equipment Standard and Quality Control Division to be used as a reference for bid consideration and acceptance processes.

The other samples and oxide inhibiting contact grease will be sent to acknowledged independent testing laboratories/institutes, mentioned below, for type testing in accordance with the test items in **Table 1**. PEA will send representative for witnessing the test.

The type tests of compression splicing sleeve shall be conducted or inspected by the acknowledged independent testing laboratories/institutes as follows:

(1) Independent laboratories/institutes which are members of the Short-circuit Testing Liaison (STL) or independent laboratories/institutes which are accredited according to TIS 17025 or ISO/IEC 17025 with the scope of accreditation covered the relevant test items, standard and equipment. The certification and scope of accreditation of the independent laboratories/institutes shall be submitted with the bid for consideration.

(2) Laboratories, institutes, universities and electric utilities, as follows:

- NSTDA Characterization and testing service center (NCTC)
- Thailand Institute of Scientific and Technological Research (TISTR)
- National Metal and Materials Technology Center (MTEC)
- Electrical and Electronic Products Testing Center (PTEC)
- Thai Industrial Standards Institute (TISI)
- Electrical and Electronics Institute (EEI)
- Department of Science Service (DSS)
- Testing Laboratory, Electrical Engineering Department, Faculty of Engineering, Chulalongkorn University
- Electricity Generating Authority of Thailand (EGAT)
- Metropolitan Electricity Authority (MEA)
- Provincial Electricity Authority (PEA)
- Laboratory of manufacturers approved by PEA

(3) Other laboratories as follow:

- In case the foreign manufacturers have experience of more than twenty (20) years in design, manufacture and sell compression splicing sleeve, PEA will accept type test report(s) conducted by the manufacturer's laboratory or other independent laboratories without qualification mentioned in (1) or (2). Documents showing the manufacturer's experience such as reference list shall be submitted with the bid for consideration.
- The bidders or manufacturers who prefer to carry out the type tests of compression splicing sleeve with other laboratories without the qualification mentioned above, the detail of laboratory and the test facilities shall be submitted to PEA for approval before proceeding the tests and before the bid closing date. PEA reserves the right to send representatives to inspect or witness the tests.

The type test reports conducted by the laboratories/institutes in Thailand or local manufacturers shall be valid within five (5) years counted from the issued date in the test report to the bid closing date.
The type test reports conducted by the laboratories/institutes in other countries shall be valid within ten (10) years counted from the issued date in the test report to the bid closing date.

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The cost of all tests and report shall be borne by the Bidders or manufacturers.

The type test reports shall be submitted with the bid.

PEA will also accept other documents instead of the type test reports in the following cases:

(1) In case the proposed compression splicing sleeve has been sold to PEA at PEA's Procurement Department (from PEA's head office), The bidder can submit the Purchase Order (PO) on the bid closing date, or

(2) In case the proposed compression splicing sleeve has been registered for PEA Product Acceptance[1], the Bidder can submit the valid registration certificate on the bid closing date, or

(3) In case the proposed compression splicing sleeve has been registered for Product lists for transmission and substation turnkey project[2], the Bidder can submit the valid registration certificate on the bid closing date.

However the document in case (1), (2) and (3) mentioned above shall be proved by the bidding committee that compression splicing sleeve specified in the PO or registration certificate is the same product, type/model and all ratings as the proposed compression splicing sleeve for this bid.

Note: [1] PEA Product Acceptance (PPA) is the process for enhancing quality of electrical apparatus which PEA procure by making quality control system and certification of product's quality by reliable Certification Body (CB). PPA is taken responsibility by Electrical Equipment Standard and Quality Control Division.

[2] Product lists for transmission and substation turnkey project is the process of registration of electrical apparatus used in PEA's power system. Product lists is taken responsibility by Substation Project Management Division.

1e.1.2 Type test report

- **The type test reports shall consist of the necessary as follow; otherwise, it is not accepted by PEA**

(1) The test results of all test items as specified in **Table 1**.

(2) Details of tools and compression dies used for the compressing the compression splicing sleeve in the type test processes shall be declared as following:
- Catalogue of tools and compression die which specify the model and the name of manufacturer, or
- Dimensions of compression die are required in case of the manufacturer of compression splicing sleeve uses his own compression die in the type test processes.

(3) Outline drawing of the compression splicing sleeve, showing dimensions according to **Drawing No. SB2-015/64002**.

(4) The color photographs of compression splicing sleeve as following:
- Manufacturer's name or Trademark
- Size of conductor to be used with
- Model or catalog/drawing number compression splicing sleeve
- Oxide inhibiting contact grease

- **The type test reports will be completed only when they are approved and signed by Electrical and mechanical Engineering Division**
- **For temperature rise test item of full tension splicing sleeve, the bidders can submit the type test report of temperature rise test of partial tension splicing sleeve instead, in case both sleeves have the same dimension, except the length of sleeves.**

1e.2 **Acceptance tests**

PEA reserves the right to have acceptance tests, conducted by PEA's laboratory or acknowledge independent testing laboratories as mentioned in **1e.1** or by manufacturer's factory qualified by PEA.

The cost of all tests shall be borne by the Contractor.

PEA's acceptance committee will randomly select the samples of compression splicing sleeve for each delivery lot with the number as specified in **Table 2**.

Table 2

Number of samples for acceptance tests

Number of compression splicing sleeves for each delivery lot (sets)	Number of samples (sets)
Up to 49	1
50 to 200	2
201 to 500	3
501 to 1,000	4
1001 and more	5

Note: - The samples shall not be returned and shall not be used in the system.
- After the tests, the additional compression splicing sleeves, with the equal number of the samples specified in **Table 2**, shall be supplied by the contractor with free of charge to complete the number of compression splicing sleeve in the purchase contract.

All sample(s) shall pass acceptance test items with reference standards and test method as specified in **Table 3**.

If PEA have any suspicions of quality of the delivered sleeves in some lots or batches, PEA reserves the right to have additional acceptance test items specified in **Table 1**. The cost of all tests shall be borne by the Contractor.

Table 3

Acceptance test items of compression splicing sleeve

Item	Acceptance test items	Reference standards/Test method
1	Visual and dimension check	PEA's specification, see **Table 1**
2	Chemical composition test	Optical emission spectrometer, see **Table 1**
3	Dropping point of oxide inhibiting contact grease	ASTM D2265, see **Table 1**

1f **Guarantee**

The Contractor shall guarantee the quality of the compression splicing sleeve for three (3) years commencing from the date that the tapes are received by PEA.

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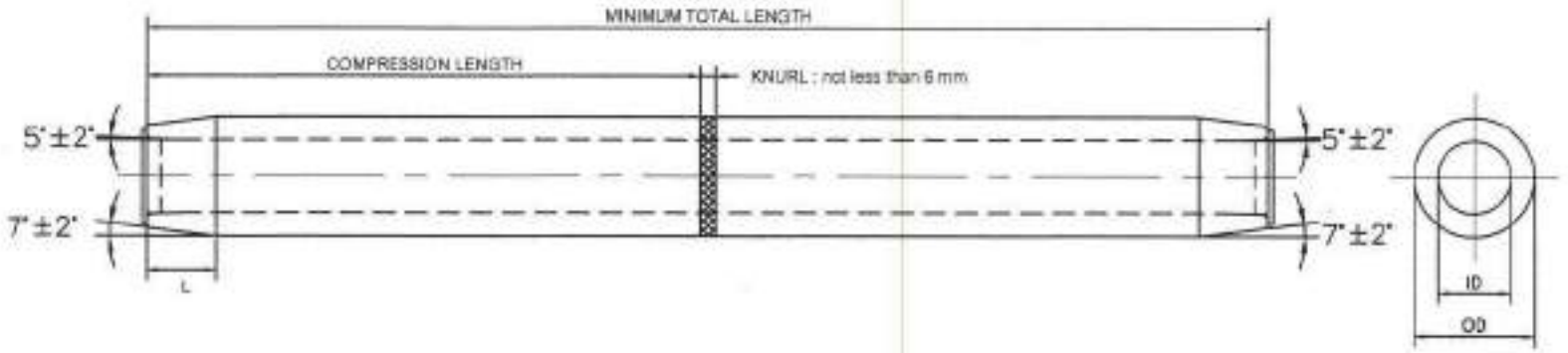
C2 Material and packing data shall be submitted with the bid:

The following critical documents and details shall be submitted with the bid:

Critical documents of the proposed compression splicing sleeve shall be submitted with the bid for each item offered:

(The bidders shall fill the table below; otherwise, the proposal shall be rejected)

No.	Required technical document	Proposed Technical document	Reference document (Page No.)
1	Type test report (see **1e.1**) or	❑ YES ❑ No	
	Purchase Order (PO) from PEA's Procurement Department (from PEA's head office) (see **1e.1**) or	❑ YES ❑ No	
	Product acceptance certificate (see **1e.1**)	❑ YES ❑ No	
	Product lists certificate (see **1e.1**)	❑ YES ❑ No	
2	Outline drawing(s) of the compression splicing sleeve, showing dimensions of compression splicing sleeve (see **1e.2**) (Outline drawing(s) by using PEA's drawings shall not be accepted)	❑ YES ❑ No	
3	Packing detail (see **1d**)	❑ YES ❑ No	



ALUMINIUM STRANDED CONDUCTOR (SQ.MM.)	DIAMETER	DIAMENSIONS OF COMPRESSION SPLICING SLEEVE			
		OD	ID	MINIMUM TOTAL LENGTH (FULL TENSION)	MINIMUM TOTAL LENGTH (PARTIAL TENSION)
50	9.06	16 ±0.5	10.5 ±0.5	150	75
185	17.64	30 ±0.5	19 ±0.5	290	145
400	25.65	45 ±0.5	27 ±0.5	420	210
COMPACT ALUMINIUM STRANDED CONDUCTOR (SQ.MM.)	DIAMETER	DIAMENSIONS OF COMPRESSION SPLICING SLEEVE			
		OD	ID	MINIMUM TOTAL LENGTH (FULL TENSION)	MINIMUM TOTAL LENGTH (PARTIAL TENSION)
50	8.00	16 ±0.5	9.5 ±0.5	160	75
185	15.98	30 ±0.5	17 ±0.5	290	145

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กองวิศวกรรมไฟฟ้าและเครื่องกล
ฝ่ายวิศวกรรม

ผู้เขียน ณรงค์เดช โพธิ์มล
วิศวกร ณรงค์เดช โพธิ์มล
หัวหน้าแผนก
ผู้อำนวยการกอง
ผู้อำนวยการฝ่าย

การไฟฟ้าส่วนภูมิภาค

หลอดต่อสายชนิดแบบปีบ
สำหรับสายอะลูมิเนียม

COMPRESSION SPLICING SLEEVE FOR ALUMINIUM CONDUCTORS

ใช้แทนแบบ -
ถูกแทนโดยแบบ -
เขียนแบบเสร็จวันที่ 10 มิ.ย. 2564
แก้แบบวันที่ -
มิติเป็น มิลลิเมตร
มาตราส่วน -
แบบลงที่ SB2-015/64002
แผ่นที่ 1 ของจำนวน 1 แผ่น

PROVINCIAL ELECTRICITY AUTHORITY

ELECTRICAL AND MECHANICAL ENGINEERING DIVISION

Specification No.: RCBL-073/2564 COMPRESSION SPLICING SLEEVE FOR ALUMINIUM CONDUCTOR

C3 Schedule of detailed requirement

Invitation to Bid No. :

Item	PEA Material No.	Quantity	Description
1	1020400012	each(s)	Full tension compression splicing sleeve, for aluminium stranded conductor according to ANNEX Table A size 50 mm^2, length not less than 150 mm, see **Drawing No. SB2-015/64002**.
2	1020400017	each(s)	Full tension compression splicing sleeve for aluminium stranded conductor according to ANNEX Table A size 185 mm^2, length not less than 290 mm, see **Drawing No. SB2-015/64002**.
3	1020400019	each(s)	Full tension compression splicing sleeve for aluminium stranded conductor according to ANNEX Table A size 400 mm^2, length not less than 420 mm, see **Drawing No. SB2-015/64002**.
4	1020400022	each(s)	Full tension compression splicing sleeve for compact aluminium stranded conductor according to ANNEX Table B size 50 mm^2, length not less than 150 mm, see **Drawing No. SB2-015/64002**.
5	1020400027	each(s)	Full tension compression splicing sleeve for compact aluminium stranded conductor according to ANNEX Table B size 185 mm^2, length not less than 290 mm, see **Drawing No. SB2-015/64002**.
6	1020410014	each(s)	Partial tension compression splicing sleeve, for aluminium stranded conductor according to ANNEX Table A size 50 mm^2, length not less than 75 mm, see **Drawing No. SB2-015/64002**.
7	1020410017	each(s)	Partial tension compression splicing sleeve for aluminium stranded conductor according to ANNEX Table A 185 mm^2, length not less than 145 mm, see **Drawing No. SB2-015/64002**.
8	1020410019	each(s)	Partial tension compression splicing sleeve for aluminium stranded conductor according to ANNEX Table A size 400 mm^2, length not less than 210 mm, see **Drawing No. SB2-015/64002**.
9	1020410022	each(s)	Partial tension compression splicing sleeve for compact aluminium stranded conductor according to ANNEX Table B size 50 mm^2, length not less than 75 mm, see **Drawing No. SB2-015/64002**.
10	1020410027	each(s)	Partial tension compression splicing sleeve for compact aluminium stranded conductor according to ANNEX Table B size 185 mm^2, length not less than 145 mm, see **Drawing No. SB2-015/64002**.
			Note: Enclosed **Drawing No. SB2-015/64002**

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PROVINCIAL ELECTRICITY AUTHORITY

ELECTRICAL AND MECHANICAL ENGINEERING DIVISION

Specification No.: RCBL-073/2564: COMPRESSION SPLICING SLEEVE FOR ALUMINIUM CONDUCTOR

C4 Price schedule

Invitation to Bid No.:

Manufacturer :

Country of origin :

Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
1	1020400012		Full tension compression splicing sleeve, for aluminium stranded conductor according to ANNEX Table A size 50 mm^2, length not less than 150 mm, see **Drawing No. SB2-015/64002**.	each(s)		
2	1020400017		Full tension compression splicing sleeve for aluminium stranded conductor according to ANNEX Table A size 185 mm^2, length not less than 290 mm, see **Drawing No. SB2-015/64002**.	each(s)		
3	1020400019		Full tension compression splicing sleeve for aluminium stranded conductor according to ANNEX Table A size 400 mm^2, length not less than 420 mm, see **Drawing No. SB2-015/64002**.	each(s)		
4	1020400022		Full tension compression splicing sleeve for compact aluminium stranded conductor according to ANNEX Table B size 50 mm^2, length not less than 150 mm, see **Drawing No. SB2-015/64002**.	each(s)		

C4 Price schedule

Invitation to Bid No.:

Manufacturer :

Country of origin :

Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
5	1020400027		Full tension compression splicing sleeve for compact aluminium stranded conductor according to ANNEX Table B size 185 mm^2, length not less than 290 mm, see **Drawing No. SB2-015/64002**.	each(s)		
6	1020410014		Partial tension compression splicing sleeve, for aluminium stranded conductor according to ANNEX Table A size 50 mm^2, length not less than 75 mm, see Drawing No. SB2-015/64002.	each(s)		
7	1020410017		Partial tension compression splicing sleeve for aluminium stranded conductor according to ANNEX Table A 185 mm^2, length not less than 145 mm, see **Drawing No. SB2-015/64002**.	each(s)		
8	1020410019		Partial tension compression splicing sleeve for aluminium stranded conductor according to ANNEX Table A size 400 mm^2, length not less than 210 mm, see **Drawing No. SB2-015/64002**.	each(s)		

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C4 Price schedule

Invitation to Bid No.:

Manufacturer :

Country of origin :

Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
9	1020410022		Partial tension compression splicing sleeve for compact aluminium stranded conductor according to ANNEX Table B size 50 mm^2, length not less than 75 mm, see **Drawing No. SB2-015/64002**.	each(s)		
10	1020410027		Partial tension compression splicing sleeve for compact aluminium stranded conductor according to ANNEX Table B size 185 mm^2, length not less than 145 mm, see **Drawing No. SB2-015/64002**.	each(s)		

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ANNEX

Table A

Characteristics of aluminium Stranded Conductor

No.	Nominal cross-sectional area	Diameter of conductor	Rated tensile strength (RTS)
1	50 mm^2	9.06 ± 1%	8,270 N
2	185 mm^2	17.64 ± 1%	31,370 N
3	400 mm^2	25.65 ± 1%	66,150 N

Table B

Characteristics of compact aluminium Stranded Conductor

No.	Nominal cross-sectional area	Diameter of conductor	Rated tensile strength (RTS)
1	50 mm^2	8.00 ± 1%	7,313 N
2	185 mm^2	15.98 ± 1%	28,974 N

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Invitation to Bid No. :

COPY

Specification No. : B-506/2546

C Material, equipment, and specifications for CONNECTORS AND ELECTRICAL CONTACT COMPOUND

C1 General material and packing instructions

Additional to the general instructions, the following shall be observed :

1a Scope

These specifications cover mechanical, compression and wedge type connectors to connect conductors, and electrical contact compound.

1b Standard

The connectors shall be manufactured and tested in accordance with the latest IEEE, ANSI, EEI-NEMA, ASTM, VDE Regulations and DIN, or equivalent; unless otherwise specified in these specifications.

The bodies of connectors shall be of aluminium-alloy according to manufacturer's standards, unless otherwise specified in these specifications.

1c Principal requirement

1c.1 General

The connectors shall be suitable for connecting stranded and/or solid conductors according to DIN, TIS, or equivalent; unless otherwise specified in these specifications.

1c.2 Bolted type connector

For the purpose of against self loosening, each bolt shall be furnished with at least of one (1) locknut. The bolts shall be designed for single-wrench installation. Each U-bolt is counted as two (2) bolts. The bolts shall be tightened to torque levels according to those shown in the table below or according to manufacturer's recommendation; the technical details of tightening torque levels shall be submitted on request.

All ferrous materials shall be hot-dip galvanized after manufacturing; except bolts, lockwashers, washers, and nuts up to M6 shall be electro galvanized; according to the relevant standards or having the thickness or zinc coating shown in the table below.

Sizes of Bolts, lockwashers, Washers, and Nuts	Tightening Torque Level of Galvanized Steel Bolts kgf-m	Minimum Thickness of Zinc Coating mm
M 6 (1/4")	-	0.010
M 8 (5/16")	2.0	0.040
M 10 (3/8")	2.7	0.040
M 12 (1/2")	5.5	0.040
M 14 (9/16")	6.5	0.040
M 16 (5/8")	7.5	0.040
M 20 (3/4")	11.0	0.045

1c.3 Compression type connector

Full tension sleeves and partial tension sleeves shall withstand at least 90% and 40%, respectively, of the minimum breaking strength of the conductors for which they are designed. Each sleeve shall be prefilled with electrical contact compound and closed both ends by plastic caps.

Conductor barrel of each terminal lug shall be prefilled with electrical contact compound and closed by a plastic cap.

Tap connectors shall be prefilled with electrical contact compound and packed in suitable packages, one (1) or two (2) pieces per package.

1c.4 Compression deadend assembly set

The aluminium body and aluminium jumper terminal shall accommodate aluminium conductor which is according to TIS; and the conductor barrel shall be prefilled with electrical contact compound and closed by a plastic cap.

1c.5 Wedge type connector

The wedge type connector shall consists of C-shaped member and wedge, and made of aluminium alloys which shall be described.

The wedge type connector shall pass the current cycle tests Class A (500 cycles) in accordance with the latest EEI-TDJ-162/NEMA CS, ANSI C 119.4 or equivalent.

Bidders who have never submitted the test reports of current cycle tests shall submit either prior to receipt of bids or within fifteen (15) days of the bid closing date, for saving bid consideration time, the item without submitting the report shall be rejected.

1c.6 Marking

Each connector shall be marked, on the body, at least as follows :

(1) Applicable conductor type and size.

(2) Manufacturer's symbol.

(3) Marks to press, for compression type only.

(4) Words "FULL TENSION" and "PARTIAL TENSION", on full tension sleeves and partial tension sleeves, respectively.

Except for compression type tap connectors for main line size less than 10 mm^2 (not including size 10 mm^2), if the applicable conductor type and size can not be marked on the bodies, the marks shall be marked on individual packages.

1c.7 Sample

Free samples shall be supplied on request. The samples will not be returned.

1d Packing

Each item shall be packed separately in suitable packages in sets or pieces of 1, 2, 100, 200, 250, or 300.

Except :

PEA Material No.	Preformed fittings	sets or pieces per package
02300103	Connector, parallel groove	75
02310001	Connector, dead-end type	100

Packages of same item may be packed together in suitable cases.

C2 **Material and packing data to be given by bidder**

2a For each item offered, the following details shall be submitted with the bid :

Catalogue number.

Specifications of materials used for the component parts (body, bolts, nuts, screws, lockwashers, washers, etc.) .

Surface finishing of the component parts.

Nominal cross-sectional area in mm^2 of conductor for which the connector is designed.

Diameter in mm of conductor for which the connector is designed.

Material of conductors for which the connector can be used (Al, ACSR, Cu, etc.) .

Recommended tightening torques for bolts in kgf-m .

Weight in kg/100 sets or pieces.

2b It shall be advised whether the connectors should be protected by armour tape or preformed line guards, etc.

2c For each item offered, a drawing with dimensions in mm and marking details shall be submitted with the bid. For compression type connector, a drawing with the dimensions including inside and outside diameters and marking details shall be submitted.

2d Number of aluminium-alloy copper-alloy, and/or the chemical compositions of the bodies of connectors.

2e Packing details

Packing method.

Number of sets or pieces in each package (maximum 300 sets or pieces in one package)

Principal dimensions of each package in cm .

Volume of each package in m^3.

Gross weight of each package in kg .

Net weight of each package in kg .

Number of packages.

If several packages are contained in one big case, further details are required :

Number of packages in each case.

Principal dimensions of each case in cm .

Volume of each case in m^3.

Gross weight of each case in kg .

Number of cases.

Addendum

This addendum is made to be a part of specifications it's attached.

1. Replace the packing detail only for the specific items in the specifications by the packing detail specified in **Table A1** below:

Table A1: Packing Detail

Item	Equipment	PEA's material No.	Packing method	Quantity per package/case	Number of packages/cases per pallet
Connectors and cable accessories:					
1	Hot line bail clamp (hot line stirrup clamp), for main aluminium conductor size 25 mm^2 to 50 mm^2	1-02-033-0000	Sealed package	40	49
2	Hot line protected thread clamp for main aluminium conductor size 25 mm^2 to 50 mm^2	1-02-033-0100	Sealed package	50	100
3	Hot line protected thread clamp for main aluminium conductor size 50 mm^2 to 120 mm^2	1-02-033-0101	Sealed package	50	50
4	Compression splicing sleeve, full tension, for aluminium conductor size 50 mm^2	1-02-040-0002	Suitable package	100	100
5	Compression splicing sleeve, full tension, for aluminium conductor size 95 mm^2	1-02-040-0004	Suitable package	50	100
6	Compression splicing sleeve, full tension, for aluminium conductor size 185 mm^2	1-02-040-0007	Suitable package	30	50
7	Compression splicing sleeve, full tension, for aluminium conductor size 400 mm^2	1-02-040-0009	Suitable package	30	50
8	Compression splicing sleeve, partial tension, for aluminium conductor size 50 mm^2	1-02-041-0002	Suitable package	100	100
9	Terminal connector (lug), compression type, for aluminium conductor size 185 mm^2	1-02-041-0106	Suitable package	50	50
10	Pin terminal, for aluminium conductor size 50 mm^2	1-02-042-0400	Suitable package	50	100
Overhead line hardware:					
11	Angle steel crossarm, size 150x100x12 mm, length 4,500 mm	1-00-012-0002	Bundle	10	-
12	Channel steel crossarm, size 100x50x5 mm, length 4,200 mm	1-01-000-0103	Bundle	20	-
13	Channel steel crossarm, size 100x50x5 mm, length 4,500 mm	1-01-000-0104	Bundle	20	-
14	Channel steel crossarm, size 150x75x6 mm, length 2,800 mm	1-01-000-0300	Bundle	20	-
15	Channel steel crossarm, size 150x75x6.5 mm, length 4,000 mm	1-01-000-0301	Bundle	20	-

Item	Equipment	PEA's material No.	Packing method	Quantity per package/case	Number of packages/cases per pallet
16	Channel steel beam, size 150x75x6.5 mm, length 4,500 mm	1-01-000-0302	Bundle	20	-
17	Channel steel beam, size 150x75x6.5 mm, length 6,000 mm	1-01-000-0303	Bundle	20	-
18	Channel steel beam, size 150x75x6.5 mm, length 2,500 mm	1-01-000-0304	Bundle	20	-
19	Channel steel crossarm, size 150x75x9 mm, length 3,000 mm	1-00-012-0004	Bundle	20	-
20	Angle steel beam, size 65x65x6 mm, length 1,000 mm	1-01-001-0000	Bundle	100	-
21	Bolt, machine, M 16 x 170 mm	1-01-011-0201	Sack	100	56
22	Bolt, machine, M 16 x 300 mm	1-01-011-0204	Sack	80	56
23	Bolt, machine, M 16 x 350 mm	1-01-011-0205	Sack	80	56
24	Bolt, machine, M 16 x 450 mm	1-01-011-0207	Sack	40	56
25	Bolt, machine, M 16 x 500 mm	1-01-011-0208	Sack	40	50
26	Bolt, machine, M 16 x 600 mm	1-01-011-0209	Sack	40	50
27	Bolt, machine, hexagon head, M 16 x 75 mm	1-01-011-0400	Sack	200	56
28	Bolt, machine, hexagon head, M 16 x 550 mm	1-01-011-0401	Sack	40	50
29	Bolt, machine, hexagon head, M 16 x 600 mm	1-01-011-0402	Sack	40	50
30	Bolt, machine, hexagon head, M 16 x 650 mm	1-01-011-0403	Sack	30	50
31	Bolt, double arming, full thread, M 16 x 450 mm	1-01-012-0001	Sack	40	50
32	Bolt, double arming, full thread, M 16 x 500 mm	1-01-012-0002	Sack	40	50
33	Bolt, double arming, full thread, M 16 x 550 mm	1-01-012-0003	Sack	40	50
34	Bolt, double arming, full thread, M 16 x 600 mm	1-01-012-0004	Sack	40	50
35	Bolt, double arming, full thread, M 16 x 650 mm	1-01-012-0005	Sack	30	50
36	Bolt, double arming eye, M 16 x 450 mm	1-01-013-0001	Sack	40	56
37	Bolt, double arming eye, M 16 x 500 mm	1-01-013-0002	Sack	40	50
38	Bolt, double arming eye, M 16 x 650 mm	1-01-013-0005	Sack	30	50
39	Bolt, round eye, M 16 x 200 mm	1-01-014-0001	Sack	80	56
40	Bolt, round eye, M 16 x 250 mm	1-01-014-0002	Sack	80	56
41	Bolt, round eye, M 16 x 300 mm	1-01-014-0003	Sack	50	56
42	Bolt, oval eye, M 16 x 150 mm	1-01-015-0000	Sack	80	56
43	Bolt, oval eye, M 16 x 200 mm	1-01-015-0001	Sack	80	56
Insulators and accessories:					
44	Insulator, pin-post type, TIS 1251, Type 56/57-2	1-03-001-0101	Export package	2	30
45	Clevis-eye	1-03-014-0000	Suitable package	40	56
46	Ball-clevis, ANSI Type K	1-03-014-0001	Suitable package	30	56

Item	Equipment	PEA's material No.	Packing method	Quantity per package/case	Number of packages/cases per pallet
47	Ball-hook, ANSI Type B	1-03-014-0002	Suitable package	40	56
48	Ball-clevis, ANSI Type B	1-03-014-0005	Suitable package	40	56
Surge arresters:					
49	LV surge arrester, 480 V, 5 kA	1-04-000-0300	Suitable package	100	5
Meters:					
50	Watt-hour meter, 15(45) A, 3-phase 4-wire	1-06-005-0107	Suitable corrugate-paper package	50	-
51	Watt-hour meter, 30(100) A, 3-phase 4-wire	1-06-005-0108	Suitable corrugate-paper package	50	-

2. Sacks used for packing equipment shall have enough durability and shall be made of hemp rope.
3. Bundle packing shall be using galvanized steel wires with diameter not less than 4 mm.
4. Pallets supplied to PEA shall have dimension not more than 1.1 m x 1.1 m (Width x Length) and the total height after containing the packages/cases shall be less than 1.5 m.

Invitation to Bid No. :

Specification No. : R-506/2546

COPY

C3 Schedule of detailed requirement

Item	PEA Material No.	Quantity	Description
1	02400002 (102040002)		Compression splicing sleeve, full tension, for aluminium conductor according to TIS 85-2522 size 50 mm^2, length not less than 155 mm, see Drawing No. SA2-015/40002.
2	02400004 (102040004)		Ditto as Item 1, but size 95 mm^2, length not less than 165 mm.
3	02400005 (102040005)		Ditto as Item 1, but size 120 mm^2, length not less than 250 mm.
4	02400007 (102040007)		Ditto as Item 1, but size 185 mm^2, length not less than 330 mm.
5	02400008 (102040008)		Ditto as Item 1, but size 240 mm^2, length not less than 360 mm.
6	02400009 (102040009)		Ditto as Item 1, but size 400 mm^2, length not less than 380 mm.
7	02400102 (102040102)		Compression splicing sleeve, full tension, for ACSR conductor according to TIS 86-2522 size 50/8 mm^2, length not less than 440 mm, see Drawing No. SA2-015/40002.
8	02400104 (102040104)		Ditto as Item 7, but size 95/15 mm^2, length not less than 500 mm.
9	02410002 (102041002)		Compression splicing sleeve, partial tension, for aluminium conductor according to TIS 85-2522 size 50 mm^2, length not less than 85 mm, see Drawing No. SA2-015/40002.
10	02410004 (102041004)		Ditto as Item 9, but size 95 mm^2, length not less than 105 mm.
11	02410005 (102041005)		Ditto as Item 9, but size 120 mm^2, length not less than 105 mm.
12	02410007 (102041007)		Ditto as Item 9, but size 185 mm^2, length not less than 125 mm.
13	02410008 (102041008)		Ditto as Item 9, but size 240 mm^2, length not less than 145 mm.
14	02410009 (102041009)		Ditto as Item 9, but size 400 mm^2, length not less than 210 mm.
15	02410010 (102041010)		Ditto as Item 9, but size 625 mm^2, length not less than 250 mm.

Invitation to Bid No. :

Specification No. : R-506/2546

C3 Schedule of detailed requirement

Item	PEA Material No.	Quantity	Description
16	02410102 (1020410102)		Compression splicing sleeve, partial tension, for ACSR conductor according to TIS 86-2522 size 50/8 mm^2, length not less than 85 mm, see Drawing No. SA2-015/40002.
17	02410104 (1020410104)		Ditto as Item 16, but size 95/15 mm^2, length not less than 115 mm.
18	09080000 (1090080000)		Compound, electrical contact aid and anti-oxidation for use in bolted connections of aluminium-to-aluminium and aluminium-to-copper. The compound shall be contained in handy squeeze packages.
19	02300102 (1020300102)		Connector, parallel groove, 2-bolt type, length not less than 55 mm, for electrical tap off connection of aluminium, aluminium-alloy, and ACSR conductors to aluminium, aluminium-alloy, and ACSR conductors, with : Main : diameter range of 6.42 mm to 13.60 mm (size 25 mm^2 to 95 mm^2). Tap : diameter range of 6.42 mm to 13.60 mm (size 25 mm^2 to 95 mm^2).
20	02300103 (1020300103)		Ditto as Item 19, but 3-bolt type length, not less than 90 mm. with : Main : diameter range of 10.75 mm to 17.64 mm (size 70 mm^2 to 185 mm^2). Tap : diameter range of 10.75 mm to 17.64 mm (size 70 mm^2 to 185 mm^2).
21	02300104 (1020300104)		Ditto as Item 19, but 3-bolt type length, not less than 100 mm. with : Main : diameter range of 12.60 mm to 20.25 mm (size 95 mm^2 to 240 mm^2). Tap : diameter range of 12.60 mm to 20.25 mm (size 95 mm^2 to 240 mm^2).

Invitation to Bid No. :

Specification No. : R-506/2546

C3 Schedule of detailed requirement

Item	PEA Material No.	Quantity	Description
22	02310000 (1020310000)		Connector, dead-end type, for aluminium conductor diameter range of 6.42 mm to 7.56 mm (size 25 mm^2 to 35 mm^2).
23	02310001 (1020310001)		Ditto as Item 22, but aluminium conductor diameter range of 9.06 mm to 10.75 mm (size 50 mm^2 to 70 mm^2).
24	02310002 (1020310002)		Ditto as Item 22, but aluminium conductor diameter range of 12.60 mm to 14.25 mm (size 95 mm^2 to 120 mm^2).
25	02420101 (1020420101)		Connector (or lug), terminal, compression type made of aluminium-alloy, for connecting aluminium cable according to TIS 293 size 35 mm^2 to terminal pad, length not less than 125 mm, see Drawing No. SA2-015/24029.
26	02420102 (1020420102)		Ditto as Item 25, but size 50 mm^2 to terminal pad, length not less than 125 mm.
27	02420103 (1020420103)		Ditto as Item 25, but size 70 mm^2 to terminal pad, length not less than 130 mm.
28	02420104 (1020420104)		Ditto as Item 25, but size 95 mm^2 to terminal pad, length not less than 140 mm.
29	02420106 (1020420106)		Connector (or lug), terminal, compression type made of aluminium-alloy, for connecting aluminium cable according to TIS 85 size 185 mm^2 to terminal pad, length not less than 155 mm, see Drawing No. SA2-015/24029.

Invitation to Bid No. :

Specification No. : R-506/2546

C3 Schedule of detailed requirement

Item	PEA Material No.	Quantity	Description
30	02340001 (1002340001)		Connector, wedge type, for electrical tap off connection of aluminium conductor to aluminium conductor, with : Main : diameter of 15.80 mm - 17.64 mm. (size 185 mm^2) Tap : diameter of 12.80 mm - 14.25 mm. (size 120 mm^2)
31	02340000 (1020340000)		Ditto as Item 30, but : Main- : diameter of 15.80 mm - 17.64 mm. (size 185 mm^2) Tap : diameter of 11.30 mm - 12.60 mm. (size 95 mm^2)
32	02340002 (1020340002)		Ditto as Item 30, but : Main : diameter of 15.80 mm - 17.64 mm. (size 185 mm^2) Tap : diameter of 8.25 mm - 9.06 mm. (size 50 mm^2)
33	02340100 (1020340100)		Power-actuated tool, for installation, and removing the wedge type connector in Item 30, Item 31 and Item 32, complete with tool for cleaning the power-actuated tool and tool for cleaning the conductor, and carrying bag.
34	02340101 (1020340101)		Power-booster (cartridge), colour-coded to match the connector size, for driving wedge into C-shaped member, for use with wedge type connector in Item 30, Item 31 and Item 32 .
35	02340102 (1020340102)		Ditto as Item 34, but for removing the wedge from C-shaped member.
			Note : 1. Enclosed Drawing No. SA2-015/40002 and SA2-015/24029. 2. The bidder has to supply five(5) samples and approximately 0.5 kg of the COMPOUND, within fifteen (15) days, counted from the Committee's request. The samples will not be returned.

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Invitation to Bid No.

Trade-mark :

Specification No. : R-506/2546

Country of Origin:

C4 Price schedule

Bidder :

Bid No. :

Date :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
1	02400002 (10204 00002)		Compression splicing sleeve, full tension, for aluminium conductor size 50 mm^2, length ..... mm.			
2	02400004 (10204 00004)		Ditto as Item 1, but size 95 mm^2, length ..... mm.			
3	02400005 (10204 00005)		Ditto as Item 1, but size 120 mm^2, length ..... mm.			
4	02400007 (10204 00007)		Ditto as Item 1, but size 185 mm^2, length ..... mm.			
5	02400008 (10204 00008)		Ditto as Item 1, but size 240 mm^2, length ..... mm.			
6	02400009 (10204 00009)		Ditto as Item 1, but size 400 mm^2, length ..... mm.			
7	02400102 (10204 00102)		Compression splicing sleeve, full tension, for ACSR conductor size 50/8 mm^2, length ..... mm.			
8	02400104 (10204 00104)		Ditto as Item 7, but size 95/15 mm^2, length ..... mm.			
9	02410002 (10204 10002)		Compression splicing sleeve, partial tension, for aluminium conductor according size 50 mm^2, length ..... mm.			

Manufa.

Invitation to Bid No.

Trade-mark :

Specification No. : R-506/2546

Country of Origin:

C4 Price schedule

Bidder :

Bid No. :

Date :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
10	02410004 (1020410004)		Ditto as Item 9, but size 95 mm^2, length ..... mm.			
11	02410005 (1020410005)		Ditto as Item 9, but size 120 mm^2, length ..... mm.			
12	02410007 (1020410007)		Ditto as Item 9, but size 185 mm^2, length ..... mm.			
13	02410008 (1020410008)		Ditto as Item 9, but size 240 mm^2, length ..... mm.			
14	02410009 (1020410009)		Ditto as Item 9, but size 400 mm^2, length ..... mm.			
15	02410010 (1020410010)		Ditto as Item 9, but size 625 mm^2, length ..... mm.			
16	02410102 (1020410102)		Compression splicing sleeve, partial tension, for ACSR conductor size 50/8 mm^2, length..... mm.			
17	02410104 (1020410104)		Ditto as Item 16, but size 95/15 mm^2, length ..... mm.			
18	09080000 (1090080000)		Compound, electrical contact aid and anti-oxidation. The compound shall be contained in handy squeeze packages of ..... grams per package.			

Manufacturer:

Invitation to Bid No.

Trade-mark :

Specification No. : R-506/2546

Country of Origin:

C4 Price schedule

Bidder :

Bid No. :

Date :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
19	02300102 (1020300102)		Connector, parallel groove, 2-bolt type, length ..... mm, for electrical tap off connection of aluminium, aluminium-alloy, and ACSR conductors to aluminium, aluminium-alloy, and ACSR conductors, with : Main : diameter range of ..... mm to ..... mm . Tap : diameter range of ..... mm to ..... mm .			
20	02300103 (1020300103)		Ditto as Item 19, but 3-bolt type length, ... mm. with : Main : diameter range of ..... mm to ..... mm . Tap : diameter range of ..... mm to ..... mm .			
21	02300104 (1020300104)		Ditto as Item 19, but 3-bolt type length, ... mm. with : Main : diameter range of ..... mm to ..... mm . Tap : diameter range of ..... mm to ..... mm .			
22	02310000 (1020310000)		Connector, dead-end type, for aluminium conductor diameter range of ..... mm to ..... mm .			

Manufacturer:

Invitation to Bid No.

Trade-mark :

Specification No. : R-506/2546

Country of Origin:

C4 Price schedule

Bidder :

Bid No. :

Date :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
23	02310001 (10203100l)		Ditto as Item 22, but aluminium conductor diameter range of ..... mm to ..... mm.			
24	02310002 (10203100O2)		Ditto as Item 22, but aluminium conductor diameter range of ..... mm to ..... mm.			
25	02420101 (10204201O1)		Connector (or lug), terminal, compression type, for connecting aluminium cable size 35 mm^2 to terminal pad, length ..... mm.			
26	02420102 (10204201O2)		Ditto as Item 25, but size 50 mm^2 to terminal pad, length ..... mm.			
27	02420103 (10204201O3)		Ditto as Item 25, but size 70 mm^2 to terminal pad, length ..... mm.			

Manufacturer :

Invitation to Bid No. Trade-mark :

Specification No. : R-506/2546 Country of Origin:

C4 Price schedule Bidder :

Bid No. :

Date :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
28	02420104 (1020420104)		Ditto as Item 25, but size 95 mm^2 to terminal pad, length ..... mm .			
29	02420106 (1020420106)		Connector (or lug), terminal, compression type, for connecting aluminium cable size 185 mm^2 to terminal pad, length ..... mm .			
30	02340001 (1020340001)		Connector, wedge type, for electrical tap off connection of aluminium conductor to aluminium conductor, with : Main : diameter of ..... mm Tap : diameter of ..... mm			
31	02340000 (1020340000)		Ditto as Item 30, but Main : diameter of ..... mm Tap : diameter of ..... mm			

Manufacturer :

Invitation to Bid No.

Trade-mark :

Specification No. : R-506/2546

Country of Origin:

C4 Price schedule

Bidder :

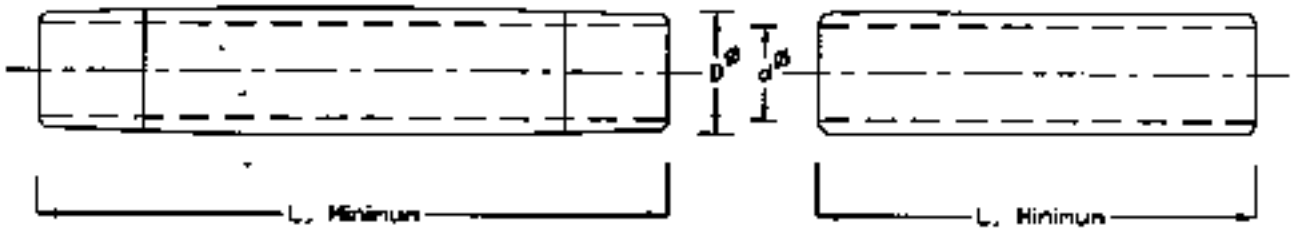
Bid No. :

Date :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
32	02340002 (1020340002)		Ditto as Item 30, but Main : diameter of ..... mm Tap : diameter of ..... mm			
33	02340100 (1020340100)		Power-actuated tool, for installation, and removing the wedge type connector in Item 30, Item 31 and Item 32, complete with			
34	02340101 (1020340101)		Power-booster (cartridge), colour-coded to match the connector size, for driving wedge type connector in Item 30, Item 31 and Item 32 .			
35	02340102 (1020340102)		Ditto as Item 34, but for removing the wedge from C-shaped member.			

II

PRELIMINARY



COMPRESSION SPLICING SLEEVE FOR CONDUCTORS ACCORDING TO TIS

CONDUCTOR		DIMENSIONS					
		FULL TENSION SLEEVE			PARTIAL TENSION SLEEVE		
NOMINAL CROSS-SECTION AREA mm^2	OVERALL DIAMETER mm	D^{ϕ} mm	d^{ϕ} mm	L mm, Min.	D^{ϕ} mm	d^{ϕ} mm	L mm, Min.
ALUMINIUM STRANDED CONDUCTORS ACCORDING TO TIS 85-2522							
50	9.06	16.0(±0.5)	10.0(±0.5)	155	16.0(±0.5)	10.0(±0.5)	85
95	12.60	23.0(±0.5)	13.5(±0.5)	165	23.0(±0.5)	13.5(±0.5)	105
120	14.25	25.5(±0.5)	16.0(±0.5)	250	23.0(±0.5)	15.0(±0.5)	105
185	17.64	28.5(±0.5)	18.5(±0.5)	330	28.5(±0.5)	18.3(±0.5)	125
240	20.25	34.5(±0.5)	21.5(±0.5)	360	32.5(±0.5)	21.5(±0.5)	145
400	25.65	43.0(±0.5)	27.0(±0.5)	380	40.0(±0.5)	27.0(±0.5)	210
625	32.56	—	—	—	53.5(±0.5)	35.5(±0.5)	250
ALUMINIUM CONDUCTORS STEEL REINFORCED ACCORDING TO TIS 96-2522							
50/8	9.60	20.5(±0.5)	10.5(±0.5)	440	16.0(±0.5)	10.7(±0.5)	85
95/15	13.60	30.0(±0.5)	14.5(±0.5)	500	22.5(±0.5)	14.7(±0.5)	115

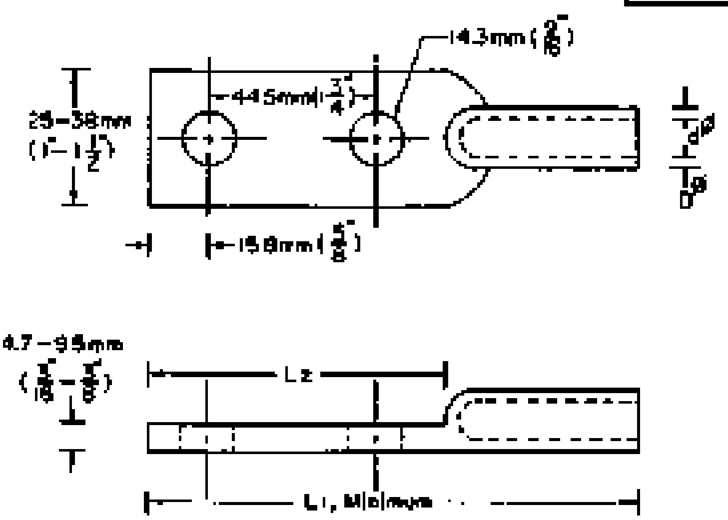
NOTE

1. FULL TENSION SLEEVES AND PARTIAL TENSION SLEEVES SHALL WITHSTAND LEAST 90% AND 40% RESPECTIVELY OF THE MINIMUM BREAKING STRENGTH OF THE CONDUCTORS FOR WHICH THEY ARE DESIGNED.
2. THE SLEEVE SHALL BE PRE-FILLED WITH ANTI-CORROSION COMPOUND AND CLOSED BOTH ENDS BY PLASTIC CAPS.
3. EACH SLEEVE SHALL BE MARKED WITH APPLICABLE CONDUCTOR SIZE. MARKS TO PRESS, AND MANUFACTURER'S SYMBOL
4. FIGURES IN PARENTHESES ARE TOLERANCE.
5. THIS DRAWING IS ATTACHED TO SPECIFICATIONS OF COMPRESSION TOOLS AND OF COMPRESSION SPLICING SLEEVES.

กองมาตรฐานระบบไฟฟ้า ฝ่ายมาตรฐานและความปลอดภัย การไฟฟ้าส่วนภูมิภาค

มิถุนายน —	TABLE OF COMPRESSION SPLICING	แบบมอก ที่ SA2-015/40002
วันที่ ๑๐ ตุลาคม 2545	SLEEVES ONE PIECE TYPE	แผ่นที่ 1 ของจำนวน 1 แผ่น

การประกอบเลขที่ ASSEMBLY NO.



COMPRESSION TYPE TERMINAL LUG, FOR ALUMINUM CABLE

COMPRESSION TYPE, TERMINAL LUG	FOR ALUMINUM CABLE		DIMENSIONS OF COMPRESSION TYPE TERMINAL LUG			
PEA MAT. NO.	SIZE mm^2	OVERALL DIAMETER OF CONDUCTOR mm	D ø mm	d ø mm	L1 mm, Min	L2 mm
02420101	35	6.95	14.0 (±0.4)	7.85 (±0.15)	125	75 $(^{+5}_{0})$
02420102	50	8.35	16.0 (±0.5)	9.75 (±0.25)	125	75 $(^{+5}_{0})$
02420103	70	9.75	18.5 (±0.5)	11.25 (±0.25)	130	75 $(^{+5}_{0})$
02420104	95	11.45	23.0 (±0.5)	13.25 (±0.25)	140	75 $(^{+5}_{0})$
02420105	120	12.95	23.0 (±0.5)	14.75 (±0.25)	145	75 $(^{+5}_{0})$
02420106	185	17.64	28.5 (±0.5)	18.3 (± 0.5)	155	75 $(^{+5}_{0})$

NOTES.
1. FIGURES IN PARENTHESES IN THE TABLE, ARE TOLERANCE.
2. THE LUG SHALL BE PREFILLED WITH ELECTRICAL CONTACT COMPOUND AND CAPPED BY PLASTIC CAPS
3. EACH LUG SHALL BE MARKED WITH APPLICABLE CONDUCTOR SIZE, MARKS TO PRESS, AND MANUFACTURER'S SYMBOL

กองวิศวกรรมไฟฟ้าและเครื่องกล ฝ่ายวิศวกรรม	การไฟฟ้าส่วนภูมิภาค	ใช้แทนแบบ
ผู้เขียน / ผู้ตรวจ / วิศวกร / หัวหน้าแผนก / หัวหน้ากอง / ผู้อำนวยการฝ่าย	ผู้ว่าการ	ถูกแทนที่โดยแบบ / เขียนเสร็จวันที่ 20.04.24 / แก้แบบครั้งที่ 20 ก.ค. 2530 / พิมพ์เป็น / มาตราส่วน
รองผู้ว่าการฝ่ายเทคนิค	CONNECTOR (OR LUG), TERMINAL, COMPRESSION TYPE	แบบเลขที่ SA2-015/24029 / แผ่นที่ 1 จากจำนวน 1 แผ่น

เอกสารเพิ่มเติมแนบท้ายรายละเอียดสเปค

(ADDENDUM)

เอกสารเพิ่มเติม (ADDENDUM) นี้ ให้ถือเป็นส่วนหนึ่งของรายละเอียดสเปคที่เอกสารฯ นี้ได้แนบอยู่ด้วย

1. **การกำหนดระยะเวลาในการส่งรายงานผลการทดสอบเฉพาะแบบ (Type test report)**

   หากรายละเอียดสเปคกำหนดให้ผู้เสนอราคาจะต้องจัดส่งรายงานผลการทดสอบเฉพาะแบบ (Type test report) หรือหนังสือรับรองผลการทดสอบเฉพาะแบบ (Type test certificates) “ให้ผู้เสนอราคาจะต้องจัดส่งรายงานผลการทดสอบเฉพาะแบบ หรือหนังสือรับรองผลการทดสอบเฉพาะแบบมาพร้อมกับการยื่นเอกสารทางเทคนิค” แทนการกำหนดระยะเวลาจัดส่งรายงานฯ ที่ได้ระบุไว้ในรายละเอียดสเปค

   ทั้งนี้ ยกเว้นบางพัสดุอุปกรณ์ที่ กฟภ. กำหนดยอมรับให้ทำการทดสอบเฉพาะแบบภายหลังจากที่ทำสัญญากับ กฟภ. แล้ว โดยคู่สัญญาจะต้องจัดส่งรายงานผลการทดสอบฯ ดังกล่าว ก่อนการส่งของนั้น ให้คงรายละเอียดไว้ตามเดิม

2. **การกำหนดระยะเวลาในการจัดส่งตัวอย่าง (Sample) เพื่อประกอบการพิจารณาจัดหา**

   หากรายละเอียดสเปคกำหนดให้ผู้เสนอราคาจะต้องจัดส่งตัวอย่างพัสดุอุปกรณ์ (Sample) เพื่อประกอบการพิจารณาจัดหา “ให้ผู้เสนอราคาจะต้องจัดส่งตัวอย่างพัสดุอุปกรณ์ ภายใน 5 วันทำการ นับถัดจากวันเสนอราคา” แทนการกำหนดระยะเวลาจัดส่งตัวอย่างที่ได้ระบุไว้ในรายละเอียดสเปค

Invitation to Bid No. :

Specification No. : RHDW-011/2556

C Material, equipment, and specifications for OVERHEAD LINE HARDWARE

C1 General material and packing instructions

Additional to the general instructions, the following shall be observed :

1a Scope

These specifications cover line hardware for overhead line construction.

1b Standard

The overhead line hardware shall be in accordance with the latest TIS, VDE Regulations, DIN, and PEA Drawings attached to these specifications, or equivalent.

1c Principal requirement

The overhead line hardware shall be marked with manufacturer's name or trade-mark, except full thread double arming bolts, full thread stubbing bolts, and washers.

All ferrous materials shall be galvanized after manufacturing. Method of galvanizing and thickness of coating shall be according to the attached Table "THICKNESS OF ZINC COATING". Free samples shall be supplied on request. The samples will not be returned.

1d Packing

Each item should be packed in suitable packages in sets or pieces of 10, 50, 100, or that specified in Table "Packing Details for Overhead Line Hardware" (see page 3 of 3).

The gross weight of each package should not exceed 40 kg.

If there are several packages, the number of package shall be stamped on each package or each tag, as follows :

package number / total number of packages.

C2 Material and packing data to be given by bidder

2a For each item offered, the following details shall be submitted with the bid :

Catalogue number.

Description of materials used for the component parts.

Surface finishing of the component parts.

Zinc coating in g/m^2 or (mm (1 µm = 0.001 mm).

Minimum breaking strength in kgf.

Weight in kg/set or piece.

2b For each item offered, a detail drawing with dimensions in mm shall be submitted with the bid.

2c Packing details

Packing method.

Number of sets or pieces in each package.

Dimensions of each package in cm

Gross weight of each package in kg (should not exceed 40 kg).

Net weight of each package in kg.

Number of packages.

If several packages are contained in one big case, further details are required :

Number of packages in each case.

Dimensions of each case in cm.

Gross weight of each case in kg.

Number of cases.

Table

Packing Details for Overhead Line Hardware

PEA Material No.	Quantity Per Package	Packing Method
00120004, 01000103	18	Bundle
01200001, 01200002	20	Bundle
01010100, 01200004, 01200005	50	Bundle
01200007	150 (15 per layer)	Bundle
01110200, 01110201, 01140000, 01170001, 01180001	150	Sack
01110202, 01110203	100	Sack
01110204, 01110205, 01140001, 01140002	75	Sack
01110206, 01110207, 01110208, 01110401, 01120000, 01120001, 01120002, 01130000, 01130001, 01130002, 01140003	50	Sack
01180100, 01180201	500	Sack
01180301	5,000	Sack
02440102	30	Sack
02440103	60	Sack

Addendum

This addendum is made to be a part of specifications it's attached.

1. Replace the packing detail only for the specific items in the specifications by the packing detail specified in **Table A1** below:

Table A1: Packing Detail

Item	Equipment	PEA's material No.	Packing method	Quantity per package/case	Number of packages/cases per pallet
Connectors and cable accessories:					
1	Hot line bail clamp (hot line stirrup clamp), for main aluminium conductor size 25 mm^2 to 50 mm^2	1-02-033-0000	Sealed package	40	49
2	Hot line protected thread clamp for main aluminium conductor size 25 mm^2 to 50 mm^2	1-02-033-0100	Sealed package	50	100
3	Hot line protected thread clamp for main aluminium conductor size 50 mm^2 to 120 mm^2	1-02-033-0101	Sealed package	50	50
4	Compression splicing sleeve, full tension, for aluminium conductor size 50 mm^2	1-02-040-0002	Suitable package	100	100
5	Compression splicing sleeve, full tension, for aluminium conductor size 95 mm^2	1-02-040-0004	Suitable package	50	100
6	Compression splicing sleeve, full tension, for aluminium conductor size 185 mm^2	1-02-040-0007	Suitable package	30	50
7	Compression splicing sleeve, full tension, for aluminium conductor size 400 mm^2	1-02-040-0009	Suitable package	30	50
8	Compression splicing sleeve, partial tension, for aluminium conductor size 50 mm^2	1-02-041-0002	Suitable package	100	100
9	Terminal connector (lug), compression type, for aluminium conductor size 185 mm^2	1-02-041-0106	Suitable package	50	50
10	Pin terminal, for aluminium conductor size 50 mm^2	1-02-042-0400	Suitable package	50	100
Overhead line hardware:					
11	Angle steel crossarm, size 150x100x12 mm, length 4,500 mm	1-00-012-0002	Bundle	10	-
12	Channel steel crossarm, size 100x50x5 mm, length 4,200 mm	1-01-000-0103	Bundle	20	-
13	Channel steel crossarm, size 100x50x5 mm, length 4,500 mm	1-01-000-0104	Bundle	20	-
14	Channel steel crossarm, size 150x75x6 mm, length 2,800 mm	1-01-000-0300	Bundle	20	-
15	Channel steel crossarm, size 150x75x6.5 mm, length 4,000 mm	1-01-000-0301	Bundle	20	-

Item	Equipment	PEA's material No.	Packing method	Quantity per package/case	Number of packages/cases per pallet
16	Channel steel beam, size 150x75x6.5 mm, length 4,500 mm	1-01-000-0302	Bundle	20	-
17	Channel steel beam, size 150x75x6.5 mm, length 6,000 mm	1-01-000-0303	Bundle	20	-
18	Channel steel beam, size 150x75x6.5 mm, length 2,500 mm	1-01-000-0304	Bundle	20	-
19	Channel steel crossarm, size 150x75x9 mm, length 3,000 mm	1-00-012-0004	Bundle	20	-
20	Angle steel beam, size 65x65x6 mm, length 1,000 mm	1-01-001-0000	Bundle	100	-
21	Bolt, machine, M 16 x 170 mm	1-01-011-0201	Sack	100	56
22	Bolt, machine, M 16 x 300 mm	1-01-011-0204	Sack	80	56
23	Bolt, machine, M 16 x 350 mm	1-01-011-0205	Sack	80	56
24	Bolt, machine, M 16 x 450 mm	1-01-011-0207	Sack	40	56
25	Bolt, machine, M 16 x 500 mm	1-01-011-0208	Sack	40	50
26	Bolt, machine, M 16 x 600 mm	1-01-011-0209	Sack	40	50
27	Bolt, machine, hexagon head, M 16 x 75 mm	1-01-011-0400	Sack	200	56
28	Bolt, machine, hexagon head, M 16 x 550 mm	1-01-011-0401	Sack	40	50
29	Bolt, machine, hexagon head, M 16 x 600 mm	1-01-011-0402	Sack	40	50
30	Bolt, machine, hexagon head, M 16 x 650 mm	1-01-011-0403	Sack	30	50
31	Bolt, double arming, full thread, M 16 x 450 mm	1-01-012-0001	Sack	40	50
32	Bolt, double arming, full thread, M 16 x 500 mm	1-01-012-0002	Sack	40	50
33	Bolt, double arming, full thread, M 16 x 550 mm	1-01-012-0003	Sack	40	50
34	Bolt, double arming, full thread, M 16 x 600 mm	1-01-012-0004	Sack	40	50
35	Bolt, double arming, full thread, M 16 x 650 mm	1-01-012-0005	Sack	30	50
36	Bolt, double arming eye, M 16 x 450 mm	1-01-013-0001	Sack	40	56
37	Bolt, double arming eye, M 16 x 500 mm	1-01-013-0002	Sack	40	50
38	Bolt, double arming eye, M 16 x 650 mm	1-01-013-0005	Sack	30	50
39	Bolt, round eye, M 16 x 200 mm	1-01-014-0001	Sack	80	56
40	Bolt, round eye, M 16 x 250 mm	1-01-014-0002	Sack	80	56
41	Bolt, round eye, M 16 x 300 mm	1-01-014-0003	Sack	50	56
42	Bolt, oval eye, M 16 x 150 mm	1-01-015-0000	Sack	80	56
43	Bolt, oval eye, M 16 x 200 mm	1-01-015-0001	Sack	80	56
Insulators and accessories:					
44	Insulator, pin-post type, TIS 1251, Type 56/57-2	1-03-001-0101	Export package	2	30
45	Clevis-eye	1-03-014-0000	Suitable package	40	56
46	Ball-clevis, ANSI Type K	1-03-014-0001	Suitable package	30	56

Item	Equipment	PEA's material No.	Packing method	Quantity per package/case	Number of packages/cases per pallet
47	Ball-hook, ANSI Type B	1-03-014-0002	Suitable package	40	56
48	Ball-clevis, ANSI Type B	1-03-014-0005	Suitable package	40	56
Surge arresters:					
49	LV surge arrester, 480 V, 5 kA	1-04-000-0300	Suitable package	100	5
Meters:					
50	Watt-hour meter, 15(45) A, 3-phase 4-wire	1-06-005-0107	Suitable corrugate-paper package	50	-
51	Watt-hour meter, 30(100) A, 3-phase 4-wire	1-06-005-0108	Suitable corrugate-paper package	50	-

2. Sacks used for packing equipment shall have enough durability and shall be made of hemp rope.
3. Bundle packing shall be using galvanized steel wires with diameter not less than 4 mm.
4. Pallets supplied to PEA shall have dimension not more than 1.1 m x 1.1 m (Width x Length) and the total height after containing the packages/cases shall be less than 1.5 m.

Invitation to Bid No. :

Specification No. : RHDW-011/2556

C3 Schedule of detailed requirement

Item	PEA Material No.	Quantity	Description
1	01200001 (1010200001)		Brace, flat, for crossarm, of flat steel 30x6x760 mm, see Drawing No. K 31-09063.
2	01200002 (1010200002)		Ditto as Item 1, but 40x6x1,000 mm, see Drawing No. K 31-09063 .
3	01200003 (1010200003)		Ditto as Item 1, but 50x10x1,950 mm, see Drawing No. SA2-015/39005.
4	01200004 (1010200004)		Brace, alley arm, of angle steel, 40x40x5 mm, 2,120 mm long, see Drawing No. K 31-09064.
5	01200005 (1010200005)		Ditto as Item 4, but 50x50x6 mm, 2,350 mm long, see Drawing No. K 31-09064 .
6	01200007 (1010200007)		Brace , for crossarm , of hot – rolled equal angle steel , 50x50x6 mm , 1,800 mm wide , 450 mm drop , hot – dip galvanized not less than 50 micrometer , see Drawing No. SB1-015/22014.
7	01110000 (1010110000)		Bolt, machine, of mild steel, square head, similar to DIN 601, M 8, 25 mm long, length of thread 22 mm, complete with one (1) square nut, see Drawing No. I50-015/140367.
8	01110101 (1010110101)		Ditto as Item 7, but M 12, 50 mm long, length of thread 40 mm, see Drawing No. I50-015/140367.
9	01110200 (1010110200)		Ditto as Item 7, but M.16, 130 mm long, length of thread 35 mm, see Drawing No. K31-09072.
10	01110201 (1010110201)		Ditto as Item 7, but M 16, 170 mm long, length of thread 50 mm, see Drawing No. K31-09072.
11	01110202 (1010110202)		Ditto as Item 7, but M 16, 200 mm long, length of thread 50 mm, see Drawing No. K31-09072.

Invitation to Bid No. :

Specification No. : RHDW-011/2556

C3 Schedule of detailed requirement

Item	PEA Material No.	Quantity	Description
12	01110203 (1010110203)		Ditto as Item 7, but M 16, 250 mm long, length of thread 75 mm, see Drawing No. K31-09072.
13	01110204 (1010110204)		Ditto as Item 7, but M 16, 300 mm long, length of thread 75 mm, see Drawing No. K31-09072.
14	01110205 (1010110205)		Ditto as Item 7, but M 16, 350 mm long, length of thread 75 mm, see Drawing No. K31-09072.
15	01110206 (1010110206)		Ditto as Item 7, but M 16, 400 mm long, length of thread 100 mm, see Drawing No. K31-09072.
16	01110207 (1010110207)		Ditto as Item 7, but M 16, 450 mm long, length of thread 100 mm, see Drawing No. K31-09072.
17	01110208 (1010110208)		Ditto as Item 7, but M 16, 500 mm long, length of thread 150 mm, see Drawing No. K31-09072.
18	01110209 (1010110209)		Ditto as Item 7, but M 16, 600 mm long, length of thread 200 mm.
19	01110300 (1010110300)		Ditto as Item 7, but M 20, 350 mm long, length of thread 100 mm.
20	01110301 (1010110301)		Ditto as Item 7, but M 20, 400 mm long, length of thread 100 mm, see Drawing No. SB1-015/22017.
21	01110302 (1010110302)		Ditto as Item 7, but M 20, 450 mm long, length of thread 100 mm, see Drawing No. SB1-015/22017.
22	01110303 (1010110303)		Ditto as Item 7, but M 20, 550 mm long, length of thread 150 mm, see Drawing No. SB1-015/22017.
23	01110400 (1010110400)		Bolt, machine, of mild steel, hexagon head, similar to DIN 601, M 16, 75 mm long, length of thread 75 mm; complete with one (1) hexagon nut, one (1) lock nut, and two (2) round washers, similar to DIN 555, DIN 936, and DIN 126 respectively; see Drawing No. SA2-015/39019 .

Invitation to Bid No. :

Specification No. : RHDW-011/2556

C3 Schedule of detailed requirement

Item	PEA Material No.	Quantity	Description
24	01110401 (1010110401)		Bolt, machine, of mild steel, hexagon head, similar to DIN 601, M 16, 550 mm long, length of thread 150 mm; complete with one (1) hexagon nut, one (1) lock nut, and two (2) round washers, similar to DIN 555, DIN 936, and DIN 126 respectively; see Drawing No. S 01-015/18035 .
25	01110402 (1010110402)		Ditto as Item 24, but M 16, 600 mm long, length of thread 150 mm, see Drawing No. S01-015/18035 .
26	01110403 (1010110403)		Ditto as Item 24, but M 16, 650 mm long, length of thread 150 mm, see Drawing No. SA2-015/39019 .
27	01120000 (1010120000)		Bolt, double arming, full thread, of mild steel, M 16, 400 mm long, complete with four (4) square nuts, see Drawing No. K31-09069
28	01120001 (1010120001)		Ditto as Item 27, but M 16, 450 mm long, see Drawing No. K31-09069.
29	01120002 (1010120002)		Ditto as Item 27, but M 16, 500 mm long, see Drawing No. K31-09069.
30	01120003 (1010120003)		Ditto as Item 27, but M 16, 550 mm long.
31	01120004 (1010120004)		Ditto as Item 27, but M 16, 600 mm long, see Drawing No. K31-09069.
32	01120005 (1010120005)		Ditto as Item 27, but M 16, 650 mm long.
33	01130000 (1010130000)		Bolt, double arming eye, of mild steel, forged round eye having 22 mm diameter hole, M 16, 400 mm long, length of thread 350 mm; complete with three (3) square nuts, minimum breaking strength not less than 5,000 kgf; see Drawing No. S 01-015/17007 .
34	01130001 (1010130001)		Ditto as Item 33, but M 16, 450 mm long, length of thread 400 mm, see Drawing No. S 01-015/17007.

Invitation to Bid No. :

Specification No. : RHDW-011/2556

C3 Schedule of detailed requirement

Item	PEA Material No.	Quantity	Description
35	01130002 (1010130002)		Ditto as Item 33, but M 16, 500 mm long, length of thread 450 mm, see Drawing No. S 01-015/17007.
36	01130003 (1010130003)		Ditto as Item 33, but M 16, 600 mm long, length of thread 550 mm, see Drawing No. S 01-015/17007.
37	01130004 (1010130004)		Ditto as Item 33, but M 16, 550 mm long, length of thread 500 mm, see Drawing No. S 01-015/17007.
38	01130005 (1010130005)		Ditto as Item 33, but M 16, 650 mm long, length of thread 600 mm, see Drawing No. S 01-015/17007.
39	01140000 (1010140000)		Bolt, round eye, of mild steel, forged round eye having 22 mm diameter hole, M 16, 100 mm long, length of thread 75 mm; complete with two (2) square nuts, minimum breaking strength not less than 5,000 kgf, see Drawing No. S 01-015/19041.
40	(1010140004)		Ditto as Item 39, but M 16, 150 mm long, length of thread 100 mm, see Drawing No. SA2-015/39018 .
41	01140001 (1010140001)		Ditto as Item 39, but M 16, 200 mm long, length of thread 150 mm, see Drawing No. S 01-015/19041 .
42	01140002 (1010140002)		Ditto as Item 39, but M 16, 250 mm long, length of thread 200 mm, see Drawing No. S 01-015/19041 .
43	01140003 (1010140003)		Ditto as Item 39, but M 16, 300 mm long, length of thread 250 mm, see Drawing No. S 01-015/19041 .

Invitation to Bid No. :

Specification No. : RHDW-011/2556

C3 Schedule of detailed requirement

Item	PEA Material No.	Quantity	Description
44	01150000 (1010150000)		Bolt, oval eye, forged steel, M 16, 150 mm long, length of thread 100 mm, complete with one(1) square nut, minimum breaking strength not less than 6,500 kgf, see Drawing No. SB1-015/22018.
45	01150001 (1010150001)		Ditto as Item 44, but M 16, 200 mm long, length of thread 150 mm, see Drawing No. SB1-015/22018.
46	01150002 (1010150002)		Ditto as Item 44, but M 16, 350 mm long, length of thread 150 mm, see Drawing No. SB1-015/22018.
47	01150100 (1010150100)		Ditto as Item 44, but M 20, 350 mm long, length of thread 150 mm, minimum breaking strength not less than 12,000 kgf, see Drawing No. SB1-015/22019.
48	01150101 (1010150101)		Ditto as Item 44, but M 20, 450 mm long, length of thread 200 mm, minimum breaking strength not less than 12,000 kgf, see Drawing No. SB1-015/22019.
49	01160000 (1010160000)		Bolt, stubbing, full thread, of mild steel, M 24, 600 mm long, complete with four (4) square nuts and two (2) flat washers 72x72x6 mm, 26 mm diameter hole.
50	01160001 (1010160001)		Ditto as Item 49, but M 24, 800 mm long .
51	01160002 (1010160002)		Ditto as Item 49, but M 24, 1,000 mm long .
52	01160003 (1010160003)		Ditto as Item 49, but M 24, 1,250 mm long .
53	01160004 (1010160004)		Ditto as Item 49, but M 24, 1,600 mm long .
54	01180001 (1010180001)		Nut, eye, of mild steel, similar to DIN 582, forged eye 35 mm in diameter, thread for bolt M 16, minimum breaking strength not less than 5,000 kgf, see Drawing No. S 01-015/16004 .
55	01180002 (1010180002)		Eyelet, according to NEMA standards or equivalent, minimum breaking strength not less than 8,320 kgf, see Drawing No. SB1-015/22028.

Invitation to Bid No. :

Specification No. : RHDW-011/2556

C3 Schedule of detailed requirement

Item	PEA Material No.	Quantity	Description
56	01180003 (1010180003)		Nut, eye, thimble, forged steel, thread for bolt M 16, minimum breaking strength not less than 6,500 kgf, see Drawing No. SB1-015/22029.
57	01180004 (1010180004)		Ditto as Item 56, but thread for bolt M 20, minimum breaking strength not less than 8,200 kgf, see Drawing No. SB1-015/22029.
58	01180100 (1010180100)		Washer, square, flat, of steel, according to Table 6 of TIS 258, nominal size 16 (18 $^{+0.7}_{0}$ mm diameter hole), 52x52x4.5 mm.
59	01180101 (1010180101)		Ditto as Item 58, but nominal size 20 (22 $^{+0.8}_{0}$ mm diameter hole), 62 x 62 x 6 mm.
60	01180102 (1010180102)		Ditto as Item 58, but nominal size 24 (26 $^{+0.8}_{0}$ mm diameter hole), 72 x 72 x 6 mm.
61	01180103 (1010180103)		Ditto as Item 58, but nominal size 12 (14 $^{+0.7}_{0}$ mm diameter hole), 40 x 40 x 3.2 mm.
62	01180200 (1010180200)		Washer, square, curved, of mild steel, dimensions 50x50x5 mm, 18 mm diameter hole, see Drawing No. K 31-09073.
63	01180201 (1010180201)		Ditto as Item 62, but dimensions 60 x 60 x 5 mm, 22 mm diameter hole, see Drawing No. K31-09073 .
64	01180300 (1010180300)		Washer, lock, of spring steel, according to Table 1 of TIS 259, nominal size 12 (12.2 $^{+0.6}_{0}$ mm diameter hole), 21.5 mm maximum outside diameter, 3.0 mm minimum thick.
65	01180301 (1010180301)		Ditto as Item 64, but nominal size 16 (16.2 $^{+0.8}_{0}$ mm diameter hole), 28.0 mm. maximum outside diameter, 4.0 mm minimum thick.

Invitation to Bid No. :

Specification No. : RHDW-011/2556

C3 Schedule of detailed requirement

Item	PEA Material No.	Quantity	Description
66	01180302 (1010180302)		Ditto as Item 64, but nominal size 20 (20.2 $^{+0.8}_{0}$ mm diameter hole), 33.8 mm. maximum outside diameter, 5.1 mm minimum thick.
67	01180303 (1010180303)		Ditto as Item 64, but nominal size 24 (24.5 $^{+1.0}_{0}$ mm diameter hole), 40.3 mm. maximum outside diameter, 5.9 mm minimum thick.
68	01050000 (1010050000)		Pipe, steel, nominal size 20 (26.9 ± 0.4 mm outside diameter), wall thickness not less than 2.27 mm, 100 mm long, without thread on both ends, hot-dip galvanized not less than 65 µm ; or pipe from galvanized steel pipe,Type 2, in accordance with TIS 277 shall be accepted.
69	01050002 (1010050002)		Ditto as Item 68, but 150 mm long.
~~70~~	~~01000100 (1010000100)~~		~~Alley arm, of channel steel, 100x50x5 mm, 2,250 mm long, see Drawing No. SB1-015/31004.~~ ให้ใช้สเปค RHDW-004/2550 Item 1 แทน
71	00120004 (1001200004)		Crossarm, of channel steel, 150x75x9 mm, 3,000 mm long, see Drawing No. SA2-015/39005.
72	01000400 (1010000400)		Channel steel beam, according to Table 4 of TIS 1227, with : Nominal size : 200 x 80 x 7.5 mm Length : 1,000 mm Punched holes/slots, and fabricated as shown in Drawing No. SA2-015/23010.
73	01010000 (1010010000)		Angle steel beam, according to Table 2 of TIS 1227, with : Nominal size : 65x65x6 mm Length : 1,000 mm Punched holes/slots, and fabricated as shown in Drawing No. SA2-015/23009.

Invitation to Bid No. :

Specification No. : RHDW-011/2556

C3 Schedule of detailed requirement

Item	PEA Material No.	Quantity	Description
74	01030102 (1010030102)		Plate, steel double arming, 12x100 mm, 760 mm long, see Drawing No. SA2-015/28002.
75	03140011 (1030140011)		Thimble clevis, pressed steel, minimum breaking strength not less than 900 kgf, see Drawing No. S01-015/19058.
76	03140013 (1030140013)		Plate spacer, of mild steel, minimum ultimate strength not less than 16,500 kgf, see Drawing No. SB1-015/22042.
77	01030002 (1010030002)		Plate, steel, 6x100 mm, 450 mm long, see Drawing No. SB1-015/22015.
78	01030100 (1010030100)		Plate, steel, double arming, 12x100 mm, 650 mm long, see Drawing No. SB1-015/22016.
79	02440102 (1020AA0102)		Clamp, guy, triple bolt, suitable for steel stranded wire 50-95 mm^2, see Drawing No. SA2-015/23024.
80	02440103 (1020AA0103)		Link for cable spacer, 9.0 mm diameter steel round bar, see Drawing No. SA2-015/23024.
81	02440112 (1020AA0112)		Bracket, of channel steel, 100x50x5 mm, for aerial cable corner support, see Drawing No. SA2-015/56006 .
82	01000106 (1010000106)		Crossarm, of channel steel, according to Table 4 of TIS 1227, with : Nominal size : 100 x 50 x 5 mm Length : 2,500 mm Punched holes, and fabricated as shown in Drawing No. SA2-015/39025.

Invitation to Bid No. :

Specification No. : RHDW-011/2556

C3 Schedule of detailed requirement

Item	PEA Material No.	Quantity	Description
83	01000201 (1010000201)		Ditto as Item 82, but Nominal size : 125 x 65 x 6 mm Length : 3,000 mm Punched holes, and fabricated as shown in Drawing No. SA4-015/39025.
84	01110404 (1010110404)		Bolt, machine, of mild steel, hexagon head, similar to DIN 601, M 16, 50 mm long, length of thread 40 mm ; complete with one (1) hexagon nut, and two (2) round washers, similar to DIN 555, and DIN 126 respectively; see Drawing No. SA2-015/40001.
85	02200106 (1020200106)		Vibration damper, dumbells type (stockbridge), for overhead ground wire diameter range 9.0 - 10.0 mm (Steel stranded wire 50 mm^2), approximate total weight 1.6 kg (3.5 pounds).
86	02200107 (1020200107)		Vibration damper, dumbells type (stockbridge), for conductor diameter range 27.0 - 29.0 mm (ACSR conductor 380/50 mm^2), approximate total weight 7.3 kg (16 pounds).
			Note : 1. Pitches of steel bolts and nuts shall be according to the attached "Nominal Thread Diameters and Pitches of Steel Bolts and Nuts". 2. Dimensions and tolerances of M 16 machine bolts shall be as specified in the attached "Dimensions and Tolerances of M 16 Machine Bolts". 3. ONLY threads of steel bolt and nut shall meet acceptance tests specified in the attached "Acceptance Tests for Threads of Steel Bolt, Anchor Rod, and Nut".

Manufacturer :

Trade-mark :

Country of Origin:

Bidder :

Bid No. :

Date :

Invitation to Bid No.

Specification No. : **RHDW-011/2556**

C4 Price schedule

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
1	01200001 (C1010200001)		Brace, flat, for crossarm, of flat steel 30x6x760 mm .			
2	01200002 (C1010200002)		Ditto as Item 1, but 40x6x1,000 mm .			
3	01200003 (C1010200003)		Ditto as Item 1, but 50x10x1,950 mm .			
4	01200004 (C1010200004)		Brace, alley arm, of angle steel, 40x40x5 mm, 2,120 mm long .			
5	01200005 (C1010200005)		Ditto as Item 4, but 50x50x6 mm, 2,350 mm long .			
6	01200007 (C1010200007)		Brace , for crossarm , of hot – rolled equal angle steel , 50x50x6 mm, 1,800 mm wide , 450 mm drop , hot – dip galvanized not less than 50 micrometer , see Drawing No. SB1-015/22014			
7	01110000 (C1010110000)		Bolt, machine, M 8x 25 mm, complete with one (1) square nut .			
8	01110101 (C1010110101)		Ditto as Item 7, but M 12x 50 mm			
9	01110200 (C1010110200)		Ditto as Item 7, but M 16x130 mm			

Invitation to Bid No.

Specification No. : RHDW-011/2556

C4 Price schedule

Manufacturer :

Trade-mark :

Country of Origin:

Bidder :

Bid No. :

Date :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
10	01110201 (1010110201)		Ditto as Item 7, but M 16x170 mm			
11	01110202 (1010110202)		Ditto as Item 7, but M 16x200 mm			
12	01110203 (1010110203)		Ditto as Item 7, but M 16x250 mm .			
13	01110204 (1010110204)		Ditto as Item 7, but M 16x300 mm .			
14	01110205 (1010110205)		Ditto as Item 7, but M 16x350 mm .			
15	01110206 (1010110206)		Ditto as Item 7, but M 16x400 mm .			
16	01110207 (1010110207)		Ditto as Item 7, but M 16x450 mm .			
17	01110208 (1010110208)		Ditto as Item 7, but M 16x500 mm .			
18	01110209 (1010110209)		Ditto as Item 7, but M 16x600 mm.			
19	01110300 (1010110300)		Ditto as Item 7, but M 20x350 mm .			
20	01110301 (1010110301)		Ditto as Item 7, but M 20x400 mm .			

Invitation to Bid No.

Specification No. : **RHDW-011/2556**

C4 Price schedule

Manufacturer :

Trade-mark :

Country of Origin:

Bidder :

Bid No. :

Date :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
21	01110302 (C1010110302)		Ditto as Item 7, but M 20x450 mm .			
22	01110303 (C1010110303)		Ditto as Item 7, but M 20x550 mm .			
23	01110400 (C1010110400)		Bolt, machine, hexagon head, M 16x75 mm; complete with one (1) hexagon nut, one (1) lock nut, and two (2) round washers .			
24	01110401 (C1010110401)		Bolt, machine, hexagon head, M 16x550 mm; complete with one (1) hexagon nut, one (1) lock nut, and two (2) round washers .			
25	01110402 (C1010110402)		Ditto as Item 24, but M 16x600 mm .			
26	01110403 (C1010110403)		Ditto as Item 24, but M 16x650 mm .			
27	01120000 (C1010120000)		Bolt, double arming, M 16x400 mm, complete with four (4) square nuts.			
28	01120001 (C1010120001)		Ditto as Item 27, but M 16x450 mm .			
29	01120002 (C1010120002)		Ditto as Item 27, but M 16x500 mm .			
30	01120003 (C1010120003)		Ditto as Item 27, but M 16x550 mm .			

Invitation to Bid No.

Specification No. : RHDW-011/2556

C4 Price schedule

Manufacturer :

Trade-mark :

Country of Origin:

Bidder :

Bid No. :

Date :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
31	01120004 (1010120004)		Ditto as Item 27, but M 16x600 mm .			
32	01120005 (1010120005)		Ditto as Item 27, but M 16x650 mm .			
33	01130000 (1010130000)		Bolt, double arming forged round eye, 16x400 mm, complete with three (3) square nuts, minimum breaking strength ..... kgf.			
34	01130001 (1010130001)		Ditto as Item 33, but M 16x450 mm, minimum breaking strength ..... kgf .			
35	01130002 (1010130002)		Ditto as Item 33, but M 16x500 mm, minimum breaking strength ..... kgf .			
36	01130003 (1010130003)		Ditto as Item 33, but M 16x600 mm, minimum breaking strength ..... kgf .			

Manufacturer :

Invitation to Bid No.

Trade-mark :

Specification No. : RHDW-011/2556

Country of Origin:

C4 Price schedule

Bidder :

Bid No. :

Date :

tem	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
37	01130004 (1010130004)		Ditto as Item 33, but M 16x550 mm, minimum breaking strength ..... kgf.			
38	01130005 (1010130005)		Ditto as Item33, but M 16x650 mm, minimum breaking strength ..... kgf.			
39	01140000 (1010140000)		Bolt, forged round eye. M 16x100 mm, complete with two (2) square nuts, minimum breaking strength ..... kgf.			
40	(1010140004)		Ditto as Item 39, but M 16x150 mm, minimum breaking strength ..... kgf.			
41	01140001 (1010140001)		Ditto as Item 39, but M 16x200 mm, minimum breaking strength ..... kgf.			
42	01140002 (1010140002)		Ditto as Item 39, but M 16x250 mm, minimum breaking strength ..... kgf.			

Invitation to Bid No.

Specification No. : RHDW-011/2556

C4 Price schedule

Manufacturer :

Trade-mark :

Country of Origin:

Bidder :

Bid No. :

Date :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
43	01140003 (1010140003)		Ditto as Item 39, but M 16x300 mm, minimum breaking strength ..... kgf.			
44	01150000 (1010150000)		Bolt, oval eye, M 16x150 mm, complete with one(1) square nut, minimum breaking strength ..... kgf.			
45	01150001 (1010150001)		Ditto as Item 44, but M 16x200 mm, minimum breaking strength ..... kgf.			
46	01150002 (1010150002)		Ditto as Item 44, but M 16x350 mm, minimum breaking strength ..... kgf.			
47	01150100 (1010150100)		Ditto as Item 44, but M 20x350 mm, minimum breaking strength ..... kgf.			
48	01150101 (1010150101)		Ditto as Item 44, but M 20x450 mm, minimum breaking strength ..... kgf.			
49	01160000 (1010160000)		Bolt, stubbing, full thread, M 24x600 mm, complete with four (4) square nuts and two (2) flat washers.			

Manufacturer :

Invitation to Bid No.

Trade-mark :

Specification No. : **RHDW-011/2556**

Country of Origin:

C4 Price schedule

Bidder :

Bid No. :

Date :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
50	01160001 (1010160001)		Ditto as Item 49, but M 24x800 mm .			
51	01160002 (1010160002)		Ditto as Item 49, but M 24x1,000 mm .			
52	01160003 (1010160003)		Ditto as Item 49, but M 24x1,250 mm .			
53	01160004 (1010160004)		Ditto as Item 49, but M 24x1,600 mm .			
54	01180001 (1010180001)		Nut, forged eye M 16, minimum breaking strength ..... kgf.			
55	01180002 (1010180002)		Eyelet, minimum breaking strength ..... kgf.			
56	01180003 (1010180003)		Nut, eye, thimble, minimum breaking strength ..... kgf.			
57	01180004 (1010180004)		Ditto as Item 56, minimum breaking strength ..... kgf.			
58	01180100 (1010180100)		Washer, square, flat, nominal size 16 .			
59	01180101 (1010180101)		Ditto as Item 58, but nominal size 20 .			
60	01180102 (1010180102)		Ditto as Item 58, but nominal size 24 .			
61	(1010190103)		Ditto as Item 58, but nominal size 12 .			

Invitation to Bid No.

Specification No. : **RHDW-011/2556**

C4 Price schedule

Manufacturer :

Trade-mark :

Country of Origin:

Bidder :

Bid No. :

Date :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
62	01180200 (C1010180200)		Washer, square, curved 50x50x5 mm, 18 mm diameter hole.			
63	01180201 (C1010180201)		Ditto as Item 62, but 60x60x5 mm, 22 mm diameter hole.			
64	01180300 (C1010180300)		Washer, lock, nominal size 12.			
65	01180301 (C1010180301)		Ditto as Item 64, but nominal size 16.			
66	01180302 (C1010180302)		Ditto as Item 64, but nominal size 20.			
67	01180303 (C1010180303)		Ditto as Item 64, but nominal size 24.			
68	01050000 (C1010050000)		Pipe, steel, nominal size 20, 100 mm long.			
69	01050002 (C1010050002)		Ditto as Item 68, but 150 mm long.			
~~70~~	~~01000100~~ (~~C1010000100~~)		~~Alley arm, of channel steel, 100x50x5 mm, 2,250 mm long.~~			
71	00120004 (C1000120004)		Crossarm, of channel steel, 150x75x9 mm, 3,000 mm long.			
72	01000400 (C1010000400)		Channel steel beam, nominal size 200x80x7.5 mm, 1,000 mm long.			
73	01010000 (C1010010000)		Angle steel beam, nominal size 65x65x6 mm, 1,000 mm long.			
74	01030102 (C1010030102)		Plate, steel, double arming, 12x100 mm, 760 mm long.			

Invitation to Bid No.
Specification No. : RHDW-011/2556
C4 Price schedule

Manufacturer :
Trade-mark :
Country of Origin:
Bidder :
Bid No. :
Date :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
75	03140011 (C1030140011)		Thimble clevis, pressed steel, minimum breaking strength ..... kgf.			
76	03140013 (C1030140013)		Plate spacer, of mild steel, minimum breaking strength ..... kgf.			
77	01030002 (C1010030002)		Plate, steel, 6x100 mm, 450 mm long.			
78	01030100 (C1010030100)		Plate, steel, double arming, 12x100 mm, 650 mm long.			
79	02440102 (C1020440102)		Clamp, guy, triple bolt, suitable for steel stranded wire 50-95 mm^2			
80	02440103 (C1020440103)		Link for cable spacer, 9.0 mm diameter steel round bar			
81	02440112 (C1020440112)		Bracket, of channel steel, 100x50x5 mm, for aerial cable corner support.			
82	01000106 (C1010000106)		Crossarm, of channel steel, nominal size 100 x 50 x 5 mm, 2,500 mm long.			
83	01000201 (C1010000201)		Crossarm, of channel steel, nominal size 125 x 65 x 6 mm, 3,000 mm long.			
84	01110404 (C1011104004)		Bolt, machine, hexagon head, M 16 x 50 mm; complete with one (1) hexagon nut, and two (2) round washers.			

Invitation to Bid No.

Specification No. : **RHDW-011/2556**

C4 Price schedule

Manufacturer :

Trade-mark :

Country of Origin:

Bidder :

Bid No. :

Date :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
85	02200106 (10202001060)		Vibration damper, dumbells type (stockbridge), for overhead ground wire diameter range 9.0 - 10.0 mm (Steel stranded wire 50 mm^2), approximate total weight 1.6 kg (3.5 pounds).			
86	02200107 (10202001070)		Vibration damper, dumbells type (stockbridge), for conductor diameter range 27.0 - 29.0 mm (ACSR conductor 380/50 mm^2), approximate total weight 7.3 kg (16 pounds).			

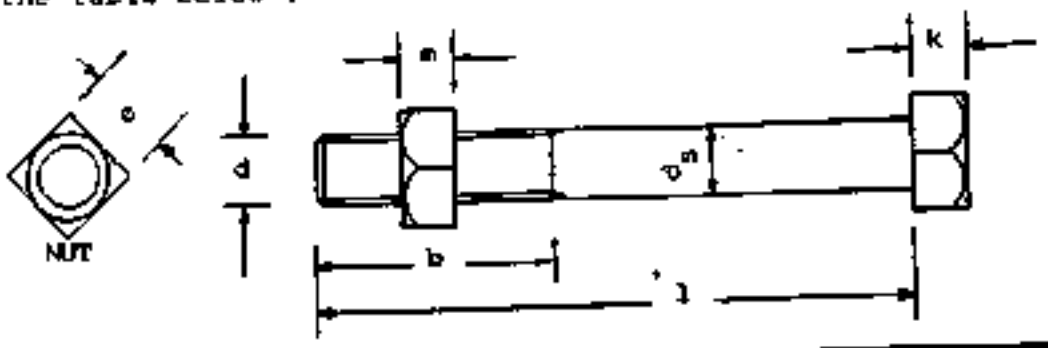
TABLE THICKNESS OF ZINC COATING

STEEL CATEGORY/MATERIAL	STEEL THICKNESS RANGE (mm)	MINIMUM AVERAGE COATING THICKNESS (µm)
FASTENERS :		
- BOLT, PIN, NUT, LOCK NUT :		
- UP TO M 10	-	43
- OVER M 10	-	53
- WASHER, LOCKWASHER	< 4.76	43
	4.76 - 6.35	53
- ANCHOR ROD	-	80
CASTINGS :		
- SOCKET EYE, SOCKET CLEVIS, STRAIN CLAMP, etc.,	-	86
FORGED ARTICLES :		
- BALL HOOK, Y CLEVIS BALL, BALL CLEVIS, BALL EYE, CLEVIS EYE, ANCHOR SHACKLES, etc.,	-	56
STRUCTURAL SHAPE :		
- STEEL CHANNEL, STEEL ANGLE, CROSSARM STEEL, BAYONET, GROUND ROD, etc.,	< 1.6	45
	< 3.2	65
	3.2 - 6.4	85
	> 6.4	100
STRIP :		
- BRACE, GUY THIMBLE, GUY GUARD, RACK, CLEVIS, STEEL BRACKET, PLATE STEEL, SPACER PLATE, etc.,	< 1.6	45
	< 3.2	65
	< 4.8	75
	4.8 - 6.4	85
	> 6.4	100
PIPE :	≥ 3.2	75

NOTE : THICKNESS OF COATING OF SPECIMENS SHALL BE MEASURED WITH A MAGNETIC MEASURING INSTRUMENT "MICROTEST" OR "ELECTROMAGNETIC COATING THICKNESS GAUGE"

Dimensions and Tolerances of M 16 Machine Bolts

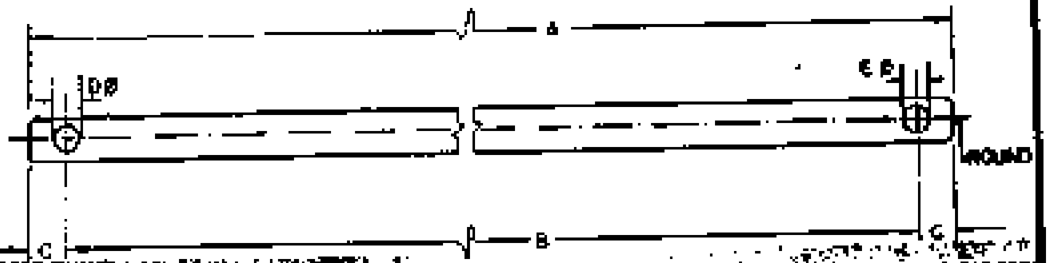
M 16 machine bolts shall have dimensions and tolerances as specified in the table below :



PEA Mat.No.	Machine Bolt Size	Dimensions in mm (Tolerances in mm)					
		d_s	l	b	k	e	m
01110200	M 16x130	16 (+0.95 −0.70)	130 (+5 −0)	35 (+6 −0)	10.5 (+2.0 −0.9)	26 or 24 (+0 −0.8)	13 (±0.9)
01110201	M 16x170	16 (+0.95 −0.70)	170 (+3 −2)	50 (+6 −0)	10.5 (+2.0 −0.9)	26 or 24 (+0 −0.8)	13 (±0.9)
01110202	M 16x200	16 (+0.95 −0.70)	200 (+3 −2.3)	50 (+6 −0)	10.5 (+2.0 −0.9)	26 or 24 (+0 −0.8)	13 (±0.9)
01110203	M 16x250	16 (+0.95 −0.70)	250 (+5 −2.3)	75 (+8 −0)	10.5 (+2.0 −0.9)	26 or 24 (+0 −0.8)	13 (±0.9)
01110204	M 16x300	16 (+0.95 −0.70)	300 (+5 −2.6)	75 (+8 −0)	10.5 (+2.0 −0.9)	26 or 24 (+0 −0.8)	13 (±0.9)
01110205	M 16x350	16 (+0.95 −0.70)	350 (+5 −2.85)	75 (+8 −0)	10.5 (+2.0 −0.9)	26 or 24 (+0 −0.8)	13 (±0.9)
01110206	M 16x400	16 (+0.95 −0.70)	400 (+5 −2.95)	100 (+8 −0)	10.5 (+2.0 −0.9)	26 or 24 (+0 −0.8)	13 (±0.9)
01110207	M 16x450	16 (+0.95 −0.70)	450 (+7 −3.15)	100 (+8 −0)	10.5 (+2.0 −0.9)	26 or 24 (+0 −0.8)	13 (±0.9)
01110208	M 16x500	16 (+0.95 −0.70)	500 (+7 −3.15)	150 (+8 −0)	10.5 (+2.0 −0.9)	26 or 24 (+0 −0.8)	13 (±0.9)

Note : Thread length (b) is measured from the end of the bolt to the last thread of nut entering.

PRELIMINARY



[illegible] MAT.NO.	[illegible] DIMENSIONS IN MM.					[illegible] MATERIAL, SURFACE FINISHING, REMARKS
	A	B	C	D Ø	E Ø	
01200001	760	707	26.5	18	18	[illegible] 30X6 [illegible] FLAT IRON 30X6 MILD STEEL HOT GALV.
01200002	1000	950	25	18	18	[illegible] 40X6 [illegible] FLAT IRON 40X6 MILD STEEL HOT GALV.

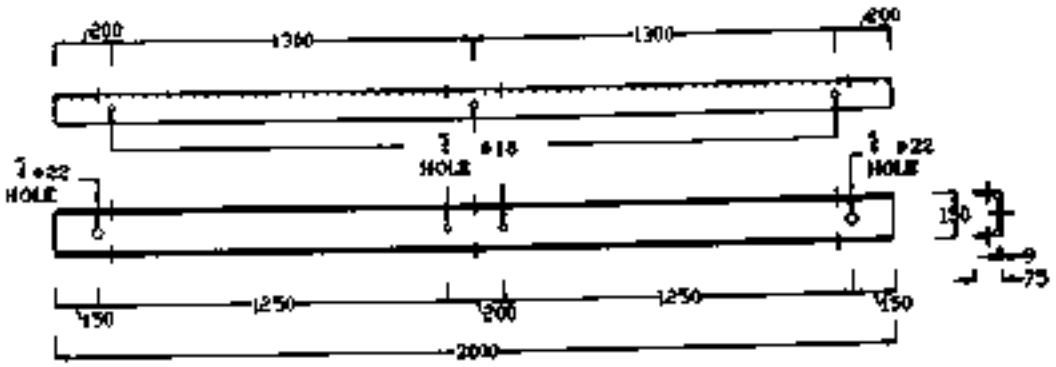
GERMAN ADVISORY TEAM — PROVINCIAL ELECTRICITY AUTHORITY

[illegible] SCALE 1:5	[illegible] DATE 20/9/66	เหล็กประกับแขน 01 [illegible]
FOR G. A. T.	FOR P. E. A. Drn by [signature]	BRACE, FLAT, FOR CROSS-ARM 01 CROSS ARMS, BRACES, ANCHORS, GUYING MATERIALS, STEEL WIRE, CLAMPS FOR STEEL WIRE.
[signature]	[signature]	K 31 | 09063 | SHEET NO. 1 OF 1

การประกอบแบบที่
ASSEMBLY NO.

PRELIMINARY

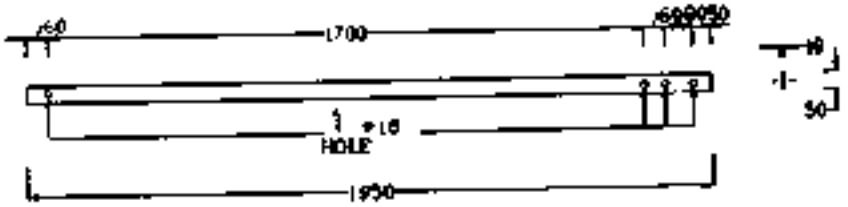
MAT. NO. 0012000M



คอนสายแบบเหล็กรูปรางน้ำ

CROSSARM, STEEL CHANNEL

MAT NO 0120000



เหล็กประกับคอนสาย

BRACE, FLAT, FOR CROSSARM

NOTE:

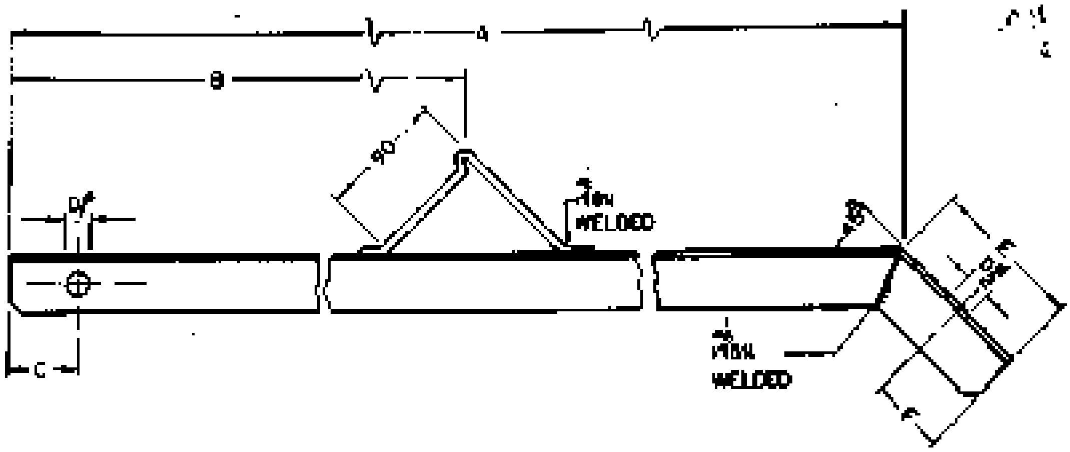
1. ALL DIMENSIONS ARE IN mm.
2. STEEL CHANNEL ACCORDING TO TABLE 8 OF TIS 116 *
3. BRACE, FLAT ACCORDING TO TABLE 1 OF TIS 55
4. HOT-DIP GALVANIZED

* CHANGE TO TIS 1227 TABLE 4

กองโครงการและพัฒนาเครื่องกลและวิศวกรรม	การไฟฟ้าส่วนภูมิภาค	ใช้แทนแบบ ดูแทนโดยแบบ เขียนแล้วเสร็จวันที่ 20 ก.พ. 39 แก้แบบวันที่ มีสิ่งเป็น มิลลิเมตร มาตราส่วน –
ผู้เขียน ผู้สำรวจ วิศวกร ผู้ตรวจแบบ ผู้อำนวยการกอง ผู้อำนวยการสาย	ผู้ว่าการ	
รองผู้ว่าการ	คอนสายแบบเหล็กรูปรางน้ำ ขนาด 150x75x9 มม.ยาว 3.00 ม. และเหล็กประกับคอนสาย ขนาด 50x10x1 950 มม. CROSSARM, STEEL CHANNEL, 150x75x9 mm. 3.00 m LONG AND BRACE, FLAT, FOR CROSSARM, 50x10x1,950 mm	แบบมาตรฐานที่ SA2-015/39005 แผ่นที่ 1 ของจำนวน 1 แผ่น

การประกอบเลขที่ ASSEMBLY NO	3103

* 2103 ...

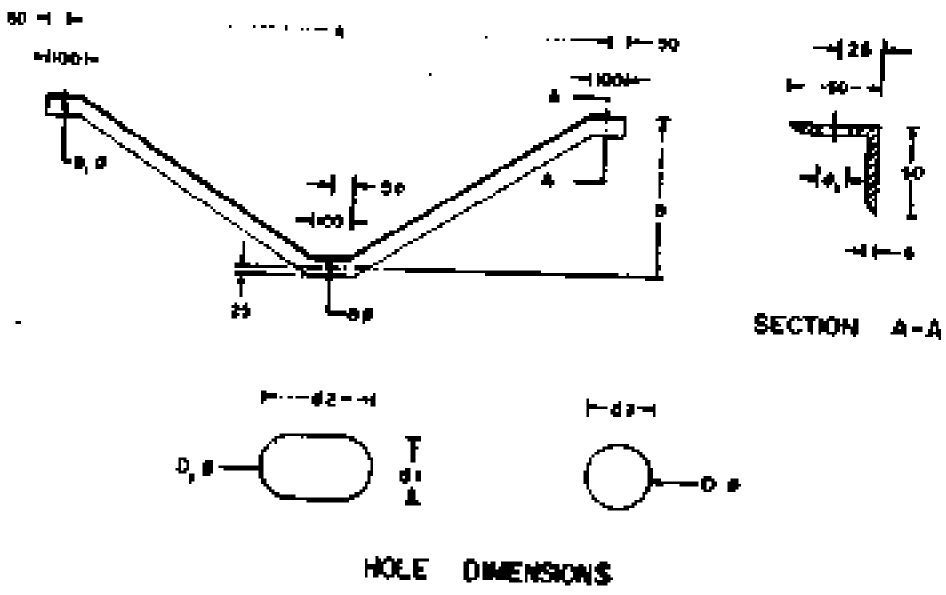


PRELIMINARY

วัสดุเลขที่ MAT.NO.	มิติ มม. DIMENSIONS MM							วัสดุ ... , หมายเหตุ MAT. SURFACE FINISHING, REMARKS
	A	B	C	Ø	Ø	E	F	
01200004	2120	1000	50	18	18	100	50	เหล็กฉาก 40 X 40 X 5 มม. ... 30 X 6 มม. ... [redacted] ... [redacted] BRACE ; ANGLE IRON 40X40X5 MM. FOOT STEP ; FLAT IRON 30X6 MM. MILD STEEL [redacted] HOT GALV. [redacted] AFTER FABRICA-TION.
01200005	2350	1000	50	18	18	100	50	เหล็กฉาก 50 X 50 X 6 มม. ... 30 X 6 มม. ... [redacted] ... [redacted]. BRACE ; ANGLE IRON 50X50X6MM. FOOT STEP: FLATIRON 30X6MM MILD STEEL [redacted], HOT GALV. [redacted] AFTER FABRICATION

GERMAN ADVISORY TEAM — PROVINCIAL ELECTRICITY AUTHORITY

มาตราส่วน SCALE 1:5	วันที่ DATE 20 / 9 / 66	เหล็กประกับไม้คอน... 01 ...
FOR G. A. T.	FOR P. E. A. Drw. by ...	BRACE, ALLEY, ARM 01 CROSS - ARMS, BRACES, ANCHORS, GUYING MATERIAL STEEL WIRE
		K 31 | 09064 | SHEET NO. 1 OF 1



ที่ชุดพัสดุ MAT NO.	มิติ เป็น DIMENSIONS IN	มม. mm			วัสดุและการตกแต่งผิว MATERIAL, SURFACE FINISHING
	A	B	D ø (d3)	D ø (d1 x d2)	
01200006	1,500	440	18	18 X 30	เหล็กฉากชนิดขาเท่ากัน ขนาด 50 X 50 X 6 มม. ตาม มอก. ชุบสังกะสีแบบจุ่มร้อน ตามมาตรฐาน กฟภ. ANGLE STEEL, EQUAL ANGLES 50 X 50 X 6 mm ACC. TIS. HOT DIP ONLY. ACC. TO PEA. STANDARD
01200007	1,800	450	18	18 X 30	

20 ก.ค. 22

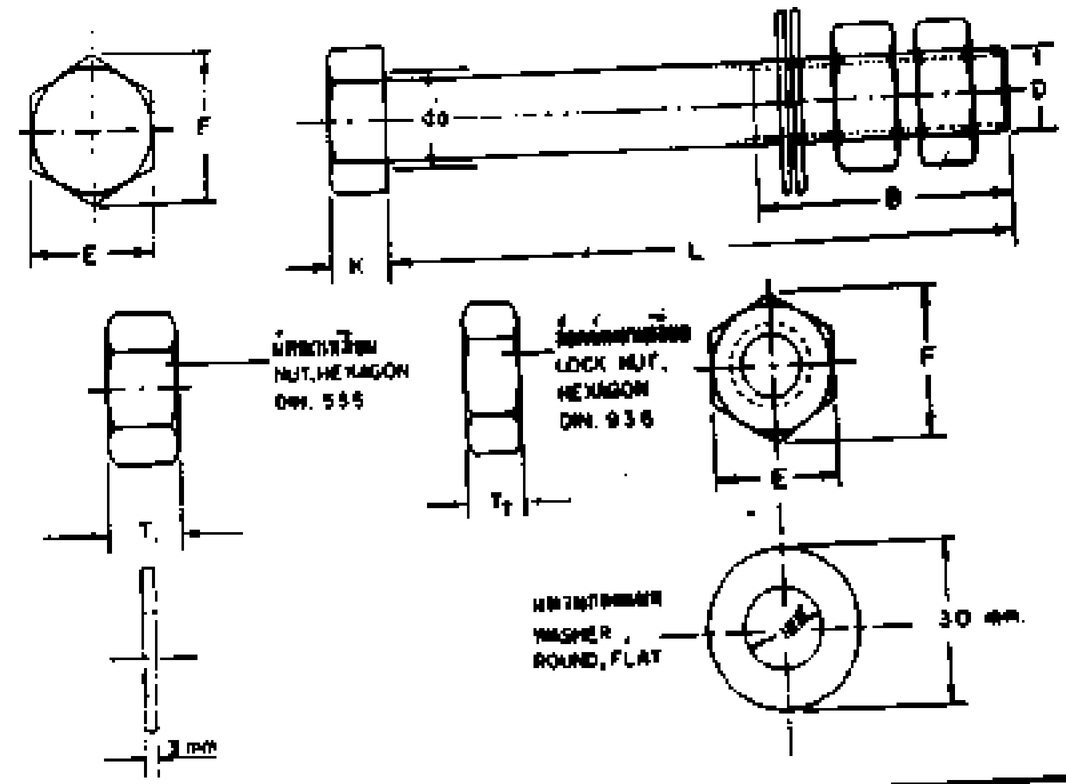
1.2.04.1.20

SM-016/22011

เหล็กฉากรับคอนสาย ขนาด 50 X 50 X 6 มม

BRACE, ANGLE STEEL 50 X 50 X 6 mm

PRELIMINARY

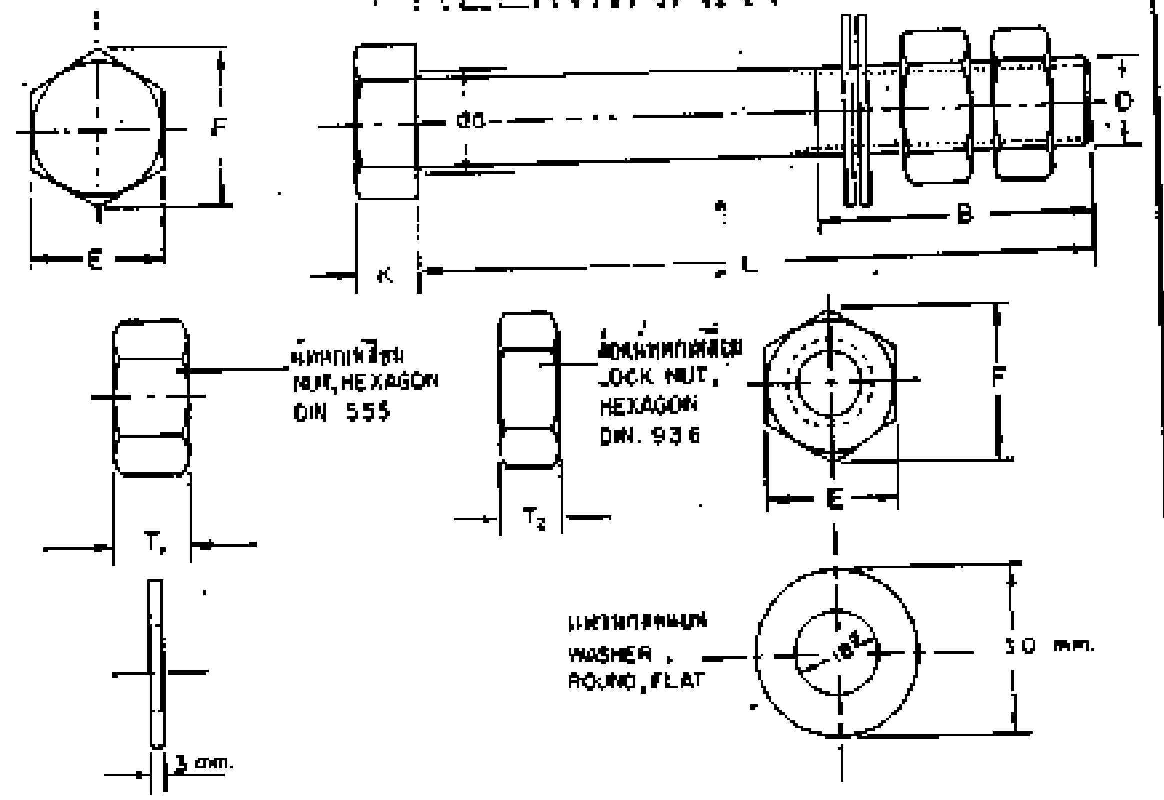


วัสดุเลขที่ MAT NO	มิติ DIMENSIONS IN มม mm									แรงประลัย (กก.) BREAKING STRENGTH (kgf.)	น้ำหนัก กก./100ชิ้น WEIGHT kg./100PCS	วัสดุ อาบผิว MATERIAL, SURFACE FINISHING
	D	L	B	K	E	F	do, max	T_1	T_2			
01110400	16	75	75	10	24	27.7	19.2	13	8	8,000		เหล็กกล้า อาบสังกะสี ตาม มาตรฐาน กฟภ. STEEL HOT DIP GALVANIZED ACC. TO PEA STANDARD
[illegible]	16	650	150	10	24	27.7	19.2	13	8	8,000		

กองวิศวกรรมไฟฟ้าและเครื่องกล ฝ่ายวิศวกรรม การไฟฟ้าส่วนภูมิภาค

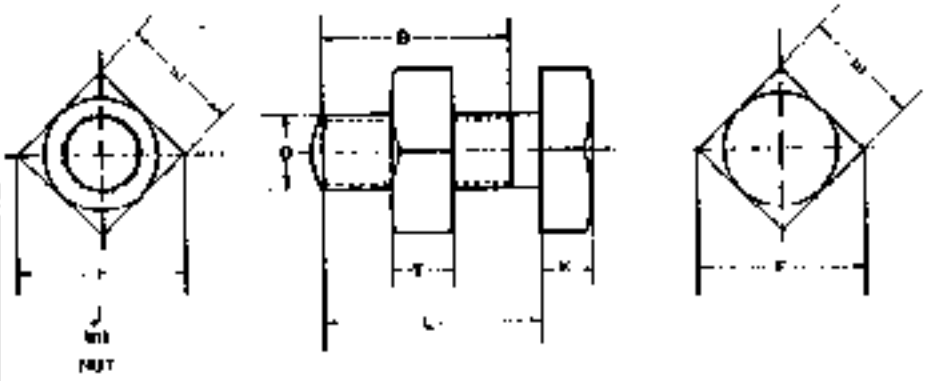
ฉบับ [illegible] วันที่ 1 ตค.2539	สลักเกลียว หัวหกเหลี่ยม เอ็ม16 BOLT, MACHINE HEXAGON M.16	แบบเลขที่ SA1-015/39019 แผ่นที่ 1 ของทั้งหมด 1 แผ่น

PRELIMINARY



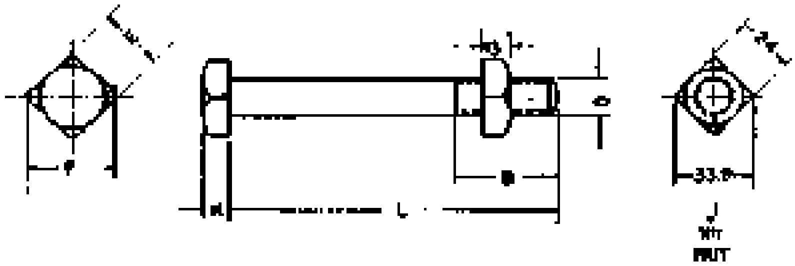
วัสดุเลขที่ MAT NO	มิติ DIMENSIONS									แรงประลัย (กก.) BREAKING STRENGTH (kg f.)	น้ำหนัก กก./100ชิ้น WEIGHT kg./100Pcs.	วัสดุ ฉาบผิว MATERIAL, SURFACE FINISHING
	D	L	B	K	E	F	do max	T_1	T_2			
												เหล็กกล้า
												ชุบสังกะสี ตามมาตรฐานของ กฟภ. STEEL
0110401	16	550	150	10	24	27.7	19.2	13	8	8,000		HOT DIP GALVANIZED ACC. TO PEA. STANDARD.
0110402	16	600	150	10	24	27.7	19.2	13	8	8,000		

กองวิศวกรรม	การไฟฟ้าส่วนภูมิภาค	ผู้ออกแบบ..............
ผู้เขียน..............	ผู้ว่าการ..............	ผู้ตรวจแบบ..............
ผู้ตรวจ..............	สลักเกลียว หัวหกเหลี่ยม เอ็ม 16	เขียนแบบวันที่ 25.06.28
วิศวกร..............		แก้แบบวันที่ 25.06.28
หัวหน้าแผนก..............	BOLT, MACHINE, HEXAGON M.16	มาตราส่วน..............
ผู้อำนวยการกอง..............		ขนาดกระดาษ..............
รองผู้ว่าการฝ่ายพัฒนา		แบบเลขที่ S01-015/18035
		แผ่นที่ 1 จำนวนทั้งหมด 1 แผ่น



MAT. NO	DIMENSION IN MM. D	L	B	K	E	F	T	WEIGHT Kg./100 pcs	MATERIAL, SURFACE FINISHING, REMARKS
DB00000	M8	25	22	5.5	13	16.4	6.5		STEEL, PROPERTY CLASS 4.8 TO TIS. 171 HOT DIP GALV. ACC. TO PEA. STANDARD
DB01100	M12	35	30	8	19	28.9	9.5		
DB01101	M12	50	40	8	19	28.9	9.5		

	การไฟฟ้าส่วนภูมิภาค	
	BOLT, MACHINE 02 BOLT, HARDWARE, STRAIN & SUSPENSION	

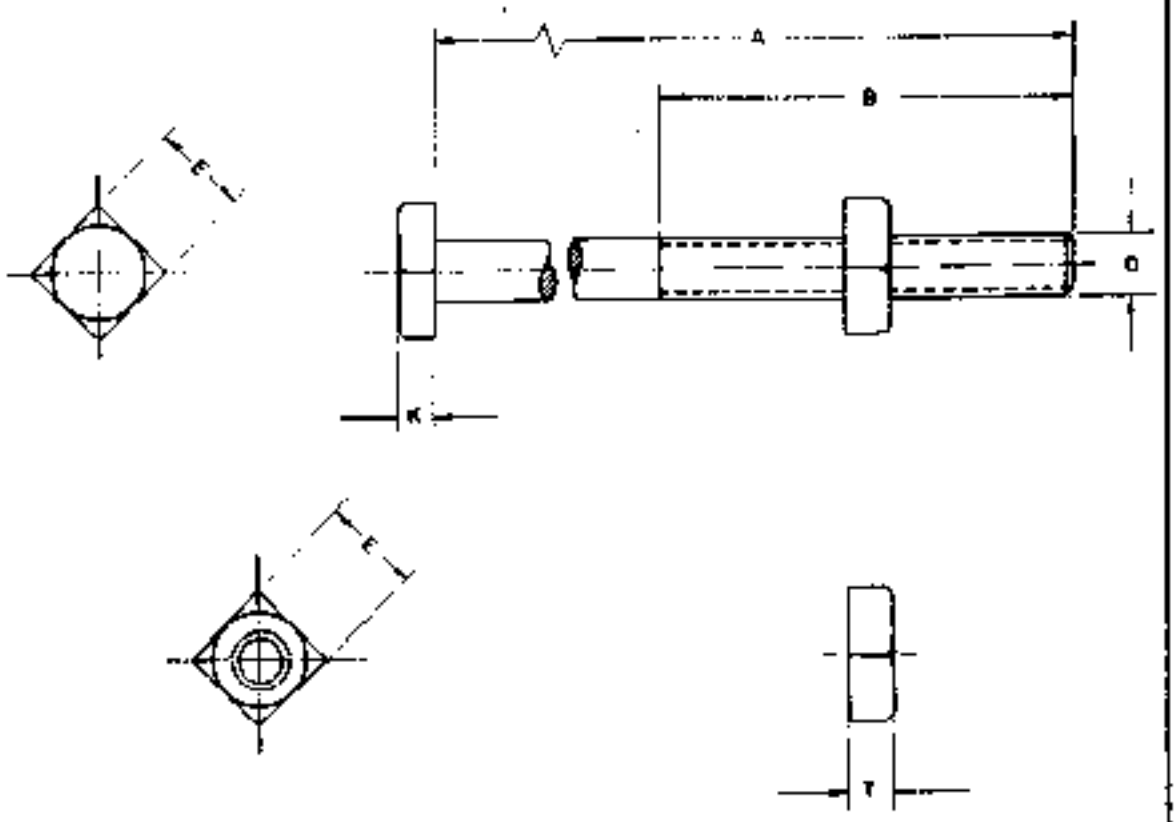


MAT. NO.	DIMENSIONS IN MM						WEIGHT kg/100 Pcs.	MATERIAL, SURFACE FINISHING, REMARKS
	D	L	B	H	E	F		
0110200	M16	130	35	10.5	24	32	≈ 24.4	STEEL, PROPERTY CLASS 4.6 ACC. TO TIS. 171 HOT DIP GALV. ACC. TO PEA. STANDARD.
0110201	M16	170	50	10.5	24	32	≈ 32.4	
0110202	M16	200	50	10.5	24	32	≈ 40.2	
0110203	M16	250	75	10.5	24	32	≈ 48	
0110204	M16	300	75	10.5	24	32	≈ 56	
0110205	M16	350	75	10.5	24	32	≈ 63.8	
0110206	M16	400	100	10.5	24	32	≈ 71.6	
0110207	M16	450	100	10.5	24	32	≈ 79.6	
0110208	M16	500	150	10.5	24	32	≈ 87.6	

NOTE: IF NOT OTHERWISE INDICATED THE MACHINE BOLT IS FITTED WITH ONE SQUARE NUT

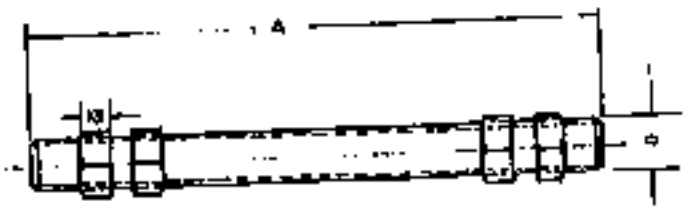
GERMAN ADVISORY TEAM · PROVINCIAL ELECTRICITY AUTHORITY

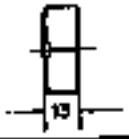
SCALE 1:2.5	DATE 22/9/64	สลักเกลียว
	Drn. by	BOLT, MACHINE.
		02 BOLTS, MACHINE, STRAIN & SUSPENSION
		K 31 | 09072 | SHEET NO. 1 OF 1

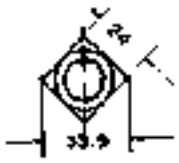


MATERIAL NUMBER	DIMENSIONS D	A	B	K	E	T	WEIGHT kg. / 100 Pcs.	MATERIAL & SURFACE FINISHING
0111030I	M.20	400	100	13	30	16		STEEL, PROPERTY CLASS 4.6 ACC. TO TIS. 171 HOT DIP GALV. ACC. TO PEA. STANDARD.
01110302	M.20	450	100	13	30	16		
01110303	M.20	550	150	13	30	16		

BOLT, MACHINE M 20 mm.







MAT. NO.	DIMENSIONS IN MM D	A	WEIGHT kg/100 PIECES	MATERIAL, SURFACE FINISHING, REMARKS
0W20000	M16	400	~ 69.2	STEEL, PROPERTY CLASS 4.6 ACC. TO TIS 171 HOT DIP GALV ACC. TO PEA. STANDARD.
0W20001	M16	450	~ 77.0	
0W20002	M16	500	~ 85.0	
0W20004	M16	600	~	

NOTE. IF NOT OTHERWISE INDICATED THE DOUBLE ARMING BOLT IS FITTED WITH FOUR SQUARE NUTS

GERMAN ADVISORY TEAM — PROVINCIAL ELECTRICITY AUTHORITY

SCALE 1:2.5

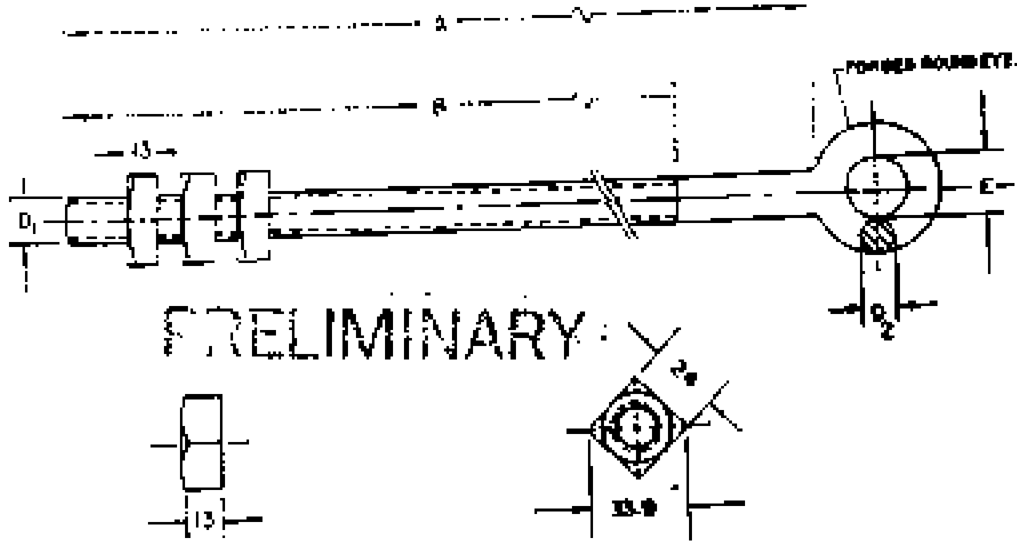
DATE 22/9/46

02

BOLT, DOUBLE ARMING

02 BOLTS, HARDWARE, STRAIN & SUSPENSION.

K 34 | 09069 | SHEET NO. 1 OF 1

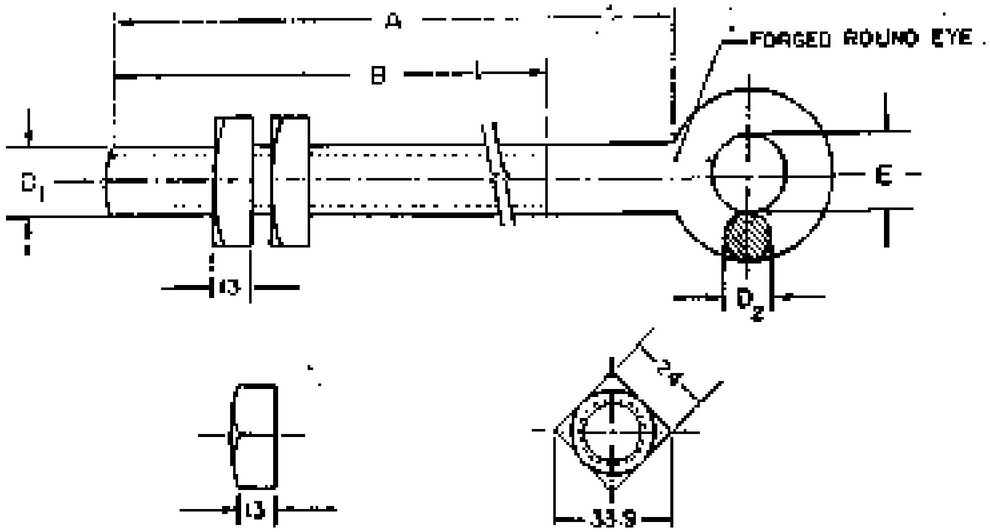


MAT NO.	DIMENSION IN MM.					BREAKING STRENGTH (kgf)	WEIGHT /100PCS.	MATERIAL + SURFACE FINISHING
	D_1	A	B	E	D_2			
0150000	M16	400	350	22	12	5000	≈ 64	
0150001	M16	450	400	22	12	5000	≈ 107	STEEL
0150002	M16	500	450	22	12	5000	≈ 143	HOT DIP GALV ACC. TO PEA STANDARD
0150003	M16	600	550	22	12	5000	≈	
0150004	M16	550	500	22	12	5000		
0150005	M16	650	600	22	12	5000		

NOTE :
IF NOT OTHERWISE INDICATED THE DOUBLE ARMING BOLT, ROUND EYE, IS FITTED WITH THREE SQUARE NUTS

กองวิศวกรรม	การไฟฟ้าส่วนภูมิภาค	KJ-09070
		20.6.A.IZ.
	สลักเกลียว , ห่วงกลม	1 : 2.5
	BOLT, DOUBLE ARMING, ROUND EYE.	201-06/1200

PRELIMINARY

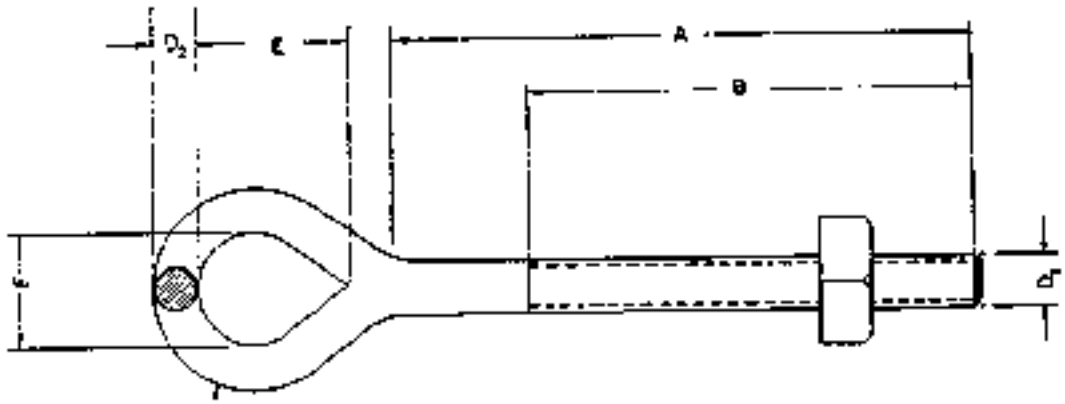


วัสดุเลขที่ MAT. NO.	มิติ มม. DIMENSION IN mm					แรงประลัย กก. BREAKING STRENGTH (kgf)	น้ำหนัก กก./100 ชิ้น WEIGHT kg/100 Pcs	วัสดุ ฉาบผิว MATERIAL, SURFACE FINISHING
	D1	A	B	E	D2			
0I40000	M16	100	75	22	12	5,000	≃ 17	เหล็กกล้า
								ฉาบสังกะสีตามมาตรฐาน ของ กฟภ.
0I40001	M16	200	150	22	12	5,000	≃ 34	STEEL
0I40002	M16	250	200	22	12	5,000	≃ 42.5	HOT DIP GALV. ACC. TO PEA STANDARD
0I40003	M16	300	250	22	12	5,000	≃ 51	

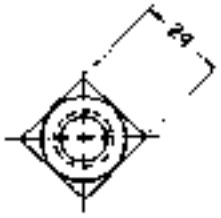
หมายเหตุ : ถ้ามิได้ระบุไว้เป็นอย่างอื่น สลักเกลียวห่วงกลมประกอบด้วย น็อตสี่เหลี่ยม 2 ตัว

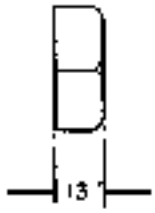
NOTE : IF NOT OTHERWISE INDICATED THE BOLT, ROUND EYE, IS FITTED WITH TWO SQUARE NUTS.

กองวิจัยและทดสอบ	การไฟฟ้าส่วนภูมิภาค	ใช้แทนแบบ........
เขียน	ผู้ว่าการ 27	ถูกแทนที่โดยแบบ ....
ตรวจ		เขียนเสร็จเมื่อ 10/9/19
หัวหน้าแผนก	0I40000 - 0I40003 สลักเกลียว ห่วงกลม	แก้ไขครั้งที่ ....
ผู้อำนวยการกอง		มาตราส่วน .... มม.
รองผู้ว่าการฝ่ายเทคนิค	0I40000 - 0I40003 BOLT, ROUND EYE	เอกสารอ้างอิง ....
		แบบเลขที่ SDI-015/19041
		แผ่นที่ 1 จำนวน 1 แผ่น



FORGED OVAL EYE

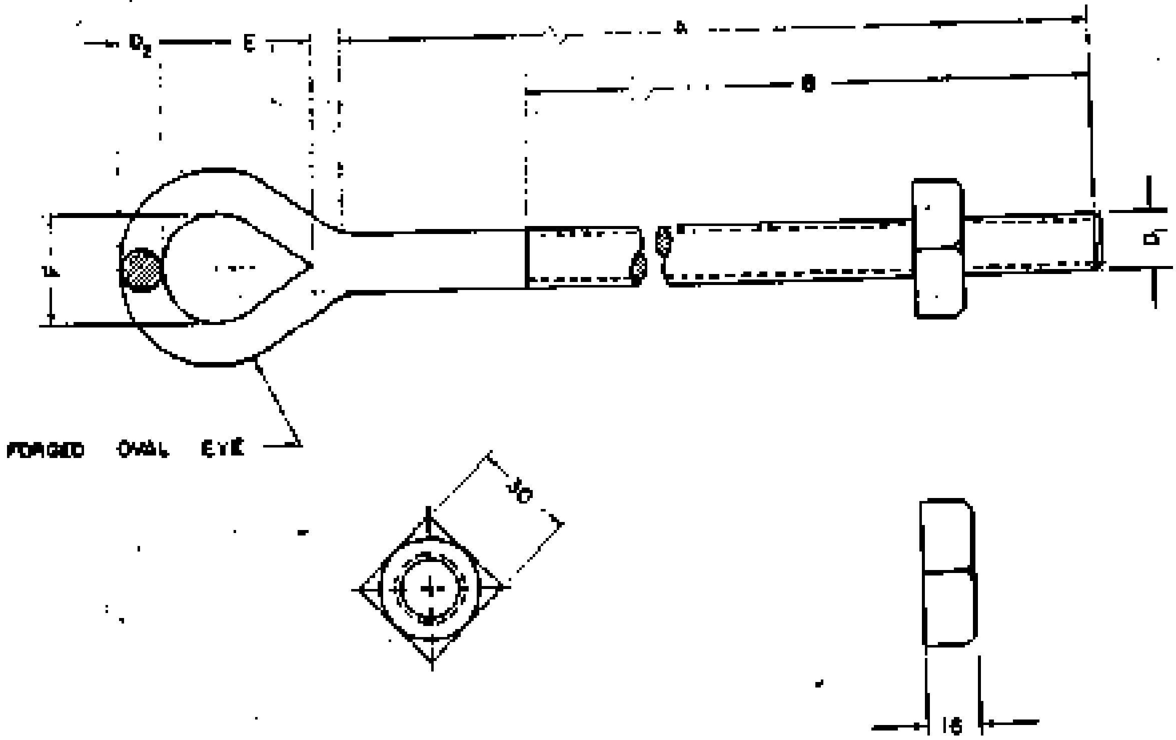




หมายเลขพัสดุ MATERIAL NUMBER	ขนาด DIMENSIONS in mm D_1	A	B	E	F	D_2	แรงดึงขาด BREAKING STRENGTH kg	น้ำหนัก WEIGHT kg/100 Pcs.	ชนิดและการอาบผิว MATERIAL & SURFACE FINISHING
01150000	M 16	150	100	50	38	14	≥6,500		ชนิดวัสดุ MILD STEEL HOT DIP GALV. ACC TO PEA. STANDARD.
01150001	M 16	200	150	50	38	14	≥6,500		
01150002	M 16	350	150	50	38	14	≥6,500		

PRELIMINARY

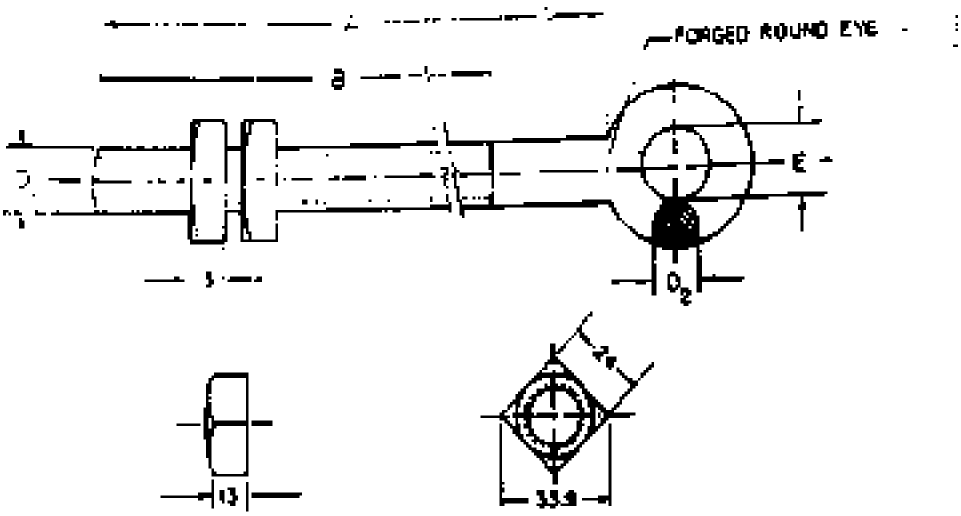
	การไฟฟ้าส่วนภูมิภาค	
	สลักห่วงโอแวล เอ็ม 16	วันที่ 29 มิถุนายน 2543
	BOLT, OVAL EYE, M 16	301-05/22016



PRELIMINARY

รหัสพัสดุ MATERIAL NUMBER	มิติ เป็น มม DIMENSIONS in mm D_1	A	B	E	F	D_2	แรงดึงประลัย BREAKING STRENGTH kg.	น้ำหนัก กก./100 ชิ้น WEIGHT kg/100Pcs	วัสดุและการชุบผิว MATERIAL & SURFACE FINISHING
01180100	M 20	350	150	50	38	16	≥12,000		[illegible] STEEL HOT DIP GALV ACC TO PEA STANDARD
01150101	M 20	450	200	50	38	16	≥12,000		

[illegible]	การไฟฟ้าส่วนภูมิภาค	เขียนแบบ..............
ผู้ออกแบบ..............	ผู้อนุมัติ..............	ตรวจสอบ..............
ผู้ตรวจ..............	สลักห่วงโอแวล, เอ็ม 20	เปลี่ยนแปลงครั้งที่..............
วิศวกร..............		เทียบแบบเดิม..............
หัวหน้าแผนก..............		มิติเป็น.....มม.....
หัวหน้ากอง..............		มาตราส่วน..............
ผู้อำนวยการฝ่าย..............	BOLT, OVAL EYE, M20	แบบเลขที่ SA1-015/22019
รองผู้ว่าการฝ่ายเทคนิค		แผ่นที่ 1 จำนวน 1 แผ่น



วัสดุเลขที่ MAT. NO	มิติ มม. DIMENSION IN mm					แรงประลัย กก. BREAKING STRENGTH (kgf)	น้ำหนัก กก./ต่อชิ้น WEIGHT kg./no Pcs.	วัสดุ ผิวสำเร็จ MATERIAL, SURFACE FINISHING
	D_1	A	B	E	D_2			
-	M16	150	100	22	12	5,000	≃ 25.5	เหล็กกล้า ชุบสังกะสีตามมาตรฐานของ กฟภ. STEEL HOT DIP GALV. ACC. TO PEA. STANDARD

หมายเหตุ . ถ้าหากไม่ระบุไว้เป็นอย่างอื่น
สลักเกลียวห่วงกลมประกอบด้วย
น๊อตสี่เหลี่ยม 2 ตัว

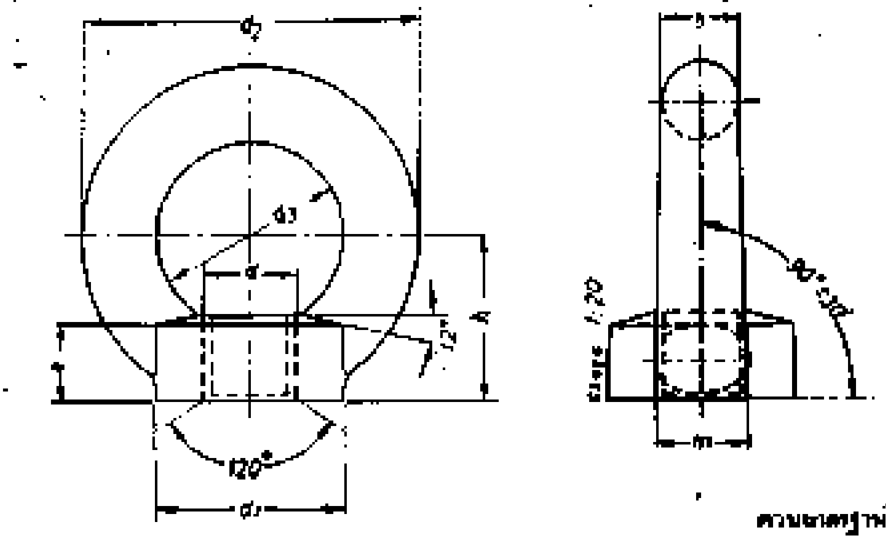
NOTE . IF NOT OTHERWISE INDICATED
THE BOLT, ROUND EYE, IS
FITTED WITH TWO SQUARE NUTS.

PRELIMINARY

[illegible]

เขียน .... - วันที่ 19 กย 2539	สลักเกลียว ห่วงกลม BOLT, ROUND EYE	แบบเลขที่ [illegible] แผ่นที่ 1 จำนวน 1 แผ่น

PRELIMINARY

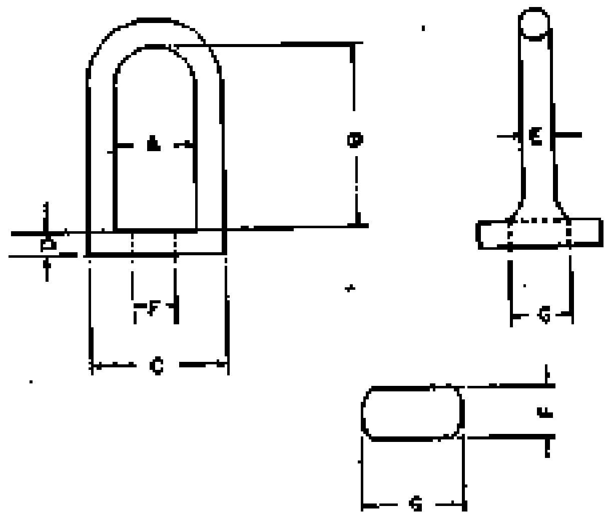


ตามมาตรฐานดิน 582
ACC. TO DIN 582

วัสดุเลขที่ MAT NO	มิติ มม DIMENSIONS IN mm								น้ำหนัก กก/100 ชิ้น WEIGHT IN kg./100 Pcs.	วัสดุ ตกแต่งผิว หมายเหตุ MAT., SURF. FINISHING, REMARKS
	d	d_1	d_2	d_3	e	h	k	m		
0118000I	M16	35	63	35	13	30	14	16	~ 238	วัสดุตามมาตรฐาน [illegible] ชุบสังกะสี MAT. [illegible] HOT GALV.

กองวิศวกรรม	การไฟฟ้าส่วนภูมิภาค	ใช้แทนแบบ KSE-09068
ผู้เขียน	ตำแหน่ง	ถูกแทนโดยแบบ ....
ผู้ตรวจ		เขียนเสร็จวันที่ ....
วิศวกร	น็อตรูปห่วง ... ดิน 582	แก้แบบวันที่ ....
หัวหน้าแผนก	03 สกรู, น็อต, แหวน, ตะปู, ตะปูสองขา	มิติเป็น ..... มม.
ผู้อำนวยการกอง	NUT EYE, ... DIN 582	มาตราส่วน ....
รองผู้ว่าการฝ่ายเทคนิค	03 SCREWS, NUT, WASHERS, NAILS, STAPLES	แบบเลขที่ SA-OPA/6004
		แผ่นที่ 1 ของจำนวน 1 แผ่น

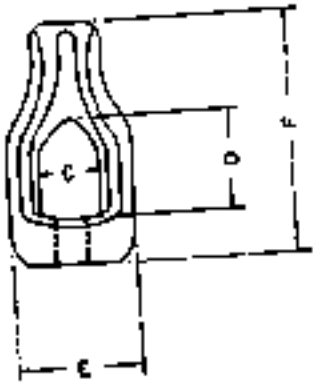
PRELIMINARY

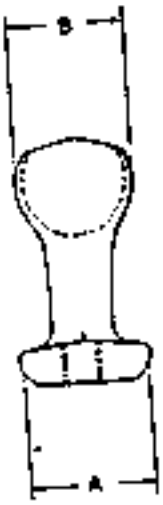


[illegible] MATERIAL NUMBER	DIMENSIONS IN mm.						[illegible] BREAKING STRENGTH kg.	[illegible] FOR BOLT	[illegible] MATERIAL & SURFACE FINISHING
	A	B	C	D	E	F x G			
01160002	32 (1¼")	76 (3")	57 (2¼")	10 (⅜")	13 (½")	21x29 (13/16"x1⅛")	≥ 6,320	M 20 (¾")	[illegible] NEMA STANDARD NO. PH 5 HOT DIP GALV. [illegible]

[illegible]	การไฟฟ้าส่วนภูมิภาค	[illegible] [illegible] [illegible] 5 [illegible] 24 [illegible] [illegible] [illegible]
[illegible]	[illegible]	
	01160002 [illegible]	
[illegible]	01160002 EYELET	[illegible] SB1-05/2025 [illegible] 1 [illegible] 1 [illegible]

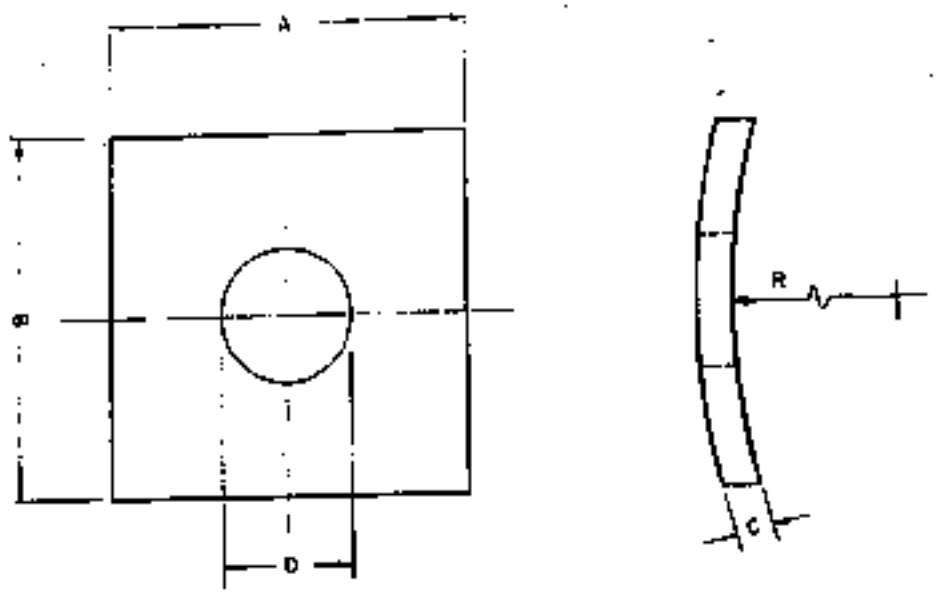
PRELIMINARY





MATERIAL NUMBER	DIMENSIONS in mm						BREAKING STRENGTH kg	FOR BOLT	FOR STEEL STRANDED WIRE mm.	MATERIAL & SURFACE FINISHING
	A	B	C	D	E	F				
01160003	38	38	22	35	47	82	≥ 8,500	M 18	25 – 30	FORGED STEEL STEEL HOT DIP GALV. ACC TO PEA. STRANDARD.
01160004	38	38	22	35	47	82	≥ 8,200	M 20	30 – 35	

กองวิจัยและทดสอบ	การไฟฟ้าส่วนภูมิภาค	
	ทิมเบิลอายนัท	
	NUT, EYE . THIMBLE	



PRELIMINARY

MAT. NO.	DIMENSIONS IN MM. A	B	C	D	R	WEIGHT IN kg./100 Pcs.	MATERIAL, SURFACE - FINISHING, REMARKS
0180200	50	50	5	18	125	~6.82	MILD STEEL, HOT GALV
0180201	60	50	5	22	125	~12.65	MILD STEEL, HOT GALV

GERMAN ADVISORY TEAM – PROVINCIAL ELECTRICITY AUTHORITY

SCALE FOR G.A.T.	DATE 23/9/66 FOR P.E.A. Drw. By	WASHER, CURVED, SQUARE. 03 SCREWS, NUTS, WASHERS, NAILS, STAPLES.
		K 31 | 09073 | SHEET NO. 1 OF 1

PRELIMINARY

ASSEMBLY NO.

MAT.NO 0100400

MAT.NO 0100401

SCALE 1:10

DETAIL A 1:10

DETAIL B 1:10

DETAIL C 1:10

NOTE

1. ALL DIMENSIONS ARE IN mm
2. CHANNEL STEEL ACCORDING TO TIS. 116 TABLE 6*
3. HOT - DIP GALVANIZED

* CHANGE TO TIS 1227 TABLE 1

CHANNEL STEEL BEAM

a. SIZE 200 X 80 X 7.5 mm LONG 1,000 mm LONG

b. SIZE 200 X 80 X 7.5 mm LONG 6,000 mm LONG

PRELIMINARY

ASSEMBLY NO

MAT NO. 01 010000

SEE DETAIL A

SCALE 1:10

DETAIL A 1:2

MAT. NO.0101 0102

SEE DETAIL B

NOTE

1. ALL DIMENSIONS ARE IN mm
2. ANGLE STEEL ACCORDING TO TIS.116 TABLE 3*
3. HOT-DIP GALVANIZED

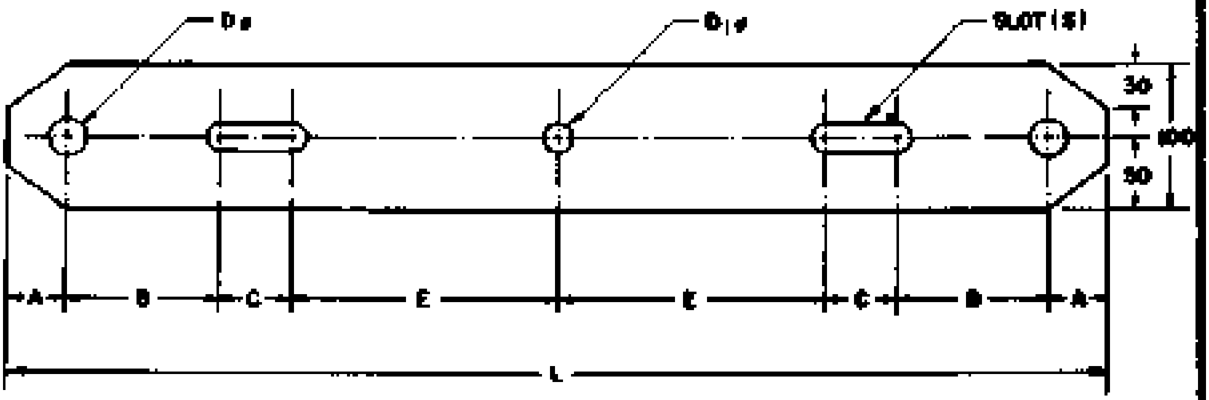
* CHANGE TO TIS 1227 TABLE 2

a. SIZE	65 X 65 X 6	mm
b. SIZE	75 X 75 X 7	mm

ANGLE STEEL BEAM

a. SIZE	65 X 65 X 6	mm
b. SIZE	75 X 75 X 6	mm

ASSEMBLY NO.



SLOT (S)

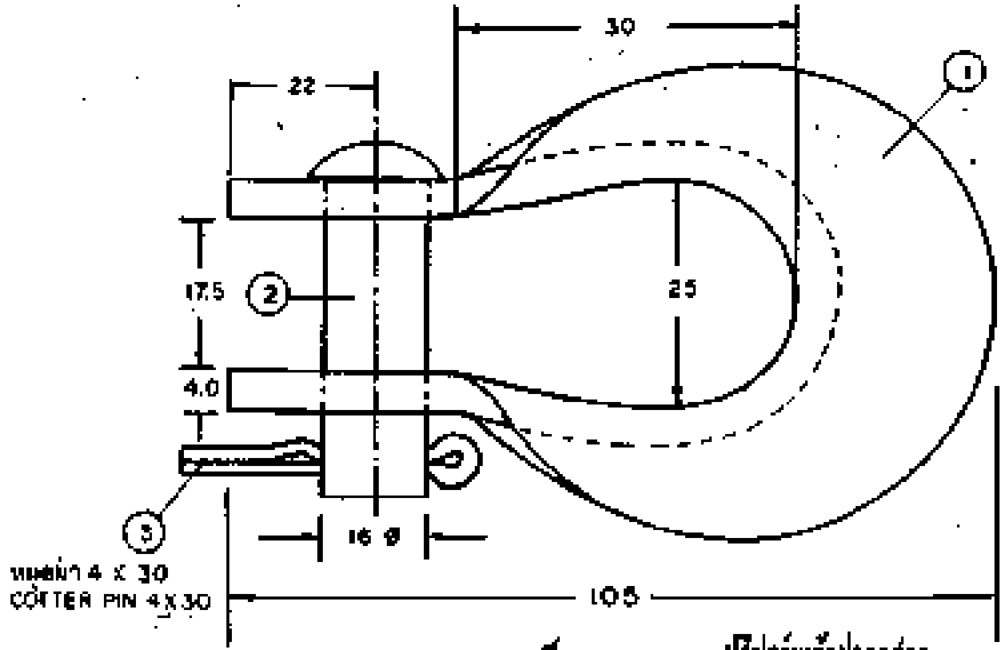
MATERIAL NUMBER	DIMENSIONS IN mm.									MATERIAL & SURFACE FINISHING
	STEEL SIZE	L	A	B	C	E	Dø	D1ø	S (d1 x d2)	
01030102	12 X 100	760	40	105	50	185	24	18	18 X 68	FLAT STEEL BARS TIS. 58 HOT DIP GALV.

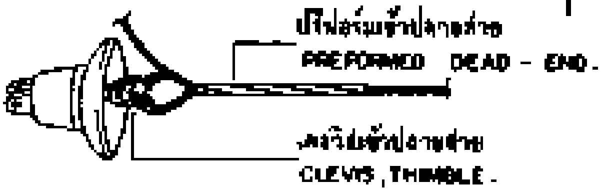
PRELIMINARY

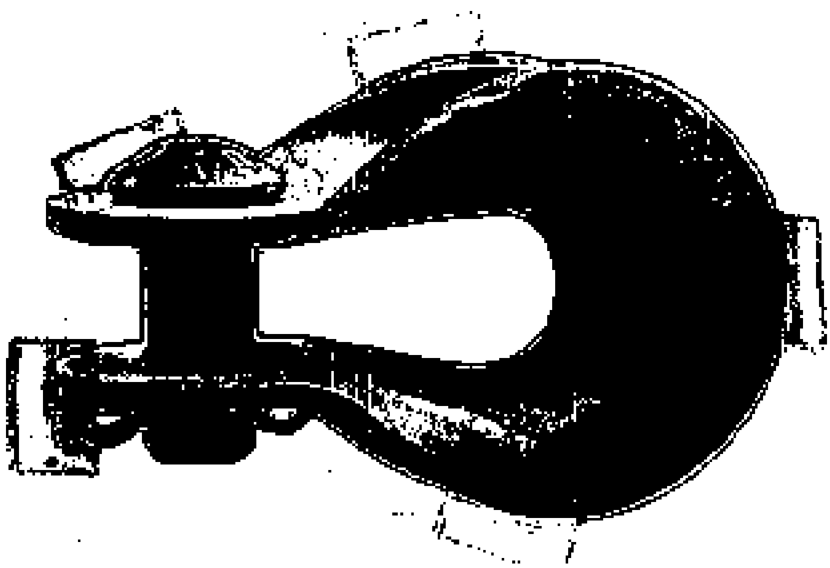
การไฟฟ้าส่วนภูมิภาค

PLATE, STEEL, DOUBLE ARMING 12X100

แบบเลขที่ SA2-015/28002







PRELIMINARY

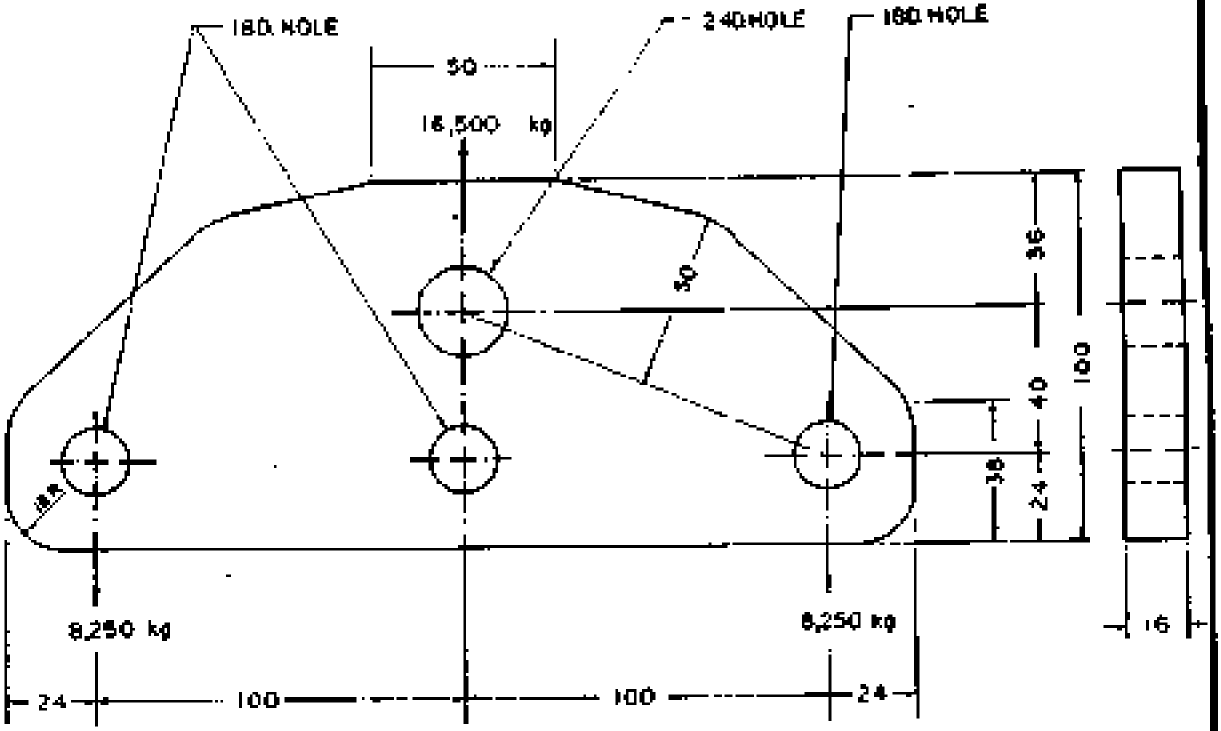
กองวิจัยและทดสอบ	การไฟฟ้าส่วนภูมิภาค	ใช้แทนแบบ ....
ผู้เขียน	ผู้ว่าการ	ถูกแทนด้วยแบบ .... เขียนเสร็จวันที่ 15/12/19
ผู้ตรวจ .... หัวหน้าแผนก .... หัวหน้ากอง	0314001 ทิมเบิลเคลวิสสำหรับปรีฟอร์มเข้าปลายสาย	แก้ไขวันที่ .... มาตรา .... หน่วยความยาว มม.
ผู้อำนวยการฝ่ายเทคนิค	0314001 CLEVIS, THIMBLE, FOR PREFORMED DEAD-END	แบบเลขที่ 501-015/19068 หน้าที่ 1 จำนวน 2 แผ่น

PRELIMINARY

วัสดุเลขที่ MATERIAL NUMBER	0314001l
ชนิด ทิมเบิลเคลวิส สำหรับปรีฟอร์มเข้าปลายสาย DESCRIPTION: CLEVIS, THIMBLE, FOR PREFORMED DEAD - END	
วัสดุที่ใช้ทำชิ้นส่วนที่ 1 MATERIAL : BODY , PART 1	เหล็กกล้าละมุน MILD STEEL
วัสดุที่ใช้ทำสลัก ชิ้นที่ 2 MATERIAL : BOLT , PART 2	เหล็กกล้าละมุน MILD STEEL
วัสดุที่ใช้ทำหมุดผ่า ชิ้นที่ 3 MATERIAL : COTTER PIN , PART 3	ทองเหลืองหรือเหล็กกล้าสเตนเลส BRASS OR STAINLESS STEEL
การชุบผิวส่วนที่เป็นเหล็ก SURFACE FINISHING OF THE FERROUS PARTS	ชุบสังกะสีตามมาตรฐาน กฟภ. HOT DIP. GALV. ACC. TO PEA-STANDARD
น้ำหนัก (ประมาณ) กก./ชิ้น WEIGHT (APPROX) Kg/pcs	0.5

กองวิจัยและทดสอบ	การไฟฟ้าส่วนภูมิภาค	[illegible]
ผู้เขียน [illegible]	ผู้ว่าการ [illegible]	[illegible]
[illegible]	0314001l ทิมเบิลเคลวิสสำหรับปรีฟอร์มเข้าปลายสาย	[illegible] 12/12/19
หัวหน้าแผนก [illegible]		[illegible]
หัวหน้ากอง [illegible]		[illegible]
[illegible]	0314001l CLEVIS, THIMBLE, FOR PREFORMED DEAD-END	แบบเลขที่ SO1-105/19058
		แผ่นที่ 2 รวมจำนวน 2 แผ่น

PRELIMINARY

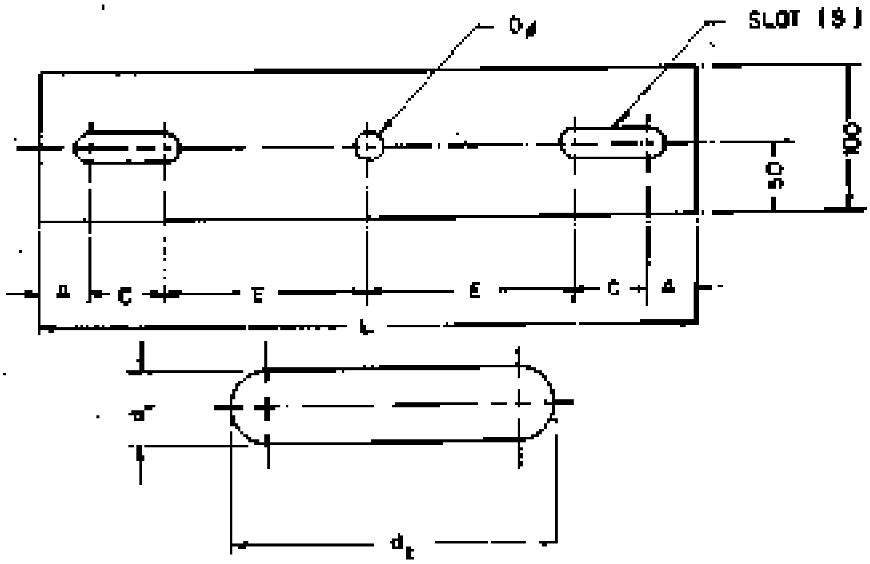


DIMENSIONS IN mm

วัสดุเลขที่ MATERIAL NUMBER	03140013
แรงดึงประลัย กก. ULTIMATE STRENGTH kg.	≥ 16,500
วัสดุ : เหล็กกล้าละมุน MATERIAL MILD STEEL	
การชุบผิว : SURFACE FINISHING . HOT DIP GALV. ACC. TO PEA STANDARD	

	การไฟฟ้าส่วนภูมิภาค	25 กค 22
	03140013 แผ่นเหล็กแยกสาย	1 : 2
	03140013 SPACER, PLATE	SBI-015/22042

PRELIMINARY

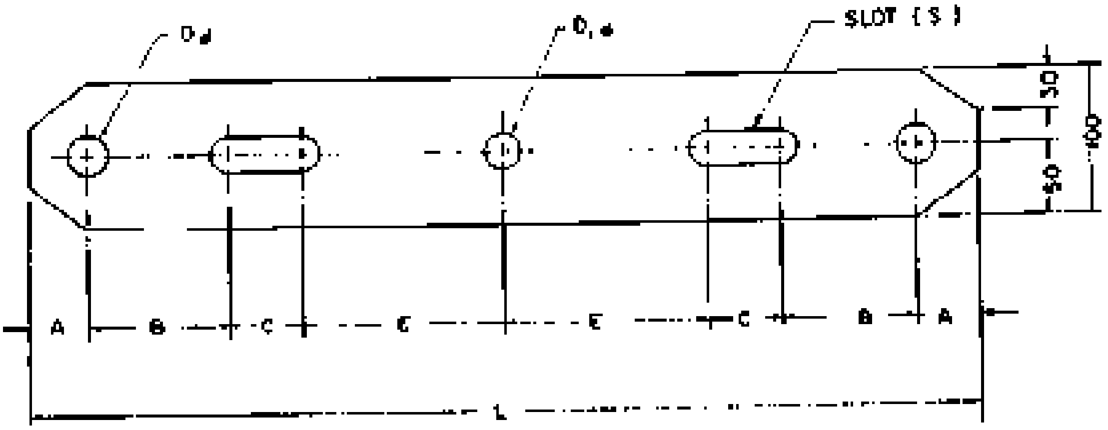


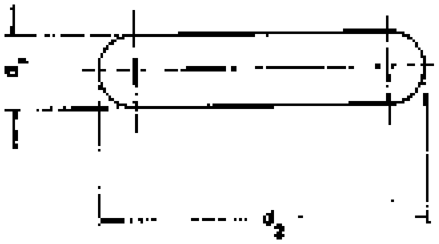
SLOT (S)

รหัสพัสดุ MATERIAL NUMBER	มิติ เป็น มม. DIMENSIONS IN mm.							วัสดุและการชุบผิว MATERIAL & SURFACE FINISHING
	ขนาดเหล็ก STEEL SIZE	L	A	C	E	D$_\phi$	S (d_1 x d_2)	
01030002	6 x 100	450	35	50	140	18	18 x 68	เหล็กแผ่นแบนตาม มอก. 55 ชุบสังกะสีตามมาตรฐาน กฟภ. FLAT STEEL BARS ACC TO TIS. 55 HOT DIP GALV. ACC. TO PEA. STANDARD.
0103 0003	6 x 100	500	30	60	180	18	18. x 78	

[illegible]	การไฟฟ้าส่วนภูมิภาค	[illegible]
[illegible]	ผู้ว่าการ [signature]	วันที่อนุมัติ 5 ต.ค. 22
	แผ่นเหล็ก ขนาด 6 X 100	มาตราส่วน 1 : 5
รองผู้ว่าการ [illegible]	PLATE, STEEL, 6 X 100	แบบเลขที่ SBI-015/22015
		แผ่นที่ 1 จำนวน 1 แผ่น

SUMMARY





SLOT (S)

รหัสพัสดุ MATERIAL NUMBER	ขนาดเหล็ก STEEL SIZE	L	A	B	C	E	$D\phi$	$D_1\phi$	S $(d_1 \times d_2)$	วัสดุและการตกแต่งผิว MATERIAL & SURFACE FINISHING
	มิติ เป็น มม. DIMENSIONS IN mm									
01030100	12 x 100	650	40	95	50	140	24	18	18 x 68	เหล็กแผ่นแบนตาม มอก. 55 ชุบสังกะสีตามมาตรฐาน กฟภ.
01030101	12 x 100	700	40	90	60	160	24	18	18 x 78	FLAT STEEL BARS TIS 55 HOT DIP GALV. ACC TO PEA STANDARD

การไฟฟ้าส่วนภูมิภาค

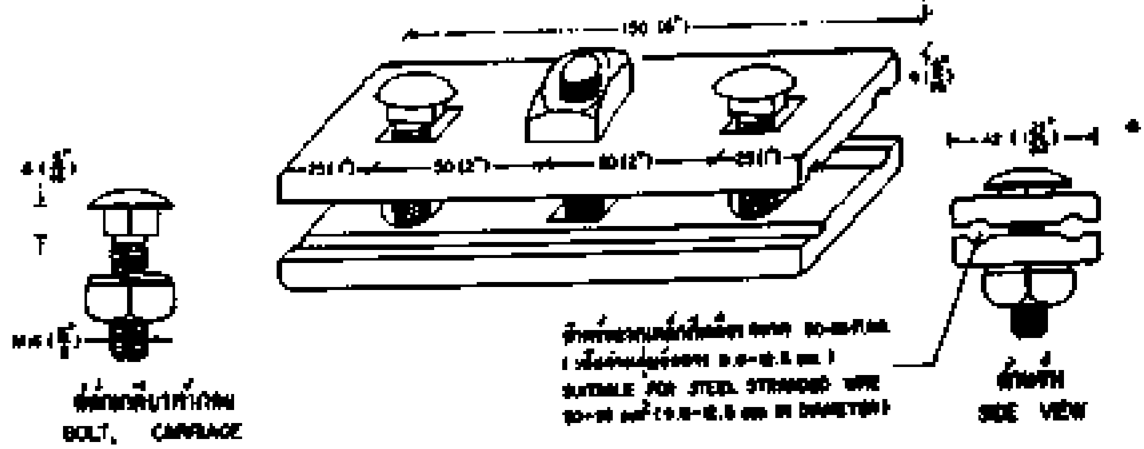
แผ่นเหล็กยึดสองปลาย ขนาด 12 x 100

PLATE, STEEL, DOUBLE ARMING 12 X 100

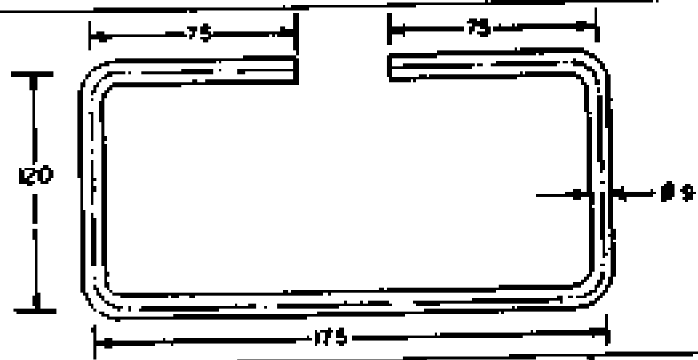
เลขที่แบบ SBI-015/22016

PRELIMINARY

ALL DIMENSIONS ARE IN mm (INCH)



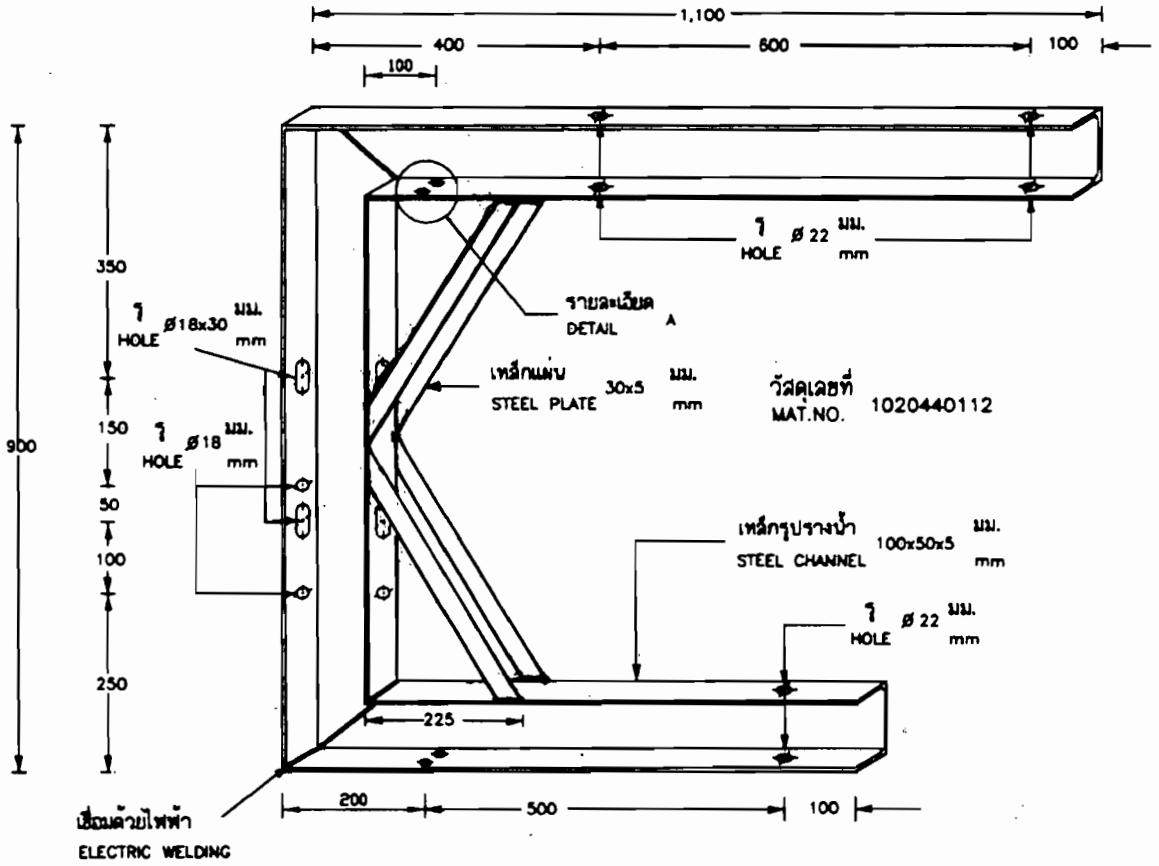
รหัสพัสดุ MATERIAL NUMBER	02440102
ชื่อ DESCRIPTION : [illegible] 3 [illegible] CLAMP, GUY, TRIPLE BOLT	
วัสดุ MATERIAL เหล็กเหนียว MILD STEEL	
[illegible] SURFACE FINISHING	[illegible] HOT DIP GALV.
น้ำหนัก WEIGHT	

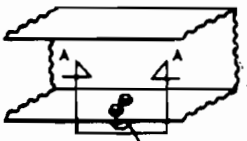


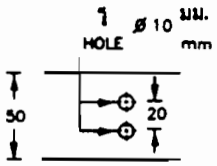
รหัสพัสดุ MATERIAL NUMBER	02440103
ชื่อ DESCRIPTION [illegible] LINK, CABLE SPACER	
วัสดุ MATERIAL [illegible] Ø 9 มม. [illegible] 20 STEEL ROUND BAR Ø 9 mm ACC. TO TIS. 20	
[illegible] SURFACE FINISHING	[illegible] HOT DIP GALV.
น้ำหนัก WEIGHT	

[illegible]	การไฟฟ้าส่วนภูมิภาค	[illegible]
[illegible]	[illegible]	[illegible] 22 ก.ค. 23
[illegible]	[illegible]	[illegible] 7 ก.พ. 2530
[illegible]	[illegible]	[illegible]
วิศวกร[illegible]	CLAMP, GUY AND LINK, CABLE SPACER	[illegible] SA2-08/23024
		แผ่นที่ 1 [illegible] 1 แผ่น

การประกอบเลขที่	2304 A
ASSEMBLY NO.	3905 A







รายละเอียด A DETAIL จุดต่อสายดิน GROUND TERMINAL

ภาพตัด A–A SECTION

หมายเหตุ: 1 เหล็กรูปรางน้ำเป็นชนิดผลิตร้อนตาม มอก. 1227 ตารางที่ 4

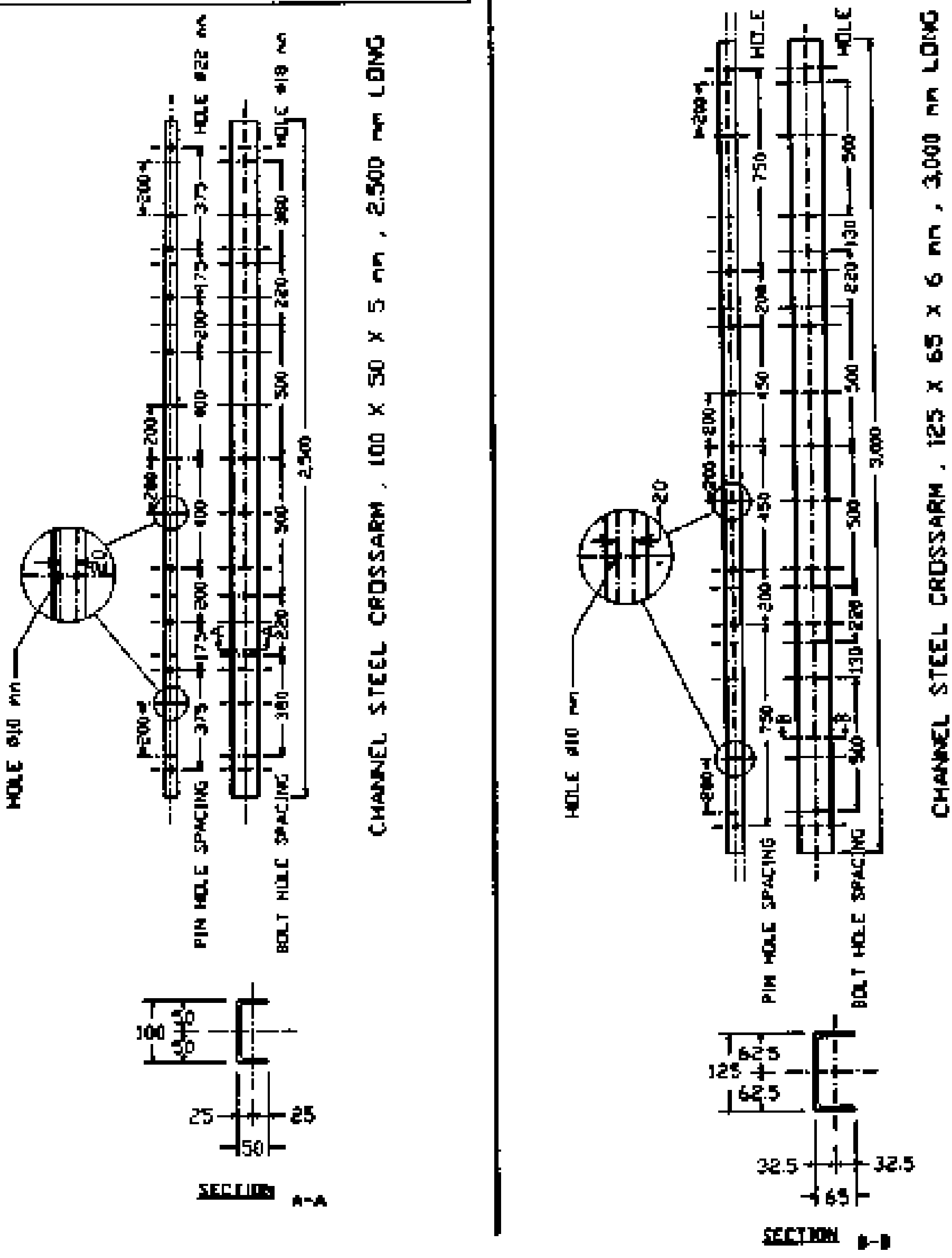
2 ให้อาบสังกะสีหลังจากการประกอบ โดยวิธีจุ่มร้อน และมีความหนาสังกะสีเฉลี่ยไม่น้อยกว่า 85 ไมครอน

NOTES: 1 STEEL CHANNEL ACCORDING TO TIS 1227, TABLE 4.

2 AFTER FABRICATION, THE BRACKET SHALL BE GALVANIZED BY HOT-DIP PROCESS AND THE MINIMUM AVERAGE THICKNESS OF ZINC-COATING SHALL BE NOT LESS THAN 85 MICRONS.

กองมาตรฐานระบบไฟฟ้า ฝ่ายมาตรฐานและความปลอดภัย	การไฟฟ้าส่วนภูมิภาค	ใช้แทนแบบ SA4-015/44007 ถูกแทนโดยแบบ .....
ผู้เขียน วิทยา เชื้อสิงห์ ผู้สำรวจ ..... วิศวกร ..... หัวหน้าแผนก ..... ผู้อำนวยการกอง ..... ผู้อำนวยการฝ่าย	ผู้ว่าการ ..... 12 ส.ค. 2556	เขียนเสร็จวันที่ 2 ส.ค. 2556 แก้แบบวันที่ ..... มิติเป็น มิลลิเมตร มาตราส่วน 1:10
รองผู้ว่าการฝ่ายวางแผนและพัฒนาระบบไฟฟ้า	เหล็กดอนเคเบิลอากาศทางโค้ง สำหรับระบบ 22 kV และ 33 kV AERIAL CABLE CORNER SUPPORT BRACKET FOR 22 kV AND 33 kV SYSTEMS	แบบเลขที่ SA2-015/56006 แผ่นที่ 1 ของจำนวน 1 แผ่น

PRELIMINARY



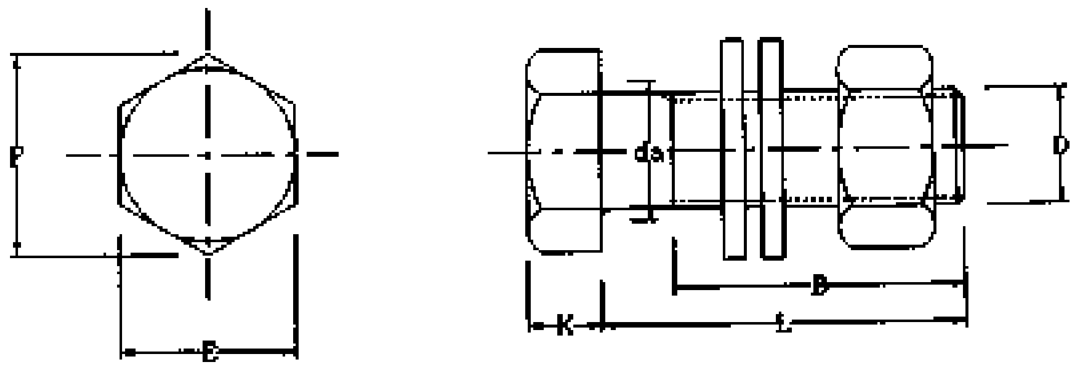
NOTES

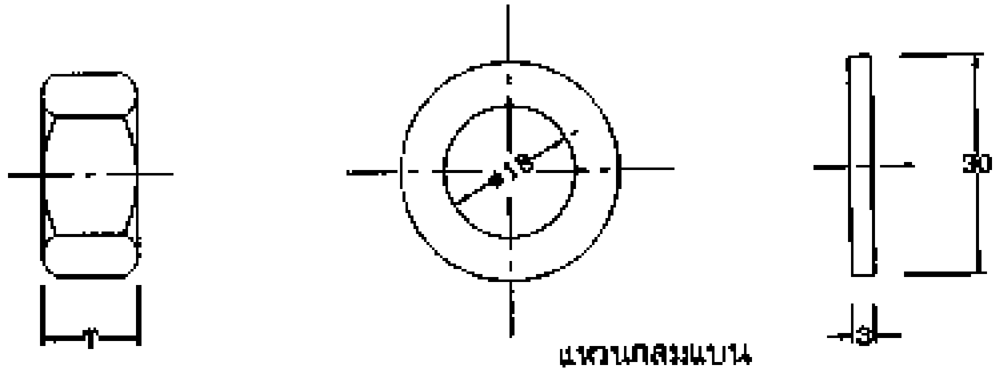
1. CHANNEL STEEL ACCORDING TO TIS 1227 TABLE 4
2. TO BE HOT DIP GALVANIZED ACCORDING TO PEA STANDARD

กองวิศวกรรมไฟฟ้าและเครื่องกล ฝ่ายวิศวกรรม การไฟฟ้าส่วนภูมิภาค

วัดเป็น มิลลิเมตร วันที่ 17 ธันวาคม 2539	CHANNEL STEEL CROSSARM FOR 22-33 KV	แบบเลขที่ SA2-015/39025 แผ่นที่ 1 ของจำนวน 1 แผ่น

PRELIMINARY





นัทหกเหลี่ยม

NUT,HEXAGON,DIN.555

แหวนกลมแบน

WASHER,ROUND,FLAT

วัสดุเลขที่ MAT NO	มิติ มม. DIMENSIONS IN mm								แรงประลัย (กก.) BREAKING STRENGTH (kgf)	น้ำหนัก กก./100 ชิ้น WEIGHT kg/100 Pcs.	วัสดุและการฉาบผิว MATERIAL AND SURFACE FINISHING
	D	L	B	K	E	F	da, max.	T			
-	16	50	40	10	24	27.7	19.2	13	5,000		เหล็กกล้า ชุบสังกะสี ตามมาตรฐานของ กฟภ. STEEL HOT DIP GALVA- -NIZED ACC. TO PEA STANDARD

กองวิศวกรรมไฟฟ้าและเครื่องกล ฝ่ายวิศวกรรม การไฟฟ้าส่วนภูมิภาค

หน่วยเป็น มิลลิเมตร	สลักเกลียว หัวหกเหลี่ยม เอ็ม 16x50	แบบเลขที่ SA2-016/40001
วันที่ 10 มกราคม 2540	BOLT, MACHINE, HEXAGON M.16x50	แผ่นที่ 1 ของจำนวน 1 แผ่น

Nominal Thread Diameters and Pitches of Steel Bolts and Nuts

Bolts and Nuts shall have nominal thread diameters(d) and coarse pitch(P) as specified in the table below :

Nominal Thread Diameter(d) in mm	Coarse Pitch(P) in mm
6	1
8	1.25
10	1.5
12	1.75
16	2
20	2.5
24	3

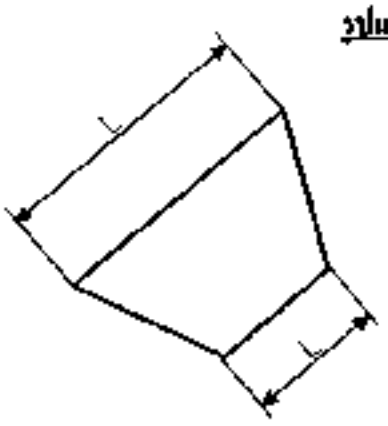
ภาคผนวก (Addendum)

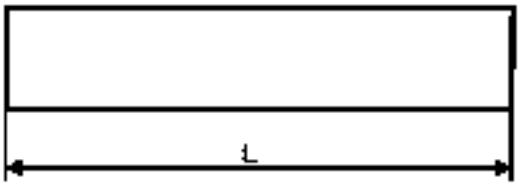
ที่	รายละเอียด	ค่าความคลาดเคลื่อน (มิลลิเมตร)		สัญลักษณ์	รูปที่
1	ระยะความยาวรวม (ขอบเหล็ก ถึง ขอบเหล็ก)	+ 5	- 3	L	(1)
2	ระยะจากจุดศูนย์กลางรู Slot ถึง ขอบเหล็ก ระยะจากจุดศูนย์กลางรูกลม ถึง ขอบเหล็ก	+ 5	- 3	A	(2)
3	ระยะจากจุดศูนย์กลางรู Slot ถึง จุดศูนย์กลางรู Slot	+ 2	- 2	X1	(3)
4	ระยะจากจุดศูนย์กลางรูกลม ถึง จุดศูนย์กลางรูกลม ระยะจากจุดศูนย์กลางรูกลม ถึง จุดศูนย์กลางรู Slot	+ 1	- 1	X2	(4)
5	ขนาดเส้นผ่านศูนย์กลางรูกลม 10 มิลลิเมตร ถึง 24 มิลลิเมตร	+ 1	- 1	ØØ	(5)
	ขนาดรู Slot	+ 1	- 1	d1, d2	
6	ระยะเกลียวถึงปลาย Bolt	+ 8	- 0	B	(6)

หมายเหตุ :

1. ภาคผนวกนี้จะไม่นำไปใช้ ในกรณีดังต่อไปนี้
   1.1 มีการกำหนดค่าความคลาดเคลื่อนในข้อกำหนดทางเทคนิคแล้ว
   1.2 ข้อกำหนดทางเทคนิคได้อ้างอิงถึงมาตรฐานอุตสาหกรรม (มอก.) ต่างๆ ซึ่งมีการกำหนดค่าความคลาดเคลื่อนในมาตรฐานอุตสาหกรรม (มอก.) ดังกล่าวแล้ว
2. รูปแสดงตัวอย่าง และสัญลักษณ์ ให้ดูที่ Page 2 of 2
3. สำหรับการตรวจรับฮาร์ดแวร์ที่ต้องมีการประกอบใช้งานร่วมกับฮาร์ดแวร์อื่นๆ เช่น เหล็กประกับ, ขอบเหล็ก เป็นต้น PEA ขอสงวนสิทธิ์ในการทดลองประกอบใช้งานร่วมกับฮาร์ดแวร์ดังกล่าว ในการตรวจรับด้วย

รูปแสดงตัวอย่าง และสัญลักษณ์





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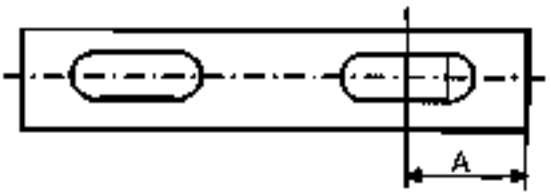

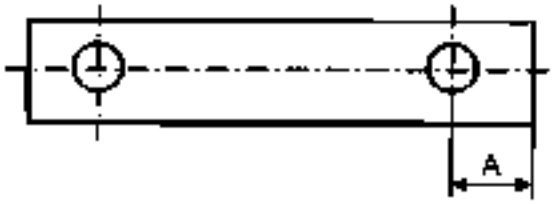

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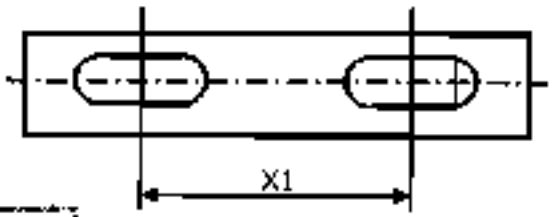

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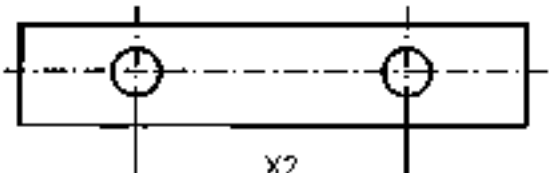

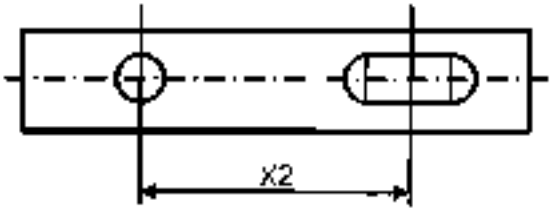

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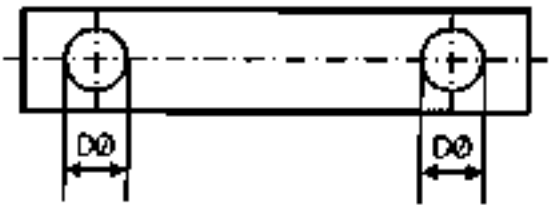
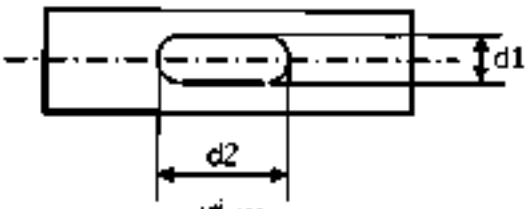
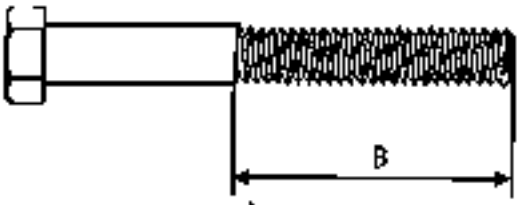




รูปที่ (5)



รูปที่ (6)

เอกสารเพิ่มเติมแนบท้ายรายละเอียดสเปค

(ADDENDUM)

เอกสารเพิ่มเติม (ADDENDUM) นี้ ให้ถือเป็นส่วนหนึ่งของรายละเอียดสเปคที่เอกสารฯ นี้ได้แนบอยู่ด้วย

การกำหนดการส่งรายงานผลการทดสอบเฉพาะแบบ (Type test report)

ผู้ยื่นข้อเสนอสามารถยื่นเอกสาร หรือหลักฐานอื่นเพื่อประกอบการพิจารณาจัดซื้อ จัดจ้าง หรือจ้างก่อสร้าง แทนการยื่นรายงานผลการทดสอบเฉพาะแบบ (Type test report) หรือหนังสือรับรองผลการทดสอบเฉพาะแบบ (Type test certificate) ได้ ดังนี้:

(1) กรณีที่เป็นอุปกรณ์ที่การไฟฟ้าส่วนภูมิภาคสำนักงานใหญ่ โดยฝ่ายจัดหา หรือฝ่ายงานสถานีไฟฟ้า หรือฝ่ายงานระบบไฟฟ้า เคยรับไว้ใช้งานจากการจัดซื้อ จัดจ้าง หรืองานจ้างก่อสร้างแล้ว ผู้ยื่นข้อเสนอสามารถยื่นสำเนาหนังสือสั่งซื้อ/จ้าง (Purchase order) หรือสำเนาหนังสือสัญญาจ้างก่อสร้างพร้อมบัญชีแสดงปริมาณวัสดุ (Bill of Quantities: BOQ) ที่ออกโดยการไฟฟ้าส่วนภูมิภาค แทนได้ หรือ

(2) กรณีที่อุปกรณ์ที่เสนอได้รับการขึ้นทะเบียน และควบคุมคุณภาพผลิตภัณฑ์ (PEA Product Acceptance) แล้ว ผู้ยื่นข้อเสนอสามารถยื่นเอกสารรับรองการขึ้นทะเบียนฯ ที่ยังไม่หมดอายุในวันที่ยื่นเอกสาร แทนได้ หรือ

(3) กรณีที่อุปกรณ์ที่เสนอราคาได้รับการขึ้นทะเบียนอุปกรณ์หลักในงานจ้างก่อสร้างสถานีไฟฟ้า (Product list) แล้ว ผู้ยื่นข้อเสนอสามารถยื่นเอกสารรับรองการขึ้นทะเบียนฯ ที่ยังไม่หมดอายุในวันที่ยื่นเอกสารแทนได้

ทั้งนี้ เอกสาร หรือหลักฐานที่ระบุไว้ในข้อ (1) ข้อ (2) และข้อ (3) ดังกล่าวข้างต้น จะสามารถใช้แทนการยื่นรายงานผลการทดสอบเฉพาะแบบ (Type test report) หรือหนังสือรับรองผลการทดสอบเฉพาะแบบ (Type test certificate) ได้ ต้องเป็นเอกสาร หรือหลักฐานที่ตรวจสอบแล้วพบว่าเป็นของอุปกรณ์ที่เป็นผลิตภัณฑ์รุ่น และพิกัดเดียวกันกับอุปกรณ์ที่จัดซื้อ หรือจัดจ้าง หรือจ้างก่อสร้างในครั้งนี้

Invitation to Bid No.:

C Material, equipment, and specifications for HOTLINE CLAMPS

C1 General material and packing instructions

Additional to the general instructions, the following shall be observed:

1a Scope

These specifications cover hotline clamps; i.e., protected thread clamps and bail clamps for connection of bare aluminium stranded conductor, aluminium-alloy stranded conductor and aluminium conductor steel reinforced.

1b Standards

Except otherwise specified elsewhere in the specification, hotline clamps shall be manufactured and tested in accordance with the standards listed below.

American National Standards Institute (ANSI):

ANSI C119.4: 2016 Electric connectors – Connectors for use between Aluminum-to-Aluminum and Aluminum-to-Copper Conductors Designed for Normal Operation at or Below 93°C and Copper-to-Copper Conductors Designed for normal Operation at or Below 100°C

PEA will also accept hotline clamps tested in accordance with the later edition of the above standards.

PEA will also accept the Design test report in accordance with the previous edition of the above standards, if there is no significant change in any test items or no additional test item(s) compared with the above standards. On the other hand, if there is significant change in any test items or there are any additional test items, the previous edition Design test report with the additional test report(s) of the significant change test item(s) and/or additional test item(s) will be also accepted.

1c Principal requirement

The contact surface of the hotline clamps shall be thoroughly filled with conduction aid oxide inhibiting compound prevents water and contaminants interfering with the connection, prevents the formation of surface oxide and decreases electrical resistance in the connection area. The minimum thickness of conduction aid oxide inhibiting compound in the connection area shall be 0.5 mm.

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1c.1 Hotline protected thread clamp

The hotline protected thread clamp shall be suitable for using with bail (tin plated hard draw copper) of hotline bail clamp.

Hotline protected thread clamp shall be suitable for using with clampstick according to standard ASTM F1825-03.

Dimension of the hotline protected thread clamp shall be according to **Figure 1.**

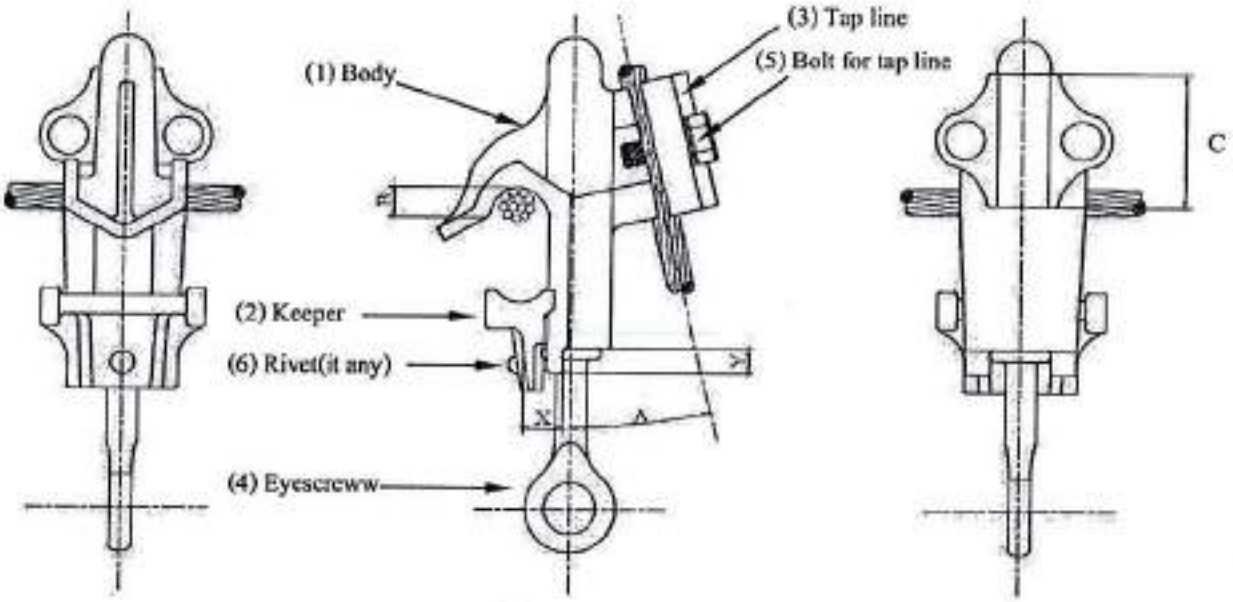

Figure 1

Note:

- Dimension of clamp base (clamp base shall be able to align into notch of clampstick)
  Max, width (X) 12.2 mm
  Min, depth (Y) 7.6 mm
- Dimension of body
  Min, depth (B) 14 mm
  Min, length (C) 45 mm
- Dimension of tap line shall have the same minimum length (C) 45 mm of the body
- Angle between body and tap line
  The angle (A) shall be between 20 and 30 degrees according to **Figure 1.**
- Eyescrew size of hotline protected clamp shall not less than 7/16 inch and withstand tightening torque of at least 240 lbf•in.
- Bolt(s) for tap line of hotline protected clamp shall not less than 7/16 inch and withstand tightening torque of at least 240 lbf•in.

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Hotline protected thread clamp shall be made of material as following:

(1) Body – Aluminum alloy (with chemical composition (%) of aluminium not less than 90%)

(2) Keeper – Aluminum alloy (with chemical composition (%) of aluminium not less than 90%)

(3) Tap line – Aluminum alloy (with chemical composition (%) of aluminium not less than 90%)

(4) Eyescrew – Bronze

(5) Bolt(s) for tap line – Stainless steel (grade 304)

(6) Rivet of keeper (if any); for stopping Eyescrew – Stainless steel (grade 304)

(7) Spring washer(s) (on Eyescrew & Tap line) – Stainless steel (grade 304)

The chemical compositions of body, keeper, tap line and eyescrew shall also be in accordance with standards as following: SAE, AISI, JIS, ASTM or others approved by PEA.

1c.2 Hotline ball clamp

The hotline ball clamp shall be suitable for using with PEA's installed aluminum conductor and shall have diameter ranges as specified in **Table 1.**

Hotline ball clamp shall be suitable for using with clampstick according to standard ASTM F1825-03. Dimension of the hotline ball clamp shall be according to **Figure 2.**

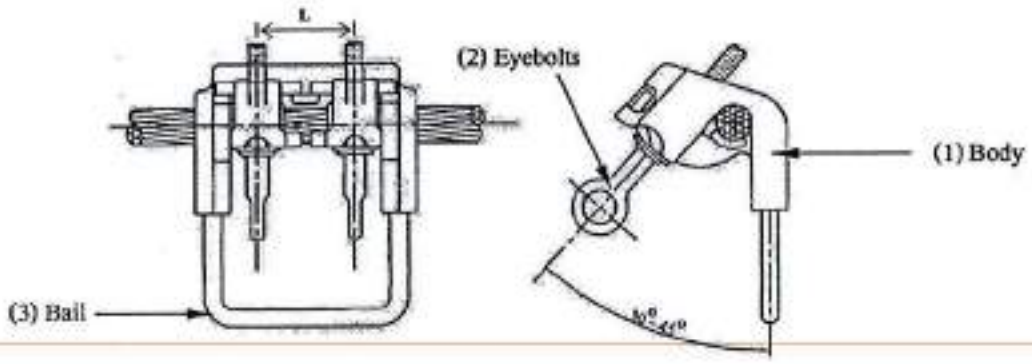

Figure 2

Note:

- The length (L) of **Figure 2** shall not be less than 44 mm.
- The hotline bail clamp shall be suitable for used on hotline operation by means of spring load Eyescrews. Angle between Bail and Eyebolts shall be between 30 and 45 degree according to **Figure 2.**
- The design of hotline bail clamp as shown in **Figure 3** is not accepted.

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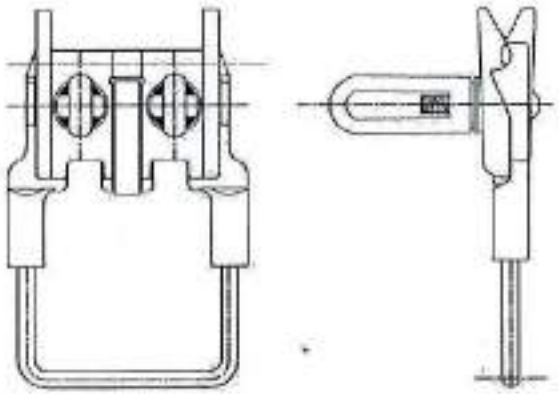

Figure 3

The hotline bail clamp shall be made of material as following:

(1) Body – Aluminium-alloy (with chemical composition (%) of aluminium not less than 90%)

(2) Eyebolt(s) – Bronze

(3) Bail – Tin plated hard drawn copper (with chemical composition (%) of copper not less than 99%)

(4) Spring washer(s) on Eyescrews – Stainless steel (304 grade)

(5) Spring load(s) – Stainless steel (304 grade)

The chemical compositions of Body and eyebolt(s) shall also be in accordance with standards as following: SAE, AISI, JIS, ASTM or others approved by PEA.

Table 1

Items of hotline bail clamp

Item	Main line	Bail diameter	Eyebolt size	Minimum Tightening torque
1	diameter range of 6.6 mm to 10.2 mm (sizes 35 mm^2 to 70 mm^2)	not less than 8.5 mm	7/16 inch	240 lbf•in (27 N•m)
2	diameter range of 9.3 mm to 19 mm (sizes 70 mm^2 to 185 mm^2)	not less than 8.5 mm	7/16 inch	240 lbf•in (27 N•m)
			or 1/2 inch	300 lbf•in (34 N•m)

1c.3 **Marking**

Each hotline clamps shall be marked by mean of emboss on the body at least listed below. Except purchase order number may be marked by means of engraving, stamping or laser marking.

(1) Manufacturer's name or Trademark

(2) Conductor tap and size to be used (the marking shall be of metric system)

(3) Catalog number of the connector

(4) Purchase order number

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1c.4 Sample

The bidders shall submitted at least one (1) sample for each proposal item within five (5) working days counted from bid closing date for consideration; otherwise, the proposal shall be rejected. PEA's Bids committee will initially check the material, conduction aid oxide inhibiting compound filling on the contact surface of the hotline clamps and others by comparing with the color photograph of the Design test report and PEA's specification. PEA's committee shall reject a proposal if there are any parts of hotline clamp differing from the color photograph of Design test report and PEA's specification. The sample shall not be returned. The sample of the successful bidder will be used as a reference sample in acceptance process. The supplied hotline clamp with a difference material or design compared with the reference sample shall be rejected.

1d Packing

Each hotline clamps shall be supplied in individually sealed package.

The packages shall be packed in suitable carton. Each carton shall be marked with lots number and date of manufacturing; date, month and year. The carton shall contain hotline clamps not more than twenty-five (25) pieces.

If there are many cartons for containerized shipment, the cartons shall be arranged into pallets so as to facilitate their movement by forklift trucks.

1e Tests and test report

1e.1 Design tests

The proposed hotline clamps shall be passed the Design tests as follow:

- Current Cycle Test (CCT) (class A) or Current Cycle Submersion Test (CCST) (Class A)
- Torque strength test

Unless otherwise specified in this specification, both Current Cycle Test (CCT) (class A) or Current Cycle Submersion Test (CCST) (Class A) and torque strength test shall be complied with ANSI C119.4: 2016 or later edition with the additional requirement as follow:

(1) **Additional requirement for Current Cycle Test (CCT) and Current Cycle Submersion Test (CCST):**

Loop of Current Cycle Test (CCT) (class A) or Current Cycle Submersion Test (CCST) (Class A) shall test with Four (4) sets of hotline clamps. (Each set consisted of hotline bail clamp installed with hotline protected thread clamp)

Temperature measurements shall be measured at least for eight (8) points of the connector. four (4) points shall be measured at hotline bail clamps and others shall be measured at hotline protected thread clamp.

The conductor used in the process of current cycle test shall be aluminium stranded conductor.

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(2) **Additional requirement for torque strength test**

(2.1) Hotline protected thread clamp

- Torque the fastener to the value specified in **1c.1**.
- Hotline protected thread clamp shall be tested with bail of hotline bail clamp for run and 50 mm^2 and 185 mm^2 aluminium stranded conductor for tap.

(2.2) Hotline bail clamp

- Torque the fastener to the value specified in **Table 1**.
- Hotline bail clamp (sizes 35 mm^2 to 70 mm^2) shall be tested with 35 and 70 mm^2 conductor for run
- Hotline bail clamp (sizes 70 mm^2 to 185 mm^2) shall be tested with 70 and 185 mm^2 conductor for run

The cable used in the process of torque strength test shall be aluminium stranded conductor.

The Design test report shall include the necessary data as specified in ANSI C119.4-2016, or later edition, recommendation - Test Report and PEA's additional requirement as follow:

- Description documents of hotline clamps according to manufacturer's data
  - Catalog of hotline clamps consisting of at least brand name and type/model of the product
  - Detailed outline drawing of hotline clamps with the data as specified in **2d** (see page 13)
  - Test reports of grade and chemical composition of each part of the hotline clamps as specified in **Table 2**, which shall be in accordance with standards as following: SAE, AISI, JIS, ASTM or others approved by PEA. The certificates of grade of material from material supplier are accepted in this specification. Except body, keeper and tap line, the test reports of grade and chemical composition are required.

Table 2

Each part of Hotline clamp

Hotline protected thread clamp	Hotline bail clamp
Body and keeper	Body
Tap line	Eyebolt(s)
Eyescrew	Bail
Bolt(s) for tap line	Spring washer(s)
Spring washer(s)	Spring load(s)
Rivet of keeper (if any)	

- Brand name, Type or model, Manufacturer and properties of conduction aid oxide inhibiting compound filled in the contact surface of hotline clamps.

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- Certificate of conduction aid oxide inhibiting compound, for proving the properties that it is suitable for using with a bolted connector and have the properties as required in this specification (**see 1c**). The certificate is required only when the bidder mix the material of conduction aid oxide inhibiting compound by himself.

- The color photograph of each part of hotline clamps as specified in **Table 2** and others as following:
  - Manufacturer's name or Trademark
  - Conductor tap and size to be used
  - Catalog number of the connector
  - Conduction aid oxide inhibiting compound filled in the contact surface of hotline clamps
- Net weight of each hotline clamps

The additional conditions for the Design test report tested by laboratories in Thailand

The Design test report shall be completed only when there is signature of PEA's representative, from Electrical Equipment Standard and Quality Control Division and/or Technical Specification Division, on all pages of the Design test report.

In the Current Cycle Test (CCT) (class A) or Current Cycle Submersion Test (CCST) (Class A) process, PEA reserves the right to send PEA's representative by PEA's expense to witness the process of collecting the data of current cycle resistance stability and current cycle temperature stability at least (3) three data point number at the measurement intervals as specified in **Table 3.**

Table 3

Data point number for measurement intervals

Data point number	Cycles of CCT	Cycles of CCST
1	(25 – 30 cycles)	(5 – 7 cycles)
6	(160 – 170 cycles)	(57 – 61 cycles)
11	(495 – 505 cycles)	(98 – 102 cycles)

At data point number 1, PEA's representative reserve the right to sign the signature on test objects with permanent marker pen as an indicator.

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The Design tests of hotline clamps shall be conducted or inspected by the acknowledged independent testing laboratories/institutes as follows:

(1) Independent laboratories/institutes which are members of the Short-circuit Testing Liaison (STL) or independent laboratories/institutes which are accredited according to TIS 17025 or ISO/IEC 17025 with the scope of accreditation covered the relevant test items, standards and equipment. The certification and scope of accreditation of the independent laboratories/institutes shall be submitted with the bid for consideration.

(2) Laboratories, institutes, universities and electric utilities, as follows:

- National Metal and Materials Technology Center (MTEC)
- Electrical and Electronic Products Testing Center (PTEC)
- Thai Industrial Standards Institute (TISI)
- Electrical and Electronics Institute (EEI)
- Department of Science Service (DSS)
- Testing Laboratory, Electrical Engineering Department, Faculty of Engineering, Chulalongkorn University
- Electricity Generating Authority of Thailand (EGAT)
- Metropolitan Electricity Authority (MEA)
- Provincial Electricity Authority (PEA)
- Other laboratories, institutes, universities or electric utilities approved by PEA

The Design test report done by the laboratories in Thailand or local manufacturers shall be valid with five (5) years counted from the issued date in the test report to the bid closing date.

The Design test report of the proposed hotline clamps shall be submitted with the bid. The report will be sent to Engineering Department for approving.

PEA will also accept other documents instead of the Design test reports in the following conditions:

(1) In case the proposed hotline clamps has been supplied to PEA and get the order from PEA's Procurement Department (from PEA's head office), the Purchase Order (PO) can be submitted, or

(2) In case the proposed hotline clamps has been registered for PEA Product Acceptance, the not-expired registration certificate counted to the bid closing date can be submitted, or

(3) In case the proposed hotline clamps has been registered for Product lists for substation turnkey project, the not-expired registration certificate counted to the bid closing date can be submitted instead

However the document in case (1) and (2) shall be proved that the hotline clamps specified in the PO or registration certificate shall be the same product, type/model and all ratings as the proposed hotline clamps for this bid and shall be used the same PEA's specification number. In case (3), the hotline clamps specified in the registration certificate shall be the same product, type/model and all ratings as the proposed hotline clamps for this bid.

1e.2 Acceptance tests

1e.2.1 Acceptance test procedures

PEA reserves the right to have an acceptance test made by PEA's laboratory or by supplier's factory or by acknowledge independent testing laboratories as mentioned in **1e.1**.

The cost of all tests and report shall be borne by the Contractor.

(1) Number of sample

PEA shall randomly choose the sample of hotline clamps per lot with the number specified in **Table 4**.

Table 4

Number of sample

Number of item per lot	Number of sample for acceptance test	Test items (see Table 5 and Table 6)
not more than 50	2	Step 1 and Step 2
51 to 100	4	
more than 100	10	Step 1 and Step 2 and Step 3

Note: - The sample shall not be returned and shall not be used in the system.

- After the tests, the additional hotline clamps, with the equal number of the samples specified in **Table 4**, shall be supplied by the Contractor with free of charge to complete the number of hotline clamp in the purchase contract.

PEA will test the hotline clamps step by step as the sequence of testing specified in **Table 5** and **Table 6,** In case hotline clamps fails the test at least 1 (one) sample in any step of the test sequence, PEA shall not continue the test in the next step and reject all items in the lot.

The number of sample for acceptance test which are not more than (4) four items shall be tested by the sequence of testing at least for step 1 and step 2 according to **Table 5** and **Table 6.**

The number of sample for acceptance test having (10) ten units shall be tested by all sequence of testing for step 1, step 2 and step 3 according to **Table 5** and **Table 6**; (6) six units for torque strength test, (4) units for temperature rise test.

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(2) Hotline protected thread clamp

The acceptance test process of hotline protected thread clamp shall be according to **Table 5.**

Table 5

Acceptance test for hotline protected thread clamp

Sequence of testing	Test Item	Test method	Condition
Step 1	Visual check	PEA's procedure	The materials of hotline clamps shall not differ from PEA's specification and the Design test report.
Step 2	Torque strength test[1]	Torque the fastener to the value specified in **1c.1**	All connectors do not show any sign of crack.
Step 3	Temperature rise test[2]	NEMA CC1-2009 clause 2.6 and 3.1	Temperature rise of all connectors shall not exceed the temperature rise of tested conductor and current values to be used in the temperature rise tests shall be accordance with **Table B-3** for outdoor connector type.

Remark

(1) Test sample units shall be tested with hotline bail clamp for run and 185 mm^2 compact stranded aluminium conductor for tap.

(2) The cable used in the temperature rise test shall be new compact stranded aluminium conductor.

(3) Hotline bail clamp

The acceptance test process of hotline bail clamp shall be according to **Table 6.**

Table 6

Acceptance test for hotline bail clamp

Sequence of testing	Test Item	Test method	Condition
Step 1	Visual check	PEA's procedure	The materials of hotline clamps shall not differ from PEA's specification and the Design test report.
Step 2	Torque strength test[3]	Torque the fastener to the value specified in **Table 1**	All connectors do not show any sign of crack.
Step 3	Temperature rise test[4]	NEMA CC1-2009 clause 2.6 and 3.1	Temperature rise of all connectors shall not exceed the temperature rise of tested conductor and current values to be used in the temperature rise tests shall be accordance with **Table B-3** for outdoor connector type.

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Remark

(5) Test samples units shall be tested with conductor size as follow:

- For hotline bail clamp (sizes 35 mm^2 to 70 mm^2); Test samples shall be tested with 70 mm^2 (if any) or 50 mm^2 compact stranded aluminium conductor for run
- For hotline bail clamp (sizes 70 mm^2 to 185 mm^2); Test samples shall be tested with 185 mm^2 compact stranded aluminium conductor for run

(6) The cable used in the temperature rise test shall be as follow:

- For hotline bail clamp (sizes 35 mm^2 to 70 mm^2); Size of cable in the test loop shall be 70 mm^2 (if any) or 50 mm^2 compact stranded aluminium conductor.
- For hotline bail clamp (sizes 70 mm^2 to 185 mm^2); Size of cable in the test loop shall be 185 mm^2 compact stranded aluminium conductor.

The cable used in the temperature rise test shall be new compact stranded aluminium conductor.

1e.2.2 Special acceptance test

PEA reserve the right to inspect the chemical compositions of each part of hotline clamps at any time he deems necessary by PEA's expense for proving the materials of hotline clamps that they are the same as shown in the Design test report.

If the materials of hotline clamps differ from the data showed in the Design test report, PEA shall reject all items in the lot.

1f Manufacturing process inspection

PEA reserves the right to send the representatives by PEA's expense to inspect material, equipment, manufacturing process of the products during manufacturing with free access any time he deems necessary as follow:

- casting process
- assembly line process

The Contractor shall provide free access to the facilities where the hotline clamps are being manufactured, explain representatives about the quality assurance plan and quality control (QA & QC) of the factory and satisfy the representatives that materials used to make hotline clamps are in accordance with PEA's specification and show the suppliers list from whom you purchase materials to PEA's representatives; otherwise, the contract shall be rejected.

The documents as following shall be submitted with the bid

- Quality assurance plan in production line (QA)
- Quality control at the end of assembly line (QC)
- Material inspection process
- Production flow chart

TSP

The Contractor shall inform PEA in advance about date of manufacturing in order that PEA can make an appointment with the Contractor for inspecting the process as above-mention.

1g Guarantee

The Contractor who offer the hotline clamps shall guarantee the quality for two (2) years commencing from the date PEA receive the above-mentioned hotline clamps in the last lot in the condition as specified in note below.

Note:

ภายในกำหนดระยะเวลารับประกันคุณภาพ หากการไฟฟ้าส่วนภูมิภาคนำ Hotline clamps ไปใช้งานตามปกติแล้วปรากฏว่า ชำรุด ขัดข้อง หรือบกพร่อง คู่สัญญาจะต้องนำ Hotline clamps ตัวใหม่มาเปลี่ยนทดแทนของที่ชำรุด ภายใน 60 วัน นับถัดจากวันที่ได้รับแจ้งจากการไฟฟ้าส่วนภูมิภาค และหากการชำรุดขัดข้อง หรือบกพร่องดังกล่าว มีสาเหตุมาจากคุณสมบัติที่ไม่เป็นไปตามสเปคของการไฟฟ้าส่วนภูมิภาค คู่สัญญาจะต้องเปลี่ยนสิ่งของที่ส่งมอบตามสัญญาทั้งหมดให้แก่การไฟฟ้าส่วนภูมิภาค โดยไม่คิดค่าใช้จ่ายใดๆ ทั้งสิ้น และในกรณีการชำรุด ขัดข้อง หรือบกพร่องดังกล่าว เกิดขึ้นกับ Hotline clamps ที่ได้ถูกติดตั้งใช้งานแล้ว คู่สัญญาจะต้องยินยอมชดเชยค่าใช้จ่ายให้แก่การไฟฟ้าส่วนภูมิภาค ในการดำเนินการรื้อถอนและติดตั้ง Hotline clamps ใหม่ โดยมีค่าใช้จ่ายชุดละ 2,000 บาท พร้อมทั้งยินยอมรับผิดชอบค่าเสียหายอื่นที่อาจเกิดขึ้นอันสืบเนื่องมาจาก การชำรุด ขัดข้อง หรือบกพร่อง และคู่สัญญาจะต้องรับประกันคุณภาพ Hotline clamps ตัวใหม่ที่นำมาเปลี่ยนทดแทนของที่ชำรุดเป็นระยะเวลา 2 ปี นับจากวันที่การไฟฟ้าส่วนภูมิภาคได้ทำการตรวจรับ Hotline clamps ที่คู่สัญญานำมาเปลี่ยนให้ใหม่เสร็จเรียบร้อยแล้ว และในกรณีที่คู่สัญญาต้องเปลี่ยนทดแทน Hotline clamps ที่ส่งมอบตามสัญญาทั้งหมดให้แก่การไฟฟ้าส่วนภูมิภาค Hotline clamps เหล่านี้ต้องผ่านกระบวนการทดสอบเพื่อการตรวจรับตามหัวข้อ 1e.2 ด้วย

Hotline clamps ตัวใหม่ที่คู่สัญญานำมาทดแทนจะต้องทำเครื่องหมาย (Marking) ตามที่ระบุไว้ในสเปคฯ หัวข้อ 1c.3 และจะต้องทำเครื่องหมายตัวอักษร "R" (หมายถึงสิ่งของเพื่อทดแทนของที่ชำรุด) เพิ่มเติมต่อท้ายเลข PO (Purchase order number) ด้วย โดยวิธีการตามที่ระบุไว้ในหัวข้อ 1c.3

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C2 Material and packing data shall be submitted with the bid:

2a Design test report

Photographs in the Design test report shall be in color.

2b Performance data and guarantee of hotline clamps (see page 14 of 17 to 15 of 17)

2c Catalog of the proposed hotline clamps

2d Detailed outline drawing of hotline clamps with dimension

- The bidder shall submitted company's outline drawing.
- Outline drawing of PEA's specification is not accepted

Detailed outline drawing of hotline clamps shall consist of the data as follow:

- For hotline protected thread clamp
  - Dimension of clamp base (X & Y) in metric system as shown in **Figure 1**
  - Dimension of body (B & C) in metric system as shown in **Figure 1**
  - Dimension of tap line in metric system
  - Angle between body and tap line
  - Size of eyescrew to be used (inch)
  - Size of bolt(s) for tap line to be used (inch)
  - Maximum torque (lbf•in)
- For hotline bail clamp
  - Length (L) in metric system as shown in **Figure 2**
  - Angle between bail and eyebolt
  - Size of eyebolt(s) to be used (inch)
  - Maximum torque (lbf•in)

2e Detailed conduction aid oxide inhibiting compound (or Certificate of conduction aid oxide inhibiting compound in case the bidder mixes the materials by himself)

- Brand name
- Type or model
- Manufacturer
- Property

2f The quality assurance plan and quality control (QA & QC) and others as following

- Quality assurance plan in production line (QA)
- Quality control at the end of assembly line (QC)
- Material inspection process
- Production flow chart

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2g Certificate of the company from which the Contractor casts hotline clamps (see page 17 of 17)

2h Packing detail

Invitation to Bid No:

Performance data and guarantee of hotline protected thread clamp

Item .....

Country of origin Type or model Manufacturers or Distributor Applied standard Date of manufacturing PO (Purchase order number) Brand name		
Manufacturer name	-	
Catalog number (to be attached)	-	
Outline drawing number (to be attached)	-	
Diameter range of conductor		
- Main	mm^2	
- Tap	mm^2	
Material to be used (for hotline protected thread clamp)		
- Body	-	
- Keeper	-	
- Tap line	-	
- Eyescrew	-	
- Bolt(s) for tap line	-	
- Spring washer(s)	-	
- Rivet of keeper (if any)	-	
Bolt size of fastener		
- Eyescrew	inch	
- Bolt(s) for tap line	inch	
Length of rivet	mm	
Confirm to be filled with conduction aid oxide inhibiting compound	Yes/No	
Confirm to be packed in individually sealed package	Yes/No	
Type of coil lock washer (double coil lock washer or single coil lock washer)	-	
Marking (to be specified)	-	
Net weight per each	g	
Gross weight per carton	kg	
Guarantee period	year(s)	

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Invitation to Bid No:

Performance data and guarantee of hotline bail clamp

Item .....

Country of origin Type or model Catalog number Manufacturers or Distributor Applied standard Date of manufacturing PO (Purchase order number) Brand name		
Diameter range of conductor		
- Main	mm^2	
- Tap	mm^2	
Material to be used (for hotline bail clamp)		
- Body	-	
- Eyebolts	-	
- Bail	-	
- Spring washer(s)	-	
- Spring load(s)	-	
Bolt size of fastener		
- Eyebolt(s)	inch	
Bail size	mm	
Confirm to be filled with conduction aid oxide inhibiting compound (Yes or No)	Yes/No	
Confirm to be packed in individually sealed package (Yes or No)	Yes/No	
Type of coil lock washer (double coil lock washer or single coil lock washer)	-	
Marking (to be specified)	-	
Net weight per each	g	
Gross weight per carton	kg	
Guarantee period	year(s)	

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Required document of technical evaluation

Critical documents shall be submitted with the bid

(Please fill/check the boxes in each item)

No.	Required technical document	Proposed technical document	Reference document (Page No.)
1	- Design test report **(see 1e.1)** or - Purchase Order (PO) **(see 1e.1)** or - Product acceptance certificate **(see 1e.1)** - Product lists certificate **(see 1e.1)**	☐ YES ☐ No	
2	Performance data and guarantee of hotline clamps **(see 2b)**	☐ YES ☐ No	
3	Catalog of hotline clamps **(see 2c)**	☐ YES ☐ No	
4	Detailed outline drawing of hotline clamps with dimension **(see 2d)**	☐ YES ☐ No	
5	Detailed conduction aid oxide inhibiting compound (or Certificate of conduction aid oxide inhibiting compound) **(see 2e)**	☐ YES ☐ No	
6	- Quality assurance plan in production line (QA) - Quality control at the end of assembly line (QC) - Material inspection process - Production flow chart **(see 2f)**	☐ YES ☐ No	
7	Certificate of the company from which the Contractor casts hotline clamps**(see 2g)**	☐ YES ☐ No	
8	Packing detail **(see 2h)**	☐ YES ☐ No	

Note:

Critical documents shall be submitted with the bid; otherwise, the proposal shall be rejected.

ภาคผนวก

แบบฟอร์มรับรองการหล่อชิ้นงานของโรงงานที่ทำการหล่อชิ้นงาน
(ต้องส่งแบบฟอร์มรับรองการหล่อชิ้นงานในวันยื่นซองประกวดราคา)

วันที่.....เดือน.....พ.ศ.....

ข้าพเจ้า (บริษัท, โรงงาน).....
สำนักงานตั้งอยู่เลขที่.....หมู่.....ซอย.....ถนน.....ตำบล/แขวง.....
อำเภอ/เขต.....จังหวัด.....หมายเลขโทรศัพท์.....
ขอรับรองว่าเป็นผู้หล่อตัวอย่างชิ้นงานให้แก่ (บริษัท, ห้อง, ร้าน).....
เพื่อนำมาเสนอในการประกวดราคา เลขที่.....ของการไฟฟ้าส่วนภูมิภาคต่อไป

ลงชื่อ.....
( )
ประทับตราบริษัท, โรงงาน

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C3 Schedule of detailed requirement

Invitation to Bid No.:

Item	PEA Material No.	Quantity	Description
1	1020330104	set(s)	Hotline protected thread clamp, with: Main line : diameter range of 6.6 mm to 19 mm (sizes 35 mm^2 to 185 mm^2) Tap line : diameter range of 7.7 mm to 19 mm (sizes 50 mm^2 to 185 mm^2)
2	1020330005	set(s)	Hotline bail clamp, with: Main line : diameter range of 6.6 mm to 10.2 mm (sizes 35 mm^2 to 70 mm^2) Bail diameter : not less than 8.5 mm
3	1020330006	set(s)	Hotline bail clamp, with: Main line : diameter range of 9.3 mm to 19 mm (sizes 70 mm^2 to 185 mm^2) Bail diameter : not less than 8.5 mm

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PROVINCIAL ELECTRICITY AUTHORITY

TECHNICAL SPECIFICATION DIVISION

C4 Price schedule

Invitation to Bid No.:

Manufacturer :

Country of origin :

Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
1	1020330104		Hotline protected thread clamp, with: Main line : diameter range of ..... mm to ..... mm (sizes..... mm^2 to ..... mm^2 Tap line : diameter range of ..... mm to ..... mm (sizes..... mm^2 to ..... mm^2	set(s)		
2	1020330005		Hotline bail clamp, with: Main line : diameter range of ..... mm to ..... mm (sizes..... mm^2 to ..... mm^2 Tap line : diameter range of ..... mm to ..... mm (sizes..... mm^2 to ..... mm^2	set(s)		
3	1020330006		Hotline bail clamp, with: Main line : diameter range of ..... mm to ..... mm (sizes..... mm^2 to ..... mm^2 Tap line : diameter range of ..... mm to ..... mm (sizes..... mm^2 to ..... mm^2	set(s)		

TSP PEA II

Invitation to Bid No.:

C Material, equipment, and specifications for High-voltage insulating tape, self-fusing EPR based

C1 General material and packing instructions

Additional to the general instructions, the following shall be observed:

1a Scope

These specifications cover High-voltage insulating tape, self-fusing Ethylene Propylene Rubber (EPR) based designed for splicing and repairing of electrical wire and cables operating at voltages up to 69 kV.

1b Standard

The High-voltage insulating tape, self-fusing EPR based shall be manufactured and tested in accordance with following standard:

American Society for Testing and Materials (ASTM):

ASTM D4388: 2013 Standard specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes

And all other relevant standards, unless otherwise specified in these specifications.

PEA will accept High-voltage insulating tape that manufactured and tested in accordance with the later edition of the above standards.

PEA will also accept High-voltage insulating tape manufactured and tested in accordance with the previous edition of the above standard, if there is no significant change in any test items or no additional test item(s) compared with the above standards. On the other hand, if there is significant change in any test items or there are any additional test items, the previous edition type test report with the additional test report(s) of the significant change test item(s) and/or additional test item(s) will be also accepted.

1c Principal requirement

1c.1 Properties

The properties of the proposed High-voltage insulating tape shall be in accordance with type three (3) classification of ASTM D 4388: 2013, or later edition, as specified in **Table 1**.

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Table 1: Properties of the High-voltage insulating tape, self-fusing EPR based

Properties	Requirements	Test method
Dimension - length/roll - width - thickness	not less than 9 m* 19 mm ± 0.76 mm 0.76 mm ± 0.076 mm * The length of the tape of each roll shall be continuous.	ASTM D4325: 2013, or later edition
Tensile strength, min	1.7 MPa	
Elongation at break, min	700 %	
Dielectric strength, min	24 kV/mm	
Dissipation factor, max - after water immersion - after hot water immersion	 0.05 0.05	
Permittivity, max - after water immersion - after hot water immersion	 4 4	
Volume resistivity, min - 96 h at 23°C and 50 % RH - 96 h at 23°C and 96 % RH	 10^{14} ohm-cm 10^{12} ohm-cm	
Fusion-Flag 2 mm, max	pass at 300 % elongation	
Ozone resistance	pass if no visible signs of cracks	
Heat exposure	pass at 130 °C	
UV resistance	Pass	

1e.2 Sample

The bidders shall submit at least one (1) sample for each proposed item within five (5) working days counted from bid closing date for consideration; otherwise, the proposal will be rejected.

PEA reserves the right to test the samples according to testing items and procedure specified in **1e.2**. In case of the failing test results, the bidders shall be rejected.

The sample shall not be returned.

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1c.3 Marking

The proposed High-voltage insulating tape shall be marked legibly and durably, as follows:

(1) Name of manufacturer or trademark

(2) Catalogue number or model

(3) Width, thickness and length of the tape

(4) Manufacturing date

(5) Net weight

(6) Purchase order number (PO), water resistance plastic sticker is acceptable.

Noted:

- Marking as specified in (1) shall be marked on tape core, plastic wrap and package box.
- Marking as specified in (2) to (4) shall be marked on plastic wrap and package box.
- Marking as specified in (5) and (6) shall be marked on package box.

1d Packing

Each High-voltage insulating tape roll shall be securely wrapped and sealed in a moisture-proof plastic and then shall be contained in a package box individually. The package boxes shall be packed in a carton box, the number of package boxes per carton box shall be not more than 50.

1e Tests and test reports

1e.1 Type test

The High-voltage insulating tap shall pass all test items for the properties specified in **Table** 1 and the tests shall be conducted or inspected by the acknowledged independent testing laboratories/institutes as follows:

(1) Independent laboratories/institutes which are members of the Short-circuit Testing Liaison (STL) or independent laboratories/institutes which are accredited according to TIS 17025 or ISO/IEC 17025 with the scope of accreditation covered the relevant test items, standards and equipment. The certification and scope of accreditation of the independent laboratories/institutes shall be submitted with the bid for consideration.

(2) Thailand's national laboratories, institutes, universities and electric utilities, as follow:

- NSTDA Characterization and testing service center (NCTC)
- Thailand Institute of Scientific and Technological Research (TISTR)
- National Metal and Materials Technology Center (MTEC)
- Electrical and Electronic Products Testing Center (PTEC)
- Thai Industrial Standards Institute (TISI)
- Electrical and Electronics Institute (EEI)
- Department of Science Service (DSS)

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- Testing Laboratory, Electrical Engineering Department, Faculty of Engineering, Chulalongkorn University
- Electricity Generating Authority of Thailand (EGAT)
- Metropolitan Electricity Authority (MEA)
- Provincial Electricity Authority (PEA)

(3) Other laboratories as follow:

- In case the foreign manufacturers have experience of more than twenty (20) years in design, manufacture and sell High-voltage insulating tape, self-fusing EPR based, PEA will accept type test report(s) conducted by the manufacturer's laboratory or other independent laboratories without qualification mentioned in (1) or (2). Documents showing the manufacturer's experience such as reference list shall be submitted with the bid for consideration.
- The bidders or manufacturers who prefer to carry out the type tests of High-voltage insulating tape, self-fusing EPR based with other laboratories without the qualification mentioned above, the detail of laboratory and the test facilities shall be submitted to PEA for approval before proceeding the tests and before the bid closing date. PEA reserves the right to send representatives to inspect or witness the tests.

The type test reports conducted by the laboratories/institutes in Thailand or local manufacturers shall be valid within five (5) years counted from the issued date in the test report to the bid closing date.

The type test reports conducted by the laboratories/institutes in other countries shall be valid within ten (10) years counted from the issued date in the test report to the bid closing date.

The type test reports shall include the necessary data as following:

(1) Brand name of the tape

(2) The catalogue number / type or model of the tape

(3) Colour photograph of the tape before testing

(4) Date of issue or date of approval

The cost of all tests and report shall be borne by the Bidders or manufacturers.

The type test reports shall be submitted with the bid.

PEA will also accept other documents instead of the type test reports in the following cases:

(1) In case the proposed High-voltage insulating tape has been sold to PEA at PEA's Procurement Department (from PEA's head office). The bidder can submit the Purchase Order (PO) on the bid closing date, or

(2) In case the proposed High-voltage insulating tape has been registered for PEA Product Acceptance[1], the Bidder can submit the valid registration certificate on the bid closing date, or

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(3) In case the proposed High-voltage insulating tape has been registered for Product lists for transmission and substation turnkey project[2], the Bidder can submit the valid registration certificate on the bid closing date.

However the document in case (1), (2) and (3) mentioned above shall be proved by the bidding committee that High-voltage insulating tape specified in the PO or registration certificate is the same product, type/model and all ratings as the proposed High-voltage insulating tape for this bid.

Note: [1] PEA Product Acceptance (PPA) is the process for enhancing quality of electrical apparatus which PEA procure by making quality control system and certification of product's quality by reliable Certification Body (CB). PPA is taken responsibility by Electrical Equipment Standard and Quality Control Division.

[2] Product lists for transmission and substation turnkey project is the process of registration of electrical apparatus used in PEA's power system. Product lists is taken responsibility by Substation Project Management Division.

1e.2 Acceptance test

PEA reserves the right to have an acceptance tests conducted by PEA's laboratory or acknowledge independent testing laboratories as mentioned in **1d.1** or by manufacturer's factory qualified by PEA.

The cost of all tests shall be borne by the Contractor.

PEA's acceptance committee will randomly select the samples of the High-voltage insulating tape for each delivery lot with number as specified in **Table 2**.

Table 2: Number of samples for acceptance tests

Number per lot (Rolls)	Number of samples for acceptance test (Rolls)	Required test items (see Table 3)
Up to 49	1	Item 1 to 5
50 to 200	2	
201 to 500	3	
501 to 1,000	4	
1001 and more	5	

Note: - All samples shall be passed the tests.
- The samples shall be not returned and shall be not used in the system.
- After the tests, the additional High-voltage insulating tape with the equal number of the samples specified in **Table 2**, shall be supplied by the contractor with free of charge to complete the number of High-voltage insulating tape in the purchase contract.

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Table 3: Acceptance test for High-voltage insulating tape

Item	Test items	Requirements	Test method
1	Dimension - length - width - thickness	 not less than 9 m 19 mm ± 0.76 mm 0.76 mm ± 0.076 mm	ASTM D 4325: 2013 or later edition
2	Tensile strength, min	1.7 MPa * (see additional condition in Note below)	
3	Elongation at break, min	700 %	
4	Dielectric strength, min	24 kV/mm	
5	Fusion-Flag 2 mm, max	pass at 300 % elongation ** (see additional condition in Note below)	

Note: - * Additional conditions for tensile strength test:
During the tests, tensile strengths of the tape shall be measured and recorded at the elongation of 100%, 200%, 300%, 400%, 500%, 600% and 700%. The tensile strength shall be increased by the increasing of the elongation. The graph of tensile strength and elongation shall be plotted and showed in the report.

- ** Colour photographs showing the sample preparation after wrapped on the mandrel shall be showed in the report.

If the sample(s) fail in the test, PEA will reject all High-voltage insulating tapes in the delivery lot.

1f Manufacturing process inspection

PEA reserve the right to send the representatives by PEA's expense to inspect manufacturing processes of the products during manufacturing with free access any time he deems necessary. The contractor shall facilitate PEA's representative to get access to where the tapes are being manufactured; otherwise, the contract shall be rejected.

The manufacturing factory shall have production machines at least by the following:

- Extrusion machine, for extruding the compound to the tape
- Calendering machine, for smoothing out the surface and shape to required thickness
- Winding machine, for winding to the jumbo roll
- Converting machine, for cutting to the required width

The contractor shall inform PEA in advance for the date of manufacturing in order that PEA can make an appointment with the contractor for inspecting the processes as above-mention.

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1g Guarantee

The contractor has to guarantee quality of the High-voltage insulating tapes for two (2) years commencing from the date that the tapes are received by PEA. During the guarantee period, the contractor shall replace the defective High-voltage insulating tapes, such as unduly attaching of the tape to the separators or loss of their properties, with free of charge within fifteen (15) days after receiving the document of PEA.

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C2 Material and packing data shall be submitted with the bid:

The following critical documents and details shall be submitted with the bid:

Critical documents of the proposed High-voltage insulating tape shall be submitted with the bid for each item offered:

(The bidders shall fill the table below; otherwise, the proposal shall be rejected)

No.	Required technical document	Proposed technical document	Reference document (Folder/Page No.)
1	Guarantee performance data of High-voltage insulating tape, self-fusing EPR based (see Pages 9 of 9)	❑ YES ❑ No	
2	Type test report (see **1d.1**), or	❑ YES ❑ No	
	Purchase Order (PO) from PEA's Procurement Department (from PEA's head office), or	❑ YES ❑ No	
	Registration certificate of PEA Product Acceptance, or	❑ YES ❑ No	
	Registration certificate of Product lists for transmission and substation turnkey project	❑ YES ❑ No	
3	Catalogue	❑ YES ❑ No	
4	Packing detail (see **1c.4**)	❑ YES ❑ No	

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Invitation to Bid No:

Performance data and guarantee of the proposed High-voltage insulating tape, self-fusing EPR based

Manufacturers		
Country of origin		
Brand name		
Type or model		
Distributor		
Properties	**Unit**	**Proposed data**
Dimension - length - width - thickness	 m mm mm	
Tensile strength, min	MPa	
Elongation at break, min	%	
Dielectric strength, min	kV/mm	
Dissipation factor, max - after water immersion - after hot water immersion	 - -	
Permittivity, max - after water immersion - after hot water immersion	 - -	
Volume resistivity, min - 96 h at 23°C and 50 % RH - 96 h at 23°C and 96 % RH	 ohm-cm ohm-cm	
Fusion-Flag 2 mm, max, at 300 % elongation	PASS/FAIL	
Ozone resistance	PASS/FAIL	
Heat exposure, at 130 °C	PASS/FAIL	
UV resistance	PASS/FAIL	
Guarantee period	year(s)	

EME
PEA

PROVINCIAL ELECTRICITY AUTHORITY

ELECTRICAL AND MECHANICAL ENGINEERING DIVISION

Specification No. : RMIS-105/2564 HIGH-VOLTAGE INSULATING TAPE, SELF-FUSING EPR BASED

C3 Schedule of detailed requirement

Invitation to Bid No. :

Item	PEA Material No.	Quantity	Description
1	1020180008	roll(s)	High-voltage insulating tape, self-fusing EPR based shall be designed for the splicing and repair of electrical wire and cables operating at voltages up to 69 kV with: Length : Not less than 9 m Width : 19 mm ± 0.76 mm Thickness : 0.76 mm ± 0.076 mm

EME PEA

PROVINCIAL ELECTRICITY AUTHORITY

ELECTRICAL AND MECHANICAL ENGINEERING DIVISION

Specification No.: RMIS-105/2564: HIGH-VOLTAGE INSULATING TAPE, SELF-FUSING EPR BASED

C4 Price schedule

Invitation to Bid No.:

Manufacturer :

Country of origin :

Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
1	1020180008		High-voltage insulating tape, self-fusing, EPR based shall be designed for the splicing and repair of electrical wire and cables operating at voltage up to 69 kV with Length : ..... m Width : ..... mm Thickness : ..... mm	roll(s)	set(s)	

EME
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