

EGAT's Privacy Notice on Procurement, Inventory Management and Contract Administration

Electricity Generating Authority of Thailand (EGAT) has performed the protection of the Personal Data regarding procurement, inventory management and contract administration to be in accordance with the **Personal Data Protection Act B.E. 2562** (the "2019 PDPA"), which comes into effect on June 1, 2022.

Details about EGAT's Privacy Notice on Procurement, Inventory Management and Contract Administration are available for you at https://www.egat.co.th/privacy-notice-procurement_en.html or the below QR Code.



The Redaction of Sensitive Personal Data

EGAT has announced the Privacy Notice on Procurement, Inventory Management and Contract Administration for the collection, use or disclosure of Personal Data, excluding the Sensitive Personal Data.

Should the documents you wish to submit to EGAT contain the Sensitive Personal Data as defined in Section 26 of the 2019 PDPA, pertaining to racial, ethnic origin, political opinions, cult, religious or philosophical beliefs, sexual behavior, criminal records, health data, disability, trade union information, genetic data, biometric data, or of any data which may affect you in the same manner, you shall redact or conceal such data before submitting to EGAT.

ประกาศความเป็นส่วนตัว (Privacy Notice) สำหรับการจัดซื้อจัดจ้าง การบริหารพัสดุ และการบริหารสัญญาของ กฟผ.

การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย (กฟผ.) ได้ดำเนินการคุ้มครองข้อมูลส่วนบุคคลสำหรับการจัดซื้อจัดจ้าง การบริหารพัสดุ และการบริหารสัญญา เพื่อให้เป็นไปตามพระราชบัญญัติคุ้มครองข้อมูลส่วนบุคคลของประเทศไทย พ.ศ. 2562 (PDPA) ซึ่งมีผลบังคับใช้อย่างครบถ้วน ตั้งแต่วันที่ 1 มิถุนายน 2565 ทั้งนี้ ท่านสามารถศึกษารายละเอียดประกาศความเป็นส่วนตัว (Privacy Notice) สำหรับการจัดซื้อจัดจ้าง การบริหารพัสดุ และการบริหารสัญญา ได้ที่ <https://www.egat.co.th/privacy-notice-procurement.html> หรือที่ QR Code ด้านล่าง



การขิดฆ่าข้อมูลส่วนบุคคลอ่อนไหว

กฟผ. มีประกาศความเป็นส่วนตัว (Privacy Notice) สำหรับการจัดซื้อจัดจ้าง การบริหารพัสดุ และการบริหารสัญญา เพื่อใช้ในการเก็บรวบรวม ใช้ หรือเปิดเผย ข้อมูลส่วนบุคคล แต่ไม่เก็บข้อมูลส่วนบุคคลอ่อนไหว หากเอกสารของท่านที่ต้องส่งมอบให้ กฟผ. มีข้อมูลส่วนบุคคลอ่อนไหวตามที่ถูกบัญญัติไว้ในมาตรา 26 ของ PDPA ดังนี้ เชื้อชาติ เผ่าพันธุ์ ความคิดเห็นทางการเมือง ความเชื่อในลัทธิ ศาสนาหรือปรัชญา พฤติกรรมทางเพศ ประวัติอาชญากรรม ข้อมูลสุขภาพ ความพิการ ข้อมูลสหภาพแรงงาน ข้อมูลพันธุกรรม ข้อมูลชีวภาพ หรือข้อมูลอื่นใด ซึ่งกระทบต่อเจ้าของข้อมูลส่วนบุคคลในทำนองเดียวกันรวมอยู่ด้วย ขอให้ท่านขิดฆ่า หรือปกปิดข้อมูลดังกล่าว ก่อนส่งมอบให้แก่ กฟผ.

**1st Draft of Terms of Reference,
Announcement and Details of Medium Cost
for Invitation to Bid No. GBA3-HTLS-01
Supply of Transmission Line High Temperature Low Sag Conductor,
Hardware Assemblies and Line Accessories
Bulk Power Supply for the Greater Bangkok and Vicinity Area Phase 3**

The Electricity Generating Authority of Thailand (EGAT) plans to call for proposals for the subject Invitation to Bid. Any person who has the authorization from the company, firm, joint venture or consortium who required under the subject invitation to Bid is allowed to submit a comment against the first draft of the Terms of Reference (TOR), the Announcement and the Details of Medium Cost attached herewith.

How to Comment

Those who would like to comment shall submit an official letter signed by the authorized person(s) together with the letter of authorization or the power of attorney, and addressed to “Chief, International Procurement Department - Transmission Segment, Procurement and Inventory Management Division”.

Comments shall be submitted via EGAT Procurement website or via email address: jatuphon.p@egat.co.th with all related documents attached (e.g. the letter of authorization and the power of attorney).

Comments shall be received by EGAT on or before ***November 4, 2022***, Bangkok Standard Time, **otherwise the comments will not be taken into consideration.**

EGAT reserves the right to change or not to change the terms and conditions contained in the Terms of Reference, the Announcement and the Details of Medium Cost subject to its consideration and such decision shall be final.

Hathaipat Poonpolkul
Miss Hathaipat Poonpolkul
Head, International Buy Section - Transmission System Segment
November 1, 2022

Notice to Bidder

Subject : Online Payment for Purchase of Bidding Documents

Due to the outbreak of COVID-19 in Thailand, please be informed of the online payment for purchase of bidding documents as follows:

- 1) Payment shall be made by bank transfer or telegraphic transfer to EGAT's account no. 109-6-01958-2 (swift code : KRTHTHBK), Krung Thai Bank Public Company Limited, Bangkruai Branch, Nonthaburi.

All bank charges and fees incurred by the payment of bidding documents shall be under the buyer's responsibility.

- 2) Download the Registration Form and fill out all necessary information by typing. (Complete data is required.)
- 3) Submit the fill-out Registration Form and the proof of payment from 1) to the email address of the in-charge officer and procurement.tse@egat.co.th in the CC. before 15.00 hrs. Bangkok Standard Time.
- 4) After the payment has been verified for approximately 3 working days, the in-charge officer will send the link for downloading the bidding documents together with the receipt to the purchaser's email address in the Registration Form.

***** Please note that this online payment process is a temporary measure due to the COVID-19 outbreak. The online payment process will be available until further notice from EGAT *****



Invitation to Bid No. GBA3-HTLS-01

Supply of Transmission Line High Temperature Low Sag Conductor, Hardware Assemblies and Line Accessories Bulk Power Supply for the Greater Bangkok and Vicinity Area Phase 3

The Electricity Generating Authority of Thailand (EGAT) is calling for the subject Invitation to Bid to be financed by EGAT's fund.

Place of Delivery : Bangkok Port / Ex-works

Medium Cost (including Value Added Tax and other expenses) : THB 141,100,000.-

Eligibility of Bidders

1. The Bidder shall be a juristic person who manufactures or provides such materials or services and shall not be named in the List of Work Abandoners published by the Permanent Secretary, Ministry of Finance, and/or in the Debarment List and/or in the List of Work Abandoners declared by EGAT.
2. The Bidder shall not be a Jointly Interested Bidder with other Bidders as from the date of EGAT's issuance of the Invitation, or shall not be a person who undertakes any action as an "Obstruction of Fair Price Competition" for this Invitation.
3. The Bidder shall not either be EGAT's consultant or involve in EGAT's consultancy company under this Invitation to Bid, or shall not have EGAT's personnel involved in his business as shareholder having voting right that can control his business, director, manager, officer, employee, agent, or consultant except those who are officially ordered by EGAT to act or participate therein.
4. The Bidder shall not be the person who is privileged or protected not to be taken any legal proceedings under Thai Court; Provided that such Bidder's government declares that such special privilege is waived.
5. The Bidder who is a joint venture or consortium shall carry out all the work under such formation from the time of bidding until the fulfillment of the Contract.

Availability of Bidding Documents

Bidding Documents in CD-ROM will be available for examination of Bidder's Qualifications and purchase during 08:00 hrs. to 15:00 hrs., Bangkok Standard Time, as from _____ to _____ at _____ or _____ per copy, non-refundable, at the following address :

International Procurement Department – Transmission Segment
(Room No. 301, 3rd Floor, Tor 082 Building)
Procurement and Inventory Management Division
Electricity Generating Authority of Thailand
Bangkrui, Nonthaburi 11130, Thailand
Telephone no. 66 2436 0341
E-mail : procurement.tse@egat.co.th

Please find more details and download Registration Form for purchasing Bidding Documents at <http://www4.egat.co.th/fprocurement/biddingeng/>.

Payment can be made by a certified cheque or money order payable to EGAT or by a telegraphic transfer to EGAT's current account no. 109-6-01958-2 (swift code : KRTHTHBK), Krung Thai Bank Public Company Limited, Bangkrui Branch, Nonthaburi. All bank charges and fees incurred by the payment of bidding documents shall be under the buyer's responsibility.

Bidding Documents in CD-ROM will be either airmailed or airfreighted to the buyer at EGAT's expense upon receipt of the relevant remittance. In case the buyer requires the Bidding Documents to be sent by Express Mail Service (EMS), the charge will be at the buyer's expense.

Delivery of Bids

Bids shall be submitted at Bidding Room, 1st Floor, Tor 082 Building during 09:30 hrs. to 10:00 hrs., Bangkok Standard Time, _____ and will be opened publicly at 10:00 hrs.

ELECTRICITY GENERATING AUTHORITY OF THAILAND

(Date of Announcement)

(Miss Chattiya Chandhanayingyong)
Chief, International Procurement Department –
Transmission Segment

DRAFT



ประกาศการไฟฟ้าฝ่ายผลิตแห่งประเทศไทย เรื่อง ประกวดราคาซื้อ เลขที่ GBA3-HTLS-01

การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย (กฟผ.) มีความประสงค์จะซื้อ Transmission Line High Temperature Low Sag Conductor, Hardware Assemblies and Line Accessories สำหรับโครงการขยายระบบไฟฟ้าในเขตกรุงเทพและปริมณฑล ระยะที่ 3 โดยใช้งบประมาณ กฟผ.

สถานที่ส่งมอบ : ท่าเรือกรุงเทพฯ / หน้าโรงงานผู้ผลิต

ราคากลาง (รวมภาษีมูลค่าเพิ่มและค่าใช้จ่ายอื่นๆ) : 141,100,000.- บาท

คุณสมบัติของผู้เสนอราคา

1. ต้องเป็นนิติบุคคลผู้ผลิตหรือเป็นผู้มีอาชีพขายพัสดุตามประกาศ และต้องไม่เป็นผู้ที่งานซึ่งปลัดกระทรวงการคลังได้แจ้งเวียนชื่อไว้ หรือต้องไม่เป็นผู้ที่ กฟผ. ห้ามติดต่อหรือห้ามเข้าเสนอราคา หรือต้องไม่เป็นผู้ที่ได้รับผลของการสั่งให้นิติบุคคลหรือบุคคลอื่นเป็นผู้ทำงานตามคำสั่ง กฟผ.
2. ต้องไม่เป็นผู้มีผลประโยชน์ร่วมกันกับผู้เสนอราคารายอื่น ณ วันประกาศประกวดราคาครั้งนี้เป็นต้นไป หรือต้องไม่เป็นผู้กระทำการอันเป็นการขัดขวางการแข่งขันราคาอย่างเป็นธรรมในการดำเนินการประกวดราคาครั้งนี้
3. ต้องไม่เป็นที่ปรึกษาของ กฟผ. หรือมีส่วนร่วมในบริษัทที่ปรึกษาของ กฟผ. ในงานนี้ หรือต้องไม่มีผู้ปฏิบัติงาน กฟผ. เข้าไปมีส่วนร่วมในกิจการของผู้เสนอราคา ไม่ว่าจะในฐานะผู้ถือหุ้นที่มีสิทธิควบคุมการจัดการ กรรมการ ผู้อำนวยการ ผู้จัดการ พนักงาน ลูกจ้าง ตัวแทน หรือที่ปรึกษา ยกเว้น ในกรณีที่ผู้ปฏิบัติงานได้รับคำสั่งอย่างเป็นทางการจาก กฟผ. ให้ไปปฏิบัติงานหรือเข้าร่วมในกิจการของผู้เสนอราคา
4. ต้องไม่เป็นผู้ได้รับเอกสิทธิ์หรือความคุ้มกัน ซึ่งอาจปฏิเสธไม่ยอมขึ้นศาลไทย เว้นแต่รัฐบาลของผู้เสนอราคาได้มีคำสั่งให้สละสิทธิ์และความคุ้มกันเช่นนั้น
5. ผู้ประสงค์เข้าประกวดราคาในนามของกิจการร่วมค้าหรือกิจการค้าร่วม (Joint Venture or Consortium) จะต้องดำเนินการทุกขั้นตอนของการประกวดราคาในนามของกิจการร่วมค้าหรือกิจการค้าร่วม ตั้งแต่การเสนอราคาจนถึงสิ้นสุดข้อผูกพันกับ กฟผ.

การขายเอกสารประกวดราคา

ผู้สนใจติดต่อขอทราบรายละเอียด เพื่อตรวจสอบคุณสมบัติของผู้เสนอราคา และขอซื้อเอกสารประกวดราคา ในราคาชุดละ _____ ได้ที่ แผนกจัดซื้อต่างประเทศสายงานระบบส่ง (ห้อง 301 ชั้น 3 อาคารฝ่ายจัดซื้อจัดจ้างและบริหารพัสดุ ท.082) กองจัดซื้อจัดจ้างต่างประเทศสายงานระบบส่ง ฝ่ายจัดซื้อจัดจ้างและบริหารพัสดุ การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย เชียงสะพานพระราม 7 จังหวัดนนทบุรี ในวันทำการระหว่างเวลา 08:00 น. ถึง 15:00 น. ตั้งแต่วันที่ _____ ถึงวันที่ _____ หรือสอบถามทางโทรศัพท์หมายเลข 0 2436 0341 หรืออีเมล procurement.tse@egat.co.th ทั้งนี้ สามารถ download แบบฟอร์มลงทะเบียนผู้ซื้อเอกสารประกวดราคาได้ที่เว็บไซต์ <http://www4.egat.co.th/fprocurement/biddingeng/>

การยื่นซองประกวดราคา

กำหนดยื่นซองประกวดราคา ในวันที่_____ เวลา 09:30 น. ถึง 10:00 น. และเปิดซองประกวดราคาเวลา 10:00 น. ณ ห้องประกวดราคา ชั้น 1 อาคารฝ่ายจัดซื้อจัดจ้างและบริหารพัสดุ ท.082 การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย เชียงสะพานพระราม 7 จังหวัดนนทบุรี

ประกาศ ณ วันที่

(นางสาวฉัตติยา จันทนยิ่งยง)

หัวหน้ากองจัดซื้อจัดจ้างต่างประเทศสายงานระบบส่ง

DRAFT

ตารางแสดงวงเงินงบประมาณที่ได้รับจัดสรรและราคากลาง(ราคาอ้างอิง)
ในการจัดซื้อจัดจ้างที่มีใช้งานก่อสร้าง

1. ชื่อโครงการ Bid No. GBA3-HTLS-01
งานจัดซื้อ Transmission Line High Temperature Low Sag Conductor,
Hardware Assemblies and Line Accessories
โครงการขยายระบบไฟฟ้าในเขตกรุงเทพและปริมณฑล ระยะที่ 3
/หน่วยงานเจ้าของโครงการ ฝ่ายแผนงานและโครงการระบบส่ง การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย
2. วงเงินงบประมาณที่ได้รับจัดสรร
โครงการขยายระบบไฟฟ้าในเขตกรุงเทพและปริมณฑล ระยะที่ 3
งบประมาณ 12,100 ล้านบาท
3. วันที่กำหนดราคากลาง 11 ตุลาคม 2565 (วันที่ ชสพ. อนุมัติ)
ราคารวมภาษีมูลค่าเพิ่มและค่าใช้จ่ายอื่นๆ เป็นเงิน 141,100,000.00 บาท ราคา/หน่วย ตามเอกสารแนบ
4. แหล่งที่มาของราคากลาง
หลักเกณฑ์การกำหนดราคากลางการจัดซื้อและจัดจ้างงานก่อสร้างระบบส่งไฟฟ้าของสายงานระบบส่ง
5. รายชื่อเจ้าหน้าที่ผู้กำหนดราคากลาง
 - 5.1 นางสาวสุจรรยา กิรดิรัตน์พฤษ์ กวสส-ส.
 - 5.2 นายสมปอง บวรธีระกิจชัย หปส-ส.
 - 5.3 นายธุกานต์ นิโครวนจำรัส วศ.4 หปส-ส. กวสส-ส.

หมายเหตุ ค่าใช้จ่ายอื่นๆ ได้แก่ ค่าใช้จ่ายที่ กฟผ. ต้องจ่ายตามวิธีการพิจารณาเปรียบเทียบราคาที่กำหนดไว้ในเอกสารประกวดราคา เช่น อากรขาเข้า เป็นต้น

DETAILS OF THE MEDIUM COST FOR BID NO. GBA3-HTLS-01**SCHEDULE 1 : SUPPLY OF TRANSMISSION LINE HIGH TEMPERATURE LOW SAG CONDUCTOR**


Item	Description	Supply of Equipment	
		Foreign Supply	Foreign Currency
		CFR Thai Port	
		Amount (Baht)	Amount (Baht)
1-1	INVAR Conductor	121,325,640.00	
1-2	INVAR Conductor	955,320.00	

SCHEDULE 2 : SUPPLY OF TRANSMISSION LINE HARDWARE ASSEMBLIES AND LINE ACCESSORIES

2-1	Single string suspension insulator assemblies with armor rods for Invar conductor, 8000 kg ultimate strength, coupling type B (without insulator and arcing horn)		907,200.00
2-2	Double string suspension insulator assemblies with armor rods for Invar conductor, 12000 kg ultimate strength, coupling type B (without insulator and arcing horn)		504,000.00
2-3	Bypass string suspension insulator assemblies for Invar conductor, 8000 kg ultimate strength, coupling type B (without insulator and arcing horn)		472,500.00
2-4	Single string tension insulator assemblies for Invar conductor, 12000 kg ultimate strength, coupling type B (without insulator and arcing horn)		507,300.00
2-5	Double string tension insulator assemblies for Invar conductor, 14000 kg ultimate strength, coupling type B (without insulator and arcing horn)		4,920,300.00
2-6	Single string tension inverted insulator assemblies for Invar conductor, 12000 kg ultimate strength, coupling type B (without insulator and arcing horn)		53,400.00
2-7	Double string tension inverted insulator assemblies for Invar conductor, 14000 kg ultimate strength, coupling type B (without insulator and arcing horn)		69,300.00
2-8	Vibration damper for Invar conductor		1,243,200.00
2-9	Compression dead end for Invar conductor		112,800.00
2-10	Tension sleeve for Invar conductor		36,000.00

Bid Price	122,280,960.00	8,826,000.00
Adjusted Price (Other Expense and VAT)	9,990,907.24	
Total Bid Price Schedule 1 and 2	141,097,867.24	

MEDIUM COST OF BID NO. GBA3-HTLS-01	141,100,000.00
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 นายประวิทย์ เลิศโกวิท
 ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
 11 Oct 2022

Contract No.

Invitation to Bid No. GBA3-HTLS-01

ELECTRICITY GENERATING AUTHORITY OF THAILAND



BIDDING DOCUMENTS

**SUPPLY OF TRANSMISSION LINE
HIGH TEMPERATURE LOW SAG CONDUCTOR,
HARDWARE ASSEMBLIES AND LINE ACCESSORIES**

**BULK POWER SUPPLY FOR THE GREATER BANGKOK AND
VICINITY AREA PHASE 3**

EGAT'S FUND

BIDDER : _____

(2022)

INVITATION TO BID NO. GBA3-HTLS-01

**SUPPLY OF TRANSMISSION LINE
HIGH TEMPERATURE LOW SAG CONDUCTOR,
HARDWARE ASSEMBLIES AND LINE ACCESSORIES**

**BULK POWER SUPPLY FOR THE GREATER BANGKOK AND
VICINITY AREA PHASE 3**

EGAT'S FUND

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CONFIRMATION FORM

(INDIVIDUAL COMPANY / JOINT VENTURE)

INVITATION TO BID NO. GBA3-HTLS-01

**SUPPLY OF TRANSMISSION LINE
HIGH TEMPERATURE LOW SAG CONDUCTOR,
HARDWARE ASSEMBLIES AND LINE ACCESSORIES**

**BULK POWER SUPPLY FOR THE GREATER BANGKOK AND
VICINITY AREA PHASE 3**

By signing in the space provided below, we confirm that:-

- According to “Eligibility of Bidders” and in addition to the Documentary List attached to the bidding documents, we are not a Jointly Interested Bidder with the other bidders as from the date of EGAT’s issuance of the subject Invitation and are not a person who undertakes any actions as an “Obstruction of Fair Price Competition”.
- According to Article B-8. Information to be Submitted with Bid, we confirm
 - Registration with the Revenue Department as a value added tax registrant in Thailand as per certificate of value added tax registration (ภพ.20) attached.
 - Non-Registration as a value added tax registrant in Thailand, but will register later.
 - Non-Registration as a value added tax registrant in Thailand and will not register.

Confirmed :

.....

By :

Title :

Date :

CONFIRMATION FORM

(CONSORTIUM)

INVITATION TO BID NO. GBA3-HTLS-01

**SUPPLY OF TRANSMISSION LINE
HIGH TEMPERATURE LOW SAG CONDUCTOR,
HARDWARE ASSEMBLIES AND LINE ACCESSORIES**

**BULK POWER SUPPLY FOR THE GREATER BANGKOK AND
VICINITY AREA PHASE 3**

Member No. ... of the consortium:

By signing in the space provided below, we confirm that:-

- According to “Eligibility of Bidders” and in addition to the Documentary List attached to the bidding documents, we are not a Jointly Interested Bidder with the other bidders as from the date of EGAT’s issuance of the subject Invitation and are not a person who undertakes any actions as an “Obstruction of Fair Price Competition”.
- According to Article B-8. Information to be Submitted with Bid, we confirm
 - Registration with the Revenue Department as a value added tax registrant in Thailand as per certificate of value added tax registration (พ.ร.20) attached.
 - Non-Registration as a value added tax registrant in Thailand, but will register later.
 - Non-Registration as a value added tax registrant in Thailand and will not register.

Confirmed :

.....

By :

Title :

Date :

DISCOUNT FORM
(Excluding VAT)

INVITATION TO BID NO. GBA3-HTLS-01

**SUPPLY OF TRANSMISSION LINE
HIGH TEMPERATURE LOW SAG CONDUCTOR,
HARDWARE ASSEMBLIES AND LINE ACCESSORIES**

**BULK POWER SUPPLY FOR THE GREATER BANGKOK AND
VICINITY AREA PHASE 3**

Bidder : _____

By signing in the space provided below, we confirm that:-

- we offer no discount.
- we offer discount(s) as follows:

Details of discount	Currency	Amount

Remarks :

- ***The Bidder shall apply discount(s) on any item(s), schedule(s), or the total price, excluding Value Added Tax (VAT).***
- The above discount(s) shall not be subject to any conditions. Discount with conditions shall not be considered.
- This Discount Form, together with Bidder's Summary of Bid Price, will be publicly presented on a screen to all Bidders in the bid opening room at the time of bid opening.

Confirmed by authorized person(s):

.....

By :

Title :

Date :

Additional Regulation

This Regulation shall apply to the Enquiry, Bid for Supply, Lease, Hire of Work, or Hire of Consultant by Way of Selection.

1. Attachments

1.1 Definitions

1.1.1 Jointly Interested Bidder

1.1.2 Obstruction of Fair Price Competition

1.2 Documentary List

2. Bidder's Qualifications

2.1 The Bidder shall professionally be in the business of providing materials or services or leasing or consultancy services, as the case may be, and shall not be named in the list of work abandoners published by the Permanent Secretary, Ministry of Finance, and/or in the debarment list and/or the list of work abandoners declared by EGAT according to Article 5 of this Regulation.

2.2 The Bidder shall not be a Jointly Interested Bidder with other bidders as from the date of EGAT's issuance of the Invitation for Bid/Enquiry or the Invitation Letter/ Terms of Reference for the consultancy services, as the case may be, or shall not be a person who undertakes any action as an "Obstruction of Fair Price Competition" described in Article 1.1 – Definitions.

2.3 The Bidder shall not have EGAT's personnel involve in his business as shareholder having voting right that can control his business, director, manager, officer, employee, agent or consultant except for the ones who are officially ordered by EGAT to act or participate therein.

3. Information to be Submitted with Bid

The Bidder shall submit with his bid the documents according to Article 1.2 - Documentary List, including but not limited to, the following documents :-

3.1 Where the Bidder is a juristic person :

(a) ordinary partnership or limited partnership

a certified copy of affidavit of incorporation, name list of managing partners, list of persons entrusted with controlling power (if any), as well as a certified copy of registration for value added tax (if any).

(b) limited company or public limited company

a certified copy of affidavit of incorporation, memorandum of association, name list of managing directors, list of persons entrusted with controlling power (if any) and name list of major shareholders, as well as a certified copy of registration for value added tax (if any).

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Such certified copy of affidavit of incorporation with the validity of not more than six (6) months from the date of certification to the opening date of Bid/Enquiry or the date of Invitation Letter/Terms of Reference in case of consultancy services, as the case may be, shall certify at least the following information :

- (i) Type of a juristic person : an ordinary partnership, a limited partnership, a limited company, a public limited company,
- (ii) Name according to (i),
- (iii) Number and names of managing partners or managing directors,
- (iv) Number and names of managing partners or managing directors authorized to act on behalf of the company,
- (v) Amount of shareholders' equity or registered capital,
- (vi) Authority of managing partner in case of partnership,
- (vii) Location of head office,
- (viii) Registration purposes,
- (ix) Scope of work indicated in business permit license of a foreign juristic person who registers in Thailand,
- (x) Other documents e.g. changes or additions to the above documents, branches (if any).

3.2 Where the Bidder is a natural person or a group of persons other than a juristic person :

a certified copy of :

- identity card
- partnership agreement or contract (if any)
- partners' identity cards
- registration required by Ministry of Commerce of Thailand
- registration for value added tax (if any)

3.3 Where the Bidder is a joint venture / consortium :

a certified copy of :

- association agreement
- identity card or passport (if non Thai national)
(The participant in the joint venture or consortium is not a juristic person.)
- all documents specified in *Item 3.1* of Additional Regulation
(The participant in the joint venture or consortium is a juristic person.)

3.4 Other documentary evidence as required per *Item 3, 6 or 8* of Documentary List (if any).

4. Preliminary Examination

4.1 EGAT shall examine the qualification of all bidders to determine whether any bidder is a Jointly Interested Bidder as from the date of EGAT's issuance of the Invitation for Bid/Enquiry or the Invitation Letter/Terms of Reference for the consultancy services, as the case may be, and/or undertakes any action as an "Obstruction of Fair Price Competition" before or during the bid opening. If there is evidence showing that any bidder is a Jointly Interested Bidder or undertakes any action as an "Obstruction of Fair Price Competition", EGAT shall delete his name from the list of bidders and inform such bidder by written notice hereof.

4.2 The Bidder whose name is deleted according to Article 4.1, may, within *fifteen (15)* calendar days from the date of receipt of EGAT's written notice, appeal to EGAT, explaining reasons together with relevant documents for EGAT's reconsideration.

In case EGAT agrees with the objection of the appellant but considers that the cancellation of enquiry/bidding will be beneficial to EGAT, EGAT may, at its sole discretion, cancel such bid. In the event that the Bidder who undertakes any action as an "Obstruction of Fair Price Competition" does not appeal or, after his appeal, EGAT does not agree with his objection, such Bidder shall be regarded as a work abandoner.

EGAT's decision shall be notified to the appellant in writing and such decision shall be final and conclusive.

5. Reservation of the Right for Proposal and Others

In case any juristic person is regarded as a work abandoner by EGAT and such abandonment is caused by the manager, the managing partner, the managing director, the executive or the person authorized to manage the business of that juristic person, EGAT shall also include his name as a work abandoner.

In case any juristic person is regarded as a work abandoner by EGAT, such decision shall also be applied to other juristic persons of the same business where its manager, managing partner, managing director, executive, or person authorized to manage the business is the same person who is the manager, managing partner, managing director, executive, or person authorized to manage the business of the juristic person who is regarded as a work abandoner by EGAT as aforesaid.

In case any natural person is regarded as a work abandoner by EGAT, such decision shall also be applied to other juristic persons who submit the proposal and have such natural person as the manager, managing partner, managing director, executive or person authorized to manage the business of such juristic persons

1.1 Definitions

These definitions shall apply to the Enquiry, Bid for Supply, Lease, Hire or Work, or Hire of Consultant by Way of Selection.

1.1.1 “**Jointly Interested Bidder**” means a natural person or juristic person who submits bid to EGAT for the supply of goods, lease, hire of work, or hire of consultant by way of selection, as the case may be, and who has an interest, either directly or indirectly, in the business of another natural person or juristic person whose bid is also submitted to EGAT in this bidding.

The interest, either direct or indirect, in another natural person or juristic person as aforesaid includes the relationship in the following manners :

- (1) Management relationship, whereby the manager, the managing partner, the managing director, the executive or the person authorized to manage the business of a natural person or a juristic person has the power, or is able to exercise the power, in managing the business of the other one or more natural persons or juristic persons whose bids are also submitted to EGAT in this bidding.
- (2) Capital relationship, whereby a partner in an ordinary partnership or a partner with unlimited liability in a limited partnership or a major shareholder in a limited company or a public limited company is a partner in the other one or more ordinary partnerships or limited partnerships, or is a major shareholder in the other one or more limited companies or public limited companies whose bids are also submitted to EGAT in this bidding.
- (3) Cross relationship between (1) and (2), whereby the manager, managing partner, managing director, executive or person authorized to manage the business of a natural person or juristic person is a partner in the other one or more ordinary partnerships or limited partnerships, or is major shareholder in the other one or more limited companies or public limited companies whose bids are also submitted to EGAT in this bidding, or *vice versa*.

“**Major shareholder**” means a shareholder who holds more than twenty five (25) percent of stake in such an enterprise or at another percentage determined by the Governor as he deems expedient for some types or sizes of enterprises.

Holding of position, being a partner or shareholding as aforesaid by the spouse or minor of the person in (1), (2) or (3) shall be deemed the holding of position, being a partner or shareholding by such person.

If any bidder uses the name of another person as the manager, managing partner, managing director, executive, partner or shareholder, but in which case he himself in fact exercises the power in management or he himself is the real partner or shareholder of the partnership or limited company or public limited company, as the case may be, and the related partnership or limited company or public limited company whose bid is also submitted to EGAT in this bidding, that bidder shall be deemed to have a relationship under (1), (2) or (3), as the case may be.

1.1.2 **“Obstruction of Fair Price Competition”** means any act committed by a bidder or bidders causing hindrance or obstruction or impeding the opportunity for fair price competition in the tendering of bid to EGAT, whether done by collusion, or by granting, requesting, or agreeing to grant, demand, accept or agreeing to accept money or property or other benefit or by committing an act of violence or by threatening to commit an act of violence or presenting a false document or doing any act in bad faith, with the objective of acquiring benefit among the other bidders or in order to give benefit to any specific bidder so that such person will be entitled to enter into a contract with EGAT or in order to avoid fair price competition, or in order to take advantage of EGAT which not being usual business practices.

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1.2 Documentary List

This documentary list shall apply to the Enquiry, Bid for Supply, Lease, Hire of Work, or Hire of Consultant by Way of Selection.

	No. of page(s)	For EGAT only	
<u>Thai National Bidder</u>			
[] 1. Where the Bidder is a natural person or a group of persons other than a juristic person			
() (a) Natural Person		Yes	No
- Certified copy of identity card		<input type="checkbox"/>	<input type="checkbox"/>
() (b) Group of persons			
- Certified copy of partnership agreement or contract (if any)		<input type="checkbox"/>	<input type="checkbox"/>
- Certified copy of identity card(s) of partners or related documents according to <i>Item 2 (a) and (b)</i> of each participant of the group		<input type="checkbox"/>	<input type="checkbox"/>
[] 2. Where the Bidder is a juristic person			
() (a) Ordinary partnership or limited partnership			
- Certified copy of affidavit of incorporation		<input type="checkbox"/>	<input type="checkbox"/>
- Name list of managing partners and list of persons entrusted with controlling power (if any)		<input type="checkbox"/>	<input type="checkbox"/>
(Please fill in the form on page 10.)			
() (b) Limited company or public limited company			
- Certified copy of affidavit of incorporation		<input type="checkbox"/>	<input type="checkbox"/>
- Memorandum of Association		<input type="checkbox"/>	<input type="checkbox"/>
- Name list of managing directors and list of persons entrusted with controlling power (if any)		<input type="checkbox"/>	<input type="checkbox"/>
(Please fill in the form on page 10.)			
- Name list of major shareholders		<input type="checkbox"/>	<input type="checkbox"/>
(Please fill in the form on page 11.)			
[] 3. Other documents (if any)			
() Certified copy of any other registration required by Ministry of Commerce of Thailand		<input type="checkbox"/>	<input type="checkbox"/>
() Certified copy of registration for value added tax		<input type="checkbox"/>	<input type="checkbox"/>
()		<input type="checkbox"/>	<input type="checkbox"/>
()		<input type="checkbox"/>	<input type="checkbox"/>
()		<input type="checkbox"/>	<input type="checkbox"/>

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No. of page(s) For EGAT only

Non-Thai National Bidder

		No. of page(s)	For EGAT only	
			Yes	No
[]	4. Where the Bidder is a natural person or a group of persons other than a juristic person			
()	(a) Natural Person			
	- Certified copy of passport	<input type="checkbox"/>	<input type="checkbox"/>
()	(b) Group of persons			
	- Certified copy of partnership agreement or contract (if any)	<input type="checkbox"/>	<input type="checkbox"/>
	- Certified copy of passport of partners or related documents according to <i>Item 5</i> of each participant of the group	<input type="checkbox"/>	<input type="checkbox"/>
[]	5. Where the Bidder is a juristic person			
	- Certified copy of affidavit of incorporation	<input type="checkbox"/>	<input type="checkbox"/>
	- Name list of managing partners, directors, etc., as the case may be, and list of persons entrusted with controlling power (if any)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	- Memorandum of Association (if any) (Please fill in the form on page 10.)	<input type="checkbox"/>	<input type="checkbox"/>
	- Name list of major shareholders (if any) (Please fill in the form on page 11.)	<input type="checkbox"/>	<input type="checkbox"/>
[]	6. Other documents (if any)			
()	<input type="checkbox"/>	<input type="checkbox"/>
()	<input type="checkbox"/>	<input type="checkbox"/>
()	<input type="checkbox"/>	<input type="checkbox"/>
()		
()		

<u>Thai and Non-Thai National Bidder</u>		No. of page(s)	For EGAT only	
			Yes	No
[]	7. Where the Bidder is a joint venture / consortium			
	- Certified copy of association agreement	<input type="checkbox"/>	<input type="checkbox"/>
()	(a) If participant of a joint venture / consortium is not a juristic person			
	(i) Thai national			
	- Certified copy of identity card	<input type="checkbox"/>	<input type="checkbox"/>
	(ii) Non-Thai national			
	- Certified copy of passport	<input type="checkbox"/>	<input type="checkbox"/>
()	(b) If participant of a joint venture / consortium is a Thai-national juristic person			
	() (i) Ordinary partnership or limited partnership			
	- Certified copy of affidavit of incorporation	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	- Name list of managing partners, and list of persons entrusted with controlling power (if any) (Please fill in the form on page 10.)	<input type="checkbox"/>	<input type="checkbox"/>
	() (ii) Limited company or public limited company			
	- Certified copy of affidavit of incorporation	<input type="checkbox"/>	<input type="checkbox"/>
	- Memorandum of Association	<input type="checkbox"/>	<input type="checkbox"/>
	- Name list of managing directors, and list of persons entrusted with controlling power (if any) (Please fill in the form on page 10.)	<input type="checkbox"/>	<input type="checkbox"/>
	- Name list of major shareholders (Please fill in the form on page 11.)	<input type="checkbox"/>	<input type="checkbox"/>

	No. of page(s)	For EGAT only	
		Yes	No
() (c) If participant of a joint venture / consortium is a Non-Thai national juristic person			
- Certified copy of affidavit of incorporation	<input type="checkbox"/>	<input type="checkbox"/>
- Name list of managing partners, directors, etc., as the case may be, and list of persons entrusted with controlling power (if any) (Please fill in the form on page 10.)	<input type="checkbox"/>	<input type="checkbox"/>
- Memorandum of Association (if any)	<input type="checkbox"/>	<input type="checkbox"/>
- Name list of major shareholders (if any) (Please fill in the form on page 11.)	<input type="checkbox"/>	<input type="checkbox"/>
[] 8. Other documents (if any)			
() Certified copy of any other registration required by Ministry of Commerce of Thailand	<input type="checkbox"/>	<input type="checkbox"/>
() Certified copy of registration for value added tax in Thailand	<input type="checkbox"/>	<input type="checkbox"/>
()	<input type="checkbox"/>	<input type="checkbox"/>
()	<input type="checkbox"/>	<input type="checkbox"/>
()	<input type="checkbox"/>	<input type="checkbox"/>

We hereby confirm that all documents detailed above are true and correct.

Signed _____
(Name of Bidder)

stamp company seal (if any)

List of Names of Manager / Managing Partner / Managing Director / Executive /
 Person Who Is Authorized to Manage the Business
 (Relationship in Management)
Bidder shall fill in and submit this form with his bid

Enquiry / Bid No : Enquiry / Bid Opening Date :
 Name of Company / Partnership / Juristic Person :

No.	Name – Surname	Position	Name – Surname of Spouse	Name – Surname of Minor

We hereby confirm that all documents submitted are true and correct.

Signed _____
 (Name of Bidder)

Stamp company seal (if any)

Remarks

1. The unused wordings shall be struck out.
2. Duplicate this page as necessary.

List of Partner in Ordinary Partnership / Partner with Unlimited Liability in Limited Partnership /
Major Shareholder in Limited Company or Public Limited Company
(Relationship in Capital)

Bidder shall fill in and submit this form with his bid

Enquiry / Bid No. : Enquiry / Bid Opening Date :

Name of Company / Partnership / Juristic Person :

Registered Capital : (currency) Number of Share : Price per Share : (currency)

No.	Name - Surname	Position	Number of Share (%) or Amount of Shareholder's Equity	Name – Surname of Spouse	Number of Share (%) or Amount of Shareholder's Equity	Name – Surname of Minor	Number of Share (%) or Amount of Shareholder's Equity

We hereby confirm that all documents submitted are true and correct.

Signed _____

(Name of Bidder)

Stamp company seal (if any)

Remarks

1. The unused wordings shall be struck out.
2. "Major Shareholder" means a shareholder who holds more than twenty-five (25) per cent of stake in an enterprise. The shareholding of spouse or minor of a person shall be regarded as being the shareholding of such person. In case of no major shareholder, please specify "No major shareholder" in the tabulation above.
3. Duplicate this page as necessary.
4. The Bidder shall submit List of Names of Manager/ Managing Partner/ Managing Director/ Executive/ Person Who Is Authorized to Manage the Business (Relationship in Management)/ and List of Partner in Ordinary Partnership/ Partner with Unlimited Liability in Limited Partnership/ Major Shareholder in Limited Company or Public Limited Company (Relationship in Capital) of the Bidder as per page 10-11 of this Additional Regulation.

In case that any Major Shareholder(s) of the Bidder is (are) juristic person(s), and such juristic person(s) has (have) Major Shareholder(s) who is (are) juristic person(s), the Bidder shall submit the list of the Major Shareholder(s)/ the Names of Manager/ Managing Partner/ Managing Director/ Executive/ Person Who Is Authorized to Manage the Business/ Partner/ Partner with Unlimited Liability/ of such juristic person(s) as per page 10-11 of this Additional Regulation. The requirement of submission of list of the Major Shareholder(s)/ the Names of Manager/ Managing Partner/ Managing Director/ Executive/ Person Who Is Authorized to Manage the Business/ Partner/ Partner with Unlimited Liability/ of such juristic person(s) shall apply to **2 tiers** of Major Shareholder(s) who is(are) juristic person(s).

Important Information
for
Invitation to Bid No. GBA3-HTLS-01

The purpose of this section is to inform the Bidders to **carefully study** the details of the revised terms and conditions in the bidding documents. The following provisions have been **recently revised** as stated hereunder:

Article B-12. Evaluation and Comparison of Bids

The calculated insurance premium to be used for evaluation and comparison purpose has been revised from 0.0629% to **0.0554%**.

Article E-13. Inspection and Tests

Terms and conditions regarding inspection and tests have been revised.

Article E-14. Preparation for Shipment and/or Delivery

Details in the table of Instructions for Packaging at the end of Section E have been revised.

Article F- 11. Drawings and Documents to be Furnished by Contractor

Terms and conditions regarding EGAT's document management system have been added and the number of copies of the drawings and documents in Print and CD-ROM in the tables of Drawings and Documents to be Furnished by the Contractor (For Control and Protection Equipment) and of Drawings and Documents to be Furnished by the Contractor (For All Equipment except Control and Protection Equipment) at the end of section F have been revised.

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DATA SHEET

DATA SHEET

for

Invitation to Bid No. GBA3-HTLS-01

This section consists of provisions that are specific to each procurement and supplement the information or requirements included in bidding documents.

Article B-3. Bid Security

The amount of bid security shall be USD 195,960.- or THB 7,500,000.-.

Article B-4. Validity of Bids

The validity of the bid shall be for one hundred and fifty (150) Days from the date specified for opening of bid.

Article B-8. Information to be Submitted with Bid

Item m. is not applicable

The following document shall be added to this Article:

- n. Detailed information on the proposed INVAR Conductor, including
 - (a) Detailed calculations on the following items of the proposed INVAR Conductor

- (1) Ampacity (Current Carrying Capacity)

- (2) Sag & Tension Calculation

Sag-Tension calculations for INVAR Conductor at various output conditions given below shall be submitted along with the Bid. These calculations shall also include calculations for determination of transition temperature. The parameters and conditions taken for sag tension calculations shall be as follows :

Parameters

Ruling spans shall be in accordance with those of the existing transmission lines given in Article 3. Technical Information of Transmission Lines attached to Requirements and Design Criteria for INVAR Conductor, of Specifications for INVAR Conductor and Hardware Assemblies and Line Accessories (Revision 1).

Design condition

Base condition: 27°C, No wind, Tension 22 % UTS OF conductor

Sag & Tension Requirement Condition

6°C, 27°C, ..., Maximum temperature with no wind and 27°C with wind

Output might be given in the format as shown in Article 3. Technical Information of Transmission Lines attached to Requirements and Design Criteria for INVAR Conductor, of Specifications for INVAR Conductor and Hardware Assemblies and Line Accessories (Revision 1).

- (3) Power loss (comparing to that of 1x1272 MCM ACSR/GA conductor)
- (b) Previous test report of INVAR conductor of the same or similar size as specified in the Specifications to demonstrate that the Equipment offered meets all the requirements of the Contract. Such previous test reports shall consist of Type Test, Acceptance or Sample Test, Routine Test, and etc.
- (c) Test method or Test procedure, including referenced standardization and acceptance criteria, for the following tests of INVAR conductor
 - (1) Test before manufacturing (Type Test or Design Test).
 - (2) Test during manufacturing (Sample Test or Acceptance Test and Routine Test).
 - (3) Specific tests consisting of
 - Temperature of surrounded area
 - Temperature of current loaded conductor under rainfall condition
 - Sag-tension properties (sag behavior at high Temperature)
 - Ampacity test.

Detailed items of the tests and duration that each test item will take shall also be provided.

- (d) Previous test reports of the same or equivalent type of suspension clamp, spacer damper, compression deadend, armor rod, tension sleeve and repair sleeve for INVAR conductor to demonstrate that the Equipment offered meets all the requirements specified in Specifications for INVAR Conductor and Hardware Assemblies and Line Accessories (Revision 1). The previous test reports shall include
 - (1) Type Test
 - (2) Sample Test
 - (3) Routine Test

- (e) Detailed design of fittings at T.O.S. for connection of INVAR Conductor (Single conductor) with the other conductors in substations (to be performed at EPEC Combined Cycle Power Plant and Khlong Mai Substation)

Article B-12. Evaluation and Comparison of Bids:

The evaluation of bid prices shall be on a combination of all schedule basis.

Article E-29. Failure to Meet Requirements and F-10. Maintenance Guarantee

The Contractor shall guarantee the proper functioning of the Equipment for a period of three (3) Years.

Defective Equipment to be replaced with the whole new set

None

Article F-9. Liquidated Damages for Late Delivery of Equipment

The Liquidated Damages shall be at the rate of one-tenth of one (0.10) per cent of the price of each complete Schedule of Equipment not timely delivered for each Day of delay. This sum is payable regardless of the actual loss and/or damages incurred.

Article F-11. Drawings and Documents to be Furnished by the Contractor

Item a. Drawings, provision (4) shall be revised as follows:

(4) Reproducibles of all final approved drawings shall be made on paper.

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**SECTION A
INVITATION TO BID**

INVITATION TO BID NO. GBA3-HTLS-01

**SUPPLY OF TRANSMISSION LINE
HIGH TEMPERATURE LOW SAG CONDUCTOR,
HARDWARE ASSEMBLIES AND LINE ACCESSORIES**

**BULK POWER SUPPLY FOR THE GREATER BANGKOK AND
VICINITY AREA PHASE 3**

A-1. Invitation

The Electricity Generating Authority of Thailand (EGAT) hereby invites sealed bids for furnishing and delivering of Transmission Line High Temperature Low Sag Conductor, Hardware Assemblies and Line Accessories under Bulk Power Supply for The Greater Bangkok and Vicinity Area Phase 3 hereinafter called Equipment in accordance with the terms, conditions and Specifications described in these Bidding Documents.

A-2. Eligibility of Bidders: General Requirements

All Bidders shall meet the following requirements; failure to so comply shall constitute sufficient ground for rejection.

- a. The Bidder shall be a partnership, firm or company, either alone or in joint venture or in consortium.
- b. *The Bidder must have purchased the bidding documents from EGAT. For a joint venture or a consortium, only one (1) member of the joint venture or consortium is required to purchase the bidding documents.*

In case the Bidder's name is not exactly the same as the purchaser's name, the purchaser shall notify EGAT of the name of the Bidder in writing prior to the bid opening time.

- c. The Bidder shall be well-established and maintain a permanent place of business. For a joint venture or consortium, all members of the joint venture or consortium are required to meet this qualification.
- d. The Bidder shall not be named in the List of Work Abandoners published by the Permanent Secretary, Ministry of Finance, and/or in the Debarment List and/or in the List of Work Abandoners declared by EGAT.

- e. For the Bidder who changes name before submitting the bid, his experience records in previous name shall be considered as the experience records of the Bidder.
- f. The Bidder shall not be a Jointly Interested Bidder with other Bidders as from the date of EGAT's issuance of this invitation to bid, or shall not be a person who undertakes any action as an "Obstruction of Fair Price Competition" as defined in Additional Regulation for this invitation.
- g. The Bidder shall not either be EGAT's consultant or involve in EGAT's consultancy company under this invitation, or have EGAT's personnel involved in his business as shareholder having voting right that can control his business, director, manager, officer, employee, agent or consultant except the ones who are officially ordered by EGAT to act or participate therein.
- h. The Bidder shall not be the person who is privileged or protected not to be taken any legal proceeding under Thai court; provided that such Bidder's government declares that such special privilege is waived.
- i. In case of a joint venture or consortium, the Bidder shall carry out all the provision of the Equipment and all Work under such formation from the time of bidding until the fulfillment of the Contract and the parties to the joint venture or the consortium shall accept joint and several liability for performing all obligations under the bid and the Contract.
- j. The Bidder shall not propose to supply the Equipment from the country under the state of war whether declared or not.
- k. The Bidder shall have adequate fund to meet financial obligations incidental to this Contract.
- l. The Bidder shall submit documentary evidence established in accordance with Article B-8. Information to be Submitted with Bid to demonstrate the Bidder's sufficient eligibility to bid and qualification to perform the Contract.

A-3. Eligibility of Bidders: Technical Requirements

All Bidders shall meet the following requirements; failure to so comply shall constitute sufficient ground for rejection.

- a. The Bidder shall manufacture or supply the Equipment or Work as required under this Invitation to Bid.
- b. The Bidder shall have sufficient capacity to carry out the Work.
- c. The Bidder shall be a regular manufacturer or propose a regular manufacturer of the

Equipment of the type specified under this Invitation to Bid.

d. The Bidder / the proposed manufacturer shall fulfill the following requirements :

- 1) Being well-established and maintaining a permanent place of business
- 2) Proposing High Temperature Low Sag Conductor (HTLS) as Invar or Aluminum Conductor Composite Core (ACCC) or Aluminum Conductor Carbon Fiber Reinforced (ACFR), hardware assemblies and line accessories for HTLS with requirements as follows :
 - High Temperature Low Sag Conductor (HTLS) manufacturer having an experience in design, manufacture, test and supply of at least two hundred (200) kilometers of the same type of HTLS as the one proposed in this Invitation to Bid with successful operation for a period of at least three (3) consecutive years as of the date of the bid opening.
 - Hardware assemblies and line accessories for HTLS manufacturer having an experience in design, manufacture, test and supply of the equipment for any type of HTLS for at least three (3) years.
- 3) If the Bidder / the proposed manufacturer is a new company formed by acquisition of or merger with other companies or business units before submitting the Bid, the experience records of any of such previous companies or business units that meet the requirements set forth herein are acceptable as the experience records of the Bidder / the proposed manufacturer.
- 4) The Bidder / the proposed manufacturer shall have no just or proper claims pending against the Equipment with respect to breach in the performance of contract on other similar works awarded by EGAT or against the Equipment on other similar works. If the Bidder / the proposed manufacturer is a new company formed by acquisition of or merger with other companies or business units, the pending claim of any of such previous companies or business units shall be considered pending claim of the Bidder / the proposed manufacturer.

Reference records of either parent or affiliated companies shall not be considered as the records of such Bidder / the proposed manufacturer.

A-4. Joint Venture or Consortium

In the event that the successful Bidder is a joint venture or a consortium formed of two or more companies, EGAT requires that the parties to the joint venture or the consortium accept joint and several liability for all obligations under the Contract.

A-5. Preparation and Delivery of Bids

Bids shall be prepared in accordance with the Instructions to Bidders contained in the Bidding Documents in one (1) original and three (3) hard copies in English, on the bid forms included for this purpose and shall be accompanied with a bid security as required under the Article pertaining to Bid Security in Section B. Instructions to Bidders. The bid security will be placed in a separate sealed envelope.

The envelope of the bids will be marked in capital letters in the lower left-hand corner as follows :

INVITATION TO BID NO. GBA3-HTLS-01
SUPPLY OF TRANSMISSION LINE
HIGH TEMPERATURE LOW SAG CONDUCTOR,
HARDWARE ASSEMBLIES AND LINE ACCESSORIES
BULK POWER SUPPLY FOR THE GREATER BANGKOK AND
VICINITY AREA PHASE 3

and shall be addressed and delivered to :

International Procurement Department - Transmission Segment
Procurement and Inventory Management Division
Electricity Generating Authority of Thailand
Bangkrui, Nonthaburi 11130
Thailand

on or before 10:00 a.m., Bangkok Standard Time,*see Tentative Schedule*.....

If the envelope(s) is not sealed, marked and addressed as required above, EGAT will assume no responsibility for the bid misplacement or premature opening.

Bids will be opened publicly at **Bidding Room, 1st floor, Tor 082 Building** and at the time specified above.

Bids received after the time stipulated herein shall be rejected and returned unopened.

A-6. Availability of Bidding Documents

The Bidding Documents in CD-ROM are available for examination and can be obtained from EGAT at the hereunder address upon payment to EGAT, non-refundable, in the amount of USD 100.-.....or Baht 3,000.-..... . These prices include the value added tax.

International Procurement Department - Transmission Segment
Procurement and Inventory Management Division
Electricity Generating Authority of Thailand
Bangkrui, Nonthaburi 11130
Thailand

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SECTION B
INSTRUCTIONS TO BIDDERS

INSTRUCTIONS TO BIDDERS

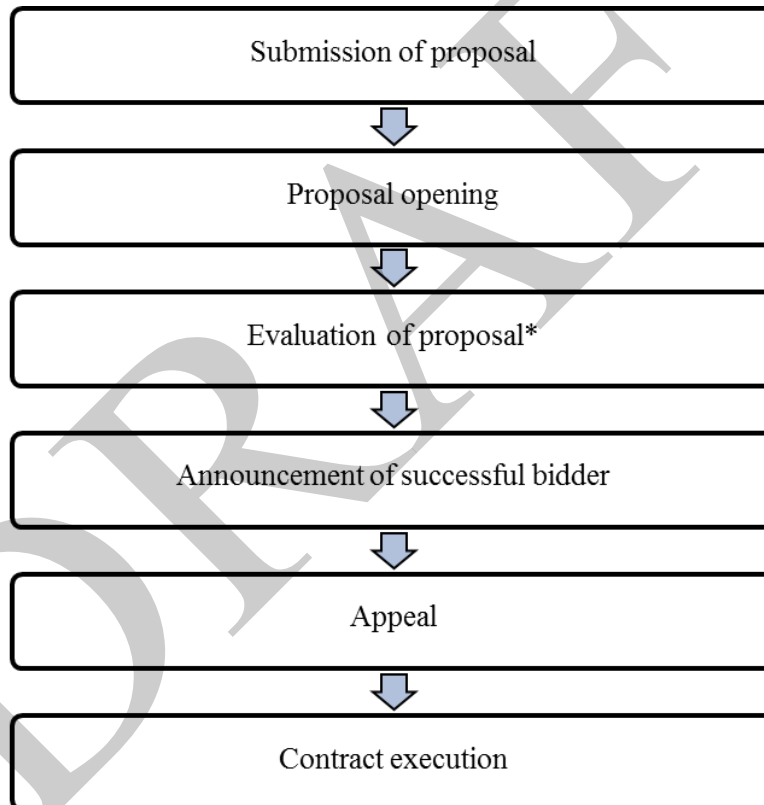
Overview of the Procurement Process

Bid prices and the Contract Price shall include value added tax (VAT) imposed under the law of Thailand. The medium cost announced by EGAT is inclusive of VAT and other relevant expenses.

The amounts of performance security, maintenance security, and liquidated damages shall also be based on the Contract Price which is inclusive of VAT (if any).

For evaluation and comparison of Bids, the bid price shall be evaluated according to the conditions specified in the bidding document.

The procurement process is summarized in the following diagram.



*Remarks

1. The Bidder shall be deemed to have carefully examined all of the terms, conditions and Specifications of the Bidding Documents.
2. EGAT will take into consideration the conformity of the bid to the requirements of the Bidding Documents as well as the suitability for the purpose intended.
3. EGAT will not be bound to accept the bid with the lowest indicated cost. EGAT reserves the right to accept the bid which in its judgement is the lowest evaluated bid.

B-1. Preparation of Bids

- a. Bids shall be prepared in English, in one (1) original and three (3) hard copies, clearly marked each "Original" and "Copy", and submitted at the place and time specified for receipt of bids.

In the event of any discrepancy between the Original and the Copy, the Original shall govern.

For price quotation, Bidder must fill bid prices in an excel file of Price Schedules contained in the Bidding Documents and submit one (1) original and three (3) hard copies together with the excel file to EGAT at the same time of bid submission.

VAT at the prevailing rate shall be filled automatically in the Summary of Bid Price of the price schedule in the Excel file subject to Article B-2. Bid Prices.

However, in case Bidder is a consortium formed of two or more companies, Bidder must also submit one (1) original hard copy including an excel file of price schedules of the Work performed by each member of the consortium in addition to hard copies and excel file of the total bid price as specified above.

If any discrepancy between the bid prices of the Work performed by each member of the consortium and the bid prices of the Bidder occurs, the bid prices of the Bidder shall govern and the bid prices of the Work performed by each member of the consortium shall be adjusted accordingly.

In the event of discrepancy between the original hard copy and the Excel file submitted, the original hard copy shall govern.

- b. Bidder shall not submit more than two (2) proposals and the proposal(s) to be submitted shall conform to the specifications. In case of any deviation from the specifications, Bidder shall follow the provisions under Article B-9. Deviations from Specifications.
- c. The "Original" and "Copy" shall be prepared on the bid forms included and made a part of the Bidding Documents, which shall be submitted with all applicable blanks in the bid forms properly filled in, and shall be manually signed in ink by a person or persons duly authorized. The letter of authorization shall be indicated by written power-of-attorney accompanying the bid.

All pages of the bid, except for unamended printed literature, shall be initialled by the person or persons signing the bid.

- d. The bid shall contain no interlineations, erasures or overwriting except as necessary to correct errors made by the Bidder, in which case such corrections shall be initialled by the person or persons signing the bid.
- e. Modification by letter or facsimile of bids already submitted will be considered if received prior to the time fixed for the receipt of bids. Confirmation by letter of any modification by facsimile should be sent to EGAT evidencing by post mark not later than the deadline for submission of Bids.
- f. No Bidder will be permitted to alter his bid after the bids have been opened, but clarifications not changing the substance of the bid therein may be accepted.
- g. Bidder may quote for any schedule or all schedules as called for, but shall quote for all items of the schedule(s) proposed. Consideration will be made as stipulated in Article B-12. Evaluation and Comparison of Bids.
- h. Any price discount to be offered shall be clearly stated in the Discount Form accompanied with the Bid to be submitted on the bid opening date specified herein.

B-2. Bid Prices

Currency

Bid prices as shown in Article C-1. Price Schedule shall be firm, not subject to adjustment and payable in the currencies as follows :

- a. The bid price shall be quoted in Thai baht, US dollar, euro, Japanese yen, renminbi (Chinese yuan), or in the Bidder's or Manufacturer's home currency only if his currency trading is prevailed at the time of bidding in any international market other than in Bidder's or Manufacturer's home country.

If the currencies quoted by the Bidder do not conform to the requirement set forth herein, EGAT reserves the right to convert the bid price to US dollars by using the exchange rate on the **Bloomberg** screen which is announced at 10.00 a.m. (Bangkok Time) on the bid opening date. Such converted bid price in US dollars shall be treated as the Bidder's proposed bid price. In such case the Contract Price for such portion under the Contract shall be made in US dollars.

Subject to paragraph a. above, in case the Bidder expects to incur a portion of its expenditures in the performance of the Contract in more than one currency and wishes to be paid accordingly, the bid price shall be expressed in different currencies and the respective amount in each currency together making up the total price.

- b. Local expenditures shall be quoted in Thai Baht.
- c. Payments will be made in the currency or currencies in which the bid prices have been stated.

Source of Supply and Service

- a. Prices for Equipment manufactured in Thailand shall be firm ex-works prices and quoted in Thai Baht. Any import duty and taxes (value added tax included) assessed by the Government of Thailand at the port of entry on imported raw materials or components shall be paid by the Contractor and included in these ex-works prices.
- b. Prices for Equipment manufactured outside Thailand (imported Equipment) shall be firm, stated both on FOB Port of Shipment/Vessel and CFR Thai Port basis, and quoted in foreign currencies specified above. Any import duty, excise tax (if any) and value added tax to be assessed by the Government of Thailand at the port of entry shall not be included in the quoted bid prices.
- c. Prices for services including cost of installation supervisor (if any) shall be firm.
- d. All expenses incurred for the Work specified in Article F-1. Scope of Work shall be included in the quoted Bid Prices.

Price Schedule

The Bidder shall enter a unit price, an amount, or a lump sum price, as required, for every item listed in the price schedule. If the unit price as entered does not conform to the amount entered for the same item, the unit price shall govern. If the sum of the amount entered for individual items does not conform to the total amount entered for these amounts under total bid prices, then the sum of the amount entered for the individual items shall govern.

Where quantity and total price only are required, the unit price shall be taken as the stated total price divided by the quantity specified.

Except for foreign supply, VAT at the prevailing rate shall be filled automatically in the Summary of Bid Price of the price schedule in the Excel file. However, the Contract Price shall include VAT only for the portion of Work which is subject to VAT.

B-3. Bid Security

The original of the bid submitted shall be accompanied with a bid security in the form of a cash deposit or a certified cheque issued by a local bank, *or a cashier cheque issued by a*

local bank, or a bank guarantee or a letter of guarantee issued only by a local bank or an acceptable financial institution in Thailand, or by a foreign bank counter-guaranteed by a local bank as primary obligor. ***In case of a cash deposit, only Thai baht can be made.***

The bid security shall be in a form as per specimen attached or in any other form with essential content in accordance with the specimen, and made payable to EGAT in the amount as specified in Data Sheet. Any bid not being accompanied with bid security shall be rejected. The bid security shall remain in force up to and including ninety (90) Days after the expiry date of the bid validity.

The bid security shall be forfeited in favor of EGAT if :

- a. The Bidder withdraws his bid after the bid is opened; or
- b. The successful Bidder fails for any reason to execute the Contract or to furnish a performance security.

The Bidder may, upon EGAT's request to extend the bid security when it has expired, refuse to do so without forfeiting the bid security. A Bidder granting the request will be neither required nor permitted to modify his bids.

The bid security of unsuccessful Bidder(s) will be returned as decided by EGAT or within thirty (30) Days following EGAT's acceptance of the successful Bidder.

The bid security of the successful Bidder will be returned upon execution of the Contract and after the performance security furnished has been accepted by EGAT.

B-4. Validity of Bids

The validity of the bid shall be as specified in Data Sheet.

In the event EGAT requires the validity period to be extended, EGAT may in writing or by facsimile so notify the Bidders at least fourteen (14) Days prior to the expiry date of the validity period, in which event any Bidder not agreeing to such request for extension may withdraw his bid by so advising EGAT in writing or by facsimile prior to the expiry date of the original validity period. If the advice of withdrawal shall not have been received by EGAT prior to the said date, the extension shall be deemed to have been accepted by the Bidder, and the Bidder shall be required to extend the effective period of the bid security accordingly.

B-5. Delivery of Bids

Where bids are submitted by mail, the hour and date of receipt of the bid will be taken as that certified by EGAT. For all bids delivered directly, a receipt will be furnished to the Bidder indicating the place, hour, and date of delivery. Late bids will be returned unopened.

B-6. Withdrawal of Bids

Bids may be withdrawn only on written requests which are received by EGAT prior to the time fixed for the receipt of the bids. Negligence on the part of the Bidder in preparing his bid confers no right for the withdrawal of the bid after it has been opened. Whenever a bid has been withdrawn, it will be returned unopened to the Bidder.

B-7. Interpretation of Bidding Documents before Bid Opening

If a prospective Bidder is in doubt about the true meaning of any part of the Bidding Documents, the Bidder may submit to EGAT a written request for a reply or an interpretation; provided that sufficient time is allowed for a reply to reach the prospective Bidder prior to the date specified for bid opening. An interpretation will be given in the form of a Supplemental Notice furnished to all prospective Bidders. Receipt of all Supplemental Notices shall be acknowledged by each prospective Bidder on the Proposal. Oral interpretation of the Bidding Documents will not be binding.

B-8. Information to be Submitted with Bid

Each Bidder shall submit with his bid the following documents, data and information in English language in addition to any other information called for elsewhere in the Bidding Documents in order to enable EGAT to fully evaluate the Proposal of the Bidder :

- a. Name of manufacturer and country of origin and type or model of Equipment he proposes to furnish.
- b. Data, drawings, catalogue and descriptive materials which will show equipment arrangement, general dimensions, principles of operation, extent of factory assembly, and the materials from which parts are made.
- c. Sufficient references describing the technical experience of the manufacturers, including lists of the Equipment supplied and installed overseas. If possible, certificates issued by the user and/or consulting engineers supporting the said work and record of commercial operation in good condition should also be submitted.

- d. Copies of Auditor's certified balance sheet of the Bidder for the past three (3) consecutive years.
- e. In case the local manufactured Equipment is proposed, the sufficient documentary evidence, if any, showing that the manufacturers have been acknowledged for producing standard product by the Thai Industrial Standard Institute (TISI), Ministry of Industry, or registered with TISI, or ISO 9000 certified by the National Accreditation Council of Thailand (NAC) or obtained the privilege from the Board of Investment or accepted by EGAT for manufacture of such Equipment, is required to be submitted with the Bid.
- f. Sufficient evidence documents clearly demonstrating that a firm/company who changes its name, merges with, or acquires other company/companies, or forms a new company by merging its business unit with those of other companies, and the experience records of the new company clearly demonstrating that it has sufficient evidence of running the business as before.
- g. A statement of proposed minor deviations from the Specifications along with complete specifications and all necessary descriptive literature for any proposed alternative Equipment or procedure, as required under Article B-9. Deviations from Specifications.
- h. Where Proposal Data Forms are provided, the Bidder shall enter all information as directed.
- i. Where the Specifications provide for submission of a sample or samples, the Bidder shall submit same together with his bid.
- j. Joint Venture/Consortium Agreement with a statement that each member of a joint venture/consortium will be jointly and severally responsible and liable for the complete execution of the work (in case the Bidder is a joint venture or consortium).
- k. Confirmation Form of not being a Jointly Interested Bidder with other Bidders and not being a person who undertakes any actions as an Obstruction of Fair Price Competition, and Registration/Non-registration with the Revenue Department as a VAT registrant.

If the Bidder has registered as a VAT registrant, he shall submit EGAT an evidence of VAT registration. On the contrary, if the Bidder is not registered as a VAT registrant, he shall inform EGAT whether he will register as a VAT registrant or not.

In case the Bidder is a consortium, each member of the consortium shall fill in the Confirmation Form provided for consortium Bidders.

- l. Filled-in Documentary List and documents required according to Additional Regulation.

- m. A statement indicating that the parent manufacturer shall certify and be responsible for the design, production process and quality control. This information is required only for the Equipment specified in Data Sheet.

Should the Bidder fail to submit any of the document described above and neglect to submit the same to EGAT within the time as specified by EGAT, such failure shall be sufficient reason for rejection of his bid.

Verbal statements made by the Bidder at any time regarding quality, quantity, or arrangement of Equipment will not be considered.

If alternative Equipment is indicated in the bid, it shall be understood that EGAT will have the option of selecting any one of the alternates so indicated and such selection shall not be a cause for extra compensation or extension of time.

In case the Bidder proposes alternative Equipment, with the condition to supply any one of the alternates so indicated at his option, such bid will be considered conditional and may be considered sufficient reasons for rejection.

B-9. Deviations from Specifications

Unless otherwise provided in the Specifications, the quality of Equipment and workmanship shall comply in all respects with the Standards required under the bidding documents.

If the Bidder proposes any minor deviations from the specifications, he shall submit a statement of each proposed deviation referenced to the particular Article of these specifications, details on the design drawings or article, paragraph and section of referenced standards or specifications. Full details of all minor deviations together with confirmation shall be submitted with the bid in a form provided in Section C. The Bidder shall submit, with his bid, copies of the standards or specifications proposed for his deviations. In case there is no statement in the form provided in Section C in the Bidder's proposal on the proposed deviations, the bid shall be regarded by EGAT as conforming in all respects to the terms and conditions and Specifications as stated in the bidding documents at no additional cost to the bid price.

Notwithstanding the foregoing, it is at EGAT's sole discretion in determining whether any of such proposed deviations is acceptable and in determining whether it is minor or major deviation.

B-10. Rejection of Bids

EGAT reserves the right not to accept the lowest evaluated bid.

Bids shall be strictly based on the Specifications and terms and conditions in the Bidding Documents. Should any bid fail to comply with the terms and conditions stipulated in these Bidding Documents, especially those under Article pertaining to payment or be incomplete, conditional or obscure, or contain additions not called for, or irregularities of any kind, it will be liable to rejection.

EGAT also reserves the right to reject any or all bids submitted without giving reason or to reject the bid from any Bidder who fails to satisfy EGAT that the bid complies with the terms and conditions stipulated in these bidding documents without any non-compliance which is deemed substantial and advantageous over other Bidders.

B-11. Delivery Time

Delivery time required is indicated for each respective Price Schedule in the Proposal section of the Bidding Documents, and shall be carefully observed. However, no preference will be given in the bid evaluation for earlier delivery than the stipulated delivery period.

All bids specifying delivery time later than those indicated may be rejected.

B-12. Evaluation and Comparison of Bids

Bid prices pursuant to Article B-2. Bid Prices will be evaluated as follows :

1. The evaluation of bid prices shall be specified in Data Sheet.
2. Bid prices will be converted into Thai Baht at the selling exchange rates, published by the Bank of Thailand, www.bot.or.th between Baht and other currencies on the bid opening date.
3. The rate of import duty prevailed on the bid opening date will be used for the purpose of bid evaluation of CFR Thai Port Price.
4. The prices to be used for evaluation and comparison purpose shall be as follows :
 1. Ex-works price including VAT for the final sale direct to EGAT for locally manufactured Equipment
 2. CFR Thai Port of Equipment to be imported plus the calculated insurance premium of **0.0554%** of [CFR price+10% (CFR price)], import duty, excise tax

(if any), value added tax to be assessed by the Thai Government at the port of entry for imported Equipment , and 0.6 % of CFR price for customs clearance

The rate of import duty to be used for price comparison shall be as follows:

- a) For Equipment consisting of separate components which are intended to contribute together as a functional unit and imported under partial import entry - using a normal single tariff rate published in the Customs Tariff Decree for such Equipment
- b) For other Equipment and spare parts
 - i) In case any imported Equipment and spare part is proposed from one (1) country of origin for the same item:
 - Country of Origin Under Free Trade Agreement (FTA) – using lower comparing rate between the FTA rate and the normal rate published in the Customs Tariff Decree;
 - Country of Origin Under Non FTA – using a normal rate published in the Customs Tariff Decree.
 - ii) In case any imported Equipment and spare part is proposed from different countries of origin for the same item, a normal rate published in the Customs Tariff Decree for such Equipment and spare part will be used for price comparison.
3. Cost of local transportation including VAT, if any
4. Cost of installation supervisor including VAT, if any
5. Guaranteed losses of Equipment, if any, at the rate as stipulated in the Proposal Data.

Price for optional items, if any, will not be taken into consideration; however, Bidders shall also quote the prices thereof as required.

B-13. Acceptance of Bids

EGAT will not be bound to accept the bid with the lowest indicated cost. EGAT reserves the right to accept the bid which in its judgement is the lowest evaluated bid. In making its selection, EGAT will take into consideration the conformity of the bid to the requirements of the Bidding Documents and Specifications, guaranteed delivery time, the suitability for the purpose intended and whenever applicable, compensating factors will

be applied to deviation or departures from Specifications. EGAT will also take into consideration whether the Bidder's experience, organization, facilities and financial resources will assure the successful carrying out of the Work under the Contract within the time specified.

B-14. Appeal

Disqualified or unsuccessful Bidders who see that their disqualification or failure are due to EGAT's non-compliance with EGAT's procurement regulations may appeal to EGAT within fifteen (15) Days from the date of receipt or announcement, whichever comes first, of EGAT's final evaluation result. An appeal shall be made in writing and clearly state the cause of appeal and argument with referred facts or regulations and related documents. Appealing does not constitute a ground for suspending the ongoing procurement process unless EGAT's Governor agrees otherwise.

The Contract or Purchase Order shall not be executed until the period of appeal has ended and there is no appeal. In the event there is an appeal during such period, the Contract or Purchase Order shall not be executed unless EGAT's Governor concurs.

Decision of EGAT's Governor is final and conclusive.

B-15. Award of Contract

The Contract will be awarded as soon as practicable after opening of the bids, to the Bidder with the lowest evaluated bid. EGAT reserves the right to award the Contract on the basis of standards and specifications as proposed by the Bidder, if in the opinion of EGAT, they are considered acceptable.

At the time of execution of the Contract, the successful Bidder shall furnish the performance security in accordance with the conditions of Contract in the specimen of performance security provided in the bidding documents.

Failure to comply with the condition as expressed in the specimen of performance security will lead to withdrawal of award and cancellation of Contract, and in this respect EGAT reserves the right to award the Contract to the Bidder with the next lowest evaluated substantially responsive bid and the Bidder who defaults shall have his bid security forfeited in favor of EGAT.

After EGAT notifies the successful Bidder that his bid has been accepted, EGAT will send the Bidder the Contract Documents incorporating all agreements between the parties not later than ninety (90) Days after *confirmation of Letter of Award of Contract*.

Promptly but not later than fifteen (15) Days after receipt of the Contract, the successful Bidder shall sign and date the Contract and return it to EGAT.

B-16. Bidder's Responsibility

The Bidder shall be deemed to have carefully examined all of the terms, conditions and Specifications of this Invitation to Bid, and also to have fully informed himself as to all conditions, local or otherwise, affecting the carrying out of the Work of the Contract, and to have formulated an estimate of the facilities available and needed.

The Bidder shall also be liable to any rules and regulations as well as Acts enforced in the Kingdom of Thailand. Failure to do so will be at the Bidder's risk.

B-17. Supplemental Notices

Supplemental Notices to the Bidding Documents may be issued prior to the date of opening of bids to clarify the Bidding Documents or to reflect modifications in the design or Contract terms. Each supplemental notice issued will be distributed to each person or organization to whom the Bidding Documents have been issued. The recipient shall acknowledge receipt of each supplemental notice by signing and returning in a reasonable time the receipt form distributed with the supplemental notice. All supplemental notices issued shall become a part of the Contract Documents.

B-18. Cost of Bidding

Bidders will not be reimbursed for any expenses they may incur in preparing and submitting their bids.

B-19. Cancellation of Bid

EGAT reserves the right not to accept any quantity or item or schedule or package, or to cancel the bid without purchasing any item. Bidders shall not be entitled to claim EGAT for any losses and/or damages in this connection. EGAT also reserves the right to cancel the bid

should there be any reasonable grounds that bidder is not in good faith in submitting *bid* such as submitting false documents.

In case of bid cancellation, EGAT will not be responsible for any losses and/or damages and will not refund payment of Bidding Documents.

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SPECIMEN OF BID SECURITY

Whereas.....(hereinafter called "the Bidder") has submitted his bid dated.....for.....(hereinafter called "the Bid") under Invitation to Bid No.....KNOW ALL MEN by these presents that WE.....of.....having our registered office at.....(hereinafter called "the Guarantor") are bound unto Electricity Generating Authority of Thailand (hereinafter called "EGAT") in the sum of..... (in words :) for which payment well and truly to be made to EGAT, the Guarantor binds itself, its successors and assigns by these presents. Sealed with the Common Seal of the said Bank this.....(date).....day of.....(month).....,(year).....

THE CONDITIONS of this obligation are :

1. If the Bidder withdraws his bid during the period of bid validity specified in the Bidding Documents; or
2. If the Bidder, having been notified of the acceptance of his bid by EGAT during the period of bid validity;
 - (a) fails or refuses to execute the Contract, if required; or
 - (b) fails or refuses to furnish the Performance Security, in accordance with the Instructions to Bidders;

We, the Guarantor, unconditionally undertake to pay to EGAT as the primary obligor, up to the above amount upon receipt of its first written demand, without EGAT having to substantiate its demand.

This guarantee will remain in force up to and including ninety (90) Days after the expiry date of the bid validity.

(Signature of the Bank)

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**SECTION C
PROPOSAL**

INVITATION TO BID NO. GBA3-HTLS-01

PROPOSAL

FOR

**SUPPLY OF TRANSMISSION LINE
HIGH TEMPERATURE LOW SAG CONDUCTOR,
HARDWARE ASSEMBLIES AND LINE ACCESSORIES**

**BULK POWER SUPPLY FOR THE GREATER BANGKOK AND
VICINITY AREA PHASE 3**

C-1. Price Schedule

The undersigned Bidder, having carefully examined the Bidding Documents, hereby offers and proposes to perform the services and to furnish the Equipment on the basis of FOB Port of Shipment/Vessel or CFR Thai Port as specified in the Delivery Schedule and Distribution List for foreign supply or Ex-works delivery for local supply, in accordance with all provisions and conditions as described herein, all for the prices stated in the Schedule(s) attached.

Note : 1. Article C-1. Price Schedule

For imported Equipment, EGAT reserves the right to award the Contract on either FOB Port of Shipment/Vessel or CFR Thai Port basis.

2. Article E-12. Performance Security

The performance security required under Article E-12. Performance Security shall be ten (10) per cent of the Contract Price. Cost for furnishing the performance security shall be spread over the items proposed.

C-2. Penalty for Equipment Not Meeting Guaranteed Characteristics

The losses of Equipment shall be evaluated with the same rate as stipulated in the Proposal Data.

If the Equipment proposed fails to meet the guaranteed characteristics or the price of the measured losses is higher than the price of the guaranteed losses, the Contract price of Equipment shall be reduced by the different amount of the comparison between the price of the measured losses and the price of the guaranteed losses.

C-3. Guaranteed Delivery Time

Delivery Time of Equipment is required as indicated in the Delivery Schedule and Distribution List attached. The undersigned Bidder guarantees to make and to complete the delivery of Equipment proposed as required by EGAT.

Whenever the Equipment in any item are sub-itemized, the Contractor shall endeavor not to make partial shipment/delivery by sub-items.

In case of failure on the part of the Contractor to comply with the provision of the above paragraph, it is hereby understood that the Equipment in such particular items shall be deemed undelivered unless and until each all sub-items have been shipped/delivered.

C-4. Drawing and Document Submission Schedule

Drawing and Document Submission Schedule is required as indicated in Article F-11. Drawings and Documents to be Furnished by Contractor. The undersigned Bidder guarantees to submit all drawings and documents as required by EGAT.

C-5. Estimate of Deliveries

The estimated number of individual shipment/delivery, shipping point or points, estimated delivery date and estimated shipping weights and volumes for each individual shipping will be as follows :

<u>Number of Shipments</u>	<u>Item No.</u>	<u>Shipping Point</u>	<u>Estimated Delivery Date from Shipping Point</u>	<u>Total Weight kg.</u>	<u>Total Volume Cu.m.</u>
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----

C-6. Bid Security

Bid security in the amount of _____,
(in words)
_____ has been deposited with EGAT.
(number)

C-7. Supplemental Notices

The undersigned Bidder certifies that the following Supplemental Notices have been received for the Contract Documents :

Proposal Submission Date _____ Day of _____ A.D. _____

Firm's Name _____

By _____

Title _____

Firm's Address _____

Witness

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PART 1: PRICE PROPOSAL

PART 1 : PRICE PROPOSAL

PRICE QUOTATION INSTRUCTIONS

This part of the Bidding Document comprises :

1. Summary of Bid Prices
2. Price Schedules

Cost of Supply of Equipment comprises Foreign Portion and Local Portion. For Foreign Portion, Bidder is allowed to quote price in only four (4) different currencies. For Local Portion, default currency is Baht (THB).

Bidder shall fill in the price schedules in the soft file recorded and given in the CD, item by item. Then, the total prices for each schedule and Summary of Bid Prices will be automatically calculated.

Filling-in the data shall be in accordance with the following instructions :

1. Bidder shall fill in all data required in blue cells of the price schedules - Currency and Unit Price.
2. For local portion, the default is THB.
3. For foreign portion, Bidder shall fill a currency code in a column "Currency".

Remarks: Price Schedules are created in Microsoft Office Excel 2007.

INVITATION TO BID NO. GBA3-HTLS-01

SUMMARY OF BID PRICE

**SUPPLY OF TRANSMISSION LINE HIGH TEMPERATURE LOW SAG CONDUCTOR, HARDWARE ASSEMBLIES AND LINE ACCESSORIES
BULK POWER SUPPLY FOR THE GREATER BANGKOK AND VICINITY AREA PHASE 3**

No.	Description	Currency	Supply of Equipment	
			Foreign Supply	Local Supply
			CFR Thai Port	Ex-works Price (excluding VAT) Baht
			Amount	Amount
1	Schedule 1 : SUPPLY OF TRANSMISSION LINE HIGH TEMPERATURE LOW SAG CONDUCTOR FOR RECONDUCTORING 230 kV KHLONG MAI JUNCTION - KHLONG MAI, AND RECONDUCTORING 230 kV EPEC COMBINED CYCLE POWER PLANT - KHLONG MAI JUNCTION			
2	Schedule 2 : SUPPLY OF TRANSMISSION LINE HARDWARE ASSEMBLIES AND LINE ACCESSORIES FOR RECONDUCTORING 230 kV KHLONG MAI JUNCTION - KHLONG MAI, AND RECONDUCTORING 230 kV EPEC COMBINED CYCLE POWER PLANT - KHLONG MAI JUNCTION			
BID PRICE				Baht
VAT				Baht
SUMMARY OF BID PRICE				Baht

INVITATION TO BID NO. GBA3-HTLS-01

**Schedule 1 : SUPPLY OF TRANSMISSION LINE HIGH TEMPERATURE LOW SAG CONDUCTOR FOR RECONDUCTORING 230 kV KHLONG MAI JUNCTION - KHLONG MAI, AND RECONDUCTORING 230 kV EPEC COMBINED CYCLE POWER PLANT - KHLONG MAI JUNCTION
BULK POWER SUPPLY FOR THE GREATER BANGKOK AND VICINITY AREA PHASE 3**

IMPORTANT :

1. The conductor to be supplied under this Schedule shall conform to Section I. SPECIFICATIONS .
2. The conductor shall be furnished in non-returnable metal reels having the length per reel of 1.14 kilometers .
3. The discharging port for the foreign supplied conductor shall be Thai Port (BKK) .
4. The Price of CFR Thai Port will automatically be calculated after the Unit Price of FOB Vessel and Cost of Transportation to Thai Port have been quoted .
5. Cost of all tests and test reports for the conductor to be supplied shall be included in this Schedule .

Item No.	Description	Qty.	Unit	Currency	Supply of Equipment			
					Foreign Supply			
					FOB Vessel	Cost of Transportation to Thai Port	CFR Thai Port	
					Unit Price	Unit Price	Unit Price	Amount
1-1	INVAR Conductor	144.78	km					
1-2	INVAR Conductor	1.14	km					
Total Price for Schedule 1								

INVITATION TO BID NO. GBA3-HTLS-01

**Schedule 2 : SUPPLY OF TRANSMISSION LINE HARDWARE ASSEMBLIES AND LINE ACCESSORIES FOR
RECONDUCTORING 230 kV KHLONG MAI JUNCTION - KHLONG MAI, AND
RECONDUCTORING 230 kV EPEC COMBINED CYCLE POWER PLANT - KHLONG MAI JUNCTION
BULK POWER SUPPLY FOR THE GREATER BANGKOK AND VICINITY AREA PHASE 3**

IMPORTANT :

1. The Hardware Assemblies and Line Accessories (for Invar Conductor) to be supplied under this Schedule shall conform to Section I. SPECIFICATIONS .
2. The Price of CFR Thai Port will automatically be calculated after the Unit Price of FOB Vessel and Cost of Transportation to Thai Port have been quoted .
3. The discharging port shall be Thai Port (BKK) for the foreign-supplied Equipment and/or Ex-work delivery for the locally-supplied Equipment .
4. Cost of all tests and test reports for Hardware Assemblies and Line Accessories to be supplied shall be included in this Schedule .

Item No.	Description	Qty.	Unit	Currency	Supply of Equipment				Supply of Equipment	
					Foreign Supply				Local Supply	
					FOB Vessel	Cost of Transportation to Thai Port	CFR Thai Port		Ex-works Price (excluding VAT) Baht	
					Unit Price	Unit Price	Unit Price	Amount	Unit Price	Amount
2-1	Single string suspension insulator assemblies with armor rods for Invar conductor, 8000 kg ultimate strength, coupling type B (without insulator and arcing horn)	144	set							
2-2	Double string suspension insulator assemblies with armor rods for Invar conductor, 12000 kg ultimate strength, coupling type B (without insulator and arcing horn)	60	set							
2-3	Bypass string suspension insulator assemblies for Invar conductor, 8000 kg ultimate strength, coupling type B (without insulator and arcing horn)	75	set							
2-4	Single string tension insulator assemblies for Invar conductor, 12000 kg ultimate strength, coupling type B (without insulator and arcing horn)	57	set							

Item No.	Description	Qty.	Unit	Currency	Supply of Equipment				Supply of Equipment	
					Foreign Supply				Local Supply	
					FOB Vessel	Cost of Transportation to Thai Port	CFR Thai Port		Ex-works Price (excluding VAT) Baht	
					Unit Price	Unit Price	Unit Price	Amount	Unit Price	Amount
2-5	Double string tension insulator assemblies for Invar conductor, 14000 kg ultimate strength, coupling type B (without insulator and arcing horn)	426	set							
2-6	Single string tension inverted insulator assemblies for Invar conductor, 12000 kg ultimate strength, coupling type B (without insulator and arcing horn)	6	set							
2-7	Double string tension inverted insulator assemblies for Invar conductor, 14000 kg ultimate strength, coupling type B (without insulator and arcing horn)	6	set							
2-8	Vibration damper for Invar conductor	777	set							
2-9	Compression dead end for Invar conductor	24	set							
2-10	Tension sleeve for Invar conductor	24	set							
Total Price for Schedule 2								Baht		

Breakdown Price for Schedule 1

IMPORTANT

The Contractor is required to fill out and return this breakdown sheet with this proposal .

Item No.	Description	Qty.	Unit	Currency	Supply of Equipment
					Foreign Supply
					CFR Thai Port
					Amount
1-1	INVAR Conductor				
	Ingot	1	km		
	Core Material	1	km		
	Fabrication	1	km		
	Complete Conductor	1	km		

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PART 2: PROPOSAL DATA

CIRCUIT CONDUCTOR (1) PROPOSAL DATA		Bidder			
		Item No.	1-1 and 1-2		
Name of Manufacturer					
Make and country of origin					
COMPLETE CONDUCTOR	Size/Nominal sectional area	Area mm ²	Area mm ²		
	Thermal resistant aluminum alloy strand	Number	Diameter mm		
	Aluminum clad invar strand	Number	Diameter mm		
	Calculated area	Aluminum Alloy mm ²	Al-Clad Invar mm ²	Total mm ²	
	Minimum breaking strength	kg			
	Outside diameter	mm			
	Standard weight	Aluminum Alloy kg/km	Al-Clad Invar kg/km	Total kg/km	
	Calculated resistance at 20°C	D.C. Ohm/km.		A.C. 50 Hz Ohm/km.	
	Calculated inductance	mH/km			
	Geometric mean radius of conductor : GMR	mm			
	Modulus of elasticity	Initial kg/mm ²	Final kg/mm ²		
	Continuous Current Capacity, not less than	A			
	Coefficient of linear expansion	Up to Transition temp.		Above Transition Temp.	
	Max. operating temperature (Continuous)	°C			
	Max. operating temperature (Emergency)	°C			
	Transition temperature (corresponding to 430 m ruling span, 22% UTS everyday tension)				
	Lay ratio and direction of lay	Outer		Second	
		Third		Fourth	
		Fifth		Sixth	
	Lenght of each reel, not less than	m.			
CREEP	for 10 years at ____ ° C and tension _____ kg.	% linear length			
	for 20 years at ____ ° C and tension _____ kg.	% linear length			

CIRCUIT CONDUCTOR (2)		Bidder		
		Item No.	1-1 and 1-2	
PROPOSAL DATA				
THERMAL RESISTANT ALUMINUM ALLOY WIRE	Type of Material			
	Make and country of origin			
	Diameter and tolerance	mm		
	Standard weight	kg/km		
	Ultimate tensile strength, average, not less than	kg/mm ²		
	Elongation in 254 mm., average	%		
	Conductivity at 20°C, average	%IACS	Individual	Average 4 Specimens
	Maximum DC resistance at 20°C	ohm/km		
	Minimum breaking strength of strand after heat resistance of 280°C in 1 hour (% of breaking strength before heat resistance test)			
	Minimum breaking load of strand	kN	Before stranding	After stranding
	Weight of aluminum wire per spool (Production unit) used in fabrication	kg		
	ALUMINUM CLAD INVAR CORE WIRE	Type of Material		
Make and country of origin				
Diameter and tolerance		mm		
Standard weight		kg/km		
Ultimate tensile strength, not less than		kg/mm ²		
Stress at 1% extension, not less than		kg/mm ²		
Elongation in 254 mm., average		%		
Conductivity at 20°C, average		%IACS	Individual	Average 4 Specimens
Maximum thickness of Al-Cladding		mm		
Maximum Co-efficient of linear expansion up to 230°C		per°C		
Aluminum Cladding for Invar Core				
Minimum purity of Aluminum		%		
Minimum number of twists in a gauge length equal to 100 times diameter of wire of which the strand can withstand in the torsion test		Nos		
Minimum breaking load of strand		kN	Before standing	After stranding

CIRCUIT CONDUCTOR (3) PROPOSAL DATA		Bidder				
		Item No. 1-1 and 1-2				
Code name of conductor						
Temperature at which strand data below obtained		°C				
Thermal rating properties						
- Resistance at two different		position 1	ohm/km		at temperature in °C	
		position 2	ohm/km		at temperature in °C	
- Emissivity coefficient						
- Solar absorption coefficient						
- Outer strands heat capacity		watt-s/m-°C				
- Core strands heat capacity		watt-s/m-°C				
Outer Strands	Final modulus of elasticity	MPa/100				
	Thermal expansion coefficients	/100 degree				
	Polynomial coefficients (all strains in %, stresses in MPa)					
	- Stress-strain	A0=	A1=	A2=	A3=	A4=
	- Creep	A0=	A1=	A2=	A3=	A4=
Core Strands	Final modulus of elasticity	MPa/100				
	Thermal expansion coefficients	/100 degree				
	Polynomial coefficients (all strains in %, stresses in MPa)					
	- Stress-strain	A0=	A1=	A2=	A3=	A4=
	- Creep	A0=	A1=	A2=	A3=	A4=
Remark These information data use for PLS-CADD Program Cable data (Nonlinear Cable Model Long Term Creep Modeled with Polynomial)						

PROPOSAL DATA OF RAW MATERIALS		Bidder	
<i>(Bidder shall submit Chemical Analysis of Aluminum wire in Aluminum strands and Core material as shown below)</i>		Item No.	1-1 and 1-2
Chemical Analysis of Aluminum wire in Aluminum strands (By Weight)			
Minimum Purity of Aluminum	%		
Maximum Copper Content	%		
Zirconium Content	%	Max.	Min.
Chemical Analysis of Core materials (By Weight)			
Iron	%	Max.	Min.
Nickel	%	Max.	Min.
Carbon	%	Max.	Min.
Manganese	%	Max.	Min.
Phosphorous	%	Max.	Min.
Sulphur	%	Max.	Min.
Silicon	%	Max.	Min.

Notes: Please specify the additional chemical that is not shown in the proposal data form of being a component in core materials and aluminum strand.

PLEASE FILL OUT AND RETURN WITH YOUR PROPOSAL

KLM Junction - KLM
EPEC power plant - KLM Junction

CONDUCTOR METAL REEL		Bidder	
PROPOSAL DATA		Item No. 1-1 and 1-2	
Reel designation			
Reel drawing No.			
Reel capacity	m ³		
Flange diameter	mm		
Drum diameter	mm		
Reel width	inside mm	outside mm	
Arbor hole diameter	mm		
Lagging wood thickness	mm		
Clearance of wire under lags	mm		
Steel strap width and thickness	mm x mm		
Conductor length and tolerance of each reel	m		
Weight and tolerance of each reel	Net kg	Gross kg	

INSULATOR STRINGS		Bidder				
		Item No.	2-1, 2-2, 2-3, 2-4, 2-5, 2-6 and 2-7			
PROPOSAL DATA						
SUSPENSION INSULATOR STRING	Make and country of origin					
	Type of insulator strings		Single	Double	By - pass	
	Ref. Drawing No. and/or Catalog No.					
	Working voltage kV					
	Number of discs per string					
	Low - frequency flashover voltage		Dry	kV		
			Wet	kV		
	Critical impulse voltage (Positive wave) kV					
	Arcing horn gap mm					
	Breaking strength of complete set kg					
Weight of insulator set kg						
TENSION & INVERTED TENSION INSULATOR STRING	Make and country of origin					
	Type of insulator strings		Single	Double	Single inverted	Double inverted
	Ref. Drawing No. and/or Catalog No.					
	Working voltage kV					
	Number of discs per string					
	Low-frequency flashover voltage		Dry	kV		
			Wet	kV		
	Critical impulse voltage (Positive wave) kV					
	Arcing horn gap mm					
	Breaking strength of complete set kg					
Weight of insulator set kg						
COUNTER WEIGHT	EQUIPMENT	Make and country of origin				
		Type of counter weight				
		Ref. Drawing No. and/or Catalog No.				
		Overall height cm				
	COUNTER WEIGHT	Make and country of origin				
		Ref. Drawing No. and/or Catalog No.				
		Material		<input type="checkbox"/> Galv. Cast iron	<input type="checkbox"/> Concrete	
		Diameter and thickness mm x mm				
		Weight per piece kg				

COMPRESSION DEADEND AND TENSION SLEEVE PROPOSAL DATA	Bidder	
	Item No. 2-9	Item No. 2-10
	COMPRESSION DEADEND	TENSION SLEEVE
Make and country of origin		
Ref. Drawing No. and/or Catalog No.	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Drawing enclosed		
Suitable for conductor size	mm ²	
Slipping strength	kg	
Ultimate tensile strength	kg	
Material for steel sleeve		
Outside diameter of sleeve before compression		
a) Aluminum/Aluminum Alloy	mm	
b) Steel	mm	
Inside diameter of sleeve before compression		
a) Aluminum/Aluminum Alloy	mm	
b) Steel	mm	
Length of sleeve before compression		
a) Aluminum/Aluminum Alloy	mm	
b) Steel	mm	
Length of sleeve after compression		
a) Aluminum/Aluminum Alloy	mm	
b) Steel	mm	
Dimensions of sleeve after compression		
a) Aluminum/Aluminum Alloy		
(i) Corner to corner	mm	
(ii) Surface to surface	mm	
b) Steel		
(i) Corner to corner	mm	
(ii) Surface to surface	mm	
Weight of sleeve		
a) Aluminum/Aluminum Alloy	kg	
b) Steel	kg	
b) Total	kg	
Maximum continuous operating temperature	°C	

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KLM Junction - KLM
EPEC power plant - KLM Junction

VIBRATION DAMPER	Bidder	
	Item No.	2-8
PROPOSAL DATA		
Maker and country of origin		
Ref. Drawing No. and/or Catalog No.		
Type of vibration damper		
Conductor diameter	mm	
Total weight of each damper	kg	
Diameter of weights	mm	
Length of weights	mm	
Weight of weights	kg	
Tolerance in weights	%	
Slip strength of steel messenger wire	kg	
Frequency response range of the damper	c/s	
Peak natural resonant frequency of the damper		
a) Upper	c/s	
b) Lower	c/s	
Free loop length at	m	
a) wind velocity	m/s	
b) tension in conductor	kg	
c) temperature	°C	
Maximum safe bending amplitude peak to peak		
a) for the conductor	mil	
b) for vibration damper clamp	mil	
Maximum bending amplitude peak to peak for the conductor with damper (s)	mil	

SUSPENSION CLAMP AND PREFORMED ARMOR ROD PROPOSAL DATA	Bidder	
	Item No.	
Make and country of origin		
Ref. Drawing No. and/or Catalog No.		
Drawing enclosed	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Slipping strength of suspension assembly	kN	
UTS of suspension clamp	kN	
Particular of preformed armor rod set for suspension assembly		
a) No. of rods per set		
b) Direction of lay		
c) Overall length after fitting on conductor	mm	
d) Actual length of each rod	mm	
e) Diameter of each rod	mm	
f) Tolerance in		
• Diameter of each rod	mm	
• Length of each rod	mm	
• Difference of length between the longest and shortest rod in a set	mm	
g) Type of Aluminum Alloy used for manufacture of preformed armor rod set		
h) UTS of each rod	kg/mm ²	
Purity of zinc used for galvanizing	%	
Maximum continuous operating temperature of		
• Clamp body	°C	
• Standard preformed rods	°C	

PROPOSAL DATA
RECORD OF PAST SUPPLY AND UNDER CURRENT COMMITMENT
OF
INVAR CONDUCTOR

(Name of Manufacturer)

Fabricating Capacity per year _____ Aluminum Ingot Melting Capacity per year _____

<u>Item</u>	<u>Contract No.</u>	<u>Conductor Size</u>	<u>Quantity</u>	<u>Utility/Purchaser</u>	<u>Country</u>	<u>Date of Contract</u>	<u>Completion Delivery</u>
_____	_____	_____	_____	_____	_____	_____	_____
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_____	_____	_____	_____	_____	_____	_____	_____

(Use continuation sheets, if required)

PROPOSAL DATA
RECORD OF PAST SUPPLY
OF
CONDUCTOR HARDWARE ASSEMBLIES

 (Name of Manufacturer)

<u>Item</u>	<u>Name of Transmission Line</u>	<u>Voltage kV</u>	<u>No. of subconductors/ per Bundle</u>	<u>Quantity Sets</u>	<u>Utility/Purchaser</u>	<u>Date of Contract</u>	<u>Date of Completion of Delivery</u>
_____	_____	_____	_____	_____	_____	_____	_____
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_____	_____	_____	_____	_____	_____	_____	_____

(Use continuation sheets, if required)

PROPOSAL DATA
RECORD OF PAST SUPPLY
OF
VIBRATION DAMPERS

(Name of Manufacturer)

<u>Item</u>	<u>Name of Transmission Line</u>	<u>Voltage</u> <u>kV</u>	<u>Conductor Size</u>	<u>Quantity</u> <u>Sets</u>	<u>Utility/Purchaser</u>	<u>Date of</u> <u>Contract</u>	<u>Date of</u> <u>Completion</u> <u>of Delivery</u>
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
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_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____

(Use continuation sheets, if required)

DEVIATIONS

The undersigned Bidder confirms that the Proposal submitted by the Bidder

complies with Specifications and commercial terms specified in the Bidding Documents.

contains deviations from Specifications and/or commercial terms specified in the Bidding Documents as listed hereunder (Use continuation sheets, if required):

.....

Confirmed :

Firm : _____

By : _____

Title : _____

PART 3: DELIVERY SCHEDULE AND DISTRIBUTION LIST

INVITATION TO BID NO. GBA3-HTLS-01

Delivery Schedule and Distribution List

Bulk Power Supply for The Greater Bangkok and Vicinity Area Phase 3

Schedule 1 : SUPPLY OF TRANSMISSION LINE HIGH TEMPERATURE LOW SAG CONDUCTOR

Item No.	Description	Qty (km.)	Job no.	Transmission Line	Delivery Required by EGAT (within months after confirmation of Letter of Award of Contract)
					CFR Thai Port
1-1	INVAR Conductor	79.8	GBA3-08-L06	KLM Junction - KLM	6
		64.98	GBA3-08-L07	EPEC power plant - KLM Junction	
1-2		1.14	GBA3-08-L06	KLM Junction - KLM (spart part to be kept separately at Ao Phai Substation)	

Thai Port = BKK Port

INVITATION TO BID NO. GBA3-HTLS-01

Delivery Schedule and Distribution List

Bulk Power Supply for The Greater Bangkok and Vicinity Area Phase 3

Schedule 2 : SUPPLY OF TRANSMISSION LINE HARDWARE ASSEMBLIES AND LINE ACCESSORIES

Item No.	Description	Qty (set)	Job no.	Transmission Line	Delivery Required by EGAT (within months after confirmation of Letter of Award of Contract)
					CFR Thai Port or Ex-works
2-1	Single string suspension insulator assemblies with armor rods for Invar conductor, 8000 kg ultimate strength, coupling type B (without insulator and arcing horn)	90	GBA3-08-L06	KLM Junction - KLM	6
2-1	Single string suspension insulator assemblies with armor rods for Invar conductor, 8000 kg ultimate strength, coupling type B (without insulator and arcing horn)	54	GBA3-08-L07	EPEC power plant - KLM Junction	
2-2	Double string suspension insulator assemblies with armor rods for Invar conductor, 12000 kg ultimate strength, coupling type B (without insulator and arcing horn)	30	GBA3-08-L06	KLM Junction - KLM	
2-2	Double string suspension insulator assemblies with armor rods for Invar conductor, 12000 kg ultimate strength, coupling type B (without insulator and arcing horn)	30	GBA3-08-L07	EPEC power plant - KLM Junction	
2-3	Bypass string suspension insulator assemblies for Invar conductor, 8000 kg ultimate strength, coupling type B (without insulator and arcing horn)	48	GBA3-08-L06	KLM Junction - KLM	
2-3	Bypass string suspension insulator assemblies for Invar conductor, 8000 kg ultimate strength, coupling type B (without insulator and arcing horn)	27	GBA3-08-L07	EPEC power plant - KLM Junction	
2-4	Single string tension insulator assemblies for Invar conductor, 12000 kg ultimate strength, coupling type B (without insulator and arcing horn)	33	GBA3-08-L06	KLM Junction - KLM	
2-4	Single string tension insulator assemblies for Invar conductor, 12000 kg ultimate strength, coupling type B (without insulator and arcing horn)	24	GBA3-08-L07	EPEC power plant - KLM Junction	

Item No.	Description	Qty (set)	Job no.	Transmission Line	Delivery Required by EGAT (within months after confirmation of Letter of Award of Contract)
					CFR Thai Port or Ex-works
2-5	Double string tension insulator assemblies for Invar conductor, 14000 kg ultimate strength, coupling type B (without insulator and arcing horn)	222	GBA3-08-L06	KLM Junction - KLM	6
2-5	Double string tension insulator assemblies for Invar conductor, 14000 kg ultimate strength, coupling type B (without insulator and arcing horn)	204	GBA3-08-L07	EPEC power plant - KLM Junction	
2-6	Single string tension inverted insulator assemblies for Invar conductor, 12000 kg ultimate strength, coupling type B (without insulator and arcing horn)	6	GBA3-08-L06	KLM Junction - KLM	
2-7	Double string tension inverted insulator assemblies for Invar conductor, 14000 kg ultimate strength, coupling type B (without insulator and arcing horn)	6	GBA3-08-L06	KLM Junction - KLM	
2-8	Vibration damper for Invar conductor	423	GBA3-08-L06	KLM Junction - KLM	
2-8	Vibration damper for Invar conductor	354	GBA3-08-L07	EPEC power plant - KLM Junction	
2-9	Compression dead end for Invar conductor	24	GBA3-08-L06	KLM Junction - KLM (spart part to be kept separately at Ao Phai Substation)	
2-10	Tension sleeve for Invar conductor	24	GBA3-08-L06	KLM Junction - KLM (spart part to be kept separately at Ao Phai Substation)	

Thai Port = BKK Port

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**SECTION D
CONTRACT**

CONTRACT

SUPPLY OF TRANSMISSION LINE HIGH TEMPERATURE LOW SAG CONDUCTOR, HARDWARE ASSEMBLIES AND LINE ACCESSORIES BULK POWER SUPPLY FOR THE GREATER BANGKOK AND VICINITY AREA PHASE 3

No. _____

This Contract is executed and delivered this _____ day of _____,
B.E. _____ (A.D. _____), between

ELECTRICITY GENERATING AUTHORITY OF THAILAND

represented by _____ of said Authority, hereinafter called "EGAT", and

(Contractor)

represented by _____, age _____ years, nationality _____, hereinafter called
the "Contractor".

EGAT and the Contractor mutually agree as follows :

D-1. Contract Documents

The following documents attached to this Contract are incorporated and made a part of this
Contract, as though fully written out and set forth herein :

Data Sheet

- A. Invitation to Bid
- B. Instructions to Bidders
- C. Contract Price, Delivery Time of Equipment and Proposal Data
- D. Contract
- E. General Conditions
- F. Special Conditions
- G. Ratings and Features (None)
- H. Bill of Materials (None)
- I. Specifications
- J. Drawings

K. Supplemental Notices

L. Attachments :

M. Changes :

All of the foregoing documents are referred to herein as the Contract Documents. They are also incorporated into this Contract and made a part hereof all codes, designations, standards, standard specifications and similar Equipment which are referred to in the Specifications and Special Conditions.

D-2. Acceptance of Proposal

EGAT has accepted the proposal of the Contractor for furnishing the Equipment in conformity and in accordance with and subject to all the terms and conditions of these Contract Documents.

D-3. Agreement

The Contractor agrees to sell and EGAT agrees to buy the Equipment as described in these Contract Documents.

D-4. Obligation of Contractor

The Contractor agrees to perform well and faithfully all of the services and to furnish all of the Equipment described in these Contract Documents, and to supply and provide all Equipment, labor and other things requisite for or incidental to the said Work.

D-5. Obligation of EGAT

EGAT agrees, subject to the terms and conditions of these Contract Documents, to pay to the Contractor the amount shown, and at the rates and times and in the manner set forth in these Contract Documents.

D-6. Mutual Obligations

EGAT and the Contractor mutually agree to perform, fulfill, abide by, and submit to any and all of the provisions and requirements and all matters and things contained or expressed in, or reasonably to be inferred from these Contract Documents.

D-7. Deposit of Performance Security

The Contractor agrees to deposit with EGAT an acceptable performance security in accordance with the Contract Documents.

D-8. Assignment

The Contract or any part thereof shall not be assigned or pledged without the written consent of EGAT, nor shall the Contractor assign or pledge any money due, or to become due, to him hereunder, without the prior written consent of EGAT.

D-9. Notices

All notices called for by the terms of this Contract shall be effective only at the time of receipt thereof and only when received by the parties to whom they are addressed at the following addresses :

EGAT : Governor
Electricity Generating Authority of Thailand
Bangkruai, Nonthaburi 11130
Thailand

Contractor : _____

All notices called for by the terms of this Contract shall be in the form of registered letters or facsimile in the English language.

D-10. Integration

EGAT and the Contractor agree that this Contract, including the Contract Documents, expresses all of the agreements, understandings, promises, and covenants of the parties, and that it integrates, combines, and supersedes all prior and contemporaneous negotiations, understandings, and agreements, whether written or oral, and that no modification or alteration of this Contract shall be valid or binding on either party, unless expressed in writing and executed with the same formality as this Contract, except as may otherwise be specifically provided in this Contract.

D-11. Counterpart

This Contract is executed in *two (2)* identical counterparts: *one (1)* for EGAT and one (1) for the Contractor.

ELECTRICITY GENERATING AUTHORITY
OF THAILAND

CONTRACTOR :

BY _____
()

BY _____
()

WITNESS :

WITNESS :

BY _____
()

BY _____
()

DRAFT

SECTION E
GENERAL CONDITIONS

GENERAL CONDITIONS

E-1. Definitions

Whenever the following terms are used in the Contract Documents, they will have the following meanings :

- EGAT : The Electricity Generating Authority of Thailand, having its Head Office at Nonthaburi, Thailand, and its authorized representative or representatives
- Engineer : Firm or company assigned by EGAT to provide engineering, consulting or construction management services in support of EGAT
- Bidder : Any person or firm or company or joint venture or consortium of firms submitting bid to EGAT for furnishing the services and Equipment described in the Contract Documents, in response to this Invitation to Bid
- Contractor : Any person or firm or company or joint venture or consortium of firms including appointed representatives, successors and assignees thereof, whose bid has been accepted by EGAT for furnishing of the services and Equipment described in the Contract Documents
- Subcontractor : Any person or firm or company (other than the Contractor) to whom any part of the Contract has been sublet, with the consent of EGAT, by the Contractor
- Contract : The agreement between EGAT and the Contractor, and all Appendices and Schedules thereto including Invitation to Bid, Instructions to Bidders, Proposal, General Conditions, Special Conditions, Specifications, Ratings and Features, Drawings, Supplemental Notices and any other documents referred to in, or connected with the Contract, eventhough the said documents are issued after execution of the Contract
- Contract Price : The sum specified in Section C which is inclusive of VAT (if any) subject to such additions thereto or deductions therefrom as may be made under the provisions hereinafter contained

Equipment	:	Machinery, apparatus, materials, goods, including accessories and spare parts to be supplied under the Contract and specifically described in the Specifications
Work	:	All the work to be done by the Contractor for design manufacture, shop test, transportation, and delivery of the Equipment ex-works, FOB Port of Shipment/Vessel or CFR Thai Port or at EGAT's store/site as agreed, including, if required, supervision for installation at site and supervision for field tests of the Equipment under the Contract
Thai Port	:	Commercial ports in Thailand including but not limited to Bangkok Port, Laem Chabang Port, Sriracha Harbour Port, Siam Seaport, Maptaphut Port, Songkhla Port, Phuket Harbour Port or Suvarnabhumi Airport, as the case may be
Bangkok Port	:	Bangkok Wharf (Klong Toey Port) and all other commercial ports in Bangkok Metropolitan area
Supervisor (if required)	:	Contractor's employee assigned as installation supervisor including assistant supervisor, to supervise and be responsible for the installation, erection, adjustment, field tests, and commissioning of the Equipment supplied under the Contract
Option (if any)	:	Equipment to be quoted by the Bidder which EGAT reserves the right to accept or omit in whole or in part
Year	:	Calendar year
Month	:	Calendar month
Day	:	Calendar day

E-2. Intent of Contract Documents

All of the Contract Documents are complementary, and what is called for by one shall be as binding as if called for by all. In the case of any discrepancy between any of the Contract Documents, or any defective description or ambiguity, the matter shall be promptly submitted to EGAT, which shall promptly make a determination in writing. Any adjustment by the Contractor without this determination shall be at the Contractor's own risk and expense. In all cases of discrepancy, defective description, or ambiguities,

the interpretation given by EGAT shall be binding on the Contractor, subject to the provisions of Article E-31. Dispute Resolution, included in these General Conditions.

E-3. Applicable Law and Legal Jurisdiction

The applicable law of this Contract shall be the law in force in the Kingdom of Thailand. Should there be any ambiguity or discrepancy arising out of or in connection with the Contract Documents, the interpretation thereof shall be made in accordance with Thai laws. Any litigations between the parties that may arise out of or in connection with this Contract or the breach or termination thereof or the performance of work thereunder shall be submitted to the Court of Thailand for decision, except as may be otherwise specifically provided in these Contract documents.

E-4. Statutory Requirements

Throughout the continuance of the Contract, the Contractor shall conform to all laws of the Kingdom of Thailand, and to all regulations, by-laws, ordinances, or orders made thereunder, and to the lawful requirements of any public, municipal, or other authority, in any way affecting or applicable to the Contractor or its operations.

E-5. Patents and Copyrights

The Contractor shall indemnify and hold EGAT, its officers, agents, and employees harmless against and from liability of any nature or kind, including costs and expenses for or on account of any copyrighted or uncopied composition, secret process, patented or unpatented invention, article, or appliance manufactured, delivered, or used in carrying out the Work under the Contract. All drawings and the information contained therein as well as the use of any process, material or Equipment developed in the course of carrying out the Work under the Contract shall become the property of EGAT where EGAT shall have the right to use any or all of them for any purpose either for present or future projects. For the avoidance of doubt, none of them will be used solely for any commercial benefit which is not related to EGAT work.

E-6. Subcontracts

The Contractor shall not assign or transfer the Contract or any part thereof or any benefit or interest therein or thereunder, any monies due or become due under this Contract to any other person or persons.

The Contractor shall not be allowed to subcontract the whole of the Work under this Contract. Subcontracting of any part of the Work shall be subject to the prior written consent of EGAT. Such consent, if given, shall not relieve the Contractor from full and entire responsibility under this Contract.

If the Contractor desires to subcontract any part or parts of the Work called for by the Contract, he shall notify EGAT in writing to that effect and shall state in such notice the nature and extent of the part or parts of the Work called for by the Contract proposed to be subcontracted and name of the person proposed as Subcontractor. Unless and until written approval is given by EGAT, approval for which shall not be unreasonably withheld, the Contractor shall not subcontract any part of the Work. All requirements specified in these Contract Documents shall be applicable to Subcontractors also.

No contractual relation shall exist between EGAT and the Subcontractors, and the Subcontractors are not to enjoy any privileges conferred on the Contractor by this Contract.

Any Work done by any Subcontractor who has not been approved by EGAT shall be subject to rejection or stoppage of Work by EGAT. In such case the Contractor cannot claim delay or request for time extension of the Contract completion date and/or make financial claim to EGAT.

E-7. Export Charges

All tariffs, duties and other taxes or charges levied by the country of origin of the Equipment shall be paid by the Contractor, and such expenses shall be included in the cost of the Equipment.

E-8. Import Duty and Taxes

EGAT will pay all costs of procuring the necessary permits and licenses for importation into Thailand, and will pay import duty and any taxes including value added tax imposed at the port of entry on the Equipment to be supplied by the Contractor and imported into Thailand for the Work under this Contract.

EGAT will not pay import duty and taxes on either the personal effects of the Contractor's employees, such as personal articles, household furnishings and appliances, and goods of any kind imported for the personal use of the Contractor's employees whether imported by an employee or by the Contractor, or in respect of food, tobacco, liquor and other commissary goods imported by the Contractor or by his employees.

EGAT will not pay import duty and taxes including value added tax on equipment, tools, instruments and machinery imported by the Contractor for purpose of carrying out the work under the Contract. All processes of importation shall be arranged by the Contractor.

Equipment, tools, instruments and machinery which are certified by the Contractor that they are required for installation, test and commissioning of the Work at the site and they are intended for re-exportation can be temporarily exempted from import duty and taxes including value added tax. All Equipment thereof shall be imported under the name of the Contractor and be in accordance with the rules and regulations of the Customs Department of the Kingdom of Thailand.

EGAT will assist the Contractor for such temporary exemption of import duty and taxes including value added tax by issuing a letter confirming such temporary import. Import duty and taxes including value added tax for the temporarily imported Equipment shall be paid by the Contractor to the Customs Department before re-exportation at the rate to be specified by the Customs Department at the time of importation for the whole period they have been imported into the Kingdom of Thailand. Temporary importation of the Equipment is subject to approval of the Customs Department and the deposit of a bond with the Customs Department in the amount to be notified by the Customs Department is required. All costs for submission of information and data if required by the Customs Department and the cost of provision of the bond shall be borne by the Contractor.

In view of numerous advantages, the ATA Carnet system or other systems may be arranged for shipment of the said temporarily imported equipment by the Contractor (if required). Any charge incurred and/or any liability shall be borne by the Contractor.

E-9. Value Added Tax

Pursuant to the Revenue Code of Thailand, EGAT shall be responsible and pay when due for the value added tax imposed on the supply of Equipment, including local transportation (if any) and/or on the provision of services under this Contract. EGAT shall in no case be responsible for the value added tax collectible on any payment made by the Contractor under any subcontract or under any other circumstances and the Contractor shall comply with the rules and regulations of the Revenue Code of Thailand.

In case there is any change on the rate of value added tax imposed by the Government of Thailand, the amount of value added tax comprised in the Contract Price shall be adjusted to reflect such change, provided that the price of the Work shall remain unchanged.

E-10. Income and Other Taxes

Income and other taxes assessed or collected by the Government of Thailand, or any subdivision thereof, or any municipality therein on the Contractor and his employees shall be under the responsibility and account of the Contractor.

In accordance with the Revenue Code of Thailand, should the payment under this Contract be subject to income tax and withholding tax of any kind is required to be withheld by EGAT, such withholding tax shall be deducted by EGAT from each payment and EGAT will be responsible to remit such withholding tax to the Revenue Department of Thailand on behalf of the Contractor. In case any payment being made through the letter of credit or being made directly from foreign source whereby the withholding tax cannot be deducted from payment, the Contractor is required to immediately inform EGAT once each such payment is made to the Contractor, and the withholding tax of which will be paid from EGAT's own fund to the Revenue Department in the same manner as aforesaid. Such withholding tax amount as advanced by EGAT on behalf of the Contractor shall be reimbursed by the Contractor to EGAT within the period of time fixed by EGAT.

In the case where the Contractor considers that the transaction under this Contract is exempted from income tax of Thailand (under any circumstance), the Contractor shall submit, together with his proposal(s), a statement detailing such exemption and the valid documentary evidence. Should EGAT rely on the statement so submitted, no deduction for withholding tax shall be made from payment. However, if the tax authority of Thailand determines that such exemption is not applicable, the Contractor shall then be responsible for the amount(s) equal to the withholding tax, plus the amount(s) of tax exceeding those of withholding tax, including the surcharge and/or penalties imposed on EGAT and the Contractor. The responsibility and liability of the Contractor as provided in the preceding sentence shall survive termination of the Contract.

If the Contractor fails to immediately inform EGAT of the payment as required under the second paragraph preventing EGAT from remitting the withholding tax to the Revenue Department within seven (7) Days from the end of the month in which such payment is made, or fails to pay and/or reimburse EGAT for any amount required under this Article within the period of time fixed by EGAT, such period not to be shorter than fifteen (15) Days from the date of EGAT's notice for payment, EGAT has the right to claim directly from the Contractor or claim from Performance Security or Maintenance Security, as the case may be, or deduct or setoff from any money due to the Contractor under this Contract

for the outstanding amount, surcharge and/or penalty (if any) together with interest at the rate of Minimum Overdraft Rate (MOR) plus two (2) per cent calculated from the due date up to the date the payment is made in full.

EGAT will proceed with the tax matters under the Contract by relying on the information and document submitted by the Contractor in relation to the Bidder's status and tax liability.

If the Revenue Department of Thailand differently determines the status and tax liability, the Contractor shall be responsible and liable for any cost and expense, penalty and/or surcharge incurred and/or imposed on him and EGAT in relation thereto.

E-11. Fees and Duties

Any and all immigration fees, stamp duties, and other fees assessed or collected by the Government of Thailand, or by any subdivision thereof, or by any municipality therein, on this Contract, on the Contractor and/or his personnel shall be paid by the Contractor. Any taxes collectible under this Contract, other than those stipulated in this Contract, shall be at the responsibility and account of the Contractor.

The stamp duty for any service contract (Construction, Hire of Work, Consultancy Service, Transportation, Supervisor, etc.) with the Contract value of the service portion lower than baht 200,000.- is required to be affixed by the Contractor on the original copy and the counterpart of the Contract. In case the value of the service portion is baht 200,000.- and over, payment of such stamp duty by the Contractor shall be made in cash to the Revenue Department of Thailand or its authorized subdistrict offices. In either case, the stamp duty is required to be affixed or paid, as the case may be, within fifteen (15) Days after the date of Contract execution, otherwise the Contractor shall be liable to pay for any and all penalties imposed for the delay as required by law.

The Contract value of the service portion to be calculated for stamp duty under this provision shall be the price excluding value added tax.

For a foreign Contractor who has no representative in Thailand, EGAT will, upon receipt of written request from the Contractor, affix or pay for stamp duties from EGAT's own fund on behalf of the Contractor, the Contractor is therefore required to reimburse EGAT for such stamp duties plus any and all penalties imposed by law for delay, if such delay is due to Contractor's failure to make written request to EGAT as aforesaid within a reasonable period of time.

If the Contractor fails to reimburse EGAT for any and all amount as required under this Article within the period of time fixed by EGAT, such period not to be shorter than fifteen (15) Days from the date of EGAT's notice for payment, EGAT has the right to claim directly from the Contractor or claim from Performance Security or Maintenance Security,

as the case may be, or deduct or setoff from any and all money due to the Contractor under this Contract for the outstanding amount together with interest at the rate of Minimum Overdraft Rate (MOR) plus two (2) per cent calculated from the due date up to the date the payment is made in full.

E-12. Performance Security

The Contractor shall, at the time of execution of the Contract, deposit with EGAT a performance security for the due and proper performance of this Contract in the amount of ten (10) per cent of the total Contract Price. The performance security shall insure payment of any obligations, penalty, damages, liquidated damages, or expenses for which the Contractor may become liable to EGAT.

The amount of the performance security shall be adjusted or the Contractor may deposit a new performance security in the amount of ten (10) per cent of the additional Contract Price to cover the Contractor's obligation in case the Contract Price is increased due to change of the Work under the Article E-21. Changes and Extra or Omitted Work.

The performance security shall be in the form of a cash deposit, *or a certified cheque issued by a local bank, or a cashier cheque issued by a local bank*, or a bank guarantee or letter of guarantee issued only by a local bank or an acceptable financial institution in Thailand, or by a foreign bank counter-guaranteed by a local bank and, made payable to EGAT in the same currency as that of the Contract. In case of a cash deposit, only Thai baht portion of the Contract Price can be made. EGAT may at any time, upon application by the Contractor, approve the substitution for any performance security held under this Article by other performance security on such terms and conditions as may be approved by EGAT. The Contractor shall bear the cost of the performance security.

The conditions of the guarantor's obligations in the performance security shall include, inter alia, the following :

- (1) The guarantor shall unconditionally guarantee, as primary obligor and not as surety merely, payment of any obligations, penalties, damages, liquidated damages, or expenses for which the Contractor may become liable to EGAT.
- (2) No extension of time, change in, addition to, or other modification of the terms of the Contract or Work to be performed thereunder, or of the specifications or other Contract Documents shall in anyway release the guarantor from any liability under the performance security, and the guarantor shall thereby waive notice of any such extension of time, change, addition or modification.

- (3) The performance security shall be valid and remain in full effect from the date of execution of the Contract until the issuance of the Acceptance Certificate by EGAT or the acceptance of Equipment deemed to be made by EGAT against submission of the Maintenance Security accepted by EGAT.

Unless and until an official receipt is issued in respect to a security deposit, EGAT will not recognize or accept any such deposit as fulfilling the requirements of this Article. Failure to deposit a performance security at the time specified above in this Article or such extended time as may be approved by EGAT shall be a breach of this Contract and EGAT is entitled to terminate the Contract or suspend any payment for Work performed until the performance security has been accepted by EGAT. EGAT shall not be liable for any losses, expenses and/or damages resulting from such payment suspension.

If any performance security furnished under this Article becomes unacceptable to EGAT, or if any guarantor fails to furnish reports as to guarantor's financial condition from time to time, as requested by EGAT, the Contractor shall promptly furnish such additional or alternative security as may be required by EGAT from time to time to protect the interests of EGAT up to an amount equal to the amount of the security.

In the event of any default or breach of this Contract by the Contractor, EGAT may convert into money any performance security which does not consist of money, and the proceeds shall be deemed to be a cash deposit under this Article. EGAT shall not be liable for any cost, expenses and/or loss incurred in connection with such conversion.

The performance security, in case of a bank guarantee, or letter of guarantee, shall be in conformity with the specimen acceptable to EGAT as shown herein at the end of these General Conditions.

E-13. Inspection and Tests

All Equipment furnished and all *Work* performed under this Contract shall be subject to inspection by EGAT or EGAT's authorized *representatives* at its option. *while such Work is in progress to ascertain that the completed Work will comply in all respects with the standards and requirements set forth in the Contract Documents. Notwithstanding such inspection, the Contractor will be responsible for the acceptability of the finished Work.*

EGAT or EGAT's representatives shall at all times have access to the Work whenever it is in preparation or progress and the Contractor shall provide proper facilities for such access and shall furnish promptly, without additional charge, all facilities, labor and material reasonably needed for safe and convenient inspection by EGAT or EGAT's representatives. The Contractor shall notify EGAT at least two (2) *Months* in advance

when and where the Equipment **and the Work** will be available for each inspection **and** test. Any **expense** incurred by EGAT or EGAT's **representatives** to inspect the Equipment **and the Work** or **to** attend the test caused by false call of the Contractor for inspection and tests shall be borne by the Contractor.

If any Work should be covered up, or otherwise made inaccessible, without the approval of EGAT, it shall, if required by EGAT, be uncovered and made accessible for examination. Any such cover, which is required in the finished Work, shall be restored to EGAT's satisfaction at the Contractor's expense.

The acceptance of any Work or Equipment covered by these Contract Documents, or the making or waiving of any inspection or witnessing of any tests shall in no way relieve the Contractor of full responsibility for the quality, character and satisfactory operation and performance of the complete Work, and every part of it, as outlined in these Contract Documents, nor shall it prejudice or affect the rights of EGAT as set forth in the Contract.

Unless otherwise specifically provided in the Contract, the expenses directly required for all labor, tools, instruments, other materials and Equipment necessary for performance of the tests shall be borne by the Contractor.

The Contractor shall at his own expense conduct shop tests in accordance with the Specifications and submit the results of the tests to EGAT upon completion of tests. EGAT reserves the right to inspect all Equipment either in person or via video conference during its manufacture or fabrication and prior to its preparation for shipment, to inspect its packing when ready for shipment, and to witness any or all tests.

In the event the results of the tests do not satisfy the requirements of the Specifications or the guaranteed performance, the Contractor shall rectify to improve the Equipment until satisfactory results are obtained and shall conduct all necessary retests at his own expense.

Any delay in delivery due to the retest shall not constitute a release of the Contractor from his responsibility for delay. Any expenses incurred by EGAT in attending these retests shall be borne by the Contractor.

EGAT reserves the right to send one or more of EGAT's employees, not as inspectors, to the Contractor's plant to witness the fabrication, assembly and testing of any or all parts of the Equipment being furnished under this Contract. Travelling expenses and per diem of such employee or employees shall be borne by EGAT.

E-14. Preparation for Shipment and/or Delivery

The Contractor shall submit shipment and/or delivery schedule for EGAT's approval at least thirty (30) Days in advance before each shipment and/or delivery is made. No shipment and/or delivery shall be made prior to EGAT's approval which will be notified to the Contractor within fifteen (15) Days after receipt of the said shipment and/or delivery schedule.

All imported and local Equipment to be delivered under this Contract shall be satisfactorily packaged in such a manner to protect them from damage during transportation and for outdoor storage at the site in hot, wet, humid and dusty conditions. In addition, the imported Equipment shall also be satisfactorily packaged for moist tropical ocean shipment. Where necessary, heavy parts shall be mounted on skids so that cable slings for handling can readily be attached. Where it is unsafe to apply external slings to a package, attached slings shall be provided and shall project through the package so that attachment can readily be made.

In order to keep the damage to non-water proof Equipment during the transportation at minimum level, the Contractor and/or supplier is required to put an umbrella mark on every package of the Equipment.

In order to accelerate the dispatch of the Equipment to the site, the Contractor is required to arrange packaging of the Equipment in such a manner that a complete set of one unit shall be packed in package(s) or crate(s) with indication of designated substation but each individual package or crate shall contain the Equipment for only one unit or part of a complete set of one unit or otherwise as directed in the Instructions for Packaging attached at the end of Section E. General Conditions.

For Power Transformer and Shunt Reactor, in addition, all accessories, which are packed in aforesaid manner shall be contained in a container per transformer except for transformer insulating oil, radiators and conservator including other accessories which for dimensional reason after packaging are unable to be contained in the said container. However, spare parts shall be contained in a separate container per each shipment or Contract to be awarded. The containers to be used shall become the property of EGAT. The dimensions of containers shall be as follows :-

<u>Container Dimensions</u>	<u>Door Dimensions</u>
Height 2.59 m.	Height 2.28 m.
Width 2.44 m.	Width 2.33 m.
Length 6.05 m.	

In addition, details of Equipment and substation destination per container shall be identified in Bill of Lading.

Detailed breakdown prices for spare parts of Equipment shall be also indicated in the invoice.

Prior to delivery of all Equipment, packaging details shall also be submitted to EGAT for approval.

The cost incurred for repair or replacement of any damages to the Equipment due to improper packaging shall be at the Contractor's expense.

Each individual package or crate shall be clearly and plainly tagged or marked for identification as follows:

EGAT, THAILAND

PROJECT NAME : _____

CONTRACT NO. : _____

SUBSTATION : _____

CASE NO. : _____

ITEM NO. : _____

DESCRIPTION : _____

EGAT'S SERIAL NO. : _____ (if any)

In addition to this, the following instructions shall be observed :

- a. Each box, crate, case, bundle or piece of loose Equipment shipped must show the following information clearly marked on its body :
 1. Gross weight in kilograms
 2. Net weight in kilograms
 3. Dimensions in centimeters
- b. All boxes, crates, cases, bundles, loose pieces, etc. must be marked consecutively from No. 1 upward throughout all shipments to completion of the order without repeating the same number.
- c. The packing list must indicate whether shipment is partial or complete, and shall incorporate the following information on each container, etc., according to its individual shipping number:
 1. Export case markings
 2. Case number
 3. Container number (for Power Transformer and Shunt Reactor)
 4. Item number
 5. Gross weight and net weight in kilograms
 6. Dimensions in centimeters
 7. Complete description of Equipment
 8. EGAT's serial No. (if any)

E-15. Clearance and Weight Limitations

The largest unloading facilities at Bangkok Wharf are 35 metric ton cranes. Lifts heavier than 35 tons will have to be handled by ocean freighter on-board lifting equipment. Ocean freighters of the 10,000 tons class regularly calling at Bangkok Wharf have off-loading capacities to handle 50 tons.

The largest unloading facilities at Laem Chabang Port are 30 metric ton cranes. Lifts heavier than 30 tons will have to be handled by ocean freighter on-board lifting equipment.

Generally, unloading at Thai Port and highway transportation are subject to the following limitations:

Dimensions	Limitations		
	Unloading at Bangkok Wharf/ Highway Transportation		Unloading at Laem Chabang Port/Maptaphut Port
Weight (tons)	60.0	>60.0-135.0	120.0
Width (meters)	3.5	3.5	4.5
Length (meters)	10.0	10.0	25.0
Height from Loading Platform (meters)	3.7	4.0	4.0

The Contractor shall therefore exercise due care to pack the Equipment to meet the above transport limitations.

For Power Transformer and Shunt Reactor, the shipping weight of the largest part is indicated in Ratings and Features.

E-16. Shipment

Shipment of Equipment from port of embarkation to the final port of discharge shall be effected by using Thai vessels through the sea freight forwarder appointed by the Contractor. The Contractor is required to notify EGAT of the name of the sea freight forwarder one (1) week prior to shipment.

According to the regulations of the Maritime Promotion Bureau, Marine Department (as amended from time to time), shipments by non-Thai vessels can be made after receipt of

permission granted by the Maritime Promotion Bureau, Marine Department as requested by the Contractor.

The Contractor is, therefore, required to immediately contact the Maritime Promotion Bureau, Marine Department for such permission with supporting documents of the case thereof for arrangement of the permission in advance.

The Contractor shall follow all other regulations stated in the Mercantile Marine Promotion Act B.E. 2521 and the regulations of the Maritime Promotion Bureau, Marine Department (as amended from time to time).

The Contractor shall be liable for any and all costs and expenses, losses and/or damages suffered by EGAT as a result of the Contractor's failure to comply with such regulations.

For more information, the Contractor may contact the Maritime Promotion Bureau, Marine Department at telephone No. 66 2233 1311-8 extension 391, 393 and facsimile No. 66 2639 4780.

All imported Equipment shall be shipped on Conference Line or on seaworthy oceangoing vessels which are members or associate members of the International Association of Classification Societies (IACS) and ISM Code Certified Vessels. Vessels over fifteen (15) years of age shall not be used for shipment under this Contract unless they : -

- a) have been used for the carriage of general cargo on an established and regular pattern of trading between a range of specified ports and do not exceed twenty-five (25) years of age, or
- b) were constructed as containerships, vehicle carrier or double-skin open-hatch gantry crane vessels (OHGCs) and have been continuously used as such on an established and regular pattern of trading between a range of specified ports, and do not exceed thirty (30) years of age.

Shipment shall be made under deck except for such Equipment which for dimensional reasons cannot be stowed in the vessels hold. In case Equipment cannot be stowed in the vessel hold, permission shall be obtained from EGAT prior to loading such Equipment on deck. Such approval shall not be unreasonably withheld. The Contractor shall in any case be responsible for proper packing for protection of such Equipment loaded on deck of the vessel. Shipment of all Equipment by dry cargo container will be accepted, but all the incidental expenses shall be borne by the Contractor.

For shipment of Equipment under this Contract, transshipment is allowed.

Any delicate Equipment, materials, instruments and tools including but not limited to computers, electronic parts, etc., shall be shipped by airfreight. The Contractor shall be

responsible for proper packing for protection of such Equipment loaded on cargo hold of the aircraft.

Air freight shipment to airport of disembarkation in Thailand shall be effected through the air freight forwarder appointed by the Contractor. The Contractor is required to notify EGAT of the name of the air freight forwarder one (1) week prior to shipment.

E-17. Documents Required for Each Shipment

a. For Seafreight

For accounting procedure, the Contractor is required to send to EGAT the bill of lading, invoice and master packing list immediately by facsimile but not later than three (3) Days after the Equipment are actually loaded free on board (FOB Vessel) at the port of Shipment.

One (1) original negotiable bill of lading, three (3) original signed invoices and packing lists shall be mailed directly to EGAT by express airmail within four (4) working days after the date of departure of the ocean-going vessel from the port of shipment.

Two (2) original negotiable and five (5) copies of non-negotiable bill of lading, ten (10) original signed invoices and three (3) copies of packing lists shall be submitted to EGAT through the Bank within the time as specified in the letter of credit. - This requirement is applied only in case payment is made by letter of credit.

b. For Airfreight

For accounting procedure, the Contractor is required to send to EGAT the airway bill, invoice and master packing list immediately by facsimile but not later than three (3) Days after the Equipment are actually loaded on the air carrier at the airport of departure.

Three (3) original signed invoices and packing lists shall be attached to the airway bill and dispatched together with the airfreight shipment.

One (1) copy of airway bill, two (2) original signed invoices and packing lists shall be sent directly to EGAT by courier within four (4) working days after the date of departure of the carrier from the airport.

Two (2) copies of airway bill, ten (10) signed invoices and three (3) copies of packing lists shall be submitted to EGAT through the bank within the time as specified in the letter of credit. - This requirement is applied only in case payment is made by letter of credit.

To act in accordance with the rules and regulations of the Customs Department of the Kingdom of Thailand, as well as to enable EGAT to expedite clearing the Equipment from the Customs House accordingly, the following declarations, other than regular statements, have to be made in English in the invoice for any transaction concluded with EGAT.

- a. Country from which Equipment is purchased as well as country of origin; if the Equipment is produced in the country or group of countries where there are trade agreements between such country or group of countries and the Kingdom of Thailand, preferential treatment on import duty and taxes for importation of the Equipment is required;
- b. Electricity Generating Authority of Thailand as consignee and Thailand as consigning country
- c. Date and Number of Contract;
- d. Name of Project, if any;
- e. Marking and numbers, as well as gross weight and volume;
- f. Details of Equipment, i.e. names, kinds, qualities, quantities, net weights, and other particulars as available for each type including trademarks or other symbols of such Equipment. If there are no trademarks or symbols, the invoice shall indicate "no trademarks", "no symbols", as the case may be;
- g. Selling price or value of Equipment per unit expressed in the type of currency under transaction and representing actual price or value of Equipment as stated in the price schedules or price breakdown, as the case may be;

If the Contractor fails to specify the price or value of Equipment according to the Contract in the invoice prepared for shipment, the Contractor shall be held responsible for the following:

1. In case of over value or price of Equipment stated in the invoice, the Contractor shall be responsible for reimbursement to EGAT for the import duty and taxes (excluding value added tax) collected by the Customs Department and the insurance premium (excluding value added tax) on the over value or price of Equipment as well as interest. Value added tax imposed in connection thereto shall be EGAT's responsibility. The Contractor shall also refund to EGAT the amount of over value payment as well as interest. The interest to be applied under this Article shall be Minimum Overdraft Rate announced by Krung Thai Bank plus two (2) (MOR+2) percent calculated from the date of EGAT's payment of the over value payment, import duty and taxes as well as insurance premium until the date of the Contractor's settlement of the same in full.
2. In case of under value or price of Equipment stated in the invoice, the Contractor shall be responsible for reimbursement to EGAT the surcharges imposed on additional import duty and taxes at the rate currently established by

the Customs Department as well as interest (if any) and also shall be responsible for compensation to EGAT for cost incurred in repair or replacement of the damaged Equipment which is not covered by insurance due to under value or price of Equipment stated in the invoice.

- h. Other expenses:
1. Packing charges (if any)
 2. Insurance premiums (if insured)
 3. Freight
 4. Others (if any)

The Contractor shall, at the time of shipment, prepare and submit a certificate of origin(s) for the Equipment required as per point a. above together with the invoice and other shipping documents for EGAT to obtain the benefit from preferential treatment on import duty and taxes for importation of the Equipment from the country or group of countries where there are trade agreements between such country or group of countries and the Kingdom of Thailand. For each shipment, all items of Equipment requiring certificate of origin shall be included in only one (1) certificate of origin except as otherwise specified in any trade agreement. The trade agreements shall include but not be limited to the following:

1. Common Effective Preferential Tariff (CEPT) Scheme for the ASEAN Free Trade Area (AFTA);
2. Agreement between the Kingdom of Thailand and Japan for an Economic Partnership; and
3. Agreement between the Government of the Kingdom of Thailand and the Government of the People's Republic of China on Accelerated Tariff Elimination under the Early Harvest Programme of the Framework Agreement on Comprehensive Economic Cooperation between ASEAN and China.

If the Contractor advises EGAT in writing before shipment that it is unable to provide a certificate of origin to EGAT, the Contractor shall be responsible for all costs incurred including but not limited to reimbursement to EGAT for the excess amount of the import duty and taxes (except value added tax) paid by EGAT to Customs Department.

Further to the above, if the Contractor delays to provide a proper certificate of origin to EGAT, the Contractor shall be responsible for all costs incurred including but not limited to reimbursement to EGAT for the storage charges and the interest on the excess amount of import duty and taxes (except value added tax) paid by EGAT to the Customs Department at the rate of Minimum Overdraft Rate announced by Krung Thai Bank plus two (2) (MOR+2) percent calculated from the date of EGAT's payment of import duty and taxes up to the date of receipt of the excess amount of import duty and taxes refund from the Customs Department.

However, if the Contractor fails to provide such proper certificate to EGAT, the Contractor shall be responsible for all costs incurred including but not limited to reimbursement to EGAT for the storage charges and the excess amount of import duty and taxes (except value added tax) paid by EGAT to the Customs Department as well as interest on the said excess amount of import duty and taxes at the rate of Minimum

Overdraft Rate announced by Krung Thai Bank plus two (2) (MOR+2) percent calculated from the date of EGAT's payment of import duty and taxes up to the date of acknowledgement that the certificate cannot be issued in conformity with requirement of the Free Trade Agreement.

The Contractor is also required to study the existing trade agreements and any new trade agreement between the Kingdom of Thailand and a country or group of countries published in the website of Customs Department (www.customs.go.th) and/or Ministry of Commerce (www.moc.go.th), and ask for more information from EGAT in order that EGAT can obtain the benefit from preferential treatment on import duty and taxes for importation of the Equipment from the country or group of countries where there are trade agreements between such country or group of countries and the Kingdom of Thailand.

Fullest conformity with the requirements of the Customs Department of the Kingdom of Thailand mentioned above is essential as a condition precedent.

Unless by force majeure, failure to furnish EGAT with these shipping documents and the certificate of origin within the specified period and strictly in accordance with conditions stipulated above thereby causing impossibility of making prompt customs clearance of the Equipment from Thai Port, the Contractor shall, upon receipt of the EGAT's notice, reimburse EGAT for go down rent / storage charge and other expenses arising from or in consequence of the nonconformity with the above specified requirement.

E-18. Force Majeure

The Contractor shall not be in default under this Contract because of any delays in delivery or in completion of the Work on the separable parts thereof which delays are caused by force majeure; provided, that the Contractor shall notify EGAT in writing of the cause of any such delay within fifteen (15) Days after the end of the event which results in the delay. Upon receipt of any such notice of delay, EGAT will promptly ascertain the facts and the extent of the delay and will extend the time for the delivery and assembly of the Equipment or the time for completing the Work when, in the opinion of EGAT, the delay is caused by force majeure or the findings of fact to justify an extension. EGAT's decision shall be binding on the Contractor, subject to the provision of Article E-31. Dispute Resolution included in these General Conditions.

"Force Majeure" shall be defined as any event, the happening or pernicious results of which could not be prevented even though a person against whom it happened or threatened to happen were to take such appropriate care as might be expected from him in this situation. (Normal rains, inundation, dearth of water, and the overturning or sinking of barges in canals, rivers, or streams and similar events shall not be considered as force majeure).

E-19. Transportation Insurance

Transportation insurance from the port of shipment/from the Contractor's premise(s) to EGAT's Store and/or EGAT's site will be under the responsibility of EGAT.

E-20. Transfer of Title

The title of ownership for the Equipment furnished under this Contract shall be passed to EGAT at the time the Equipment is actually loaded onto the vessel at the port of shipment, or into charge of the air carrier at the port of departure, or at the time the Equipment is actually delivered ex-works and the Contractor's statement or delivery order confirming delivery of the Equipment ex-works has been certified by EGAT's representative. However, this transfer of title shall not be construed as an acceptance of the Equipment. The Contractor shall continue to be responsible for the quality and performance of the Equipment, and for their compliance with the Specifications as well as any loss, theft or damage of the Equipment during the course of execution of the Contract, until final acceptance of the Work by EGAT and the fulfillment of the guarantee provision of the Contract.

E-21. Changes and Extra or Omitted Work

EGAT may at any time authorize changes in, additions to, or deductions from the Equipment to be furnished under the Contract. Changes, additions, or deductions *shall* be authorized only by written notice served by EGAT upon the Contractor and such notice shall be treated as an integral part of the Contract. Adjustments, if any, in the amounts to be paid to the Contractor by reason of any such change, addition, or deduction shall be determined by one or more of the following methods :

- a. by unit price contained in the Price Schedules
- b. by an acceptable lump sum or unit price proposal from the Contractor
- c. on a cost-plus limited basis not to exceed a specific limit. A cost-plus limited basis is defined as the cost of Equipment, labor, and insurance, plus fifteen (15) per cent of the said cost to cover superintendence, general expense, and profit.

No claim for an addition to the Contract Price shall be valid unless authorized as described in this Article. If the parties are unable to agree to the method to be employed in determining adjustments in the Contract Price, the method shall be determined by EGAT.

E-22. Termination and Suspension of Contract

EGAT may, by written notice sent to the Contractor, terminate the Contract, in whole or in part, at any time for its convenience. The notice of termination shall specify that termination is for EGAT's convenience, the extent to which performance of work under the Contract is terminated, and the date upon which such termination becomes effective.

The Equipment that are completed and ready for shipment within thirty (30) Days after the Contractor's receipt of notice of termination shall be purchased by EGAT at the Contract terms and prices. For the remaining Equipment, EGAT may elect :

- a. to have any portion completed and delivered at the Contract terms and prices and/or
- b. to cancel the remainder and pay to the Contractor an agreed amount for partially completed Equipment and for materials and parts previously procured by the Contractor.

E-23. Default and Termination

Should the Contractor :

- a. fail to furnish the Equipment or carry out the Work in accordance with this Contract; or
- b. refuse or fail to prosecute the Work or any part thereof which shall ensure its completion within the time specified in this Contract or any authorized extension of time by EGAT; or
- c. fail to furnish the Equipment and/or complete the Work or any part thereof within the time specified in this Contract or any authorized extension of time by EGAT; or
- d. commit any breach or fail to comply with any of the provisions of this Contract; or
- e. notify EGAT in writing that the Contractor is unable or unwilling to furnish the Equipment or complete the Work or any part thereof; or
- f. become insolvent or bankrupt or make an arrangement or composition with the Contractor's creditors or, being a corporation, go into liquidation whether compulsory or voluntary (except for the purpose of reorganization); or
- g. by himself or by any person on his behalf, give or offer any money or benefit of forbearance to any employee of EGAT and/or any employee of the Engineer who has duties or responsibilities in connection with the acceptance of the proposal or the making of this Contract;

then, in any of such events, the Contractor shall be in default under this Contract, and EGAT may at his sole discretion take any one or more of the following actions that it considers appropriate :

- (i) suspend payments under this Contract until the default has been rectified;
- (ii) cancel or terminate the Contract in whole or in part;
- (iii) take that part of the furnishing of Equipment or the Work, in respect of which the delay or default has occurred, out of the hands of the Contractor or any other person in whose control or possession it is;
- (iv) reduce the Contract Price by an amount equal to the reduction in value to EGAT of the Equipment as actually delivered.

The Contractor shall be liable for all losses and/or damages including but not limited to the increased installation costs and increased administrative costs, suffered by EGAT as a result of the Contractor's default. The Contractor shall have no claim for payment with respect to Work thereafter performed.

All such damages may be recovered by EGAT from the Contractor in any court of competent jurisdiction or, without prejudice to that right, by deduction from any money due or becoming due to the Contractor under this Contract, or from any security deposited, or, after use of the property and materials of the Contract for completion of the work, as provided in this Contract, such property and materials may be sold and the proceeds shall be applied to any remaining obligations of the Contractor.

E-24. Indemnification by the Contractor

The Contractor shall fully indemnify and hold harmless EGAT and its employees and officers from and against any and all suit, actions or administrative proceedings, claims (including any claim for copyright or patent infringement), demands, losses, costs, expenses (including attorney's fees and expenses) and damages of whatsoever nature except breach or default, in respect of death or injury of any person or loss of or damage to any property caused by any act or omission of the Contractor or the Contractor's own officers, directors, agents, employees, Contractors or Subcontractors arising in any manner whatsoever, except any injury, death or property damage caused by the negligence of EGAT, its contractors, employees, officers or agents.

E-25. Limitation of Liability

The liability of the Contractor to EGAT arising from default or termination under the Contract in aggregate shall not exceed the total Contract Price.

E-26. Consequential Damages

Neither party shall be liable to the other party for any indirect, incidental, consequential or punitive damages as a result of the performance or nonperformance of the obligations imposed pursuant to this Contract, unless such indirect, incidental, consequential or punitive damages are foreseen or could have been foreseen at the time of execution of the Contract.

E-27. Vesting of Contract in Receiver

If the Contractor shall compound with his creditors, or shall become bankrupt or insolvent, or carry on business under a receiver, or become incapable from any cause whatsoever of carrying out the Work, any such receiver or any person in whom by law the Contract shall become vested, shall forthwith give notice to EGAT of the fact that the Contract has become vested in it and shall take all reasonable steps to carry on the Work at a rate fulfilling the Contract requirements. Thereupon, if EGAT so desires, such receiver or other such person as aforesaid shall have the option, during the period of one (1) Month from the date when the Contract becomes so vested in it, of carrying out the Contract. In the event of the Work being stopped, this option shall be opened only for a period of fourteen (14) Days from the stoppage date. In the event of the receiver or such other person not electing to carry out the Contract or EGAT not approving the carrying out of the Contract by the receiver, the Contractor shall then be in default and EGAT may proceed in accordance with Article E-23. Default and Termination.

E-28. Extension of Time

If, by reason of any of the following :

- a. Negligence or default on the part of EGAT or its agents,
- b. Alteration in or addition to the Work,
- c. Suspension of the Work at the written direction of EGAT for reasons beyond the control of the Contractor,
- d. War, insurrection, riot or civil commotion or delay caused thereby,
- e. Strikes, not caused by the Contractor's management,
- f. Lawful order of civil or military authorities,
- g. Unusually natural calamities, acts of God,
- h. Any other unforeseen circumstance beyond the Contractor's control.

The Contractor claims that he has been unduly delayed in the progress of the Work, he shall make written request to EGAT for an extension of time for completion of the Work or any portion of it.

Should EGAT consider such claim to be valid, it will grant such extension of time as may seem reasonable to EGAT, without thereby prejudicing or in any manner affecting the validity of the Contract. No extension of time will be granted unless the Contractor makes the written request within fifteen (15) Days after the end of the event which results in the delay.

Other than claiming an extension of time for completion of the Work or any portion of it, the Contractor shall not have any further recourse or claim against EGAT, nor shall he have any right of action against EGAT for loss or damage suffered by reason of such delay.

E-29. Failure to Meet Requirements

EGAT shall have the right to require the Contractor to make any changes in the Equipment or Work covered by this Contract, which may be necessary in the opinion of EGAT, to make the Equipment or Work conform to the requirements of the Contract Documents, without additional cost to EGAT. Any defects in the Equipment or workmanship or other failure, to meet the requirements of the Contract, including errors and omissions on the part of the Contractor, which are disclosed prior to final payment or prior to acceptance by

EGAT, or after completion of all tests, whichever occurs at the later date, shall, if so directed by EGAT, be corrected or replaced promptly by the Contractor at the expense of the Contractor.

In case of replacement of Equipment due to non-conformity with EGAT's specifications and/or defects found prior to acceptance of Equipment by EGAT or replenishment for short pack or returning of repaired Equipment due to such defect, the Contractor shall, upon receipt of EGAT's written notice supported with the receipt issued by the relevant parties, be responsible for reimbursement of the expenses incurred for the following :

- All re-export charges (if any)
- Import duty and taxes
- Landing charges, rents and handling charges (ocean freight)
- Storage charges (air freight)
- Truck hire
- Labour charges

These expenses shall exclude value added taxes, which will be EGAT's responsibility.

The contractor shall be also responsible for reimbursement of Service charges for customs clearance (if any) including value added tax.

Any latent defects not disclosed prior to the date of final payment or prior to acceptance or after completion of all tests, whichever occurs at the later date, but disclosed within the guarantee period as specified in Article F-10.a., shall be corrected or replaced promptly by the Contractor at the expense of the Contractor, except that the cost of import duty and taxes, inland transportation and installation of the replacement parts for foreign supply Equipment, and the cost of inland transportation and the installation of the replacement parts for local supply Equipment will be borne by EGAT.

For Equipment specified in Data Sheet, in case EGAT, at its sole discretion, requires the Contractor to replace any defected Equipment, the Contractor shall replace the Equipment with the whole new set at its own costs and expenses including the cost of all re-export charges (if any), import duty and taxes, landing charges, rents and handling charges (ocean freight), storage charges (air freight), truck hire, labour charges, service charges for customs clearance, inland transportation and installation of the Equipment.

The Contractor shall extend the provisions of his liability to cover all repair and replacement parts furnished from the day immediately following the date of completion of such repair or replacement as follows:

Time of Malfunctioning and/or Defect Found	Guarantee Period Extension				
	Equipment with 1-Year guarantee period	Equipment with 2-Year guarantee period	Equipment with 3-Year guarantee period	Equipment with 4-Year guarantee period	Equipment with 5-Year guarantee period
First Year	For a new period of one (1) Year.	For a new period of two (2) Years.	For a new period of three (3) Years.	For a new period of four (4) Years.	For a new period of five (5) Years.
Second Year	n/a	For a new period of one (1) Year.	For a new period of two (2) Years.	For a new period of three (3) Years.	For a new period of four (4) Years.
Third Year	n/a	n/a	For a new period of one (1) Year.	For a new period of two (2) Years.	For a new period of three (3) Years.
Fourth Year	n/a	n/a	n/a	For a new period of one (1) Year.	For a new period of two (2) Years.
Fifth Year	n/a	n/a	n/a	n/a	For a new period of one (1) Year.

The Contractor shall, if required by EGAT in writing, search under the directions of EGAT for the cause of any defect, imperfection or fault appearing prior to the acceptance of Equipment or in the period of maintenance guarantee. Unless such defect, imperfection or fault shall be one for which the Contractor is liable under the Contract, the cost of the work carried out by the Contractor in searching as aforesaid shall be borne by EGAT. If such defect, imperfection or fault shall be one for which the Contractor is liable under the Contract, the cost of the work carried out in searching as aforesaid shall be borne by the Contractor and he shall in such case repair, rectify and make good such defect, imperfection or fault at his own expense.

E-30. Operation or Use of Unsatisfactory Equipment

If the operation or use of the Equipment proves to be unsatisfactory to EGAT, EGAT shall have the right to operate and use such Equipment until they can be taken out of service for correction by the Contractor of such latent defects, error, or omissions and for replacement in whole or in part, if correction is unsuccessful or infeasible. The period of such operation or use shall not exceed one (1) Year from the day immediately following the date of acceptance of Equipment by EGAT.

E-31. Dispute Resolution

Any dispute arising out of or in connection with this Contract, interpretation, breach, or termination thereof shall be settled by amicable discussion between authorized representatives of each Party. Either Party may at any time send a written notice to the other Party requesting for an appointment of authorized representative for a settlement of any dispute hereunder. The Parties agree to make diligent and good faith attempt to resolve such dispute in an equitable manner. If the authorized representatives of both Parties are unable to resolve such dispute within 30 Days after commencement of the discussion for dispute resolution or other extended period of time as mutually agreed by both Parties, either Party may file a lawsuit to the court having jurisdiction in Thailand for settlement of such dispute. Each Party agrees that the final court judgment shall be conclusive and binding upon the Parties.

Pending decision of the court, both Parties shall continue to perform their respective obligations under this Contract.

E-32. Language and Numbers

All drawings, designs, specifications, manuals, nameplates, markings, operating instructions, statements, schedules, notices, documents, and all written communications between EGAT and the Contractor, concerning this Contract, shall be in the English language and in the metric system of weights and measures unless otherwise specified.

SPECIMEN OF GUARANTEE

To :

Date

Electricity Generating Authority of Thailand
Bangkruai, Nonthaburi, 11130

Thailand

Re : Performance Security for Contract No. _____

Gentlemen :

In accordance with the provision of the Contract for _____ No. _____ (hereinafter referred to as the Contract) the contents of which have been noted by us that Messrs. _____ (hereinafter referred to as the Contractor) has to deposit with Electricity Generating Authority of Thailand (hereinafter referred to as EGAT) a Performance Security for the proper and faithful performance of the Contract in the amount of _____ (in words : _____) which is _____ per cent of the total Contract Price, we, the _____ as instructed by the Contractor, agree unconditionally to irrevocably guarantee as primary Obligor, the payment to EGAT on its first demand, without whatsoever right of objection on our part and without its first claim to the Contractor, in the amount not exceeding : _____ (in words : _____) in the event the obligations expressed in the above mentioned Contract have not been fulfilled by the Contractor, giving EGAT the right of claim for penalty, damages, liquidated damages or any expenses for which the Contractor may become liable to EGAT under the Contract.

We further agree that no extension of time, change in, addition to or other modification of terms of the Contract or Work to be performed thereunder, or of the Specifications or other Contract Documents, which may be made between EGAT and the Contractor, shall in any way release us from any liability under this guarantee, and we shall thereby waive notice of any such change, addition or modification.

This Performance Security shall be valid and remain in full effect from the date of execution of the Contract until the issuance of the Acceptance Certificate by EGAT or the acceptance of Equipment deemed to be made by EGAT against submission by the Contractor of the Maintenance Security accepted by EGAT.

Yours very truly,

Authorized Signature

Instructions for Packaging

Name of Equipment	Packed per complete set of one unit/units	Packed per Substation
1. Power Transformer	√(1)	-
2. Distribution Transformer	√(1)	-
3. Shunt Reactor	√(1)	-
4. Surge Arrester	√(1)	-
5. Current Transformer	√(1)	-
6. CC, CCVT, VT	√(1)	-
7. GIS	-	√
8. Shunt Capacitor Bank	-	√
9. Power Circuit Breaker	√(1)	-
10. Disconnecting Switch	√(1)	-
11. AC/DC Dist. Board, LCUS, LRP	√(1)	-
12. Stationary Battery	√(1)	-
13. Lighting Fixture	-	√
14. Identification and Danger Notice Plate	-	√
15. Control and Protection System	√(1)*	-
16. Computerized Control System	-	√
17. Power Line Carrier	-	√
18. Teleprotection	-	√
19. Line Trap	-	√
20. Battery Charger	√(1)	-

- Note :
1. Number in parenthesis represents maximum number of complete set of one unit/units packed in an individual package or crate.
 2. * In case of spare for control and protection system, such Equipment shall be packed per board, but in case of loose control and protection system, such Equipment of whichever substation shall be packed in the same package or crate of that substation.
 3. Other substation Equipment not mentioned shall be packaged in such a manner that it will not cause unreasonable expenses or delay to EGAT in distribution of such Equipment to the designated substation.
 4. Prior to delivery of all Equipment, packaging details shall be submitted to EGAT for approval.

DRAFT

SECTION F
SPECIAL CONDITIONS

SPECIAL CONDITIONS

F-1. Scope of Work

The Contractor shall perform, furnish and deliver the Equipment as required by these Contract Documents.

For imported Equipment, Transportation from Thai Port to sites shall be EGAT's responsibility. However, the Contractor shall, at his own expenses and responsibility, perform unloading the Equipment at the port or airport of disembarkation in Thailand.

For local supply, Transportation from the Contractor's premises to the sites shall be EGAT's responsibility. However, the Contractor shall, at his own expenses and responsibility, perform loading the Equipment on EGAT's trucks or trailers at the Contractor's premises and shall be liable for all losses and/or damages to the Equipment as well as any expenses causing therefrom.

F-2. Responsibility of Contractor

The Contractor shall be solely responsible for ensuring that the Work throughout is executed in the most substantial, proper and workmanlike manner, with the best quality materials and conforming to the best engineering practice for the operating conditions specified; the drawings and quality control are performed or made in accordance with the Contract; and services reasonably to be furnished though not specifically provided in the Contract are furnished; all to EGAT's entire satisfaction notwithstanding that certain portions of the work may be executed by the Subcontractor.

F-3. Cooperation with Other Contractors

The Contractor, if required, shall exchange with other Contractor furnishing associated Equipment, all necessary drawings and other information required to insure the complete and proper design and manufacture of the Equipment to be furnished under these Specifications. One (1) copy of all drawings and correspondence, relating to information interchanged between Contractors, shall be sent to EGAT in Nonthaburi, Thailand.

***F-4. Supervision of Installation**

Subject to the desire and decision of EGAT, the Contractor may be required to furnish the services of qualified and experienced supervisor(s) who has at least three years experience on the particular Work required under the Contract and shall be the permanent employee of the manufacturer of the Equipment. For 230 kV (or lower) Power Circuit Breaker and 115 kV (or lower) Gas-Insulated Switchgear, the permanent employee of the representative of the manufacturer is acceptable, provided that such employee is certified by the manufacturer.

The scope of responsibility of the supervisor on behalf of the Contractor is as follows :

- a. Supervise and be responsible for the installation, erection, adjustment, field test and commissioning of the Equipment.
- b. Prepare formulation sheets for a check list, test sheet, release form and field report to be discussed with EGAT before performing the installation work.
- c. Submit four copies of report summarizing the work performance, from the beginning to the completion of the supervisory period, to EGAT within one month after finish the installation work or final inspection. The report shall include the following :
 1. Note on pending matter i.e. faulty and omitted equipment, performance deficiency etc.
 2. Problem concerning installation performance.
 3. Photographs showing progress of the installation work periodically until the work is completed.

The Contractor shall, in each and every instance, cooperate fully with the construction personnel installing and/or operating the Equipment and the Work, the operations of the supervisor shall be coordinated with the program of construction at the site as directed by EGAT.

The supervisor shall report at EGAT in Nonthaburi, Thailand, on the date designated by EGAT after a reasonable advance notice from EGAT, and shall remain until the Equipment have been in satisfactory operation for at least ten (10) working days as determined by EGAT, unless released earlier by EGAT.

The installation supervisor must be able to understand, speak, read and write the English language fluently. Should an interpreter be necessary, the cost of such interpretation service shall be at the Contractor's expense.

*If installation supervisor is required as specified in Price Schedule, this provision shall apply to this Contract.

F-5. Acceptance Tests

After the Equipment have been installed and placed in satisfactory operation, they may be tested by and at the expense of EGAT to determine whether or not all requirements of these Contract Documents have been met and the Contractor's guarantees have been fulfilled. The Contractor will be permitted to have his representative present at his own expense. If the tests show that the requirements or guarantee have not been met, the Contractor shall, at his own expense, make all necessary corrections. Additional tests will then be made to demonstrate to EGAT's satisfaction the effectiveness of these corrections. These additional tests will be at the Contractor's expense. Unless the necessary corrections have been made, the conditions of the Contract shall be considered unfulfilled.

All tests will be performed in accordance with the latest applicable Test Codes, unless otherwise stated.

F-6. Failure to Meet Performance Guarantees

If EGAT elects to accept the Equipment which do not meet any performance guarantee or which do not meet other requirements of these Contract Documents, as may be determined by factory test, field test or operation under service conditions, appropriate adjustment will be made of the Contract Price for such Equipment; provided that no such adjustment will be made until after the Contractor has been given a reasonable opportunity to repair, improve, or replace defective Equipment or parts thereof wherever practicable.

F-7. Acceptance Certificate

When EGAT is satisfied with the Equipment or agrees to accept the Equipment under the provision of Article F-6. Failure to Meet Performance Guarantees and there are no major unsettled claims against the Contractor by EGAT, EGAT will issue a written Acceptance Certificate against submission by the Contractor of maintenance security(ies) as specified in Article F-12. Maintenance Security and effective for a period of time as specified in Article F-10.a.

The Acceptance Certificate will list all deficiencies and reservations as a result of the inspection and tests performed, if any.

The purpose of the maintenance security is to guarantee the proper functioning of the Equipment supplied by the Contractor with a provision that the effective period of the maintenance security shall automatically be extended in case that the obligations stipulated in Article F-10. Maintenance Guarantee are not fulfilled.

A form of maintenance security acceptable to EGAT is shown in Article F-12. Maintenance Security.

F-8. Payment

Payment in foreign currency will be made in the currency or currencies in which the price has been stated in the price schedules. The Contractor has to inform EGAT the mode of payment he requires for payment for foreign currency portion together with detail of bank account No., beneficiary's name and address etc. *If the Contractor requires the payment of foreign currency portion to be paid directly to the suppliers, he has to inform EGAT which portion of the Contract Price, as stipulated in the term of payment of the Contract, to be paid accordingly.* In case the local Contractor requires foreign currency or currencies to be paid directly to him, payment of such foreign currency or currencies will be made to the local Contractor in Thai Baht by using the *selling* exchange rate published by the Bank of Thailand on the *payment* date.

In case the Contractor requires the payment of foreign currency portion to be made through letter of credit, EGAT will, if there is no fault or any delay caused by the Contractor, establish the letter of credit in the name of the Contractor or Suppliers not later than thirty (30) Days after signing the Contract. The Contractor shall be responsible for all bank charges inside and outside Thailand and including opening, amendment, reimbursing charges, payment commission, cable charges, discrepancy fee, acceptance commission and others (if any) arising from Letter of Credit.

Payment in local currency will be made directly by EGAT.

The Contractor or beneficiary has to inform EGAT by mailed letter or telex or facsimile immediately the date upon which he has received the original letter of credit opened in his favour.

Payment will be made in the following manner :

a. Payment for Equipment (except Spare Parts and Optional Items)

Foreign Supply

1. Eighty (80) per cent of the Contract Price will be paid after delivery FOB Port of Shipment (FOB Vessel) on the basis of pro rata value of each shipment against presentation of invoices, shipping documents, EGAT's letters of approval for shipment and EGAT's letter of approval for test report* of the relevant Equipment including EGAT's letter(s) of approval for final drawings only for Control and Protection Equipment.

*Test report means the report of tests specified in Article E-13. Inspection and Tests.

2. Ten (10) per cent of the Contract Price of each Schedule will be paid against presentation of Drawing and Document Acceptance Certificate to be issued by EGAT to certify the receipt of all drawings and documents required from the Contractor under Article F-11. Drawings and Documents to be Furnished by Contractor for such schedule, provided that payment shall not be made until EGAT has received from the Contractor the original signed negotiable Bill of Lading and appertaining documents giving evidence of shipment of the main Equipment of that Schedule.
3. Ten (10) per cent of the Contract Price of each Schedule will be paid after the Equipment have been installed, tested and operated or used for a period of 30 Days and the acceptance of the said Equipment has been made by EGAT against presentation of Acceptance Certificate to be issued by EGAT and submission of maintenance security by the Contractor. EGAT will list the minor pending claim(s), if any, and payment will be made by deducting such claimed amount.

However, if, through no fault of the Contractor or of the Equipment, such installation, test and operation or use of the Equipment are delayed beyond a period of six (6) Months after complete delivery at Thai Port; payment of this ten (10) per cent will be made as soon as possible but not later than the ninth (9th) Month after complete delivery and it shall be deemed as if acceptance of Equipment is made by EGAT at the end of the said sixth (6th) Month and the guarantee period shall start therefrom against submission of maintenance security by the Contractor.

In case there is some minor claim(s) or minor fault of the Contractor, the payment of this ten (10) per cent shall be made by deducting such claimed amount and the guarantee period of this part will start after such minor claim(s) has been settled by the Contractor and acceptance of which has been made by EGAT.

Local Supply

1. Eighty (80) per cent of the Contract Price will be paid on the basis of pro rata value of each delivery against presentation of the Contractor's statement or delivery order confirming the *ex-works delivery* of Equipment duly certified by EGAT's representative*, EGAT's letters of approval for delivery and EGAT's letter of approval for test report** of the

relevant Equipment including EGAT's letter(s) of approval for final drawings only for Control and Protection Equipment.

*EGAT's representative means the authorized EGAT's Store personnel to verify the quantity of Equipment according to the packing list to be delivered to the Site.

**Test report means the report of tests specified in Article E-13. Inspection and Tests.

2. Ten (10) per cent of the Contract Price of each Schedule will be paid against presentation of Drawing and Document Acceptance Certificate to be issued by EGAT to certify the receipt of all drawings and documents required from the Contractor under Article F-11. Drawings and Documents to be Furnished by Contractor for such schedule, provided that payment shall not be made until EGAT has received from the Contractor the statement or delivery order and appertaining documents giving evidence of delivery of the main Equipment of that Schedule.
3. Ten (10) per cent of the Contract Price of each Schedule will be paid after the Equipment have been installed, tested and operated or used for a period of 30 Days and the acceptance of the said Equipment has been made by EGAT against presentation of Acceptance Certificate to be issued by EGAT and submission of maintenance security by the Contractor. EGAT will list the minor pending claim(s), if any, and payment will be made by deducting such claimed amount.

However, if, through no fault of the Contractor or of the Equipment, such installation, test and operation or use of the Equipment are delayed beyond a period of six (6) Months after complete ex-works delivery; payment of this ten (10) per cent will be made as soon as possible but not later than the ninth (9th) Month after complete delivery and it shall be deemed as if acceptance of Equipment is made by EGAT at the end of the said sixth (6th) Month and the guarantee period shall start therefrom against submission of maintenance security by the Contractor.

In case there is some minor claim(s) or minor fault of the Contractor, the payment of this ten (10) per cent shall be made by deducting such claimed amount and the guarantee period of this part will start after such minor claim(s) has been settled by the Contractor and acceptance of which has been made by EGAT.

b. Payment for Spare Parts

One hundred (100) per cent will be paid after complete delivery against presentation of invoices, shipping documents and EGAT's letter of approval for shipment for foreign supply or the Contractor's statement or delivery order confirming the delivery of Equipment ex-works duly certified by EGAT's representative* and EGAT's letter of approval for test report** of the relevant Equipment and the acceptance has been made by EGAT. The guarantee period shall start from the day immediately following the date of the acceptance of the Spare Parts.

*EGAT's representative means the authorized EGAT's Store personnel to verify the quantity of Equipment according to the packing list to be delivered to the site.

**Test report means the report of tests specified in Article E-13. Inspection and Tests.

c. Payment for Optional Items

Payment for Equipment

One hundred (100) per cent will be paid after complete delivery with presentation of invoices, shipping documents and EGAT's letter of approval for shipment and the acceptance has been made by EGAT. The guarantee period shall start from the day immediately following the date of the acceptance of Equipment.

Payment for Mechanical Operation Life Test (if any)

One hundred (100) per cent of the cost of the Mechanical Operation Life Test will be paid after the test has been performed successfully and test report has been accepted by EGAT.

d. Payment for Field Test Cost

One hundred (100) per cent of Field Test Cost will be paid after the test has been performed successfully and the test report has been accepted by EGAT.

e. Payment for Installation Supervisor

Payment for the services of the installation supervisor will be made within thirty (30) Days after his release by EGAT. Payment will be made on the basis of actual working man-days at the quoted cost per man-day up to a maximum equal to the total man-days quoted. For man-days exceeding the quoted total man-days, no payment shall be made by EGAT unless the Contractor can claim for any delays in

the progress of the work caused by EGAT. Any such additional man-days approved by EGAT shall be paid on the basis of the quoted man-day rate.

The number of quoted man-days shall include Sundays and shall cover a seven (7) day workweek, if required by the construction program. The working hours shall be forty-eight (48) hours per week, eight (8) hours per day, the working hours over 8 hours per day if requested by EGAT will be counted as overtime at 1½ times the regular hourly rate.

The amount to be paid for each Day for the services of the supervisor shall include for all salary, subsistence expense, insurance, compensations and personal expense of the supervisor, and all liabilities and responsibilities thereto. EGAT will pay for round-trip economy class air transportation for the installation supervisor between the Contractor's home office and Bangkok by the most expeditious and direct route on trip basis by draft after receipt of the Contractor's invoice supported with the used air ticket of such supervisor. The remission of immigration fees and taxes collectible by the Kingdom of Thailand shall not be paid by EGAT, as described in Article E-11. Fees and Duties.

F-9. Liquidated Damages for Late Delivery of Equipment

In the event of failure by the Contractor to make delivery of any Equipment within the time set forth in the Contract, plus any extension thereof authorized by EGAT as provided in the Contract, such failure shall be a default under the Contract for which the Contractor shall be liable for payment to EGAT as liquidated damages at the rate specified in Data Sheet.

Whenever any Equipment under any item is to be used together with other Equipment in other item as specified in Price Schedule as a complete set or unit, the Contractor shall make sure that they shall be shipped together as a complete set or unit. Failure on the part of the Contractor to comply with this requirement, the liquidated damages for late delivery of partial shipment shall be imposed on the Contractor for the whole amount of the Contract Price of such related items.

Notwithstanding, in case the Contractor fails to make delivery of minor part of any Equipment within the time set forth in the Contract and such late delivery does not have any effect to the performance of the Equipment, the Contractor shall be liable for payment to EGAT as liquidated damages at the rate of one-tenth of one (0.10) per cent of the total price of the minor part of the Equipment not timely delivered for each Day of delay. The price of such delayed minor part of the Equipment shall be determined by EGAT. EGAT shall, at his own discretion, determine whether such late delivery Equipment is the minor part and has any effect to the performance of the Equipment or not.

The payment of such liquidated damages shall not relieve the Contractor of his obligations to complete the Work under the Contract.

In case any Equipment is defective or does not conform to the requirements or specifications of the Contract where replenishment or correction or replacement must be made by the Contractor as per Article E-29. Failure to Meet Requirements, it shall be deemed that such Equipment has not yet been delivered unless such Equipment has been replenished or corrected or replaced, as the case may be, and delivered to EGAT at the delivery point specified in the Contract.

Payment of liquidated damages is contingent exclusively upon late delivery; in no case shall EGAT be required to substantiate any claim for payment of liquidated damages with proof of loss and/or damages. The liquidated damages shall be calculated for each Day of delay until the Equipment is delivered to EGAT excluding a period of time from the actual delivery date at the delivery point set forth in the Contract until the issuance of notification of defect or short pack or out of specification made by EGAT to the Contractor. This sum is payable regardless of the actual loss and/or damages incurred.

The Contractor shall not be liable for liquidated damages in the event of delay caused by force majeure.

F-10. Maintenance Guarantee

- a. The Contractor shall guarantee the proper functioning of the Equipment for a period as specified in Data Sheet from the day immediately following the date of acceptance of Equipment by EGAT; provided, however, that should any malfunctioning and/or latent defect in Equipment under normal use and service be found during the said period, and such malfunctioning and/or defective portion be repaired or replaced as stipulated in (c) and (d) hereinafter, then the guarantee period for such portion shall be extended from the day immediately following the date of completion of such repair or replacement as follows:

Time of Malfunctioning and/or Defect Found	Guarantee Period Extension				
	Equipment with 1-Year guarantee period	Equipment with 2-Year guarantee period	Equipment with 3-Year guarantee period	Equipment with 4-Year guarantee period	Equipment with 5-Year guarantee period
First Year	For a new period of one (1) Year.	For a new period of two (2) Years.	For a new period of three (3) Years.	For a new period of four (4) Years.	For a new period of five (5) Years.
Second Year	n/a	For a new period of one (1) Year.	For a new period of two (2) Years.	For a new period of three (3) Years.	For a new period of four (4) Years.
Third Year	n/a	n/a	For a new period of one (1) Year.	For a new period of two (2) Years.	For a new period of three (3) Years.
Fourth Year	n/a	n/a	n/a	For a new period of one (1) Year.	For a new period of two (2) Years.
Fifth Year	n/a	n/a	n/a	n/a	For a new period of one (1) Year.

The premium for the maintenance guarantee shall be paid by the Contractor.

- b. On the expiration of the maintenance guarantee period and if the Equipment is functioning normally, the Contractor shall thereafter be released of all obligations and responsibilities under the Contract and the maintenance security deposited in accordance with Article F-7. Acceptance Certificate, will be released and returned to the Contractor.
- c. If during the guarantee period EGAT finds any malfunctioning and/or defect in the Equipment, EGAT shall inform without delay the Contractor thereof, stating in writing the nature of the malfunctioning and/or defect, and the Contractor shall promptly commence to repair and make good or replace such malfunctioning and/or defect at the expense of the Contractor, except that the cost of import duty and taxes,

inland transportation and installation of the replacement parts for foreign supply Equipment, and the cost of inland transportation and the installation of the replacement parts for local supply Equipment will be borne by EGAT.

For Equipment specified in Data Sheet, in case EGAT, at its sole discretion, requires the Contractor to replace any defected Equipment, the Contractor shall replace the Equipment with the whole new set at its own costs and expenses including the cost of all re-export charges (if any), import duty and taxes, landing charges, rents and handling charges (ocean freight), storage charges (air freight), truck hire, labour charges, service charges for customs clearance, inland transportation and installation of the Equipment.

- d. If, after the repair or replacement performed in accordance with this Article, such Equipment continues to show malfunctioning and/or defect, EGAT may, at its option, demand further repair or replacement, and reserve the right to claim damages, if applicable, arising therefrom.
- e. If the Contractor fails to take action for starting up the necessary works for repair or replacement within fourteen (14) Days after receipt of EGAT's written notice of defect, the defect will be corrected by EGAT or any third party selected by EGAT at EGAT's discretion, and the cost of the corrections shall be on the responsibility and account of the Contractor.

In the event of an emergency where in the judgement of EGAT the delay resulting from giving formal notice would cause serious loss or damage which could be prevented by immediate action, defects may be corrected by EGAT or a third party chosen by EGAT without giving prior notice to the Contractor, and the cost of the corrections shall be paid by the Contractor. In the event such action is taken by EGAT, the Contractor will be notified promptly and shall assist wherever possible in making the necessary corrections.

F-11. Drawings and Documents to be Furnished by Contractor

EGAT reserves the right to require the Contractor to submit the drawings and documents listed in the tables attached at the end of this Section by the designated dates either by registered airmail for foreign mail and registered mail for local mail and/or by electronic files uploaded via document management system. However, cover letters shall be submitted in hard copy to EGAT.

After the requirement under this Article has been fulfilled by the Contractor, a Drawing and Document Acceptance Certificate will be issued by EGAT to certify the receipt of all required drawings and documents:

a. Drawings

- (1) Drawing Title and Sizes. The title of Contractor's drawing shall also include the followings :

ELECTRICITY GENERATING AUTHORITY OF THAILAND

EGAT's Contract No. _____

Item No. _____

Subs. Name _____

The sizes of the drawings except otherwise specified in the Specification shall be as follows :

<u>Size Designation</u>	<u>Dimensions in MM</u>	<u>Dimensions in Inches</u>
A0	841 x 1,189	(33.11 x 46.81)
A1	594 x 841	(23.39 x 33.11)
A2	420 x 594	(16.54 x 23.39)
A3	297 x 420	(11.69 x 16.54)
A4	210 x 297	(8.27 x 11.69)

- (2) Reference Drawings and Catalogues. General drawings showing principal dimensions and weights of Equipment, including controlling dimensions which affect space and handling requirements.

- (3) Drawings and Data for Approval. The Contractor shall submit for approval checked detail assembly drawings including firm dimensions, foundation details and setting diagrams, physical size and weights of all principal parts, complete operating characteristics and ratings of Equipment, connection and schematic wiring diagrams, descriptive information and any other information sufficient to demonstrate fully that the Equipment to be furnished will conform to the requirements and intent of these Contract Documents.

Schematic diagrams shall indicate the operation and function of all electrical Equipment, accompanied, where necessary, with explanatory notes. Wiring diagrams shall show the external connection required, sufficient for EGAT to complete interconnection cable diagrams.

One print each of the drawings submitted for approval will be returned to the Contractor by EGAT or its authorized representative within thirty (30) Days after receipt at EGAT's office, marked either "Approved",

"Approved Except as Noted", or "Returned for Correction"/"Not Reviewed". The notations "Approved" or "Approved Except as Noted" will authorize the Contractor to proceed with the manufacture of the Equipment covered by such drawing, subject to the correction, if any, indicated thereon. When prints of drawings have been "Returned for Correction"/"Not Reviewed"., the Contractor shall make the necessary revisions on the drawings and shall within thirty (30) Days resubmit drawings for approval in the same manner as before.

Any manufacturing done before approval of the drawings will be at the Contractor's risk. EGAT shall have the right to require the Contractor to make any changes in the design which may be necessary, in the opinion of EGAT, to make the Equipment conform to the requirements and intent of these Contract Documents without additional cost to EGAT. Approval of the Contractor's drawings shall not be held to relieve the Contractor of any part of his obligation to meet all of the requirements of these Contract Documents or of the responsibility for the correctness of his drawings.

- (4) Reproducibles of all final approved drawings shall be made on mylar films.
- b. Report of Shop Test. The Contractor shall furnish certified copies of reports of all tests required of the manufacturer to show compliance with the applicable standards and specifications. The cost of all tests and reports shall be borne by the Contractor.
- c. Instruction Manuals. The Contractor shall furnish complete set of instruction manuals and all final approved drawings (if any) for erection, operation, maintenance and repair of the Equipment, and for identification of parts. The instruction manuals shall be combined, assembled and bound in binders. Each binder cover shall be stamped with proper identification indicating name of Equipment, manufacturer's name and address, EGAT's Contract number, manufacturer's reference, etc.

Prior to the assembly and submittal of the instruction manuals, a proof of the cover lettering and the table of contents shall be submitted in sufficient time for EGAT's acceptance without delaying submittal of the finished manuals.

The CD-ROM (Compact Disc-Read Only Memory) of final drawings, final documents, test report and instruction manual, if required, shall conform to the applicable International Standard Organization 9660 (ISO 9660) and have capacity of approximately 700 Mbytes.

The data in CD-ROM shall be created by the following software :

Drawing

The Contractor shall submit all drawings created by CAD software as follows:

1. MICROSTATION software Version SE or
2. AUTOCAD software Version 2000

Any necessary information supporting the completion of reading files (such as special font etc.) shall be included in CD-ROM.

Documents

The Contractor shall submit all documents in Adobe Portable Document Format File (PDF format) and also Program of Acrobat Reader in order to read the file completely in CD-ROM.

Drawing/Document List

The Contractor shall submit the drawings/documents listing information in work sheets file provided by EGAT in CD-ROM in Microsoft Excel file format.

Drawing list of design drawings, as built drawings, manufacturing drawings shall also be submitted together with the drawings in the CD-ROM.

F-12. Maintenance Security

The Contractor shall provide to EGAT prior to the issuance of the acceptance certificate and as a condition for the release of the payment of the last instalment as specified in Article F-8. Payment, maintenance security(ies) in the amount of ten (10) per cent of the total Contract Price or ten (10) per cent of each schedule, excluding the cost of installation supervisor and cost of test(s), guaranteeing the Contractor's performance of the provision of Article F-10. Maintenance Guarantee. The Contractor shall oblige himself to attend to and replace, during the period of maintenance, all malfunctioning parts and for repair of all defects noted in the Work and communicated to the Contractor in writing by EGAT. In case of extended guarantee of the repaired or replaced Equipment, the Contractor may request for return of the original maintenance security and submit a new maintenance security in the amount of ten (10) per cent of the Contract Price of Equipment under the extended guarantee.

The maintenance security shall be in the form of a cash deposit, ***or a certified cheque issued by a local bank, or a cashier cheque issued by a local bank***, or a bank guarantee or letter of guarantee issued only by a local bank or an acceptable financial institution in Thailand, or by a foreign bank counter-guaranteed by a local bank, and made payable to EGAT in the same currency as that of the Contract. In case of a cash deposit, only Thai

baht portion of the Contract Price can be made. EGAT may at its absolute discretion refuse to approve any maintenance security offered or may at any time, upon application by the Contractor, approve of the substitution for any maintenance security held under this Article by other maintenance security on such terms and conditions as may be approved by EGAT.

The conditions of guarantor's obligations in the maintenance security shall include, inter alia; the following :

1. The guarantor shall unconditionally guarantee, as primary obligor and not as surety merely, payment of any obligations, damages, liquidated damages, performance penalties, or expenses for which the Contractor may become liable to EGAT.
2. No extension of time, change in, addition to, or other modification of the terms of the Contract or Work to be performed thereunder, or of the Specifications or other Contract Documents shall in anyway release the guarantor from any liability under the maintenance security, and the guarantor shall thereby waive notice of any such extension of time, change, addition or modification.
3. The maintenance security shall be valid and remain in full effect from the date of acceptance of Work until all obligations on the part of the Contractor under the Contract have been fulfilled.

Unless and until an official receipt is issued in respect to a maintenance security deposit, EGAT will not recognize or accept any such deposit as fulfilling the requirements of this Article. Failure to deposit a maintenance security at the time specified above in this Article or such extended time as may be approved by EGAT shall be a breach of this Contract and EGAT may, at its discretion, retain the payment of the last instalment of the total Contract Price.

If any maintenance security furnished under this Article shall become unacceptable to EGAT, or if any guarantor shall fail to furnish reports as to guarantor's financial condition from time to time, as requested by EGAT, the Contractor shall promptly furnish such additional or alternative maintenance security as may be necessary to satisfy the Contract requirements for a maintenance security.

In the event of any default or breach of this Contract on the part of the Contractor, EGAT may convert into money any maintenance security which does not consist of money, and the proceeds shall be deemed to be a cash deposit under this Article. EGAT shall not be liable for any cost, expenses and/or loss resulting from the conversion of any maintenance security deposit into money as herein provided. The Contractor shall bear the cost of the maintenance security.

The maintenance security, in case of a bank guarantee, or letter of guarantee, shall be in conformity with the following specimen.

SPECIMEN OF MAINTENANCE GUARANTEE

To :

Date :

Electricity Generating Authority of Thailand
Bangkruai, Nonthaburi 11130
Thailand

Re : Maintenance Security for Contract
No. EGAT _____

Gentlemen :

In accordance with the provision of the Contract for _____ No. EGAT _____ dated _____ (hereinafter referred to as the Contract), the contents of which have been noted by us that Messrs. _____ (hereinafter referred to as the Contractor) has to deposit with Electricity Generating Authority of Thailand, (hereinafter referred to as EGAT) a Maintenance Security to guarantee the proper functioning of the _____ of the Contract as specified in Article F-10. Maintenance Guarantee in the amount of _____ (in words : _____) which is equivalent to ten (10) per cent of the total Contract Price or ten (10) per cent of each schedule of the said Work, excluding the cost of installation supervisor and cost of test(s), we, the _____ as instructed by the Contractor, agree unconditionally to irrevocably guarantee as primary Obligor, the payment to EGAT at its first demand, without whatsoever right of objection on our part and without its first claim with the Contractor giving EGAT the right of claim for penalty, damages, liquidated damages or any expenses for which the Contractor may become liable to EGAT under the Contract.

We further agree that no extension of time, change in, addition to or other modification of terms of the Contract or work to be performed thereunder, or of the Specifications or other Contract Documents, which may be made between EGAT and the Contractor, shall in any way release us from any liability under the Maintenance Security, and we shall thereby waive notice of any such extension of time, change, addition or modification.

This Maintenance Security shall be valid and remain in full effect for a period of _____ (...) Year(s) from the day immediately following the date of the acceptance of Equipment. If necessary, this Maintenance Security shall be extended as specified in Article F-10. Maintenance Guarantee.

Yours very truly,

Authorized Signature

Drawings and Documents to be Furnished by the Contractor
(For Control and Protection Equipment)

The Contractor shall submit by registered mail *and/or by electronic files uploaded via document management system* with the drawings and other documents listed below by the designated deadlines.

Should EGAT require the Contractor to submit the drawings and documents in electronic files via EGAT's document management system, the Contractor is also required to submit the drawings and documents in Print and CD-ROM at the number of copies listed in the parenthesis below.

Drawings/Documents	No. of copies		Deadline and Remarks
	P	CD-ROM	
Manufacturing and Delivery Schedule	1 (-)	- (-)	Within 60 Days after <i>confirmation of Letter of Award of Contract</i>
Quality Assurance Program (If requested by EGAT)	1 (-)	- (-)	Within 60 Days after <i>confirmation of Letter of Award of Contract</i>
Drawings or Documents "RELAY AND EQUIPMENT INSTRUCTION MANUAL"	1 (-)	- (-)	Within 90 Days after <i>confirmation of Letter of Award of Contract</i>
Drawings or Documents "FOR APPROVAL"	1 (1)	- (-)	Within 90 Days after <i>confirmation of Letter of Award of Contract</i>
Drawings or Documents "FOR REAPPROVAL"	1 (1)	- (-)	Within 30 Days after receipt of returned approval drawings for correction
Drawings "DRAFT-FINAL DRAWING"	1 (1)	- (-)	Within 30 Days for P and 60 Days for CD-ROM after receipt of returned approved drawings
Drawings and Documents "FINAL DRAWING or FINAL DOCUMENT"	1 (1)	1 (1)	Within 20 Days after Equipment delivery
Test Procedure (Factory Test)	1 (-)	- (-)	Within 90 Days after <i>confirmation of Letter of Award of Contract</i>
Test Schedule (Factory Test)	1 (-)	- (-)	Not less than 60 Days before testing for foreign supply Not less than 30 Days before testing for local supply
Test Report (Factory Test)	1 (-)	- (-)	Upon completion of tests
Instruction Manuals	- (-)	3(3)	30 Days before first shipment/delivery

Note : P = Print Drawing or Document
CD-ROM = Compact Disc-Read Only Memory with capacity of approximate 700 Mbytes conforming to ISO 9660

Drawings and Documents to be Furnished by the Contractor
(For All Equipment except Control and Protection Equipment)

The Contractor shall submit by registered mail *and/or by electronic files uploaded via document management system* with the drawings and other documents listed below by the designated deadlines.

Should EGAT require the Contractor to submit the drawings and documents in electronic files via EGAT's document management system, the Contractor is also required to submit the drawings and documents in Print and CD-ROM at the number of copies listed in the parenthesis below.

Drawings/Documents	No. of copies		Deadline and Remarks
	P	CD-ROM	
Manufacturing and Delivery Schedule	1 (-)	- (-)	Within 60 Days after <i>confirmation of Letter of Award of Contract</i>
Quality Assurance Program (If requested by EGAT)	1 (-)	- (-)	Within 60 Days after <i>confirmation of Letter of Award of Contract</i>
Drawings or Documents "FOR REFERENCE"	4 (2)	- (-)	Within 90 Days after <i>confirmation of Letter of Award of Contract</i>
Drawings or Documents "FOR APPROVAL"	4 (-)	- (-)	Within 60 Days for foundation, steel supporting structure (if any) and within 90 Days for others after <i>confirmation of Letter of Award of Contract</i>
Drawings or Documents "FOR REAPPROVAL"	4 (-)	- (-)	Within 30 Days after receipt of returned approval drawings for correction
Drawings and Documents "FINAL DRAWING or FINAL DOCUMENT"	4 (2) *4 (-)	- (-)	Within 30 Days after receipt of approved drawings
Final Design Data	4 (-)	- (-)	Within 150 Days after <i>confirmation of Letter of Award of Contract</i>
Test Procedure (Factory Test)	1 (-)	- (-)	Within 150 Days after <i>confirmation of Letter of Award of Contract</i>
Test Schedule (Factory Test)	1 (-)	- (-)	Not less than 60 Days before testing for foreign supply Not less than 30 Days before testing for local supply
Test Report (Factory Test)	1 (-)	- (-)	Upon completion of tests
Installation Instruction	9 (7)	5 (5)	60 Days before first shipment/delivery
Instruction Manuals	9 (7)	5 (5)	Before shipment/delivery

Note : P = Print Drawing or Document
 CD-ROM = Compact Disc-Read Only Memory with capacity of approximate 700 Mbytes conforming to ISO 9660

**For Transmission Line Insulator, Hardware Assemblies and Line Accessories, Transmission Line Steel Tower, HTLS Transmission Line Conductor and Invar Transmission Line Conductor.*

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**SECTION I
SPECIFICATIONS**

I. SPECIFICATIONS

I-1. Specifications

The following specifications are attached hereto and made a part of the Contract Documents :

<u>Specifications No.</u>	<u>Description</u>	<u>Page</u>
Specifications for INVAR Conductor and Hardware Assemblies and Line Accessories (Revision 1)	- Section A : INVAR Conductor	A1-A7
	- Section B : Hardware Assemblies and Line Accessories for INVAR Conductor	B1-B2
	- Requirements and Design Criteria for INVAR Conductor for Reconductoring 230 kV Khlong Mai Junction - Khlong Mai, Reconductoring 230 kV EPEC Combined Cycle Power Plant - Khlong Mai Junction, Sectionalizing 230 kV Bang Pakong - Khlong Dan to Khlong Mai, and Sectionalizing 230 kV Bang Pakong - Khlong Dan to EPEC Combined Cycle Power Plant Transmission Line	1 - 2
Specifications C-2 (Revision 6) Construction of Transmission Line, January 1987	- Section D : Insulator Assemblies	D1-D4
	- Section F : Line Accessories	F1-F3
	- Specifications No. TL-02 (Rev.0) : Additional Specifications for Vibration Dampers	TL-02.1 - TL-02.5
	- Attachment No. 1 : Test of Transmission Line Hardware/Fittings	1 - 4

**SPECIFICATIONS FOR INVAR CONDUCTOR AND HARDWARE
ASSEMBLIES AND LINE ACCESSORIES (REVISION 1)**

AND

**REQUIREMENTS AND DESIGN CRITERIA FOR HIGH TEMPERATURE
LOW SAG CONDUCTOR**

**INVITATION TO BID NO. GBA3-HTLS-01
SUPPLY OF TRANSMISSION LINE HIGH TEMPERATURE LOW SAG CONDUCTOR, HARDWARE
ASSEMBLIES AND LINE ACCESSORIES**

**230 kV KHLONG MAI JUNCTION - KHLONG MAI
230 kV EPEC COMBINED CYCLE POWER PLANT - KHLONG MAI JUNCTION**

**SPECIFICATIONS FOR INVAR CONDUCTOR AND HARDWARE
ASSEMBLIES AND LINE ACCESSORIES (REVISION 1)**

SECTION A
INVAR CONDUCTOR

A-1. General

This section provides a *functional specification* for Invar conductor. It is the **general information** for the design, fabrication and test of Invar conductor.

A-2. Standard

The conductor shall conform to the following International Standards, which shall mean latest revisions, with amendments/changes adopted and published, unless specifically stated otherwise in the Specification.

IEC 60468:1974	Method of measurement of resistivity of metallic materials
IEC 60888:1987	Zinc-coated steel wires for stranded conductors
IEC 60889:1987	Hard-drawn aluminium wire for overhead line conductors
IEEE 524-1980	Guide to the Installation of Overhead Transmission Line Conductors

Reference to standards and specifications, or to equipment and materials, of a particular manufacture shall be considered as followed by "or equivalent". The Contractor may propose equivalent standards, specifications, materials of equipment which shall be equal in every respect to that specified. If the Contractor for any reason proposes equivalents to, or deviations from, the above standards, the Contractor shall state the exact nature of the change, the reason for making the change and shall submit complete specifications of the materials, as well as copies of pertinent standards, for the approval of EGAT. EGAT's decision in the matter of quality will be final.

A-3. Conductor Requirements

The conductor to be supplied shall have characteristics conforming to those shown in the attached document for Requirements and Design Criteria for Invar Conductor.

A-4. Materials

a. Thermal Resistant Aluminum Alloy Wires

The thermal resistant aluminum alloy strands shall be drawn from thermal resistant aluminum alloy rods. Thermal resistant aluminum alloy rods shall be manufactured through suitable heat treatment.

b. Aluminum Clad Invar Wires

The aluminum clad invar strands shall be composed of a high strength bare invar (Nickel-iron alloy) core with substantially uniform and continuous aluminum covering thoroughly bonded to it.

A-5. Workmanship

a. Forming and Finishing

All the thermal resistant aluminum alloy and aluminum clad invar strands shall be smooth, uniform and free from all imperfections, such as spills and splits, cracks, die marks, scratches, rust etc., after drawing and also after stranding.

The finished conductor shall be smooth, compact, uniform and free from all imperfections including kinks (protusion of wires), wire cross over, over riding, looseness (wire being

dislocated by finger/hand pressure and/or unusual bangle noise on tapping), material inclusions, white rust, powder formation or black spot (on account of reaction with trapped rain water etc.) dirt, grit etc.

The invar strands shall be aluminum clad and shall have a minimum aluminum thickness as given in "Minimum thickness of aluminum cladding" after stranding.

The aluminum cladding shall be smooth, continuous, of uniform thickness, free from imperfections.

The invar wire rods shall be of such quality and purity that, when drawn to the size of the strands specified, the finished strands and the individual wires shall be of uniform quality and conform to the requirements of "the detail of aluminum clad invar strand"

The invar strands shall be preformed and post formed in order to prevent spreading of strands in the event of cutting of composite core wire.

Care shall be taken to avoid, damages during pre-forming and post-forming operation.

b. Cleaning

The conductor shall be free from excessive amounts of die grease, metal particles and dirt.

The Contractor shall describe in complete detail the method which he proposes to use in normal production to clean the conductor.

The effectiveness of the cleaning process shall be subject to verification.

A-6. Joints in Wires

a. Thermal Resistant Aluminum Alloy Wires

During stranding, no thermal resistant aluminum alloy wire welded shall be made of the purpose of achieving the required conductor length.

No joint shall be permitted in the individual wires of the finished conductor.

b. Aluminum Clad Invar Wires

There shall be no joint of any kind in the finished wire entering into the manufacture of the strand. There shall also be no strand joints or strand splices in any length of the completed stranded invar core of the conductor.

A-7. Tests

The acceptance values for all type tests, acceptance tests and specified tests shall be as specified in conductor characteristics and/or as proposed by the Contractor.

a. Type Tests

The following type tests shall be carried out to prove the process of manufacture and general conformity of the material to this specification. One set of type tests shall be made once on samples prior to commencement of commercial production against the order.

- (1) Heat Resistance Test on Thermal Resistant Aluminum Alloy Wire. Breaking load test shall be carried out in accordance with IEC 60889 before and after heating the sample in uniform heat furnace at 280 °C (+5/-3 °C) temperature for one hour. The breaking strength of the wire after heating shall not be less than 90% of the breaking strength before heating.

(2) Type Tests on Aluminum Clad Invar Wire

- (a) Coefficient of linear expansion on aluminum clad invar wire. The temperature and elongation on a sample shall be continuously measured & recorded at intervals of approximate 15 °C from 15 °C to 230 °C while changing the applied heating temperature. Coefficient of linear expansion from 15 °C to 230 °C temperature shall be obtained for aluminum clad invar wire from the measured results.
- (b) Bending test on aluminum clad invar strand. A sample of aluminum clad invar strand measuring 30 cm in length shall be subjected to bending with help of a vise. The vise length of wire should be 5 cm and radius of bend 4.8 mm. The bending should be first 90 degrees left and then 90 degrees right. After this operation the strand should be cut at the bending point. There should be no separation of invar and aluminum at the bending point after this operation.

(2) Type Tests on Stranded Conductor

- (a) UTS test on stranded conductor. Circles perpendicular to the axis of the conductor shall be marked at two places on a sample of conductor of minimum 5m length between fixing arrangement suitable fixed by appropriate fittings on a tensile testing machine. The load shall be increased at a steady rate upto 50% of minimum specified UTS and held for one minute. The circles drawn shall not be distorted due to relative movement of strands. Thereafter the load shall be increased at steady rate to minimum UTS and held for one minute. The conductor sample shall not fail during this period. The applied load shall then be increased until the failing load is reached and the value recorded.
- (b) DC resistance test on stranded conductor. On a conductor sample of minimum 5m length, two contact-clamps shall be fixed with a predetermined bolt torque. The resistance shall be measured. The test shall be repeated at least five times and the average value recorded. The value obtained shall be corrected to the value at 20 °C. The resistance corrected at 20 °C shall conform to the requirements of this specification and proposal data of the Contract.
- (c) Stress-strain test. A sample section of the complete conductor and of invar core shall be given tensile strength tests to obtain representative short-time and repeated stress-strain curves. The samples of conductor shall be obtained from the first satisfactory production run. The gage length shall be 13 meters. Test report shall include complete tabulated data and plotted stress-strain curves (or, if automatic recording extensionmeters have been used, only the plotted stress-strain curves need be supplied) so that initial and final modulus of elasticity values may be determined. Such stress-strain tests shall be completely performed in accordance with the standard method proposed and adopted by the Aluminum Association, 750 Third Avenue, New York, N.Y. 10017.
- (d) Creep test Creep tests shall be run in complete accordance with the standard method proposed and adopted by the Aluminum Association, 750 Third Avenue, New York, N.Y. 10017.
- (e) Coefficient of linear expansion. The temperature and elongation on a sample shall be continuously measured & recorded at intervals of approximate 15 °C from 15 °C to 230 °C while changing the applied heating temperature. Coefficient of linear expansion from 15 °C to 230 °C temperature shall be obtained for aluminum clad invar wire from the measured results.

b. Acceptance Tests

One set of the following acceptance tests shall be carried out on samples taken from each lot offered for pre-despatch inspection, for the purpose of acceptance of that lot.

- (1) Visual and Dimensional Check on Drum. The drums shall be visually and dimensionally checked to ensure that they conform to proposal data of the Contract.
- (2) Visual Check For Joints Scratches Etc. And Length Measurement Of Conductor By Rewinding. The conductor shall be visually checked for scratches, joints etc. and generally conformity to the requirements of this specification.
- (3) Dimensional Check On Aluminum Clad Invar And Aluminum Alloy Strands. The individual strands shall be dimensionally checked to ensure that they conform to proposal data of the Contract.
- (4) Check For Lay-Ratios Of Various Layers. The lay-ratios of various layers shall be checked to ensure that they conform to the requirements of this specification.
- (5) Aluminum Thickness Test On Aluminum Clad Invar Strands. The individual strands shall be checked to ensure that they conform to proposal data.
- (6) Torsion and Elongation Tests On Aluminum Clad Invar Strands. The test procedure shall be as per clause No. 10.3 of IEC 60888. In torsion test, the number of complete twists before fracture shall not be less than 18 on a length equal to 100 times the standard diameter of the strand. In case test sample length is less or more than 100 times the stranded diameter of the strand, the minimum number of twists will be proportioned to the length and if number comes in the fraction then it will be rounded off to next higher whole number. In elongation test, the elongation of the strand shall not be less than the specific value in proposal data.
- (7) Breaking Load Test On Aluminum Clad Invar And Thermal Resistant Aluminum Alloy Strands. The tests shall be carried out in accordance with IEC 60889 and the results shall meet the specific value in proposal data.
- (9) Wrap Test On Aluminum Clad Invar Strands. The aluminum clad invar strand shall be wrapped around a mandrel of diameter 5 times that of strand to form a helix of eight turns. The strand shall then be unwrapped. No breakage of strand shall occur.
- (10) Minimum Conductivity Test on Thermal Resistant Aluminum Alloy Strands. Resistivity test shall be conducted in accordance with IEC 60468 / IEC 60889 to conform minimum conductivity as specified in proposal data.
- (11) Heat Resistance Test On Thermal Resistant Aluminum Alloy Strands. Breaking load test shall be carried out before and after heating the sample in uniform heat furnace at 280 °C (+5/-3 °C) temperature for one hour. The breaking strength of the wire after heating shall not be less than 90% of the breaking strength before heating.
- (12) Minimum Conductivity Test On Aluminum Clad Invar Strands. Resistivity test shall be conducted in accordance with IEC 60468 to conform minimum conductivity as specified in proposal data.

All the tests shall be carried out on thermal resistant aluminum alloy and invar strands after stranding only.

c. Routine Tests

The routine tests shall be carried out on the material to check requirements which are likely to vary during production as follows:

- (1) Check to ensure that no joints are per Specification.
- (2) Check that there are no cuts, fins etc., on the strands.
- (3) Check that drum are as per Specification.
- (4) All acceptance test mentioned in Article 7.b above shall also be carried out on each reel.

d. Tests during Manufacture

Tests during manufacture shall mean those tests, which are to be carried out during the process of manufacture and end inspection by manufacturer to ensure the desired quality of the end product to be supplied by him. One set of these tests shall be conducted on a sample of each lot.

- (1) Chemical analysis of Aluminum alloy used for making thermal resistant aluminum alloy strands
- (2) Chemical analysis of invar used for making invar strands

Samples taken from the Aluminum and invar strands shall be chemically/spectrographically analyzed as specified in proposal data.

e. Specific Tests

The type tests shall be conducted once on a sample of conductor before the conductor first delivery.

- (1) Temperature of surround area (ambient temperature) at maximum continuous temperature and no wind condition. Relation between temperature and distance from conductor will be examined.
- (2) Temperature of a current loaded conductor under rainfall condition. The condition of rainfall ratio (intensity) for the test shall be approved by EGAT. The test will be carried out under artificial rainfall.
- (3) Sag-tension properties (sag behavior at high temperature)
- (4) Ampacity Tests

For the ampacity tests, 12 m conductor shall be mounted in the test frame and loaded to 250 kg. This load shall be maintained throughout the duration of the experiment. After that, the conductor's surface shall be heated to the test temperature 210 °C and maintained for a period of 30 minutes. A multimeter will be used to measure the current and potential difference during the 30 minutes hold. Readings shall be taken at three locations along the conductor. For each test, either three or five thermocouples (depending on the length of the conductor) shall be used to measure the temperature of the conductor at different locations along the length of the conductor and an additional thermocouple will be used to record the ambient temperature. The measured current shall not be less than the requirements of this specification.

f. Test Report

Four (4) copies of the reports of the above tests shall be submitted to EGAT for approval.

A-8. Packing

a. Reel

The complete conductor shall be furnished on either metal or wooden reels, equipped with lagging bound on the reels with two circumferential steel straps. The steel straps shall be 32 x 0.8 mm galvanized steel and shall be stapled to alternate lags. The reels shall be of such construction as to assure delivery of the conductor to the field, free of displacement and damage. They shall be constructed to withstand all normal stresses due to handling and stringing operations, and to prevent damage to the conductor during normal construction practices but are not required to be designed to withstand the forces required for braking during tension stringing.

There shall be no sharp objects that may damage the conductor. The increase of distance between reel flanges anywhere on the circumference due to forces applied during reeling, delivery, handling, and stringing shall not be more than two-thirds of the diameter of the conductor. Two or more dog holes shall be provided near the arbor hole.

Chemically inert and waterproof material shall be wrapped around the drum and strapped or glued to the flange surface of all reels. The material shall be at least 0.6 millimeter thick and shall remain securely attached to the reel. Any glue used shall be chemically inert and shall be used in such a manner as not to harm the conductor at any time.

The conductor on each reel shall be securely fastened at both ends by the use of adjustable screw clamps after the conductor has been taped to prevent damaging to the conductor and fastened under tension to the flange by the use of galvanized steel wire, 2 mm diameter. The tension shall be such that no looseness will be transmitted to the internal layers. The conductor shall be tightly and uniformly spooled on the reel with each wrap laid snugly against the side of the preceding wrap, and the first and last wrap in each layer shall fit snugly against the flange of the reel. The transition from one layer to the next layer above shall be made with a minimum of void space.

Winding of conductor on the reels shall conform to the left or right hand rule, as applicable, as detailed in IEEE Standard 524-1992.

The clearance between the outermost layer of the conductor and the lagging bound shall not be less than 75 mm.

Materials used in or on the reels and conductor shall neither adhere to the conductor nor produce corrosion during outdoor storage.

The packing shall be carried out with caution to protect the conductor from moisture, salt or any impurities which may cause rust or harmful effects to the conductor.

In case wooden reels are employed, the Contractor shall treat them with chemical solution to prolong the life of service. The solution used for such treatment shall be harmless to conductor and approved by EGAT. The Contractor shall submit for EGAT's approval drawings detailing all dimensions of reel, type and sizes of each piece of wood assembled, through bolts, steel arbor and fixing bolts, steel strap bound on the reel and materials to protect the conductor from moisture or harmful effects.

b. Marking

The following information shall be marked with paint on the reels and clearly indicated on at least one metal tag firmly attached to the reel :

- Contractor and/or Manufacturer's name or trade mark.
- Manufacturer's plant location
- Purchaser's name

- Reel number
- Date of manufacturing
- Destination
- Size
- Actual length
- Gross weight and tare weight
- Contract number

An arrow, showing the direction in which the reel should be rolled, shall be marked on each side of reel at the position of the outer end of conductor placed.

c. Shipping

The Contractor shall exercise every precaution to adequately protect all shipments against damage in transit and the Contractor shall be liable for and assume the entire risk of damage or loss while the equipment is in transit and prior to delivery. The Contractor shall assume responsibility for filing and prosecuting any claim against the carrier. Vessels and cars in which equipment is shipped shall be reasonably clean and free from foreign material which could in any way injure the equipment. Any expense incurred by EGAT as a result of improper shipping of equipment will be backcharged to the Contractor.

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SECTION B

HARDWARE ASSEMBLIES AND LINE ACCESSORIES FOR INVAR CONDUCTOR

This Section specifies particular technical requirements for hardware assemblies and line accessories, in addition to those already specified in Specifications No. C-2 (Rev.6), for Invar Conductor.

The technical requirement for hardware assemblies and line accessories for Invar Conductor shall generally conform to those specified in Section D: Insulator Assemblies, Section F: Line Accessories, Attachment No. 1: Tests for Transmission Line Hardware/Fittings of Specifications No. C-2 (Rev.6) and Specification No. TL-03 (Rev.0): Specification for Spacer Damper and Rigid Spacers respectively with the additional requirements for the following equipment in order to make the assemblies and accessories suitable to be used with Invar conductor.

B-1. Compression Type Dead End Clamps

The material of compression type dead end clamps for Invar Conductor shall be suitable for continuing good performance corresponding to the maximum temperature. The current carrying capacity of compression type dead end clamps shall not be less than that of Invar Conductor as specified in Requirements and Design Criteria of Invar Conductor attached with these Specifications for Invar Conductor and Hardware Assemblies & Line Accessories.

B-2. Line Accessories

The current carrying capacity of conductor connection, repairs and armor rod shall not be less than that of Invar Conductor as specified in Requirements and Design Criteria of Invar Conductor. The material not specifically covered herein shall be of standard commercial quality suitable for the intended use. The Contractor shall be responsible for satisfactory performance of complete conductor system along with accessories offered by the Contractor for continuous operation at 210°C.

For spacer damper and rigid spacer damper, they shall maintain all requirements as specified in Specification No. TL-03 (Rev.0) and shall have good performance under operating temperature of Invar Conductor. The elastomer and non-metallic material shall be capable of withstanding continuous operating temperature up to 210°C without permanent loss of essential properties. The energy absorption assembly shall be designed to provide effective damping throughout operating temperature range.

B-3. Test of Hardware Assemblies and Line Accessories

Test of hardware assemblies and line accessories for Invar Conductor shall generally conform to ATTACHMENT No.1: TESTS FOR TRANSMISSION LINE HARDWARE/FITTING of Specifications No. C-2 (Rev.6). In addition, tension sleeve and dead end clamp for Invar Conductor shall comply with requirement of Article 7 of BS 3288: Part 1: 1997, provided that the temperature of conductor during each cycle of the test shall be 210(+10/-5) °C.

B-4. Sag and Tension Table for Stringing of Invar Conductor

The Contractor shall provide initial Sag and Tension Table for Invar Conductor and submit it to EGAT for approval before commencement of Stringing Work.

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REQUIREMENTS AND DESIGN CRITERIA FOR INVAR CONDUCTOR

REQUIREMENTS AND DESIGN CRITERIA FOR INVAR CONDUCTOR
FOR
RECONDUCTORING OF 230 kV KHLONG MAI JUNCTION – KHLONG MAI,
RECONDUCTORING OF EPEC COMBINED CYCLE POWER PLANT – KHLONG MAI JUNCTION,
SECTIONALIZING OF 230 kV BANG PAKONG – KHLONG DAN TO KHLONG MAI,
AND SECTIONALIZING OF 230 BANG PAKONG –KHLONG DAN TO EPEC COMBINED CYCLE
POWER PLANT

1. CONDUCTOR CHARACTERISTICS

The High Temperature Low Sag Conductor supplied for the subject transmission lines shall have characteristics conforming to the following requirements.

<u>Description</u>	<u>High Temperature Low Sag Conductor</u>	
Minimum breaking strength	14,050	kg
Outside diameter, not more than	33.91	mm
Weight of conductor, not more than	2,040 (Totally)	kg/km
Continuous current capacity, not less than (see <u>Note</u>)	1,840 (with solar)	A
Max. Operating temperature – continuous	210	°C
Direction of lay	Outer Right Hand	
Length of each reel, not less than	1,140	m

Note: Thermal limit conditions of conductor are as follows:

Maximum conductor temperature	210 °C
Ambient temperature	35 °C
Wind velocity	2.2 km/hr
Solar intensity	0.06 w/cm ²
Solar absorption	0.75
Emissivity of surface area	0.60

2. DESIGN CRITERIA

The conductor shall be designed to have characteristic as mentioned above with its maximum tension and maximum sag not exceeding the tension worst case and maximum sag of EGAT typical design and of the existing transmission line, in case of conductor replacement work, at any ruling span.

3. TECHNICAL INFORMATION OF TRANSMISSION LINES

3.1 Conductor Information for EGAT's Typical Transmission Line

(a) Conductor

Nominal size	1272 MCM
Material	ACSR/GA
Stranding	42x4.42 AL/7x2.46 ST

Total area	677.77	mm ²
Diameter	33.91	mm
Weight	2.04	kg/m
Ultimate strength	14,050	kg
Modulus of elasticity	6,200	kg/mm ²
Coefficient of linear expansion	0.0000213	/°C

(b) Operation Condition

Nominal voltage	230	kV
Maximum operating conductor temperature	75	°C
Ambient temperature	35	°C
Solar intensity	0.06	W/cm ²
Solar absorption coefficient of conductor surface	0.75	
Wind velocity	2.2	km/hr
Relative emissivity of surface area	0.6	
Current power carrying capacity		
With solar	1,078	A
Without solar	1,197	A

3.2 Sag & Tension Data

The High Temperature Low Sag Conductor shall be designed to have its maximum tension and maximum sag not exceeding those shown herein.

Tension and Sag – Ruling Span 430 m

Case				Condition	Controlling Tension and Sag		
27°C +	Wind	100.00	kg/m ²	Final	Tension ≤	5535	kg
27°C +	Wind	64.00	kg/m ²	Final	Tension ≤	4327	kg
27°C +	Wind	20.30	kg/m ²	Final	Tension ≤	3244	kg
40 °C +	No Wind			Final	Tension ≤	2981	kg
27°C +	No Wind			Final	Tension ≤	3091	kg
6°C +	No Wind			Final	Tension ≤	3293	kg
Max. Operating Temperature				Final	Sag ≤	17.29	m

Specifications C-2 (Revision 6)
Construction of Transmission Line, January 1987

Section D

INSULATOR ASSEMBLIES

Section D

INSULATOR ASSEMBLIES

- D-1. General. The insulator assemblies shall consist of the indicated number of insulator discs, hardware, suspension clamps, compression type dead end clamps or strain clamps and arcing horn (if specified). The details are as shown on the drawings and shall meet the requirements hereafter described.

An insulator assembly complete with hardware shall not exhibit excessive corona formation at voltages less than the flashover voltage. The design of the insulators and hardware shall be made to minimize the effect of local corona formation and discharges likely to cause radio interference.

- D-2. Insulators. The insulator discs shall be of the cap and pin, ball and socket type, radio interference free. Each insulator disc shall be in accordance with the ANSI C29.2 for Wet Process Porcelain (Suspension Type) and shall have the characteristics as specified hereunder and shown on the drawing No. TP-126.

- a. Porcelain Insulator Shells. The insulator shells shall be made of the highest grade, dense, homogeneous, wet-process porcelain, cylindrical headed with sanded surface, completely and uniformly vitrified throughout to produce uniform mechanical and electrical strength and long life service. The porcelain shall be free from warping, roughness, cracks, blisters, laminations, projecting points, foreign matters and other defects, except those within the limits of accepted standard practice.

All porcelain surfaces exposed to the weather shall be glazed with reasonably uniform color as specified on the drawing No. TP-126. The glaze shall be smooth, hard, dense, and properly fitted to the porcelain and shall be unaffected by the weather, ozone, nitric acid, nitric oxides, alkali, dust, or sudden changes in temperature within the atmosphere range.

- b. Cap and Pin. The cap and pin shall be of such design that it will not yield or distort under the specified mechanical load in such a manner as to change the relative spacing of the insulators or add other stresses to the shells. The insulator caps shall be of the socket type, provided with non-ferrous metal or stainless steel cotter key. The cap shall be made of good commercial grade malleable iron or open hearth or electric furnace steel, hot-dip galvanized. The cap shall be truly circular, with the inner and outer surfaces concentric, and shall be free from cracks, shrinks, air holes, burrs, and rough edges, to minimize field concentrations and radio disturbances. The insulator pins shall be made of malleable iron or drop-forged or machine steel free from cracks and air-holes. All bearing surfaces shall be smooth and uniform so as to distribute the loading stresses evenly.

The cap and pin shall have practicle hot-line maintenance capability.

- c. Cementing. In cementing the insulator shell to the cap and pin, high quality Portland cement shall be used.

d. Marking. Each insulator unit shall bear legible and indelible symbols identifying the manufacturer, the year of manufacture and the rated combined mechanical and electrical strength. Marking on porcelain shall be printed, not impressed, and shall be applied before firing.

e. Tests. The manufacturer shall make adequate tests to demonstrate that the insulators meet the requirements of this Specification. All requirements for sampling, inspections and tests of ANSI C29.2 made by the method of ANSI C29.1 and the requirements of thermal-mechanical performance test in accordance with IEC Publication 575 shall be met. EGAT reserves the right to require the design tests, only for new designs in ANSI C29.2 and IEC Publication 575; if insulators of the same manufacture and design are not presently in general use in EGAT system.

The Contractor shall furnish four certified copies of all tests whether or not inspection is waived. For the purposes of sampling for quality conformance tests, the lot size shall be 3,000 units or fraction thereof. The cost of all tests and certificates shall be borne by the Contractor.

D-3. Hardware. All hardware shall be made of malleable iron or of steel for forging, metal mold casting or drop forging process; hot-dip galvanized, and shall have an ultimate strength not less than the mechanical and electrical strengths of the insulator discs for each type of insulator assembly. The insulator assemblies except suspension clamps, compression type dead end clamps or strain clamps shall be designed in such a manner that the ultimate tensile strength is not less than that specified in the Contract.

All bolts, nuts and locknuts shall be made of steel. All cotter pins shall be made of non-ferrous metal or stainless steel and shall be of the self-locking type.

D-4. Arcing Horns. If the use of arcing horns is required by EGAT, a set of double arcing horns shall be attached to each end of the suspension insulator strings. A single arcing horn shall be attached at the line end and earth end of the tension strings, and the horn being directed upwards. Arcing horns shall not be attached to insulator balls or caps.

Attaching of the arcing horns shall be to prevent damage to clamps and conductors and to reduce as far as reasonably possible damage to insulator units and the arcing horn themselves when flashover occurs. The gap settings to give maximum value of impulse flashover voltage consistent with the above provisions are as shown on the drawings.

The materials of arcing horn shall be round steel bars or steel tube and shall be hot-dip galvanized.

D-5. Suspension Clamps. The suspension clamps for the conductor shall be made of aluminum alloy suitable for use on the conductor with preformed armor rods installed and shall be free to pivot in the vertical plane containing the conductor. The suspension clamps shall have smooth surfaces free from burrs, and the edges and fillets shall be rounded to minimize corona concentration and radio interference.

The clamps shall be designed to minimize magnetic loss with maximum permissible current of each conductor, 50 Hz current flowing through the conductor with armor rod or through conductors having the same outside diameter. If dissimilar metals are used in making the clamps, suitable precautions shall be taken to minimize corrosion due to electrolytic action. Each suspension clamp shall have a suitable bellmouth and shall be capable of holding the conductor with preformed armor rods without slipping under an unbalanced tension of 25 per cent of the rated ultimate strength of the conductor and shall have ultimate strength equal to or exceed the mechanical and electrical strength of the insulator disc. Each suspension clamp shall be furnished with bolts, two U-bolts with lock washers, a keeper piece and other required parts. The degree of U-bolt tightening shall be in accordance with the recommendations of the suspension clamp manufacturer.

- D-6. Strain Clamps. The strain clamp shall be bolted type, made of aluminum alloy and capable of holding the conductor without slipping and injuring the conductor when the conductor is under a tension of 85 per cent of the rated ultimate tensile strength of the conductor. Keeper piece shall be of the same material as the clamp body.

Bolts, nuts and washers shall be hot-dip galvanized malleable iron or steel. The degree of bolt tightening shall be in accordance with the recommendations of the strain clamp manufacturer.

- D-7. Compression Type Dead End Clamps. The compression type dead end shall be suitable for use on conductor as specified by EGAT, and shall consist of galvanized steel clevis end or steel oval eye end, an aluminum dead end body and aluminum jumper connector with bolted connection between the jumper connector and the dead end. The compression dead end clamps and the jumper connector shall have strength of not less than 95 and 30 per cent of rated ultimate tensile strength of the conductor respectively. The compression dead end clamp and jumper connector shall have an electric conductivity of not less than that of the conductor, and shall be free from all defects and shall not damage the conductor when attached. The position of compression shall be clearly marked on the surface of each clamp and jumper socket. The steel parts shall be hot-dip galvanized.

The ampacity of compression type dead end clamp shall not be less than that of table 1B.1, 1B.2 and 1B.3.

- D-8. Counter Weight. The counter weight equipment shall be of vertical type, consisting of adaptor to be fastened to the suspension clamp, hanger and accessories. The equipment and counter weight shall not reduce the live parts to tower clearance below the minimum design clearance.

All units of counter weight shall be made of concrete or cast iron with cylindrical shape. Each unit will be approximately 30 kg.

- D-9. Miscellaneous Materials. Materials not specifically covered herein by detailed specifications shall be of standard commercial quality suitable for the intended use.

- D-10. Galvanizing. Unless otherwise specified, all ferrous metal shall be galvanized in accordance with ASTM A153. All metal shall be free from burrs, sharp edges, lumps and dross, and shall be smooth so that interconnecting parts will fit properly and so that the parts may be assembled and disassembled readily. Bolts and nuts shall be galvanized after being threaded and excessive zinc shall be removed, and shall run freely (hand fit) for the entire length of the thread. Retapping of nuts after galvanizing is permitted provided sufficient protective zinc or tapping oil will remain on threads in nuts.
- D-11. Marking. All components of insulator assemblies shall be marked by means of legible relief process or impressed process into the metal mold or die, in accordance with ASTM A47 and ASTM A668 respectively, as designated by the manufacturer and approved on the drawings. Marking for ferrous metal shall be done before galvanizing.

Section F

LINE ACCESSORIES

Section F

LINE ACCESSORIES

- F-1. General. All line accessories to be furnished shall be made of aluminum, aluminum alloy, malleable iron or steel. The current carrying capacity of conductor connection, repairs and armour rod shall not be less than that of conductor specified in Table 1B.1, 1B.2 and 1B.3.

Material not specifically covered herein shall be of standard commercial quality suitable for the intended use.

F-2. Conductor Connection and Repair.

- a. Tension Sleeves. The tension sleeves for all aluminum conductor shall be made of aluminum or aluminum alloy and suitable for use on conductor.

The tension sleeves for ACSR conductor shall consist of a steel compression sleeve for the steel core, an aluminum or aluminum alloy compression sleeve for the complete conductor and aluminum plugs for sealing the holes in aluminum compression sleeve through which aluminum joint compound is to be injected.

Each tension sleeve shall be capable of developing not less than 95 per cent of the ultimate strength of the conductor and shall have a conductivity of not less than that of the conductor.

- b. Repair Sleeves. The compression type repair sleeves for conductor shall be made of aluminum or aluminum alloy, and suitable for use on the conductor and each shall consist of aluminum or aluminum alloy sleeve body and keeper.

- c. Line Splices. The line splices for the conductor shall be of the preformed type. They shall be made of aluminum or aluminum alloy and shall be designed to hold the full rated strength, and provide equivalent conductance of the conductor. The minimum holding strength shall be equal to or exceeding the ultimate strength of conductor. Each line splice shall consist of three sub-sets.

- d. Patch Rods. The patch rods shall be of the preformed type. They shall be of aluminum alloy and shall be designed to restore full conductance and strength of the damaged conductor where the damage does not exceed 25 per cent of the outer strand layer.

F-3. Overhead Ground Wire Connection. The overhead ground wire connection shall be suitable for use on the galvanized, aluminum-clad or copper-clad steel stranded overhead ground wire.

- a. Tension Sleeve. The tension sleeves for the overhead ground wire shall be made of stainless steel sleeve or mild steel sleeve. Each compression joint shall be capable of developing not less than 95 per cent of the ultimate strength of the overhead ground wire.

- b. Line Splices. The line splices for the overhead ground wire shall be of the preformed type, made of steel strand and designed to hold the full-rated strength of the overhead ground wire. Each line splice shall consist of three sub-sets.
- F-4. Armor Rods for Conductor. The armor rods for the conductor shall be of the preformed type, made of aluminum or aluminum alloy, and suitable for use on conductor. The armor rods shall be smooth, free from corrosion, split, crack or any defects. Armor rods shall be designed in such a manner so as to protect effectively the conductor from fatigue caused by vibration.
- F-5. Armor Rods for Overhead Ground Wire. The armor rods shall be of the preformed type suitable for use on overhead ground wire and formed from materials which are corrosion resistant in themselves and which will minimize corrosion due to electrolytic action with the strand.
- F-6. Vibration Dampers. The vibration dampers shall be of the stockbridge type suitable for use on the conductor or overhead ground wire. The vibration dampers used on the ACSR or all aluminum conductor shall have aluminum clamps compressed on the steel messenger strand between the weights and be suitable for attachment to the conductor.
- The damper clamp shall be designed to permit installation and removal by the use of hot line tools. Each damper weight for stockbridge type shall be provided with one drain hole at the bottom of the weight when the damper is installed in the vertical plane. Damper weights shall be made of cast iron or steel, compress the messenger strand and shall be hot-dip galvanized.
- F-7. Two Bundle Conductor Spacer. Spacers for two bundle conductors shall be of the bar socket or bar hinge type and for jumper loop shall be rigid type. The spacer shall be designed to meet the following requirements:
- a. Spacers are required to prevent the two conductors of horizontal bundle from contacting each other during normal conditions of service when installed at intervals of 80 m.
 - b. Spacers shall have sufficient strength in compression and tension to resist the maximum forces that may occur in service and during short circuits without any permanent deformation or damage to conductor or spacer.
 - c. Spacers shall have sufficient resiliency to allow some movement of conductors in any direction including some rotation relative to each other and shall maintain their correct separation of 400 mm without wear.
 - d. Spacer shall not cause any damage to the conductor strands nor shall be subjected to damage themselves when conductors are subjected to aeolian vibration.

- e. Spacer clamps shall firmly grip the conductors without producing any concentration of stresses likely to cause damage to conductor strands and shall not be subjected to loosening while in service. Clamp shall grip the conductors sufficiently to prevent torsional movement of the conductors in the clamp.
- f. Spacers shall offer restraint to the relative rotation of conductors caused by vertical movement so as to prevent conductors from twisting together.
- g. Spacers shall be free from corona and radio interference. They shall also be free from audible noise due to wind and from vibrations of the conductor.
- h. The design of connections between clamps and spacing element shall have sufficient conductivity to prevent the occurrences of any sparking when current is carried from one conductor to the other through the spacer.
- i. Spacers shall be of simple design, easy to install and suitable for carrying out hot line maintenance.
- j. The material of the spacer shall be maintenance free service under extreme climatic environmental conditions. The part in contact with the conductors shall be aluminium or aluminium alloy.

An alternative spacer-dampers of suitable design and characteristics may be offered in order to eliminate use of damper. Full technical details along with drawings and descriptive literature regarding the spacers or spacer-dampers shall be submitted along with the offer.

- F-8. Aluminum Joint Compound. The compound shall be applicable for both aluminum to aluminum, and aluminum to copper jointing accessories. The compound shall be chemically inert of a petroleum grease base. It shall include titanium dioxide for high electrical efficiency and zinc chromate as an oxide inhibitor. It shall remain workable through a temperature range of 0°C to 110°C. It shall be non-toxic and insoluble in water.
- F-9. Galvanizing. Unless otherwise specified, all ferrous metal shall be galvanized in accordance with ASTM A153. All metal shall be free from burrs, sharp edges, lumps and dross, and shall be smooth so that interconnecting parts will fit properly and so that the parts may be assembled and disassembled readily. Bolts and nuts shall be galvanized after being threaded and excessive zinc shall be removed, and shall run freely (hand fit) for the entire length of the thread. Retapping of nuts after galvanizing is permitted provided sufficient protective zinc or tapping oil will remain on thread in nuts.
- F-10. Marking. All components of line accessories shall be marked where practicable by means of legible relief process or impress process into the metal mold or die, in accordance with ASTM A47 and ASTM A668 respectively as designated by the manufacturer and approved on the drawings. Marking for ferrous metal shall be done before galvanizing.

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SPECIFICATIONS NO. TL-02 (REV.0)

ADDITIONAL SPECIFICATIONS FOR VIBRATION DAMPERS

SPECIFICATIONS NO. TL-02 (REV. 0)
ADDITIONAL SPECIFICATIONS FOR VIBRATION DAMPERS

1. General

If required in the Contract, the Contractor shall perform the laboratory and/or field tests to determine whether the vibration dampers have acceptable level of damping to protect the conductor and can function without experiencing fatigue damage. Furthermore, sample tests shall also be made on each lot of vibration dampers offered for acceptance as described herein.

2. Sample Tests

Sample tests shall be made on each lot of vibration dampers offered for acceptance.

2.1 Verification of Dimensions. It shall be verified either that the test samples comply with the requirements of the Specifications or that they are in accordance with the approved drawings, particularly as regards any dimensions to which special tolerances apply and details affecting interchangeability (e.g. dimensions for which gages are specified).

Unless otherwise agreed the following tolerances are allowed on all dimensions, except special tolerances :

<u>Dimension (mm)</u>	<u>Tolerance</u>
Up to and including 35	± 0.7 mm
Over 35	± 2 %

2.2 Galvanizing Test. Galvanized parts shall be tested in accordance with ASTM A153 and shall comply with the requirements of that standard.

The number of samples for these tests shall be selected in accordance with table below :

Number in the lot N*	Number of Samples
N < 100	1
100 < N < 300	5
300 < N < 1200	10
1200 < N < 3000	14
3000 < N < 10000	20
N > 10000	To be determined mutually.

N* is number of dampers offered for inspection.

The samples shall be selected at random from vibration dampers which have passed the appropriate routine test (if any). EGAT has the right to make the selection.

If these samples meet the test requirements, the lot is deemed to comply with the requirements of the standard. In the event of a sample not meeting the test requirements, twice the original number of new samples shall be tested. If all these new samples meet the test requirements, the lot is deemed to comply with the requirements of the standard, but if any fail to do so the lot is deemed not to comply with the requirements of the standard and shall be rejected.

3. Laboratory Tests

If required in the Contract, the Contractor shall perform the laboratory tests. Qualification will be based on the testing of five dampers as follows:

3.1 Damping Efficiency Test

3.1.1 Laboratory Setup

3.1.1.1 The tests shall be conducted on a laboratory span with a minimum length of 100 feet. The conductor shall be tensioned at 25 per cent of its nominal ultimate strength and shall not be equipped with protective armor rod at any point. After the conductor has been tensioned a clamp shall be installed to rigidly support the conductor at the end where the measurements will be taken.

- a. The clamp shall not be used for maintaining the conductor tension.
- b. There shall be no loose parts, such as suspension clamp U-bolts on the test span.

3.1.1.2 The span shall be equipped with vibration inducing equipment suitable for producing steady standing-wave vibration. Equipment shall be available for measuring the amplitude of aeolian vibration at any point along the span by producing an electrical signal that is the analog of the vibration amplitude.

- a. The amplitude signal shall be electrically or electronically filtered to attenuate frequencies above and below the frequency of the forced vibration of the span. The attenuation shall be at least 15 decibels (db), two octaves above and two octaves below the forced frequency.
- b. If the measuring equipment requires attachment to the conductor the attachment shall not significantly alter any of the vibration amplitudes.

3.1.1.3 The equipment shall be capable of measuring amplitudes to within 0.0005 inches or 4 per cent of the value being read, whichever is greater.

3.1.1.4 The test conductor shall be the same or of the same basic construction as the conductor for which the dampers are to be purchased. The characteristic impedance of the test conductor shall be within plus or minus 10 per cent of the impedance of the conductor specified. The characteristic impedance (Z) is calculated by the Formula $Z = (Tm)^{1/2}$ where T is the test tension of the conductor and m is the conductor mass per unit length.

3.1.2 Test Procedure

3.1.2.1 The damper shall be installed at the manufacturer's recommended spacing. There shall be no attachments to the conductor between the points of amplitude measurement and the damper, such as; the vibration exciter, or splices, except those necessary for amplitude measurements. The test span shall be vibrated in steady standing waves at the following frequencies and amplitudes:

- a. The test frequencies in Hertz (Hz) shall be within the range $6.5/D$ to $50/D$ where D is the test conductor diameter in inches.
- b. The amplitude of the antinode shall be adjusted to have a peak-to-peak value in inches equal to $3/f$ where f is the frequency of forced vibration in Hz. A tolerance of plus or minus 10 per cent is permitted in amplitude adjustment.

3.1.2.2 The antinode amplitude shall be measured in one of the first four loops nearest the damper.

3.1.2.3 The node amplitude shall be measured at the adjacent node, towards the damper. The node amplitude shall be determined by making measurements at several points in the apparent vicinity of the node. The lowest amplitude measured shall be recorded as the node amplitude.

3.1.2.4 The antinode and node amplitudes need only be measured once for each tunable harmonic.

3.1.3 Acceptance Criteria

3.1.3.1 Qualification of a damper for a given conductor shall be determined by comparing the damping efficiency at each tunable harmonic with the corresponding value from the acceptance curve in the Appendix No. 1.

- a. The damping efficiency at each frequency where measurements were made shall be calculated by dividing the recorded node amplitude by the recorded antinode amplitude, both in the same units (inches or volts).
- b. The normal wind velocity on the acceptance curve corresponding to each tunable harmonic shall be calculated according to the formula $V = fd/3.26$, where V is in miles per hour, f is the test frequency in Hz, and d is the conductor diameter in inches.

3.1.3.2 The five test dampers shall meet one of the following efficiency limits at each tunable harmonic:

$$X_i > E_i \text{ (where all } X_i > E_i \text{)}$$

$$\text{or } X_j - R_j/2 > E_j \text{ (where any } X_j < E_j \text{)}$$

Where X_i is the efficiency of a test damper at the i^{th} tunable harmonic

$$X_j \text{ is the average of } X_i, \text{ or } X_j = \sum X_i / N$$

$$R_j \text{ is the range of } X_i, \text{ or } R_j = X_j \text{ max} - X_j \text{ min}$$

E_j is the efficiency corresponding to that harmonic frequency as shown on the acceptance curve

N is the number of vibration damper

3.2 Damper Response

- 3.2.1 The five dampers which have passed the Damping Efficiency Test shall each be mounted on a shake table and driven at 0.04 inches peak-to-peak over the same frequency range used in the Efficiency Test. The response of the damper, in terms of the reaction force and phase angle, shall be measured and plotted against the frequency. Response versus frequency shall be plotted continuously or for at least fifteen spaced points over the frequency range.
- 3.2.2 The data obtained from the Damper Response Test on the five qualified dampers shall be used to evaluate the Damper Response Test performed on production dampers.

3.3 Fatigue Test

- 3.3.1 The damper shall be attached to a shaker and driven in a vertical direction for 10,000,000 cycles. The frequency shall be selected at one of the resonant frequencies and the minimum peak-to-peak amplitude at the clamp in inches will be equal to $1/f$, where f is frequency in Hz.
- 3.3.2 After completion of the test the damper shall be cut open and inspected. There shall be no broken or damaged parts, or significant deformation or wear on the damper.

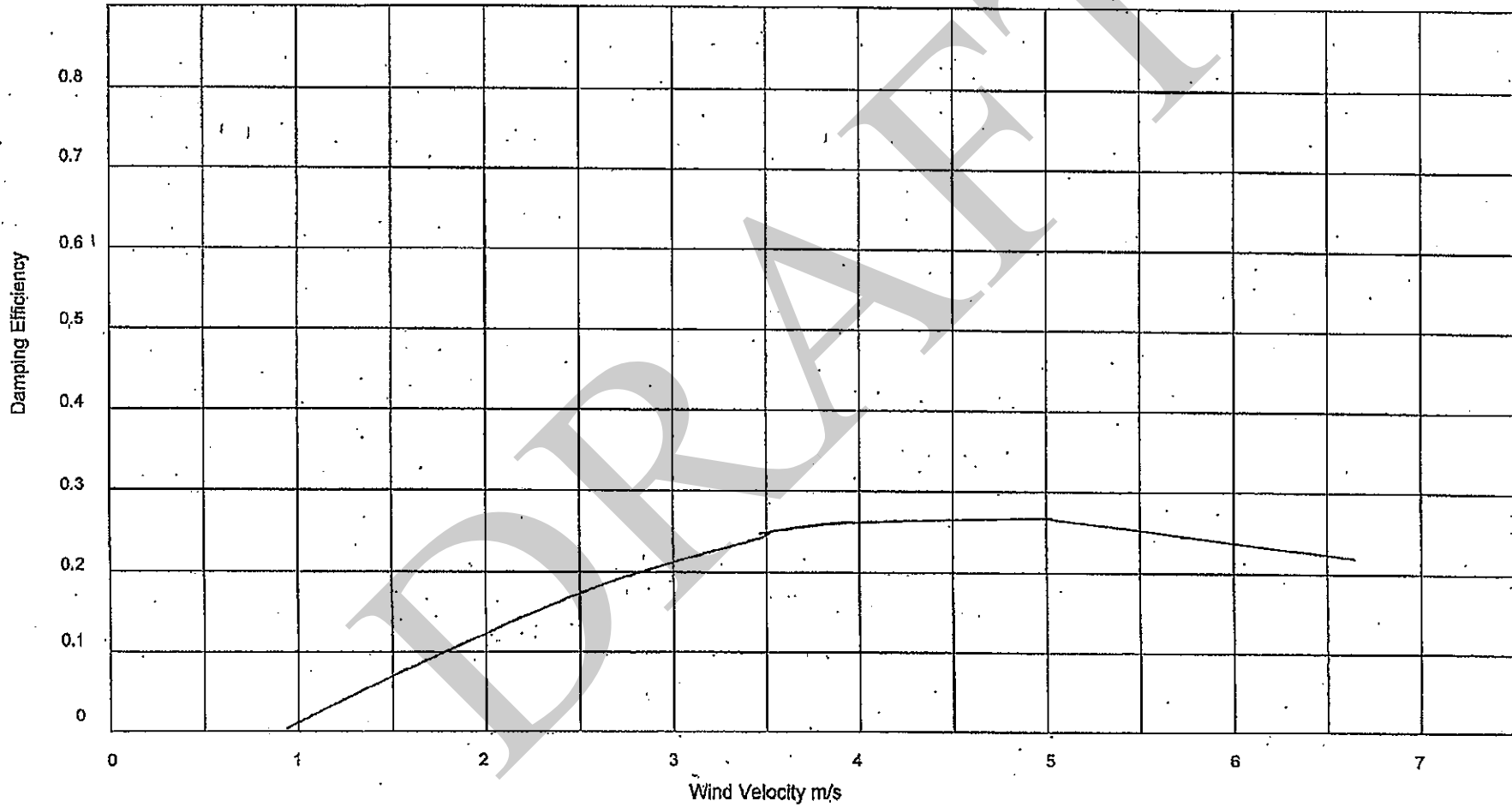
4. Field Test

If required in the Contract, the Contractor shall perform the field test. Field testing of dampers shall be performed to demonstrate their effectiveness in limiting conductor aeolian vibration magnitudes. This testing shall be performed over a period of time not less than 14 days in duration and will commence as soon as possible following construction of the span or spans to be tested. Selection of the test span or spans and the actual date of test will be subject to mutual agreement between the Contractor and EGAT. However, it is recommended that the Contractor prepare his construction schedule in such a manner that field tests can be performed before commencing of conductor stringing work. Any conductor stringing work performed prior to field tests shall be entirely at the Contractor's risk.

All tests shall be performed in accordance with the methods specified in IEEE Transaction Paper No. 31 CP 65-156, "Standardization of Conductor Vibration Measurements" and shall demonstrate that the maximum bending strain along the spans does not exceed 300 microstrain peak to peak.

In the event that the results of the test fail to meet this requirement, the Contractor shall modify his design and submit it to EGAT for approval. The modification shall then be retested at the Contractor's expense until satisfactory results are obtained.

Appendix No. 1
Vibration Damper Efficiency Acceptance Curve for Conductors



ATTACHMENT NO. 1

TESTS FOR TRANSMISSION LINE HARDWARE/FITTINGS

ATTACHMENT NO. 1

TESTS FOR TRANSMISSION LINE HARDWARE/FITTINGS

1. General.

a. Classification of Tests. In the following Articles, the requirements for the various types of fittings are given. The tests are divided into three groups :

- (1) Type Tests. The tests are intended to establish design characteristics. They are normally made once only and repeated only when the design or the material of the fitting is changed.
- (2) Sample Tests. Sample tests are intended to verify the quality of materials and workmanship. They are made on fittings taken at random from the lot offered for acceptance.
- (3) Routine Tests. Routine tests are intended to eliminate defective fittings. They are applied to every fitting of the types to which they are applicable.

b. General Requirements for Tests.

- (1) Type Tests. Unless otherwise agreed, test certificates giving the results of the appropriate type tests, made on not less than three fitting identical in all essential details with those to be supplied, shall be regarded as evidence of compliance.
- (2) Sample Tests. The number of samples for these tests shall be selected in accordance with table below :

Number in the lot N*	Number of Samples
N < 100	1
100 < N < 300	5
300 < N < 1200	10
1200 < N < 3000	14
3000 < N < 10000	20
N > 10000	By arrangement between the parties concerned, a minimum number of lots comprising between 3000 and 10000 fittings will be made up.

* N is number of fittings offered for inspection.

The samples shall be selected at random from fittings which have passed the appropriate routine test (if any). EGAT has the right to make the selection.

If these samples meet the test requirements, the lot is deemed to comply with the requirements of the standard. In the event of a sample not meeting the test requirements, twice the original number of new samples shall be tested. If all these new samples meet the test requirements, the lot is deemed to comply with the requirements of the standard, but if any fail to do so the lot is deemed not to comply with the requirements of the standard.

(3) Routine Tests. Where routine tests are specified in the following Articles, they shall be applied to every fitting.

c. Verification of Dimensions. It shall be verified either that the test samples comply with the requirements of Specifications C-2 (Rev.6) or that they are in accordance with the approved drawings, particularly as regards any dimensions to which special tolerances are applicable and details affecting interchangeability (e.g. dimensions for which gages are specified):

Unless otherwise agreed the following tolerances are allowed on all dimensions to which special tolerances are not applicable :

<u>Dimension</u> mm	<u>Tolerance</u>
Up to and including 35	± 0.7 mm
Over 35	± 2 %

2. Insulator Assembly and Overhead Ground Wire Assembly Hardware/Fittings.

a. Type Test. This test shall comply with the requirements of Article 3.2 of BS 3288 : Part 1

b. Sample Tests.

(1) Verification of Dimensions. The dimensions of the samples shall be verified as specified in Article 1.c.

(2) Mechanical Test. This test shall be the same as the type test specified in Article 2.a.

(3) Galvanizing Test. Galvanized parts shall be tested in accordance with ASTM A153 and shall comply with the requirements of that standard.

c. Routine Test.

- (1) Mechanical Routine Test. This test shall be applied only to castings and to fittings which are fabricated by welding in which the weld is stressed when the fitting is in service. A tensile load equal to 50 % of the specified minimum failing load shall be applied to the fittings and maintained for 30 seconds. The fitting shall not be damaged by the test.
- (2) Electrical Routine Test. Electrical routine test is not required.

3. Tension Sleeves and Deadend Clamps.

a. Type Test. This test shall comply with the requirements of Article 4.2 and 4.3 of BS 3288 ; Part 1

b. Sample Test.

- (1) Verification of Dimensions. The dimension of the samples shall be verified as specified in Article 1.c.
- (2) Mechanical and Electrical Tests. If required by EGAT, this test shall be the same as the type test specified in Article 3.a.
- (3) Galvanizing Test. Galvanized parts shall be tested in accordance with ASTM A153 and shall comply with the requirements of that standard.

c. Routine Test.

- (1) Mechanical Routine Test. This test does not apply to tension sleeves. It shall be applied where possible to those deadend clamps which are castings and to those which are fabricated by welding, in which the weld is stressed in use.

Where a deadend clamp is provided with an attachment point for use during erection and maintenance, the test load shall be applied between this point and the anchor point. Otherwise the test load shall be applied as nearly as possible between the points of attachment used in normal service.

A tensile load, which shall be equal to 50 % of the specified minimum failing load unless otherwise specified, shall be applied to the fitting and maintained for 30 seconds. The fitting shall not be damaged by the test.

The supplier shall inform EGAT if the form of fitting is such that a test load cannot be applied.

- (2) Electrical Routine Test. Electrical routine test is not required.

4. Suspension Clamps.

a. Type Test. This test shall comply with the requirements of Article 6.2 of BS 3288 : Part 1

b. Sample Tests.

(1) Verification of Dimensions. The dimensions of the samples shall be verified as specified in Article 1.c.

(2) Mechanical Test. This test shall be the same as the type test specified in Article 2.a.

(3) Galvanizing Test. Galvanized parts shall be tested in accordance with ASTM A153 and shall comply with the requirements of that standard.

c. Routine Test.

(1) Mechanical Routine Test. This test shall be applied only to castings and to those fittings which are fabricated by welding in which the weld is stressed when the fitting is in service. A tensile load equal to 50 % of the specified minimum failing load shall be applied as described above for type test. The load shall be maintained for 30 seconds. The fitting shall not be damaged by the test.

(2) Electrical Routine Test. Electrical routine test is not required.

5. Mechanical Protective Fittings. (Such as repair sleeves, armor rods, vibration dampers and spacers)

a. Type Tests. This test shall comply with the requirements of Article 8.2 of BS 3288 : Part 1

b. Sample Tests.

(1) Verification of Dimensions. The dimensions of the sample shall be verified as specified in Article 1.c.

(2) Mechanical Test. Mechanical test is not required.

(3) Galvanizing Test. Galvanized parts shall be tested in accordance with ASTM A153 and shall comply with the requirements of that standard.

c. Routine Test. Routine test is not required.

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**SECTION J
DRAWINGS**

J. DRAWINGS

J-1. Drawings

The following drawings are attached hereto and made a part of the Contract Documents :

Drawing No.	Description	Page
E05-006	PARTICULARS OF 230 kV SINGLE CONDUCTOR/DOUBLE CIRCUIT TOWER TYPES AND ELECTRICAL CLEARANCE DIAGRAM	001
E05-013	ELECTRICAL AND GROUND CLEARANCE FOR TOWER TYPE SWB2, SWC2, SWD2 AND SWDE(45 ⁰)	002
E11-178	HARDWARE ASSEMBLIES SINGLE AND DOUBLE SUSPENSION FOR SINGLE HTLS CONDUCTOR	003
E11-179	HARDWARE ASSEMBLIES SINGLE AND DOUBLE TENSION FOR SINGLE HTLS CONDUCTOR	004
E11-180	HARDWARE ASSEMBLIES SINGLE AND DOUBLE INVERTED TENSION FOR SINGLE HTLS CONDUCTOR	005
E11-181	INSTALLATION OF HTLS CONDUCTOR AT TAKE OFF STRUCTURE	006
E11-182	INSTALLATION OF CONDUCTOR ON TOWER NO. 10/3 & 10/4	007

ELECTRICITY GENERATING AUTHORITY OF THAILAND					
DESCRIPTION	CONDUCTOR		OHG. WIRE		
NOMINAL SIZE	1272	MCM	INCH	70	sq. mm.
MATERIAL & CODE NAME	ACSR/GA	6SK1HS1	DPGW	type 1	
STRANDING	42x4.42AL/7x2.465T	mm	7x3.048	mm	1x5.5P/8x3.2DAS
TOTAL AREA	617.77	mm ²	51.05	mm ²	71.4
DIAMETER	33.91	mm	9.144	mm	10.5
WEIGHT	2.040	kg/m	0.406	kg/m	0.458
ULTIMATE STRENGTH	14050.00	kg	4300.00	kg	8000.00
FINAL MODULUS OF ELASTICITY	6200.00	kg/mm ²	19300.00	kg/mm ²	15200.00
COEFFICIENT OF LINEAR EXPANSION	0.0000213	/°C	0.0000115	/°C	0.0000134

INSULATOR STRING (BALANCE INSULATION DESIGN)				
DESCRIPTION	SUSPENSION		TENSION	
	SINGLE	DOUBLE	SINGLE	DOUBLE
NUMBER OF DISC IN STRING	14	2x14	15	2x15
ARCING HORN	NO	NO	NO	NO
LENGTH OF INSULATOR STRING (mm)	2400	2700	2800	3400
WEIGHT OF INSULATOR STRING (kg)	97	193	101	202
a. INSULATORS (kg)	84	168	90	180
b. FITTINGS (kg)	13	25	11	22
WEIGHT OF LINE MAN & TACKLES (kg)	200	200	200	200

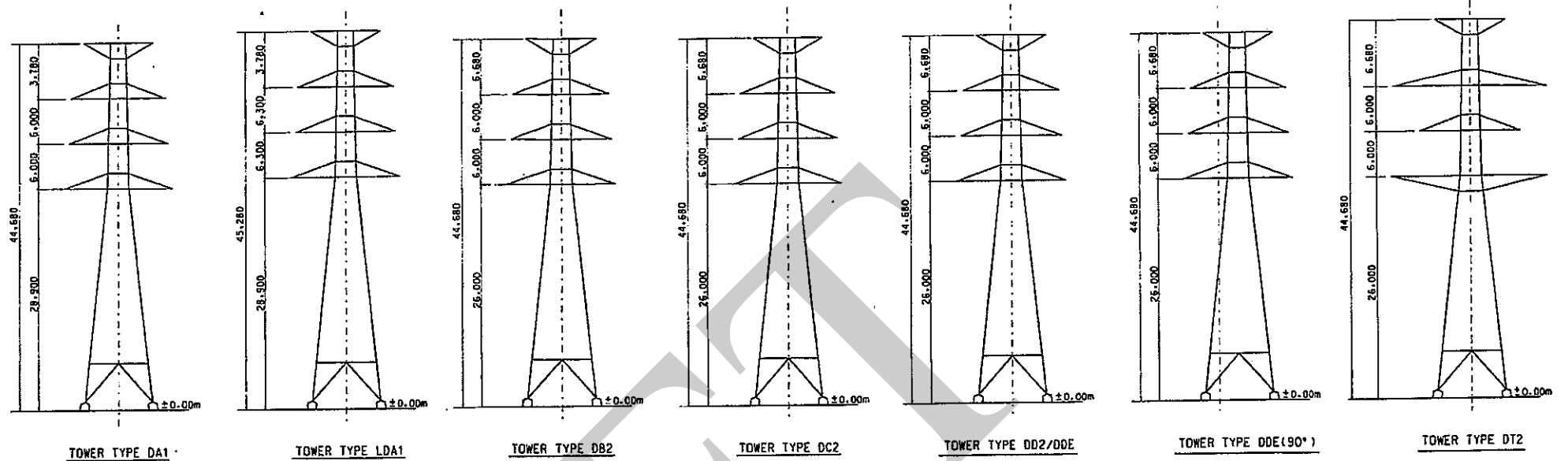
INSULATOR STRING (UNBALANCE INSULATION DESIGN)								
DESCRIPTION	SUSPENSION				TENSION			
	LV	HV	LV	HV	LV	HV	LV	HV
NUMBER OF DISC IN STRING	14	16	2x14	2x16	15	17	2x15	2x17
ARCING HORN	YES	NO	YES	NO	YES	NO	YES	NO
LENGTH OF INSULATOR STRING (mm)	2550	2682	2700	2992	2950	3092	3400	3628
WEIGHT OF INSULATOR STRING (kg)	104	109	203	217	103	113	205	226
a. INSULATORS (kg)	84	96	168	192	90	102	180	204
b. FITTINGS (kg)	20	13	35	25	13	11	25	22
WEIGHT OF LINE MAN & TACKLES (kg)	200	200	200	200	200	200	200	200

TENSION & SAG DATA (Ruling span 430 m)													
TEMPERATURE °C	SAFETY FACTOR OF CONDUCTOR	AERODYNAMIC FACTOR OF CONDUCTOR	WIND PRESSURE kg/m ²	CONDUCTOR		OHG. WIRE		CONDUCTOR		OHG. WIRE			
				TENSION kg	SAG m	TENSION kg	SAG m	TENSION kg	SAG m	TENSION kg	SAG m		
27	4.33	1.0	1.1	20.30	3244.60	15.36	23.10	898.20	11.70	76.20	826.10	14.68	95.60
27	3.25	1.0	1.1	64.00	4327.30	15.94	30.80	1354.30	13.00	81.60	1354.30	15.80	99.10
27	2.54	1.0	1.1	100.00	5535.50	16.56	39.40	1779.00	14.11	85.20	1844.10	16.77	101.30
6	4.27				3293.10	14.34	23.40	865.50	10.85	75.70	764.90	13.85	96.60
27	4.55				3091.00	15.28	22.00	819.60	11.46	75.00	732.30	14.48	94.70
40	4.71				2981.60	15.84	21.20	794.10	11.83	74.70	713.90	14.85	93.70
65	5.02				2798.00	16.89	19.90						
75	5.14				2732.90	17.29	19.50						

TOWER APPLICATION					
TOWER TYPE	PARTICULAR	RULING SPAN (m)	WIND SPAN (m)	WEIGHT (SPAN)	LINE ANGLE
DA1	SUSPENSION TYPE	430	440	550	0°-1°
LDA1	SUSPENSION TYPE	430	650	1300	0°-1°
DB2	TENSION TYPE	430	440	550	0°-15°
DC2	TENSION TYPE	430	440	550	0°-30°
DD2	TENSION TYPE	430	440	550	0°-60°
DE2	TENSION TYPE	430	440	550	0°-90°
DDE	DEADEND TYPE	430	330	450	0°-45° (SLACK SPAN)
DDE	DEADEND TYPE	430	220	300	0°- COMPLETE DEADEND
DDE(90°)	DEADEND TYPE	430	330	450	0°-90° (SLACK SPAN)
DDE(90°)	DEADEND TYPE	430	220	300	0°- COMPLETE DEADEND
DT2	TRANSPOSITION TYPE	430	440	550	0°-1° TRANSPOSITION

NOTES

- Clearance dimensions are minimum from surface of steel (not from member gage or working lines) to the nearest point on the conductor or hardware.
- All dimensions are in millimeter except as noted.
- Strain plates for OHG.wire and conductor shall be bent to suit dip angles of OHG.wire and conductor of 3° and 5° respectively.



SAG AND ELECTRICAL CLEARANCE DATA

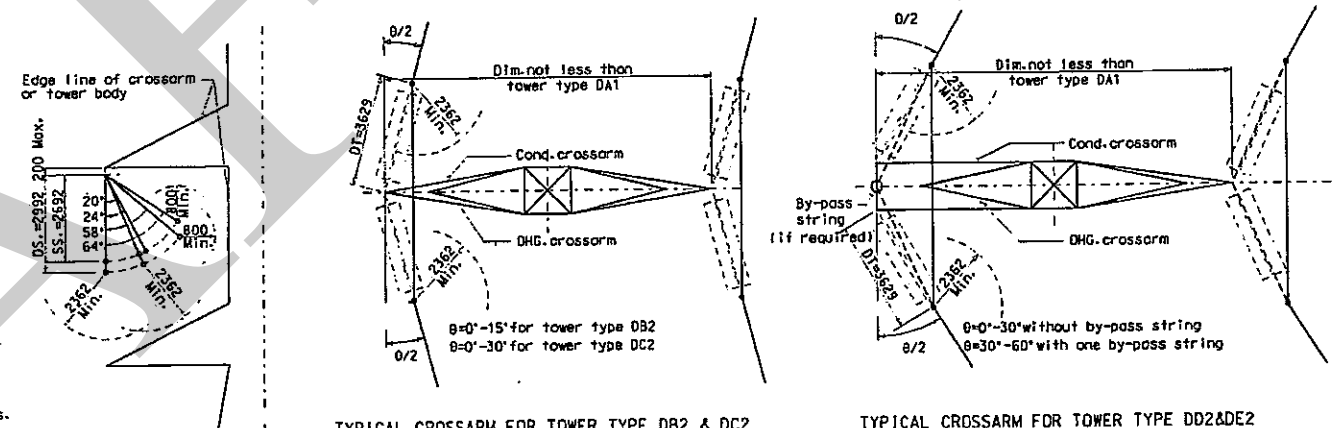
1. Sags of conductor and OHG.wire for normal span 430 m shall be as follows :

- Conductor = 1272 MCM ACSR/GA 33.91 mm diameter
 - Sag at 27°C+W (64kg/m²) = 15.94 m
 - at 6°C = 14.34 m
 - at everyday temperature 27°C = 15.20 m
 - at max.operating temperature 75°C = 17.29 m
- Overhead ground wire 3/8" High Strength galv.steel.
 - Sag at 27°C+W (64kg/m²) = 13.00 m
 - at 6°C = 10.85 m
 - at everyday temperature 27°C = 11.46 m
 - at max.operating temperature 40°C = 11.83 m

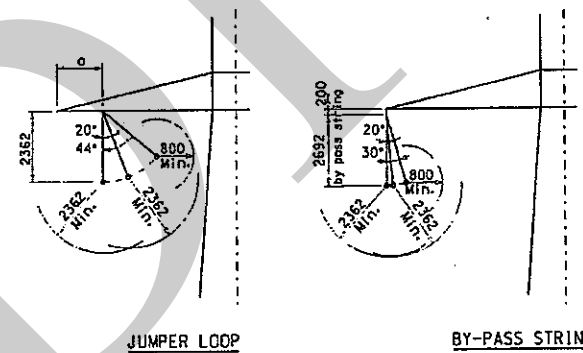
2. Tower design shall provide at least the following electrical clearances.

- Insulator swinging angle Min. clearance- m
- 0° to 20° (double) 0° to 24° (single) 2.362
 - 20° to 58° (double) 24° to 64° (single) 0.80

3. Overhead ground wire shall provide 5' protective zone.



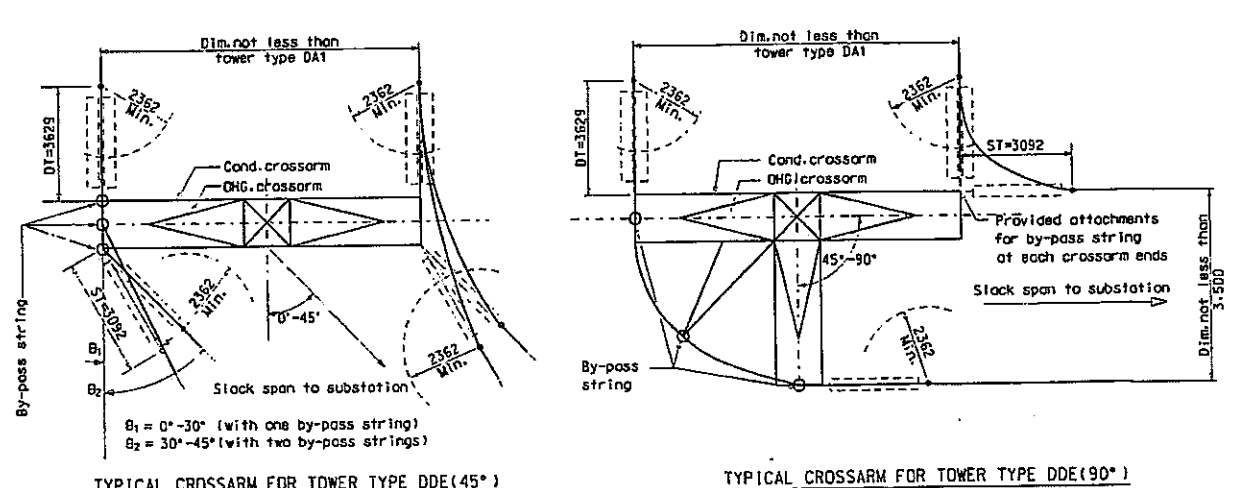
SUSPENSION STRING FOR TOWER TYPE DA1 & LDA1



JUMPER LOOP

BY-PASS STRING

Tower type	Min. dim.
DB2	482
DC2	556
DD2	556
DE2	556



TYPICAL CROSSARM FOR TOWER TYPE DDE(45°)

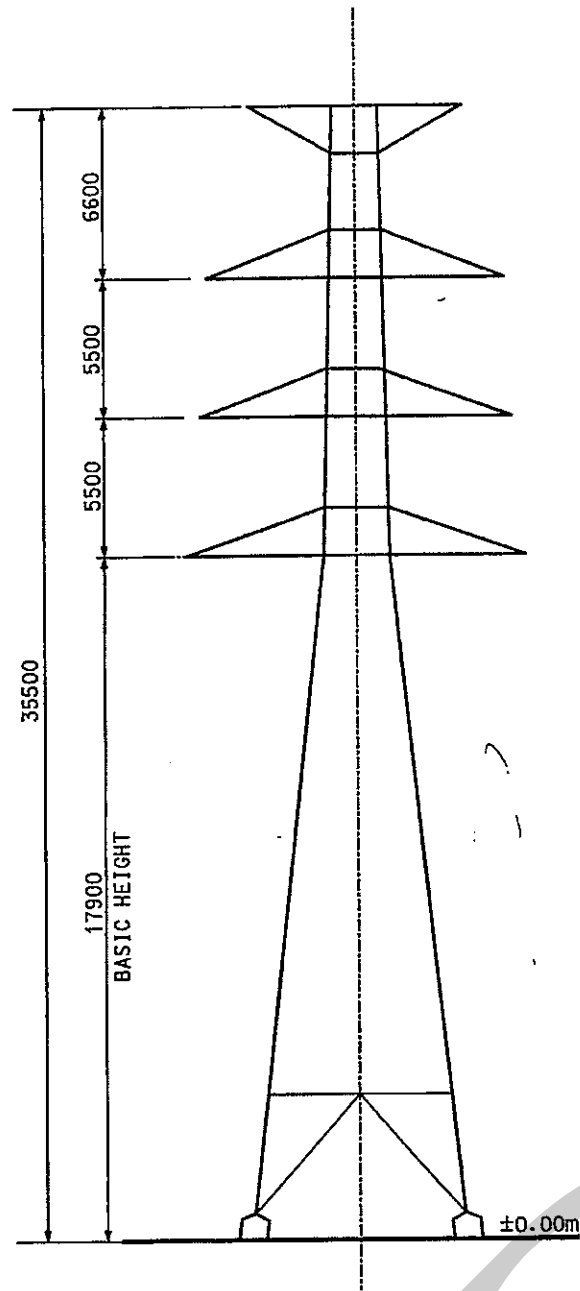
TYPICAL CROSSARM FOR TOWER TYPE DDE(90°)



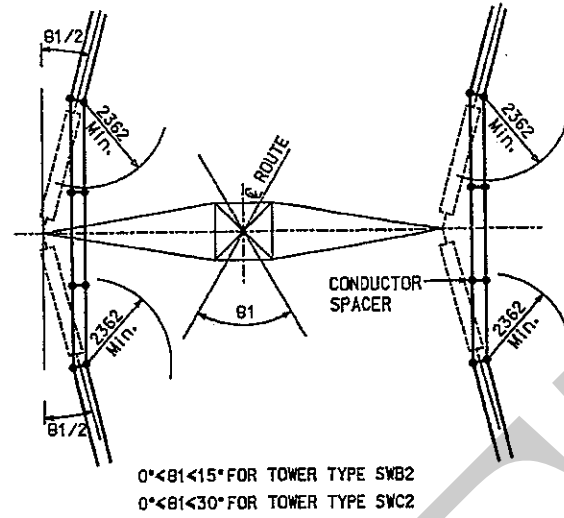
ELECTRICITY GENERATING AUTHORITY OF THAILAND

DRAWN V. PHUCHONG	VALIDATED	230 kV TRANSMISSION LINE
DESIGNED	RECOMMENDED	PARTICULARS OF 230 kV SINGLE CONDUCTOR/DOUBLE CIRCUIT TOWER TYPES AND ELECTRICAL CLEARANCE DIAGRAM
VERIFIED	CHECKED	JOB NO. REPLACING DWG. NO. DWG. NO. E05-006
APPROVED	DATE	REV.

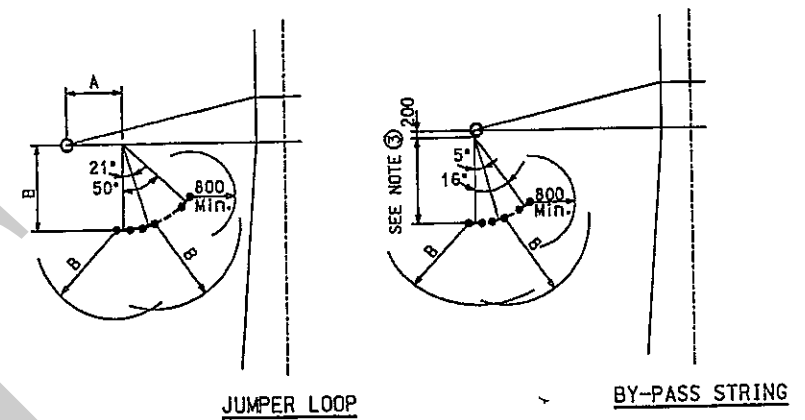
REV. NO.	JOB NO.	JOB DESCRIPTION	DRAWN	DESIGNED	VERIFIED	VALIDATED	RECOMMENDED	CONCURRED	APPROVED	DATE



TOWER TYPE SWB2, SWC2, SWD2, SWDE (45°)

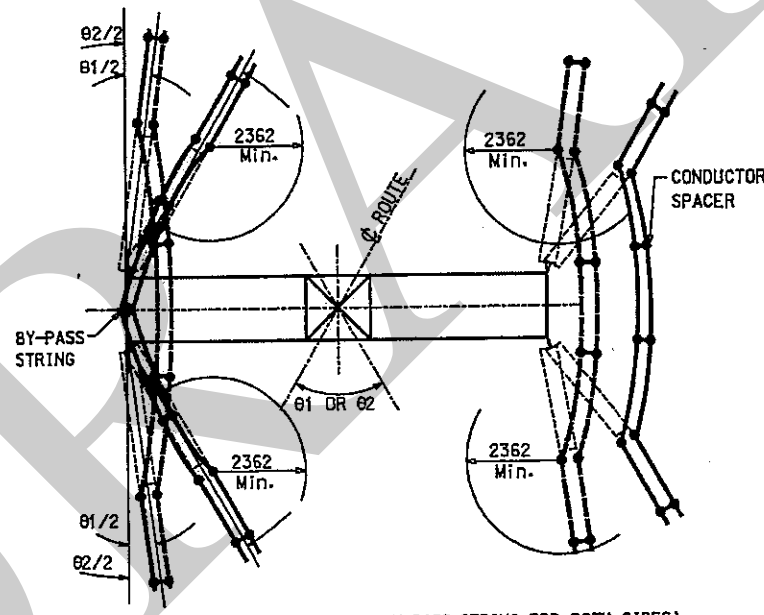


TYPICAL CROSSARM FOR TOWER TYPE SWB2 & SWC2

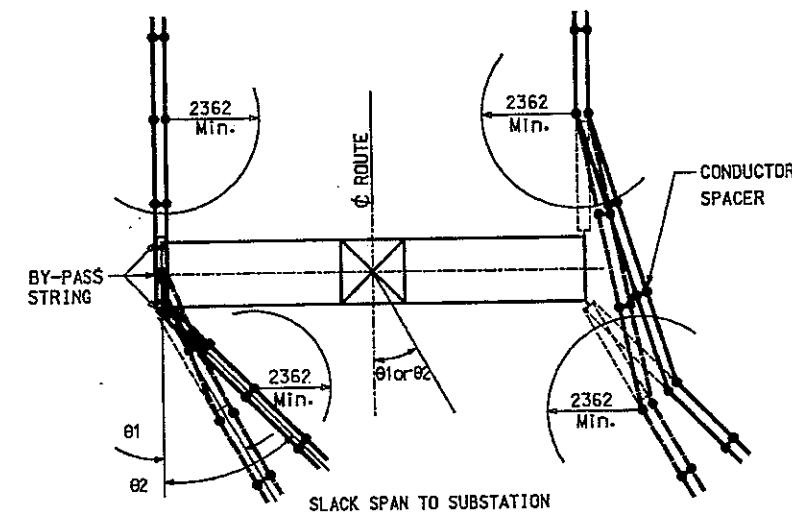


TOWER TYPE	A (mm)
SWB2	510
SWC2	1010
SWD2	1010

INSULATION LEVEL	B (mm)
LOW	2083
HIGH	2235



TYPICAL CROSSARM FOR TOWER TYPE SWD2



TYPICAL CROSSARM FOR TOWER TYPE SWDE (45°)

NOTES

- CLEARANCE DIMENSIONS ARE MINIMUM FROM SURFACE OF STEEL (NOT FROM MEMBER GAGE OR WORKING LINES) TO THE NEAREST POINT ON THE CONDUCTOR OR HARDWARE.
- ALL DIMENSIONS ARE IN MILLIMETER EXCEPT AS NOTED.
- STRING LENGTH OF TENSION STRING AND BYPASS STRING ARE SHOWN IN DWG. NO. E05-012: ELECTRICAL AND GROUND CLEARANCES FOR TOWER TYPE "SWA1"
- CONDUCTOR DATA : 1272 MCM AC3R/GA TWIN BUNDLES.
- OHG WIRE DATA : 3/8" HS. AND COMPOSITE OVERHEAD GROUND WIRE WITH OPTICAL FIBER (OPGW).
- PARTICULAR OF CONDUCTOR AND OHG WIRE ARE SHOWN IN DRAWING NO. E05-012
- RULING SPAN 300 m.

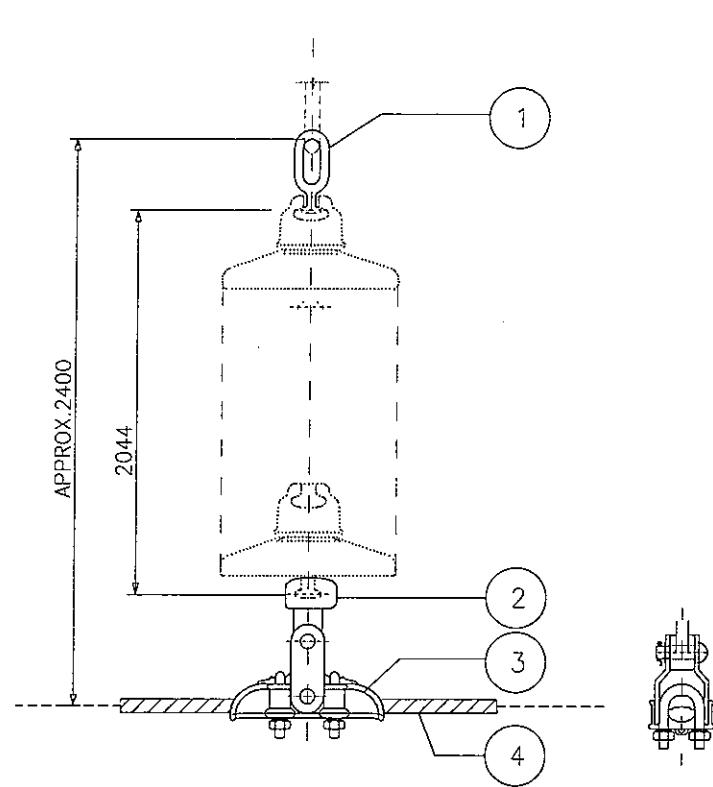


ELECTRICITY GENERATING AUTHORITY OF THAILAND

DESIGNED	J. ANUCHA	VALIDATED		230 KV TRANSMISSION LINE
DESIGNED	Chaiwat.P	RECOMMENDED		ELECTRICAL AND GROUND CLEARANCE FOR TOWER TYPE SWB2, SWC2, SWD2 AND SWDE (45°)
VERIFIED	P. Pithak	CHECKED		
APPROVED				JOB NO. E05-013

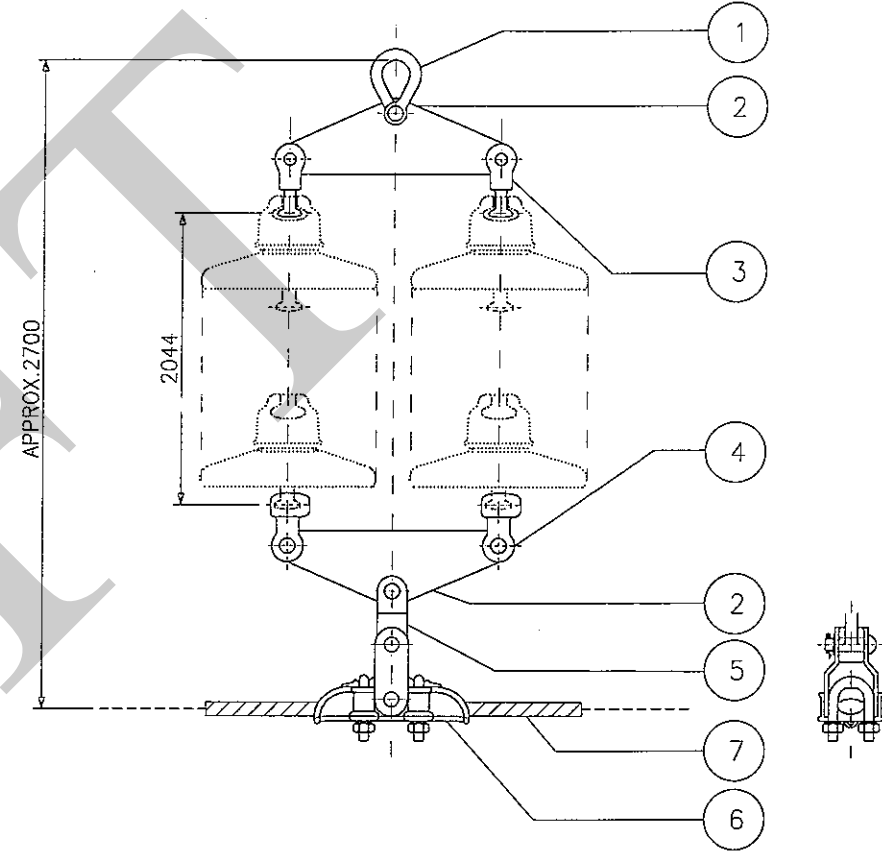
REV. NO.	JOB NO.	JOB DESCRIPTION	DRAWN	DESIGNED	VERIFIED	VALIDATED	RECOMMENDED	CHECKED	APPROVED	DATE
1		ADD NOTE FOR CONDUCTOR AND OHG WIRE. CHANGE ELECTRICAL CLEARANCE FOR TOWER TYPE SWB2, SWC2, SWD2, SWDE (45°)								

SINGLE CONDUCTOR



SINGLE SUSPENSION AND BY PASS
WITHOUT ARCING HORN

LEGEND	QTY. per SET	DESCRIPTION
1	1	Oval ball eye
2	1	Socket eye
3	1	Suspension clamp for HTLS conductor
4	1 set	Preformed armor rod



DOUBLE SUSPENSION
WITHOUT ARCING HORN

LEGEND	QTY. per SET	DESCRIPTION
1	1	Twisted shackle or shackle
2	2	Yoke plate
3	2	Ball clevis
4	2	Socket clevis
5	1	Straight clevis eye
6	1	Suspension clamp for HTLS conductor
7	1 set	Preformed armor rod

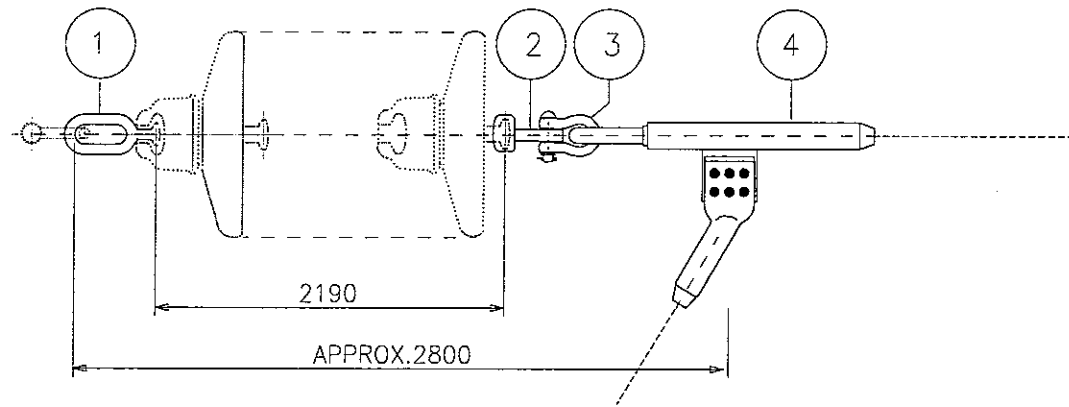


DO NOT AMEND MANUALLY
Filename: E11-178

REV. NO.	JOB NO.	JOB DESCRIPTION	REV. NO.	JOB NO.	JOB DESCRIPTION	REV. NO.	JOB NO.	JOB DESCRIPTION	REV. NO.	JOB NO.	JOB DESCRIPTION	REV. NO.	JOB NO.	JOB DESCRIPTION

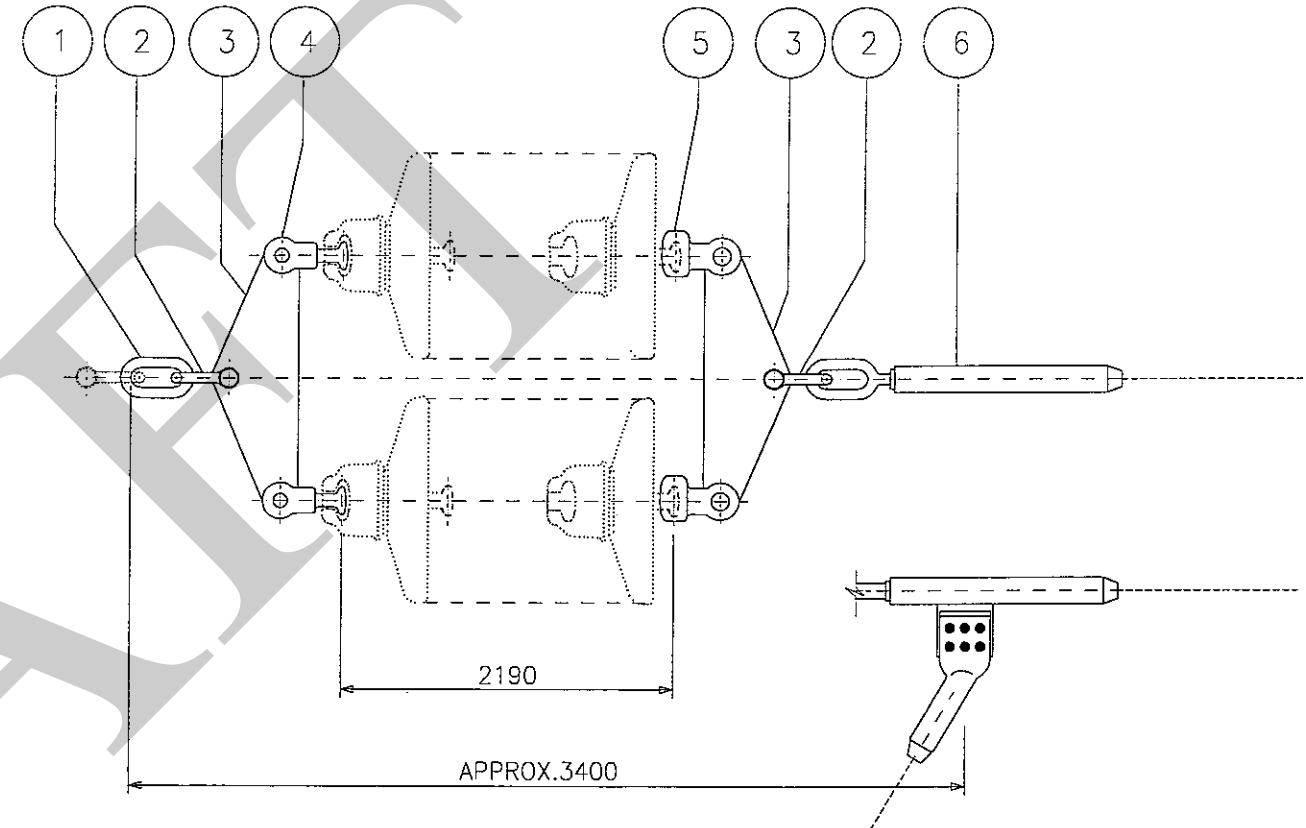
ELECTRICITY GENERATING AUTHORITY OF THAILAND											
DRAWN: WARHON						VALIDATED: <i>[Signature]</i> CHIEF, TRANSMISSION LINE ENGINEERING DIVISION					
DESIGNED: <i>J. Avornrat</i>						RECOMMENDED: <i>[Signature]</i> ASST. DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION-2					
VERIFIED: <i>[Signature]</i>						CONCURRED: <i>[Signature]</i> DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION					
APPROVED: <i>[Signature]</i>						APPROVED: <i>[Signature]</i>					
DATE: 30 June 2011						DATE: 30 June 2011					
JOB NO. GBA3-08-L06				REPLACING DWG. NO.				DWG. NO. E11-178			
GBA3-08-L07				-				-			

SINGLE CONDUCTOR



SINGLE TENSION
WITHOUT ARCING HORN

LEGEND	QTY. per SET	DESCRIPTION
1	1	Oval ball eye
2	1	Socket eye
3	1	Shackle
4	1	Compression deadend clamp with jumper pad



DOUBLE TENSION
WITHOUT ARCING HORN

LEGEND	QTY. per SET	DESCRIPTION
1	1	Oval link
2	2	Shackle
3	2	Yoke plate
4	2	Ball clevis
5	2	Socket clevis
6	1	Compression deadend clamp with jumper pad



DO NOT AMEND MANUALLY

REV. NO.	JOB NO.	JOB DESCRIPTION	DRAWN	DESIGNED	VERIFIED	VALIDATED	RECOMMENDED	CONCURRED	APPROVED	DATE

ELECTRICITY GENERATING AUTHORITY OF THAILAND

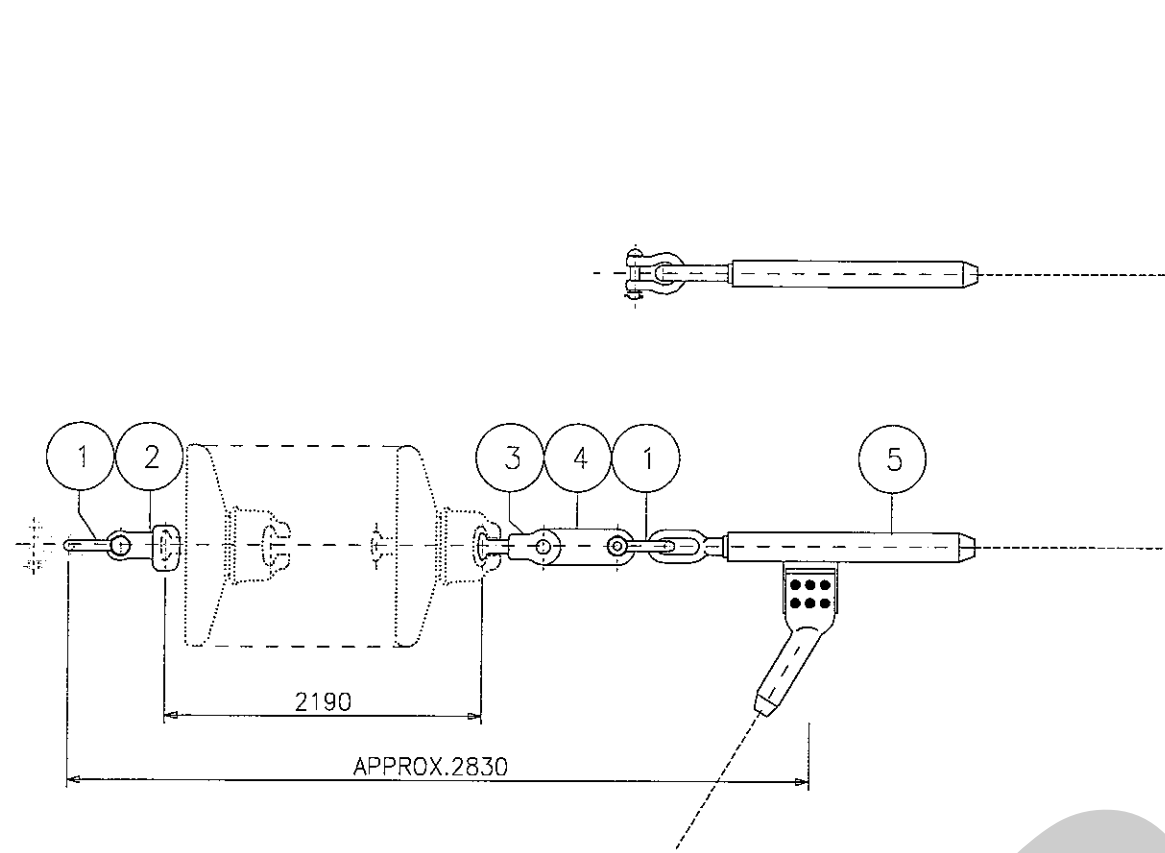
DRAWN W.ARNON	VALIDATED <i>S. Anant</i>
DESIGNED <i>S. Anant</i>	RECOMMENDED CHIEF, TRANSMISSION SYSTEM ENGINEERING DIVISION
VERIFIED <i>A. Anant</i>	CONCURRED ASSISTANT DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION
APPROVED	DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION

HARDWARE ASSEMBLIES SINGLE AND DOUBLE TENSION
FOR SINGLE HTLS CONDUCTOR

JOB NO. GBA3-08-L06 GBA3-08-L07	REPLACING DWG. NO.	DWG. NO. E11-179	REV. -
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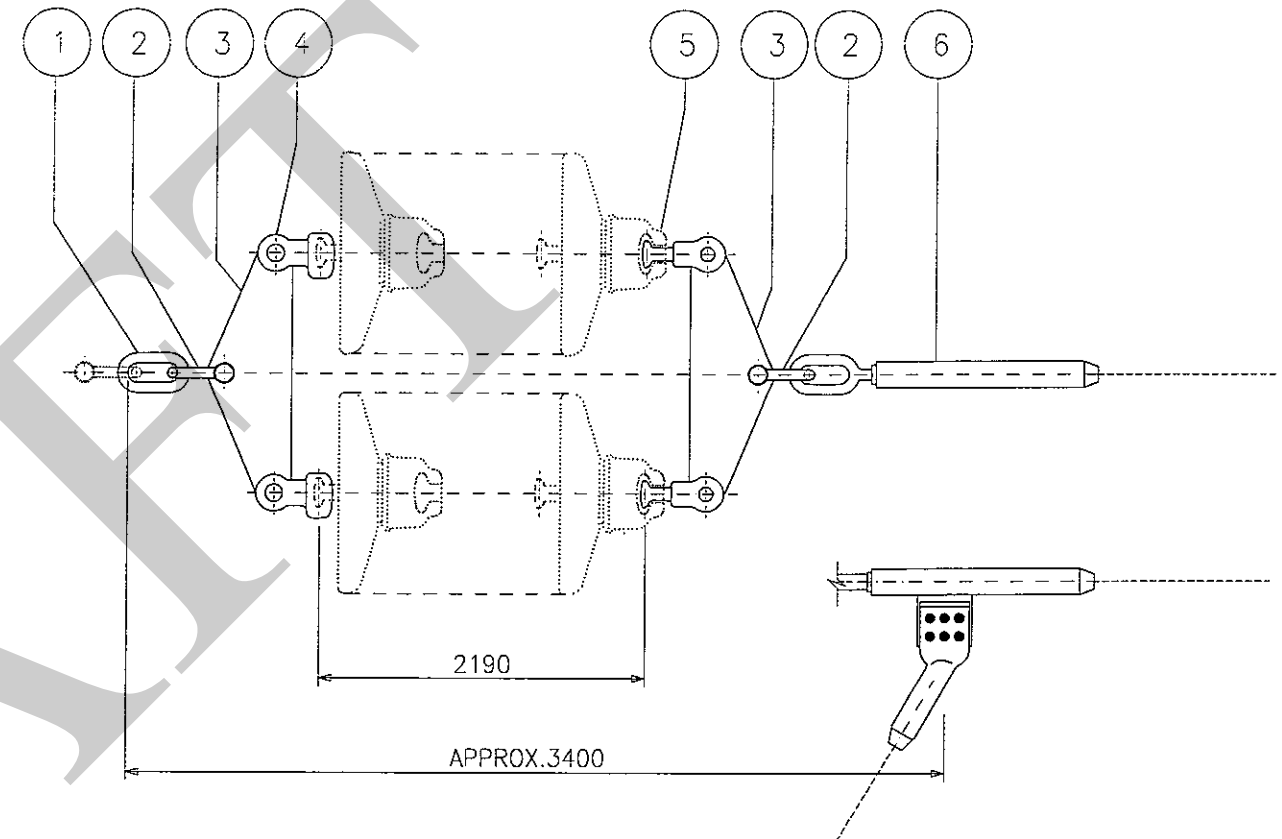
DATE 29/04/22

SINGLE CONDUCTOR



SINGLE INVERTED TENSION
WITHOUT ARCING HORN

LEGEND	QTY. per SET	DESCRIPTION
1	2	Shackle
2	1	Socket eye
3	1	Ball clevis
4	1	Plate link
5	1	Compression deadend clamp with jumper pad



DOUBLE INVERTED TENSION
WITHOUT ARCING HORN

LEGEND	QTY. per SET	DESCRIPTION
1	1	Oval link
2	2	Shackle
3	2	Yoke plate
4	2	Socket clevis
5	2	Ball clevis
6	1	Compression deadend clamp with jumper pad



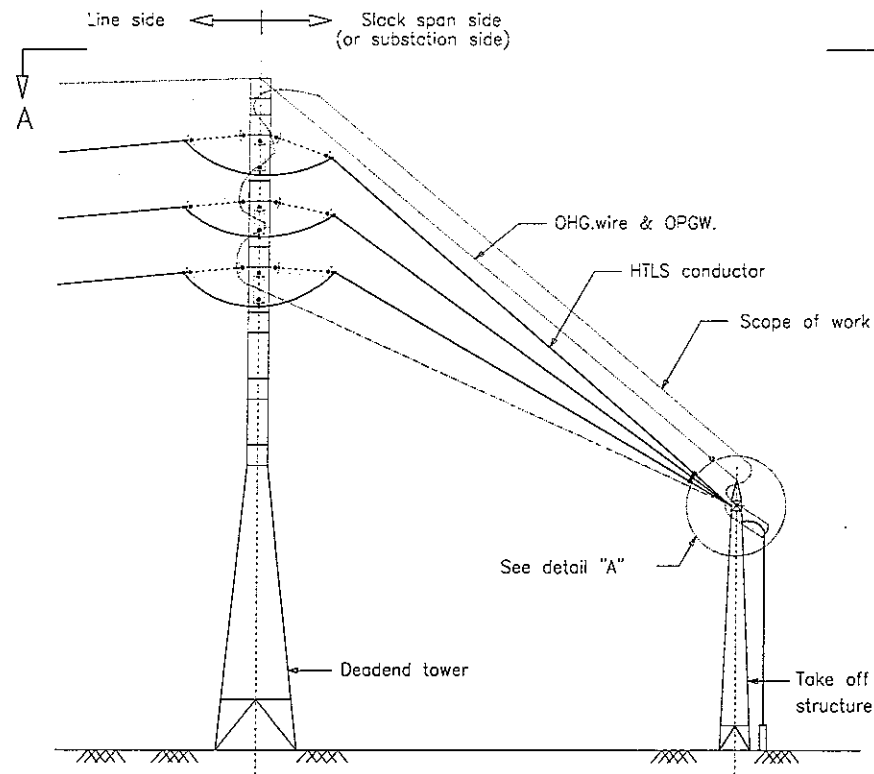
DO NOT AMEND MANUALLY

REV. NO.	JOB NO.	JOB DESCRIPTION	DRAWN	DESIGNED	VERIFIED	VALIDATED	RECOMMENDED	CONCURRED	APPROVED	DATE

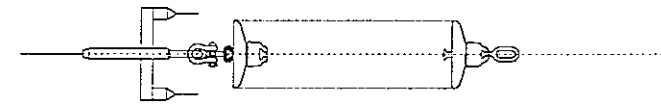
ELECTRICITY GENERATING AUTHORITY OF THAILAND

DRAWN	WARNON	VALIDATED	<i>Sivanon</i>
DESIGNED	<i>J. Amant</i>	RECOMMENDED	<i>Sivanon</i>
VERIFIED	<i>Atanand</i>	CONCURRED	<i>Sivanon</i>
APPROVED			

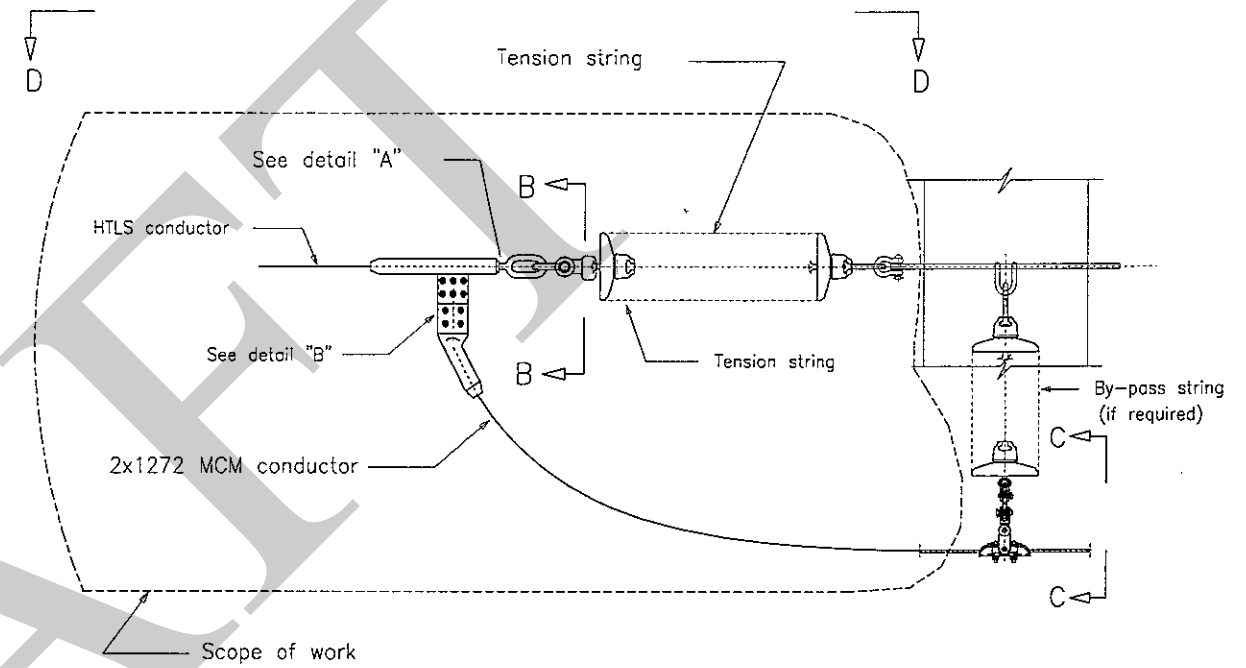
HARDWARE ASSEMBLIES SINGLE AND DOUBLE INVERTED TENSION FOR SINGLE HTLS CONDUCTOR	
JOB NO. GBA3-08-L06 GBA3-08-L07	REPLACING DWG. NO. DWG. NO. E11-180
DATE: 24/02/22	REV. - -



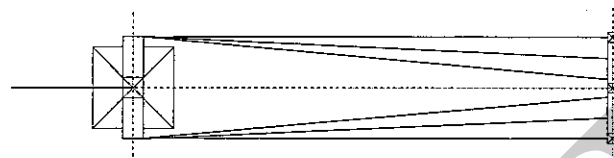
INSTALLATION OF HTLS CONDUCTORS
ON SLACK SPAN AT BANG BO POWER COMPANY LIMITED SUBSTATION AND KHLONG MAI SUB



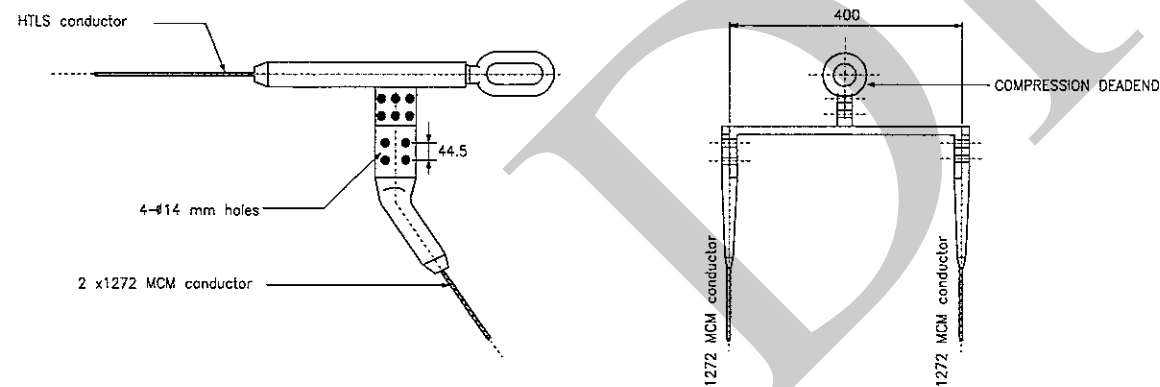
VIEW D-D



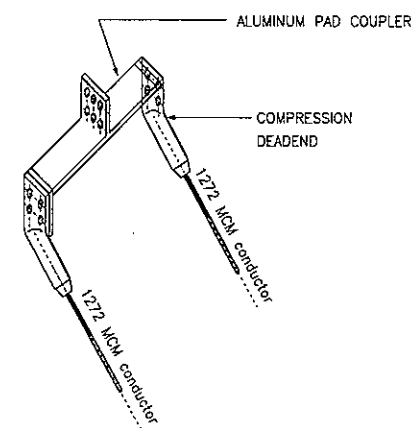
DETAIL "A"



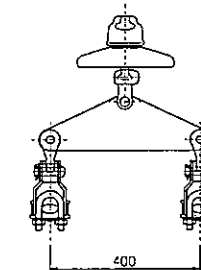
VIEW A-A



VIEW B-B



DETAIL "B"



VIEW C-C

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETER.
2. JOINTED EQUIPMENT IN DETAIL "B" SHALL BE CAPABLE OF CURRENT CARRYING CAPACITY NOT LESS THAN 1.7 TIMES OF 1272 MCM ACSR/GA CONDUCTOR.



DO NOT AMEND MANUALLY

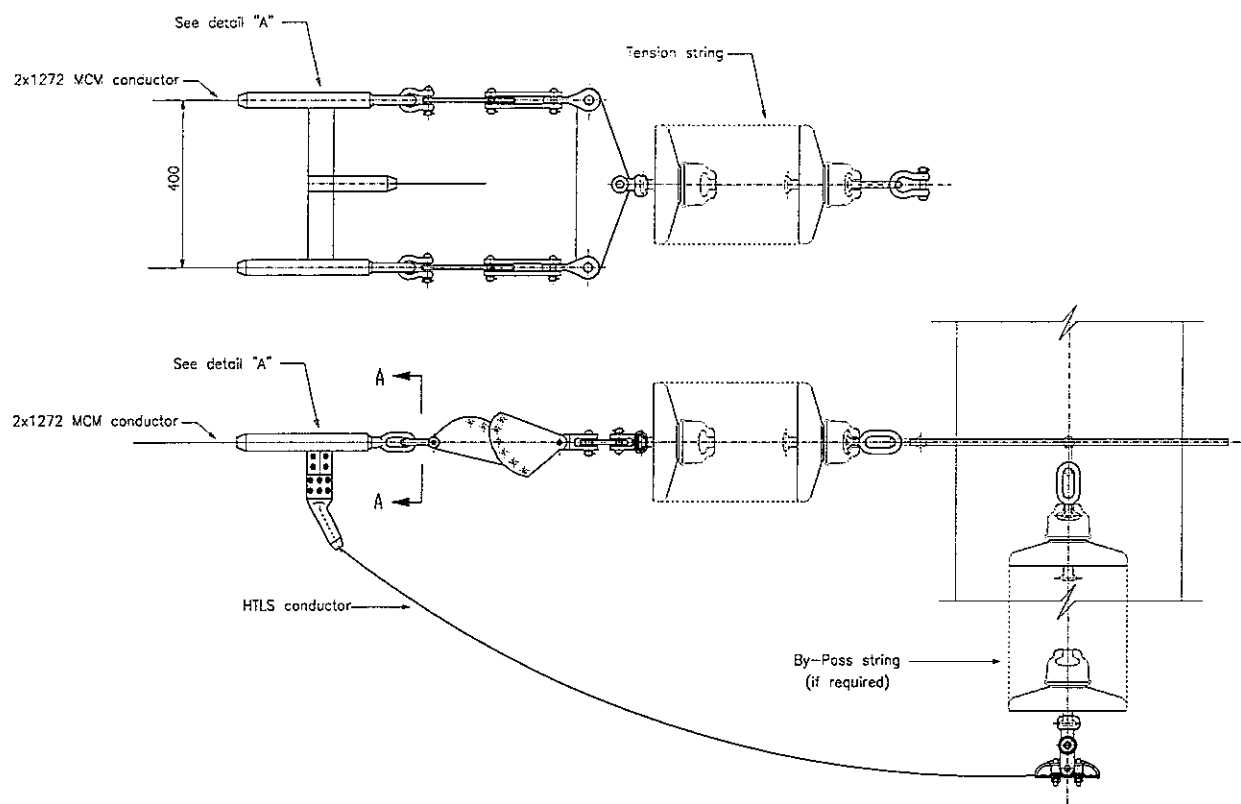
Filename: E11-181

ELECTRICITY GENERATING AUTHORITY OF THAILAND

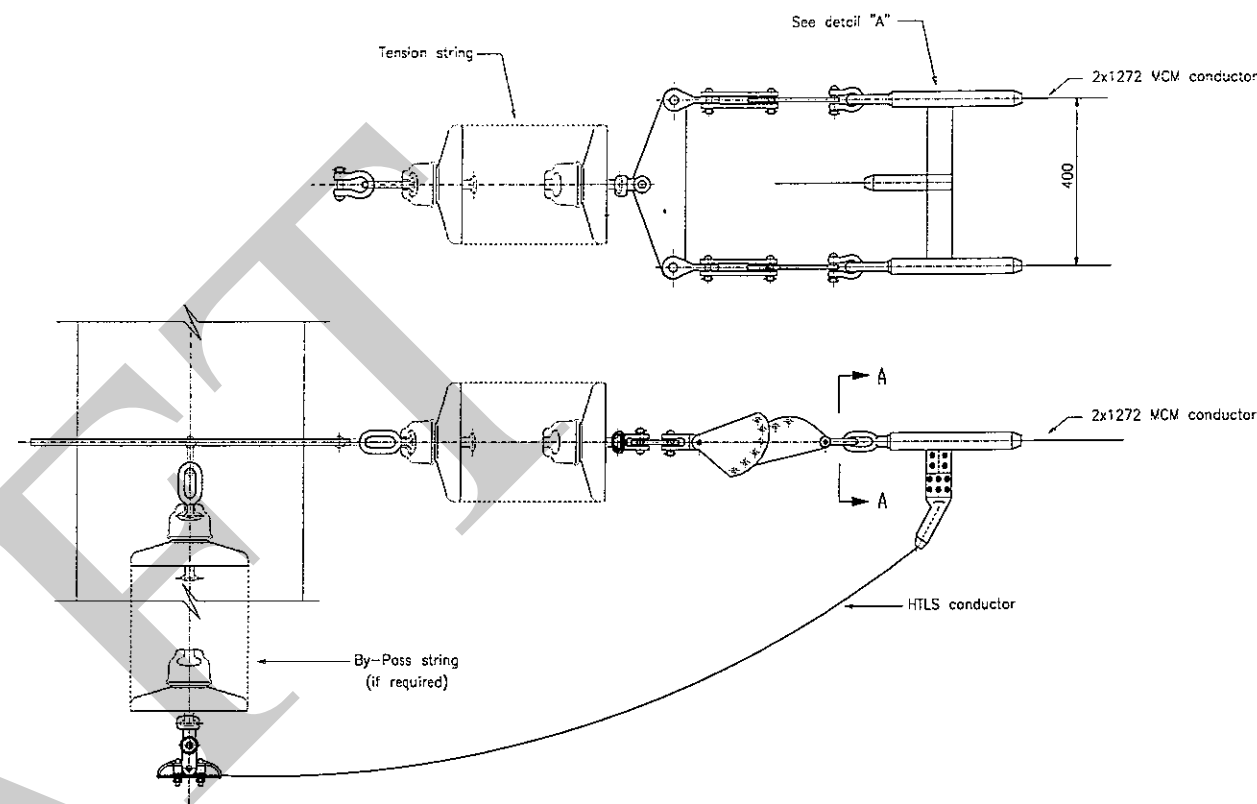
DRAWN	WARINON	VALIDATED	<i>Sirirak</i>
DESIGNED	<i>S. Anant</i>	RECOMMENDED	<i>Sirirak</i>
VERIFIED	<i>Manuchit</i>	CONCURRED	<i>Sirirak</i>
APPROVED			

MODIFICATION OF 230 KV TRANSMISSION LINE BANG PAKONG - KHLONG DAN CCT.3 TO EPEC POWER PLANT BANG PAKONG - KHLONG DAN CCT.4 TO KHLONG MAI	
INSTALLATION OF HTLS CONDUCTOR AT TAKE OFF STRUCTURE	
JOB NO. GBA3-08-L06 GBA3-08-L07	REPLACING DWG.NO. DWG.NO. E11-181

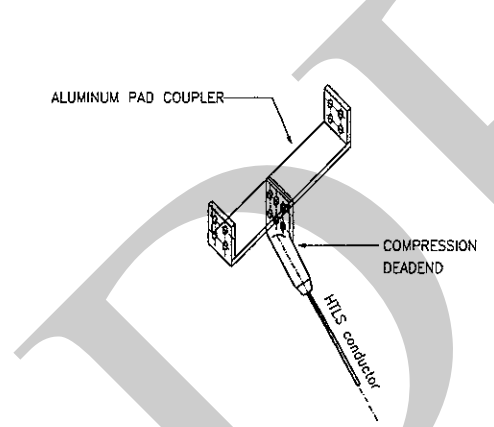
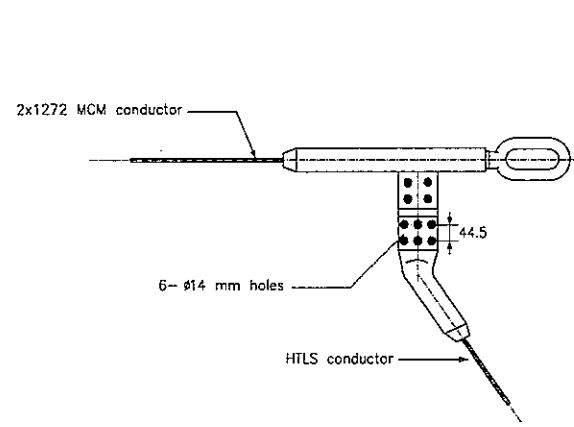
REV.NO.	JOB NO.	JOB DESCRIPTION	DRAWN	DESIGNED	VERIFIED	VALIDATED	RECOMMENDED	CONCURRED	APPROVED	DATE



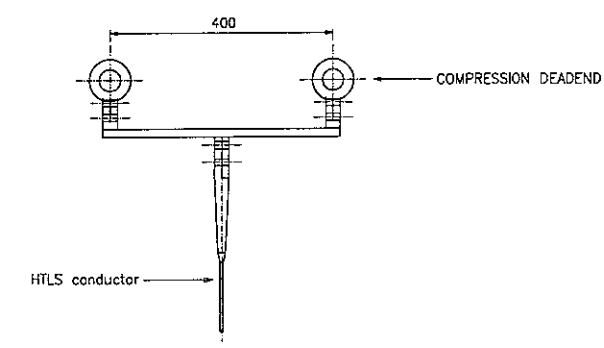
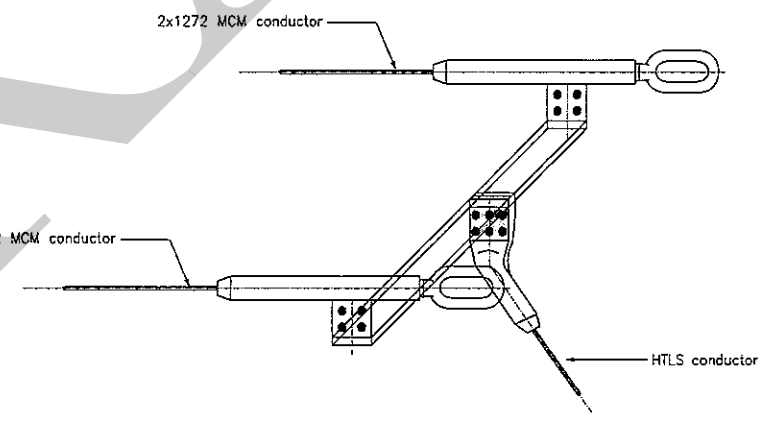
INSTALLATION OF CONDUCTOR
 (2x1272 MCM CONDUCTOR TO HTLS CONDUCTOR)
 FOR TOWER NO.10/3 AND 10/4



INSTALLATION OF CONDUCTOR
 (HTLS CONDUCTOR CONDUCTOR TO 2x1272 MCM)
 FOR TOWER NO.10/3 AND 10/4



DETAIL "A"



VIEW A-A

- NOTES :
1. ALL DIMENSIONS ARE IN MILLIMETER.
 2. ALL HARDWARE FITTINGS SHALL BE SUITABLE FOR 2x1272 MCM ACSR/GA CONDUCTOR AND HTLS CONDUCTOR.
 3. JOINTED EQUIPMENT IN DETAIL "A" SHALL BE CAPABLE OF CURRENT CARRYING CAPACITY NOT LESS THEN 1.7 TIME OF 1272 MCM ACSR/GA CONDUCTOR.



ELECTRICITY GENERATING AUTHORITY OF THAILAND

DRAWN	WARINON	VALIDATED	<i>[Signature]</i>
DESIGNED	J. Anant	RECOMMENDED	CHIEF, TRANSMISSION ENGINEERING DIVISION
VERIFIED		CONCURRED	ASST. DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION
APPROVED			DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION

SECTIONALIZING OF 230 KV	
INSTALLATION OF CONDUCTOR ON TOWER NO.10/3&10/4	
JOB NO. GBA3-08-L06 GBA3-08-L07	REPLACING DWG. NO. E11-182
DATE 24/06/22	

REV. NO.	JOB NO.	JOB DESCRIPTION	DRAWN	DESIGNED	VERIFIED	VALIDATED	RECOMMENDED	CONCURRED	APPROVED	DATE