

Public Relations Information and Channels for Submitting
Suggestions or Complaints Regarding the Promotion of Integrity
and Transparency in Operations



Channels for Submitting Suggestions or Complaints *



Submission of Suggestions or Complaints via the EGAT Official
Website *



EGAT Supplier Code of Conduct **

* This is not a channel for submitting comments on the draft Terms of Reference (TOR), draft technical specifications for procurement, draft announcements, or draft bidding documents.

** EGAT has established and published the Supplier Code of Conduct to provide all EGAT suppliers with guidelines for conducting business ethically and with good governance, taking into account environmental, social, and corporate governance (ESG) principles, legal compliance, and respect for human rights, as detailed in the EGAT Supplier Code of Conduct QR Code.

ข้อมูลประชาสัมพันธ์และช่องทางรับข้อคิดเห็นหรือข้อร้องเรียน
ด้านการส่งเสริมคุณธรรมและความโปร่งใสในการดำเนินการ



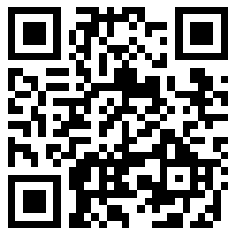
นโยบายต่อต้านการให้หรือรับสินบนเพื่อป้องกันการทุจริต
และประพฤติมิชอบ



จรรยาบรรณของผู้ปฏิบัติงานจัดซื้อจัดจ้างและบริหารพัสดุ



ช่องทางรับข้อคิดเห็นหรือข้อร้องเรียน *



การแจ้งข้อคิดเห็นหรือข้อร้องเรียนทางเว็บไซต์ กฟผ. *



จรรยาบรรณคู่ค้า กฟผ. **

* ไม่ใช่ช่องทางแสดงความคิดเห็นร่างขอบเขตของงานหรือรายละเอียดคุณลักษณะเฉพาะของพัสดุที่จะซื้อหรือจ้าง/ ร่างประกาศ/ ร่างเอกสารประกวดราคาฯ

** กฟผ. จัดทำและเผยแพร่จรรยาบรรณคู่ค้า เพื่อให้คู่ค้าของ กฟผ. ทุกฝ่ายมีแนวปฏิบัติในการดำเนินธุรกิจอย่างมีจริยธรรมและธรรมาภิบาล โดยคำนึงถึงสิ่งแวดล้อม สังคม การกำกับดูแลกิจการที่ดี ปฏิบัติตามกฎหมาย และเคารพหลักสิทธิมนุษยชน ดังมีรายละเอียดระบุใน QR Code จรรยาบรรณคู่ค้า กฟผ."

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. NPUP-TOWER-01
Supply of Transmission Line Steel Tower
Transmission System Development in the Area of Nan Phrae and Uttaradit provinces
for Power Purchase from Lao PDR Projects**

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 supplies or manufactures the equipment 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, Procurement Department - Transmission System Segment, Central Procurement and Inventory Management Division”.

Comments shall be submitted via email address: **598265@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 **August 17, 2026**, 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.

Kanchanok Phooousaha

Miss Kanchanok Phooousaha

Head, Procurement Section - Transmission System Segment 2

August 7, 2026

Notice to Bidder

Subject : Online Payment for Purchase of Bidding Documents

Please be informed of the online payment for purchase of bidding documents as follows:

- 1) Fill-out the Registration Form and the proof of payment in the link provided in <https://www4.egat.co.th/fprocurement/biddingeng>

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) The registration will be deemed complete only upon successful processing of the payment and confirmation of funds received.
- 3) 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.



Invitation to Bid No. NPUP-TOWER-01
Supply of Transmission Line Steel Tower
Transmission System Development in the Area of Nan Phrae and Uttaradit Provinces for
Power Purchase from Lao PDR Projects

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 : Ex-works

Medium Cost (including Value Added Tax) : THB 142,700,000.-

Eligibility of Bidders

1. The Bidder shall be a local manufacturer or provide such locally manufactured materials and/or equipment 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 are available for online purchase during 8:00 hrs. to 15:00 hrs., Bangkok Standard Time, as from _____ to _____ at THB 3,000.- per copy, non-refundable.

Please find more details for online purchasing process at <http://www4.egat.co.th/fprocurement/biddingeng> or contact for further information at telephone no. 0 2436 3347 or procurement.tse@egat.co.th.

Delivery of Bids

Bids shall be submitted at Bidding Room, 1st Floor, Tor 137 Building at EGAT's Head Office, Nonthaburi during 9:00 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 Wallapa Chewadhnakorkul)
Chief, Procurement Department – Transmission System Segment



ประกาศการไฟฟ้าฝ่ายผลิตแห่งประเทศไทย เรื่อง ประกวดราคาซื้อ เลขที่ NPUP-TOWER-01

การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย (กฟผ.) มีความประสงค์จะซื้อ Transmission Line Steel Tower สำหรับโครงการพัฒนาระบบส่งไฟฟ้าบริเวณจังหวัด น่าน แพร่ และ อุดรดิตถ์ เพื่อรับซื้อไฟฟ้าจากโครงการใน สปป.ลาว โดยใช้ประมาณ กฟผ.

สถานที่ส่งมอบ : หน้าโรงงานผู้ผลิต

ราคากลาง (รวมภาษีมูลค่าเพิ่ม) : 142,700,000.- บาท

คุณสมบัติของผู้เสนอราคา

1. ต้องเป็นนิติบุคคลผู้ผลิตพัสดุ หรือผู้มีอาชีพขายพัสดุที่ผลิตในประเทศไทยตามประกาศ และต้องไม่เป็นผู้ทำงานซึ่งปลัดกระทรวงการคลังได้แจ้งเวียนชื่อไว้ 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 ตั้งแต่การเสนอราคาจนสิ้นสุดข้อผูกพันกับ กฟผ.

การขายเอกสารประกวดราคา

ผู้สนใจติดต่อซื้อเอกสารประกวดราคา ในราคาชุดละ 3,000.- บาท ในวันทำการระหว่างเวลา 08:00 น. ถึง 15:00 น. ตั้งแต่วันที่ _____ ถึงวันที่ _____ ทั้งนี้ สามารถดูรายละเอียดการซื้อเอกสารประกวดราคาได้ที่เว็บไซต์ <http://www4.egat.co.th/fprocurement/biddingeng> หรือสอบถามข้อมูลเพิ่มเติมได้ทางโทรศัพท์ หมายเลข 0 2436 3347 หรืออีเมล procurement.tse@egat.co.th

การยื่นซองประกวดราคา

กำหนดยื่นซองประกวดราคา ในวันที่ _____ เวลา 09:00 น. ถึง 10:00 น. และเปิดซองประกวดราคาเวลา 10:00 น. ณ ห้องประกวดราคา ชั้น 1 อาคาร ท.137 การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย เซิงสะพานพระราม 7 จังหวัดนนทบุรี

ประกาศ ณ วันที่ _____

(นางสาววัลลภา ชีวธนากรณกุล)
หัวหน้ากองจัดซื้อจัดจ้างสายงานระบบส่ง

ตารางแสดงวงเงินงบประมาณที่ได้รับจัดสรรและราคากลาง(ราคาอ้างอิง)
ในการจัดซื้อจัดจ้างที่มีใช้งานก่อสร้าง

- 1 ชื่อโครงการ Bid No. NPUP-TOWER-01
การจัดซื้อ Transmission Line Steel Tower
โครงการพัฒนาระบบส่งไฟฟ้าบริเวณจังหวัด น่าน แพร่ และ อุตรดิตถ์ เพื่อรับซื้อไฟฟ้าจาก
โครงการใน สปป.ลาว
/หน่วยงานเจ้าของโครงการ ฝ่ายแผนงานและโครงการระบบส่ง การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย
2. วงเงินงบประมาณที่ได้รับจัดสรร
โครงการพัฒนาระบบส่งไฟฟ้าบริเวณจังหวัด น่าน แพร่ และ อุตรดิตถ์ เพื่อรับซื้อไฟฟ้าจาก
โครงการใน สปป.ลาว งบประมาณ 26,220 ล้านบาท
3. วันที่กำหนดราคากลาง 31 กรกฎาคม 2569 (วันที่ อวส. อนุมัติ)
ราคารวมภาษีมูลค่าเพิ่มเป็นเงิน 142,700,000.00 บาท ราคา/หน่วย ตามเอกสารแนบ
4. แหล่งที่มาของราคากลาง
หลักเกณฑ์การกำหนดราคากลางการจัดซื้อและจัดจ้างงานก่อสร้างระบบส่งไฟฟ้าของสายงานพัฒนาระบบส่ง
5. รายชื่อเจ้าหน้าที่ผู้กำหนดราคากลาง
 - 5.1 นายฐิติพงษ์ จินดากุล กวสส-ร.
 - 5.2 นางสาวสิรินยา ตันสัจจา หปส-ส. กวสส-ร.
 - 5.3 นายทรงธรรม ประมวทรตระกูล วศ.8 หปส-ร. กวสส-ร.

DETAILS OF THE MEDIUM COST FOR BID NO. NPUP-TOWER-01**Schedule 1: SUPPLY OF STUB ANGLE FOR SUSPENSION TOWER**

Item No.	Description	Amount (including VAT) (THB)
1-1	Stub angle DQV3	515,740.00
1-2	Stub angle DQV9	408,312.00
Total Bid Price Schedule 1 (including VAT)		924,052.00

Schedule 2: SUPPLY OF STUB ANGLE FOR TENSION TOWER

Item No.	Description	Amount (including VAT) (THB)
2-1	Stub angle DQT20	705,344.00
2-2	Stub angle DQT40	137,816.00
2-3	Stub angle DQT60	355,668.00
2-4	Stub angle DQT90	711,336.00
2-5	Stub angle DQTR	115,560.00
Total Bid Price Schedule 2 (including VAT)		2,025,724.00

Schedule 3: SUPPLY OF STUB ANGLE FOR TENSION TOWER

Item No.	Description	Amount (including VAT) (THB)
3-1	Stub angle DQT40	137,816.00
3-2	Stub angle DQT60	355,668.00
Total Bid Price Schedule 3 (including VAT)		493,484.00

Schedule 4: SUPPLY OF SUSPENSION TOWER

Item No.	Description	Amount (including VAT) (THB)
4-1	Tower Type DQV3	25,161,692.00
4-2	Tower Type DQV9	20,442,136.00
Total Bid Price Schedule 4 (including VAT)		45,603,828.00

Schedule 5: SUPPLY OF TENSION TOWER

Item No.	Description	Amount (including VAT) (THB)
5-1	Tower Type DQT20	33,510,260.00
5-2	Tower Type DQT40	4,370,522.00
5-3	Tower Type DQT60	10,860,393.00
5-4	Tower Type DQT90	20,439,354.00
5-5	Tower Type DQTR	8,851,682.00
Total Bid Price Schedule 5 (including VAT)		78,032,211.00

Schedule 6: SUPPLY OF STUB ANGLE FOR TENSION TOWER

Item No.	Description	Amount (including VAT) (THB)
6-1	Tower Type DQT40	4,509,943.00
6-2	Tower Type DQT60	11,094,830.00
Total Bid Price Schedule 6 (including VAT)		15,604,773.00

Total Bid Price (including VAT)		142,684,072.00
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MEDIUM COST OF BID NO. NPUP-TOWER-01		142,700,000.00
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นายสมชัย เจริญศรีเกษม
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง

31 Jul 2026

Contract No.

Invitation to Bid No. NPUP-TOWER-01

ELECTRICITY GENERATING AUTHORITY OF THAILAND



BIDDING DOCUMENTS

**SUPPLY OF TRANSMISSION LINE STEEL TOWER
TRANSMISSION SYSTEM DEVELOPMENT IN THE AREA OF
NAN PHRAE AND UTTARADIT PROVINCES
FOR POWER PURCHASE FROM LAO PDR PROJECTS**

EGAT'S FUND

BIDDER : _____

(2026)

INVITATION TO BID NO. NPUP-TOWER-01
SUPPLY OF TRANSMISSION LINE STEEL TOWER
TRANSMISSION SYSTEM DEVELOPMENT IN THE AREA OF NAN PHRAE
AND UTTARADIT PROVINCES FOR POWER PURCHASE
FROM LAO PDR PROJECTS
EGAT'S FUND

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CONFIRMATION FORM

(INDIVIDUAL COMPANY / JOINT VENTURE)

INVITATION TO BID NO. NPUP-TOWER-01

SUPPLY OF TRANSMISSION LINE STEEL TOWER

**TRANSMISSION SYSTEM DEVELOPMENT IN THE AREA OF NAN PHRAE
AND UTTARADIT PROVINCES
FOR POWER PURCHASE FROM LAO PDR PROJECTS**

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 (จพ.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. NPUP-TOWER-01

SUPPLY OF TRANSMISSION LINE STEEL TOWER

**TRANSMISSION SYSTEM DEVELOPMENT IN THE AREA OF NAN PHRAE
AND UTTARADIT PROVINCES
FOR POWER PURCHASE FROM LAO PDR PROJECTS**

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 (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 :

DISCOUNT FORM
(Excluding VAT)

INVITATION TO BID NO. NPUP-TOWER-01

SUPPLY OF TRANSMISSION LINE STEEL TOWER

**TRANSMISSION SYSTEM DEVELOPMENT IN THE AREA OF NAN PHRAE
AND UTTARADIT PROVINCES
FOR POWER PURCHASE FROM LAO PDR PROJECTS**

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).

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 **or passport (if non-Thai national)**
- partnership agreement or contract (if any)
- partners' identity cards **or passport (if non-Thai national)**
- 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 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, 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 to 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		☐	☐
()	(b) Group of persons			
	- Certified copy of partnership agreement or contract (if any)		☐	☐
	- Certified copy of identity card(s) of partners or related documents according to Item 2 (a) and (b) of each participant of the group		☐	☐
[]	2. Where the Bidder is a juristic person			
()	(a) Ordinary partnership or limited partnership			
	- Certified copy of affidavit of incorporation		☐	☐
	- Name list of managing partners and list of persons entrusted with controlling power (if any)		☐	☐
	(Please fill in the form on page 10.)			
()	(b) Limited company or public limited company			
	- Certified copy of affidavit of incorporation		☐	☐
	- Memorandum of Association		☐	☐
	- Name list of managing directors and list of persons entrusted with controlling power (if any)		☐	☐
	(Please fill in the form on page 10.)			
	- Name list of major shareholders		☐	☐
	(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		☐	☐
()	Certified copy of registration for value added tax		☐	☐
()			☐	☐
()			☐	☐

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

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

		No. of page(s)	For EGAT only	
			Yes	No
() (c)	If member of a joint venture / consortium is a Non-Thai national juristic person			
-	Certified copy of affidavit of incorporation		☐	☐
-	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.)		☐	☐
-	Memorandum of Association (if any)		☐	☐
-	Name list of major shareholders (if any) (Please fill in the form on page 11.)		☐	☐
[]	8. Other documents (if any)			
()	Certified copy of any other registration required by Ministry of Commerce of Thailand		☐	☐
()	Certified copy of registration for value added tax in Thailand		☐	☐
()			☐	☐
()			☐	☐
()			☐	☐

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.

Important Information

for

Invitation to Bid No. NPUP-TOWER-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 A-5. Preparation and Delivery of Bids and Article B-1. Preparation of Bids

Details on how to prepare the proposal have been revised. Bids shall be prepared in accordance with the Instructions to Bidders contained in the Bidding Documents in one (1) original hard copy and one (1) electronic copy contained in USB flash drive.

Article A-5. Preparation and Delivery of Bids

Details of bid opening time and place shall be specified in the Tentative Schedule.

Article A-6. Availability of Bidding Documents

Availability of Bidding Documents has been changed from CD-ROM to electronic files for download via link provided by EGAT.

Channel of Documents Submission

For channel of document submission in the hereunder Articles, facsimile and telex has been replaced with letters submitted electronically or electronic mails (E-mails).

- Article B-1. Preparation of Bids
- Article B-4. Validity of Bids
- Article D-9. Notices
- Article E-17. Documents Required for Each Shipment
- Article F-8. Payment

Article B-2. Bid Prices

For Source of Supply and Service 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 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.

The following paragraph has also been added :-

“Prices for the following Equipment manufactured outside Thailand which was imported before the bid opening date shall be firm ex-works and quoted in Thai baht, provided that the Bidder shall submit any document(s) evidencing the importation date of such Equipment:

- Power Fuse
- Stationary Battery and Battery Charger
- Insulator for substation
- Cable Termination
- Compression Connector and Miscellaneous Hardware
- Bus Fittings
- Grounding Material
- Substation Miscellaneous”

Article E-14. Preparation for Delivery

The Instructions for Packaging attached at the end of Section E. General Conditions has been revised in item 8. Shunt Capacitor Bank.

Article E-16. Shipment

The Maritime Promotion Bureau has been updated to the Maritime Promotion Division and its contact information has also been updated.

Article F-8. Payment

After each payment is made, the Contractor or beneficiary shall issue and submit the receipt to EGAT as detailed in the paragraph added at the end of this article.

DRAFT

DATA SHEET

DATA SHEET

for

Invitation to Bid No. NPUP-TOWER-01

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

Provisions not Applicable

All provisions and words related to Foreign Supply shall not apply to this Invitation to Bid.

Article B-3. Bid Security

The amount of bid security shall be THB 7,145,000.-.

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

Article B-12. Evaluation and Comparison of Bids:

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

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

The Contractor shall guarantee the proper functioning of Equipment for a period of one (1) Year.

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 item 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 Contractor

1. Add the following paragraph to the end of Item a. Drawings, sub item (1):

The title of the drawing, EGAT's Contract Number, the signature of the Contractor's engineer and the date prepared shall appear in the bottom right-hand corner of the drawing. The authorized signer on the engineering drawings shall be a professional engineer and shall obtain a license from a professional association for the related design work. The local engineer shall obtain a license from the Board for the Control of Engineering Profession.

All shop and construction drawings shall be size A1. Reports, data and drawings within reports shall be submitted in size A4. Size A3 may be used if folded within a report.

Size of characters for description and notes on the drawings with the size bigger than A3 shall be large enough to be readable when the size of reprinted drawings is reduced to size A3.

2. Revise Item a. Drawings, sub item (4) as follows:

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

SECTION A
INVITATION TO BID

INVITATION TO BID NO. NPUP-TOWER-01
SUPPLY OF TRANSMISSION LINE STEEL TOWER
TRANSMISSION SYSTEM DEVELOPMENT IN THE AREA OF NAN PHRAE
AND UTTARADIT PROVINCES
FOR POWER PURCHASE FROM LAO PDR PROJECTS

A-1. Invitation

The Electricity Generating Authority of Thailand (EGAT) hereby invites sealed bids for furnishing and delivering of Transmission Line Steel Tower under Transmission System Development in The Area of Nan Phrae and Uttaradit Provinces for Power Purchase from Lao PDR Projects 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. If the Bidder 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.
- d. The Bidder shall be a regular manufacturer or propose a regular manufacturer of the Equipment of the type specified which has been supplied for a minimum of three (3) years.

However, a local manufacturer who does not have experience as specified above but has obtained special permission from EGAT for manufacture of the specific Equipment within the scope specified in the letter of permission issued by EGAT, or a local manufacturer who is in the list of Eligible Local Manufacturers Accepted by EGAT will be eligible to this requirement.

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

- e. The Bidder or the proposed manufacturer shall have set up a fabrication plant/factory in Thailand.

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 ***hard copy and one (1) electronic copy contained in USB flash drive***, in English, on the bid forms included for this purpose and shall be accompanied with a bid security as required under Article B-3. Bid Security in a separate sealed envelope.

For preparation of original hard copy, each page of the original hard copy shall be marked with the volume number and the page number in the lower right-hand corner, for example, Volume 1 of 10 and Page 1 of 100.

For preparation of electronic copy, each volume of the signed original hard copy shall be scanned into one (1) PDF file and each PDF file shall be named according to the volume number.

The USB flash drive shall contain electronic files of the proposal in the following formats :-

- PDF files of all pages of each volume of the proposal, and*
- Excel files of filled-in Proposal Data, and*
- Excel files of filled-in Price Schedule*

In the event of any discrepancy between the original hard copy and the electronic file(s), the original hard copy shall govern.

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

INVITATION TO BID NO. NPUP-TOWER-01

SUPPLY OF TRANSMISSION LINE STEEL TOWER

**TRANSMISSION SYSTEM DEVELOPMENT IN THE AREA OF NAN PHRAE
AND UTTARADIT PROVINCES
FOR POWER PURCHASE FROM LAO PDR PROJECTS**

and shall be addressed and delivered to **EGAT**, 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 the *place and* time specified *in Tentative Schedule*.

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

A-6. Availability of Bidding Documents

The Bidding Documents are available for examination *and online purchase at <http://www4.egat.co.th/fprocurement/biddingeng/>* and can be obtained *by downloading via link provided by EGAT* upon payment to EGAT, non-refundable, in the amount of USD.....or Baht.....3,000.-. These prices include the value added tax.

ELIGIBLE LOCAL MANUFACTURERS ACCEPTED BY EGAT

The following local manufacturers are eligible for proposing each specific equipment for this Invitation; provided that the scope of their offerings shall be within that specified in the Certificate of Acceptance issued by EGAT.

1) STEEL TOWERS

Ajikawa & SCI Metal Tech Co., Ltd.

49/1 Moo 9, Marppong
Phantong
Chonburi 20160
Tel : 038 451 473-6
Fax : 038 451 478

Siam Steel Tower Co., Ltd.

9/10 Moo 10 Tambol Koke-Yae
Amphur Nong Khae
Saraburi 18230, Thailand
Tel : (662) 705-8755-63
Fax : (662) 705-8765

Thai-Scandic Steel Company Limited

7 I-5 Road, Maptaphut Industrial Estate
Amphur Muang
Rayong 21150
Tel : (66-38) 683070
Fax : (66-38) 683065

Sky Tower Public Company Limited

247 Romklao Road
Saensaeab
Minburi, Bangkok 10510
Thailand
Tel : 662-543-9020-8
Fax : 662-915-2114, 915-2714, 543-9029

Demco Power Company Limited

59 Moo 1, Suanphrikthai
Muangpathumthani
Pathumthani 12000
Tel : 0 2959 5811 Ext.1612
Fax : 0 2959 5915

Soravich Hiraman

2) **HARDWARE ASSEMBLIES AND LINE ACCESSORIES FOR CONDUCTOR,
OVERHEAD GROUND WIRE AND OPGW**

Preformed Line Products (Thailand) Ltd.

296 Moo 4, Lardkrabang Industrial Estate
EPZ 3 Chalongkrung Road
Lumpratew, Lardkrabang
Bangkok 10520
Tel : 0 2739 4026
Fax : 0 2326 0564

- (For
1. Hardware assemblies and line accessories (except damper) for single, twin-bundled and quad-bundled conductor for 115 kV, 230 kV and 500 kV transmission lines
 2. Hardware assemblies and line accessories (except damper) for overhead ground wire and OPGW
 3. Vibration dampers for conductor, overhead ground wire and OPGW
 4. Spacer dampers and rigid spacers for twin-bundled and quad-bundled conductor for 115 kV, 230 kV and 500 kV transmission lines)

Dulhunty Power (Thailand) Co., Ltd.

1/5 Moo 3
Nam Daeng
Muang Chachoengsao
Chachoengsao 24000
Tel : 033 590 841
Fax : 033 590 842

- (For
1. Hardware assemblies and line accessories (except damper) for single, twin-bundled and quad-bundled conductor for 115 kV, 230 kV and 500 kV transmission lines
 2. Hardware assemblies and line accessories (except damper) for overhead ground wire and OPGW
 3. Vibration dampers for conductor, overhead ground wire and OPGW
 4. Spacer dampers and rigid spacers for twin-bundled and quad-bundled conductor for 115 kV, 230 kV and 500 kV transmission lines)

Mosdorfer (Thailand) Co., Ltd.

10/96 The Trendy Building, 6th floor
Soi Sukhumvit 13 (Sangjan)
Klong Toey Nuea, Wattana
Bangkok 10110
Tel : 02 182 8351
Fax : 02 182 8350

- (For
1. Hardware assemblies and line accessories (except damper) for single, twin-bundled and quad-bundled conductor for 115 kV, 230 kV and 500 kV transmission lines
 2. Hardware assemblies and line accessories (except damper) for overhead ground wire and OPGW
 3. Vibration dampers for conductor, overhead ground wire and OPGW
 4. Spacer dampers and rigid spacers for twin-bundled and quad-bundled conductor for 115 kV, 230 kV and 500 kV transmission lines)

Soravit Hiraman

3) **OVERHEAD GROUND WIRE**

Thai Wire Products Public Company Limited

99/2 MOO 8 ZEER STREET BUILDING 7TH FL
Phahonyothin Road, Lamlookka
Pathum Thani 12130
Tel : 0 2992 6863-7
Fax : 0 2992 6870-1

USHA Siam Steel Industries Public Company Limited

209/1 K-Tower-B. 22nd Floor
Unit 3/1 Sukhumvit 21 Road (Asok)
Bangkok 10110
Tel : 0 2261 7361-4
Fax : 0 2640 8227

Charoong Thai Wire & Cable Public Company Limited

589/71 Central City Tower
Floor 12A, Bangna-Trad Road
Bangna, Bangna District
Bangkok 10260
Tel : 0 2745 6118
Fax : 0 2745 6131-32

4) **GROUNDING MATERIALS**

K.M.L. Technology Co., Ltd.

100/3 Thasabansongkrow Road
Ladyao, Jatujak
Bangkok 10900
Tel : 0 2954 3455
Fax : 0 2591 7891

G.K. Assembly Co., Ltd.

110/9-10 Moo 2
Maha Sawat, Bang Kruai District
Nonthaburi 11130
Tel : 0 2985 2250-3
Fax. 0 2985 1910

Sorach Hiraman

5) **CONDUCTOR**

Bangkok Cable Co., Ltd.

187/1 Rajdamri Road
Lumpinee, Pathumwan
Bangkok 10330
Tel : 0 2254 4550-6
Fax : 0 2253 5973, 0 2253 6028, 0 2254 3859

Charoong Thai Wire & Cable Public Company Limited

589/71 Central City Tower
Floor 12A, Bangna -Trad Road
Bangna, Bangna District
Bangkok 10260
Tel : 0 2745 6118
Fax : 0 2745 6131-32

Phelps Dodge International (Thailand) Limited

16th Floor, Maneeya Center Building
518/5 Ploenchit Road
Lumpinee, Pathumwan
Bangkok 10330
Tel : 0 2652 0588, 0 2680 5862
Fax : 0 2680 5896

Thai-Yazaki Electric Wire Co., Ltd.

21st Floor, O-NES Tower,
6 Sukhumvit Soi 6
Klongtoey Sub-District
Klongtoey District
Bangkok 10110
Tel : 0 2653 2550
Fax : 0 2653 2613-14

Venine Cable Electric Wire Company Limited

88/8-9 Moo 2 Ladbualuang-Maitra Rd.
Ladbualuang, Ladbualuang
Ayutthaya 13230
Tel : 0 3528 0493
Fax : 0 3528 0494

Sorachit Hiraman

Fuhrer Wire and Cable Co., Ltd.

70 Moo 2, Bankao-Panthong Road
Panthong
Chonburi 20160
Tel : 0 3845 2906-7
Fax : 0 3845 2899
(For manufacturing of Transmission Line Conductor up to 230 kV)

6) NON-METALLIC OPTICAL FIBER CABLE (OFC)

Thai China Fiber Optics Co., Ltd.

488 Soi Ratchadapisek 26,
Samsennog, Huaykwang,
Bangkok 10310
Tel : 0 2975 9901
Fax : 0 2975 9925

HBC Telecom Co., Ltd.

187/1 Rajadamri Road,
Lumpinee, Pathumwan
Bangkok 10330
Tel : 0 2650 5002 To 3 Ext.111,112
Fax : 0 2651 9261

Siam Fiber Optics Co., Ltd.

Floor 12 A, Central City Tower
589/71 Bangna-Trad Road, Km.3
Bangna, Bangna,
Bangkok 10260
Tel : 0 2745 6118-30
Fax : 0 2745 6575

7) CROSS-LINKED POLYETHYLENE (XLPE) CABLE

Phelps Dodge International (Thailand) Limited

16th Floor, Maneeya Center Building
518/5 Ploenchit Road
Lumpinee, Pathumwan
Bangkok 10330
Tel : 0 2652 0588, 0 2680 5862
Fax : 0 2680 5896

(For 230 kV Underground Transmission Line with XLPE Cable)

It shall be noted that the 230 kV XLPE Cable is allowed to be supplied to only one contract at the first stage. Any further contracts shall be allowed after the said Equipment under the first contract is certified by a certification letter issued by EGAT that it has been provided at least one (1) year successful operation in EGAT system.

Sorachit Hiraman

SECTION B
INSTRUCTIONS TO BIDDERS

INSTRUCTIONS TO BIDDERS

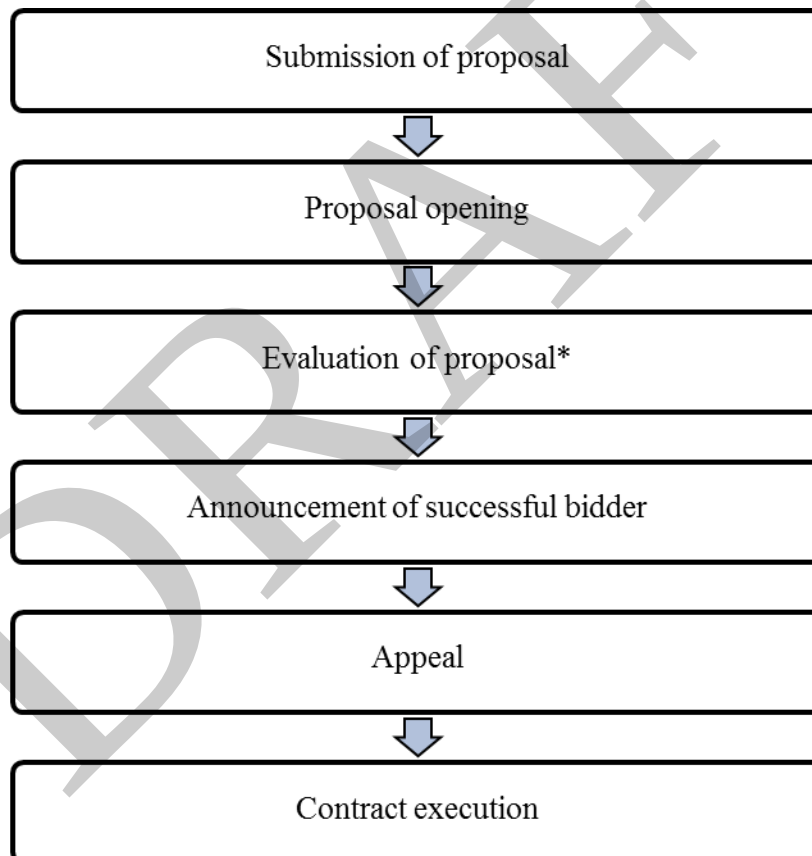
Overview of the Procurement Process

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 ***hard copy clearly marked “Original” and one (1) electronic copy contained in USB flash drive***, submitted at the place and time specified for receipt of bids.

In the event of any discrepancy between ***the original hard copy and the electronic copy, the original hard copy*** shall govern.

For Proposal Data, Bidder shall fill in information of Proposal Data in Excel files contained in the Bidding Documents, and submit one (1) original hard copy with the PDF and Excel files in USB flash drive to EGAT at the same time of bid submission.

For price quotation, Bidder ***shall*** fill ***in*** bid prices in an Excel files of Price Schedules contained in the Bidding Documents in accordance with Price Quotation Instructions in Section C, Part 1: Price Proposal, and submit one (1) original ***hard copy with the PDF and Excel files in USB flash drive*** 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 ***with the PDF and Excel files*** of price schedules of the Work performed by each member of the consortium in addition to hard copies ***with the PDF and Excel files*** 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 PDF or Excel files*** 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" 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 ***by letter submitted electronically or by electronic mail (E-mail)*** to bids already submitted will be considered if received prior to the time fixed for the receipt of bids. Confirmation by letter of any modification ***evidenced*** by post mark or by ***letter submitted electronically or by electronic mail (E-mail)*** should be sent to EGAT 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 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.

Prices for the following Equipment manufactured outside Thailand which was imported before the bid opening date shall be firm ex-works and quoted in Thai baht, provided that the Bidder shall submit any document(s) evidencing the importation date of such Equipment:

- ***Power Fuse***
- ***Stationary Battery and Battery Charger***
- ***Insulator for substation***
- ***Cable Termination***
- ***Compression Connector and Miscellaneous Hardware***
- ***Bus Fittings***
- ***Grounding Material***
- ***Substation Miscellaneous***
- 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 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 or a cashier cheque, 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 ***letter submitted electronically or by electronic mail (E-mail)*** 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 ***letter submitted electronically or by electronic mail (E-mail)*** 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 0.072% 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.

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)

SECTION C
PROPOSAL

INVITATION TO BID NO. NPUP-TOWER-01

PROPOSAL

FOR

SUPPLY OF TRANSMISSION LINE STEEL TOWER

**TRANSMISSION SYSTEM DEVELOPMENT IN THE AREA OF NAN PHRAE
AND UTTARADIT PROVINCES
FOR POWER PURCHASE FROM LAO PDR PROJECTS**

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 collection from the steel manufacturer's plant proposed by the successful Bidder, 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, round up to the nearest whole number, 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

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 Excel file(s), 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. NPUP-TOWER-01
SUMMARY OF BID PRICE
SUPPLY OF TRANSMISSION LINE STEEL TOWER
TRANSMISSION SYSTEM DEVELOPMENT IN THE AREA OF NAN PHRAE AND UTTARADIT PROVINCES FOR POWER PURCHASE FROM LAO PDR PROJECTS

No.	Description	Supply of Equipment
		Local Supply
		Ex-works Price (excluding VAT) Baht
		Amount
1	Schedule 1 : SUPPLY OF STUB ANGLE FOR SUSPENSION TOWER	
2	Schedule 2 : SUPPLY OF STUB ANGLE FOR TENSION TOWER	
3	Schedule 3 : SUPPLY OF STUB ANGLE FOR TENSION TOWER	
4	Schedule 4 : SUPPLY OF SUSPENSION TOWER	
5	Schedule 5 : SUPPLY OF TENSION TOWER	
6	Schedule 6 : SUPPLY OF TENSION TOWER	
BID PRICE		Baht
VAT		Baht
SUMMARY OF BID PRICE		Baht

INVITATION TO BID NO. NPUP-TOWER-01

Schedule 1 : SUPPLY OF STUB ANGLE FOR SUSPENSION TOWER

SUPPLY OF TRANSMISSION LINE STEEL TOWER

TRANSMISSION SYSTEM DEVELOPMENT IN THE AREA OF NAN PHRAE AND UTTARADIT PROVINCES FOR POWER PURCHASE FROM LAO PDR PROJECTS

IMPORTANT:

1. In addition to Article A-5. Fabrications, Item j. Markings of Specification No.C-2 (Revision 6), all individual pieces shall also be marked with the work "ກຟຟ" together with designations shown on detailed drawings.

Item No.	Description	Qty.	Unit	Supply of Equipment	
				Local Supply	
				Ex-works Price (excluding VAT) Baht	
				Unit Price	Amount
1-1	Stub angle (500-4x1272 DQV3)	10	tower		
1-2	Stub angle (500-4x1272 DQV9)	6	tower		
Total Price for Schedule 1				Baht	

INVITATION TO BID NO. NPUP-TOWER-01
Schedule 2 : SUPPLY OF STUB ANGLE FOR TENSION TOWER
SUPPLY OF TRANSMISSION LINE STEEL TOWER

TRANSMISSION SYSTEM DEVELOPMENT IN THE AREA OF NAN PHRAE AND UTTARADIT PROVINCES FOR POWER PURCHASE FROM LAO PDR PROJECTS

IMPORTANT:

1. In addition to Article A-5. Fabrications, Item j. Markings of Specification No.C-2 (Revision 6), all individual pieces shall also be marked with the work "ກຟຟ" together with designations shown on detailed drawings.

Item No.	Description	Qty.	Unit	Supply of Equipment	
				Local Supply	
				Ex-works Price (excluding VAT) Baht	
				Unit Price	Amount
2-1	Stub angle (500-4x1272 DQT20)	8	tower		
2-2	Stub angle (500-4x1272 DQT40)	1	tower		
2-3	Stub angle (500-4x1272 DQT60)	2	tower		
2-4	Stub angle (500-4x1272 DQT90)	2	tower		
2-5	Stub angle (500-4x1272 DQTR)	2	tower		
Total Price for Schedule 2				Baht	

INVITATION TO BID NO. NPUP-TOWER-01
Schedule 3 : SUPPLY OF STUB ANGLE FOR TENSION TOWER
SUPPLY OF TRANSMISSION LINE STEEL TOWER

TRANSMISSION SYSTEM DEVELOPMENT IN THE AREA OF NAN PHRAE AND UTTARADIT PROVINCES FOR POWER PURCHASE FROM LAO PDR PROJECTS

IMPORTANT:

1. In addition to Article A-5. Fabrications, Item j. Markings of Specification No.C-2 (Revision 6), all individual pieces shall also be marked with the work "ກຟຟ" together with designations shown on detailed drawings.

Item No.	Description	Qty.	Unit	Supply of Equipment	
				Local Supply	
				Ex-works Price (excluding VAT) Baht	
				Unit Price	Amount
3-1	Stub angle (500-4x1272 DQT40)	1	tower		
3-2	Stub angle (500-4x1272 DQT60)	2	tower		
Total Price for Schedule 3				Baht	

INVITATION TO BID NO. NPUP-TOWER-01
Schedule 4 : SUPPLY OF SUSPENSION TOWER
SUPPLY OF TRANSMISSION LINE STEEL TOWER

TRANSMISSION SYSTEM DEVELOPMENT IN THE AREA OF NAN PHRAE AND UTTARADIT PROVINCES FOR POWER PURCHASE FROM LAO PDR PROJECTS

IMPORTANT:

1. In addition to Article A-5. Fabrications, Item j. Markings of Specification No.C-2 (Revision 6), all individual pieces shall also be marked with the work "ກຟຸ" together with designations shown on detailed drawings.

Item No.	Description	Qty.	Unit	Supply of Equipment	
				Local Supply	
				Ex-works Price (excluding VAT) Baht	
				Unit Price	Amount
4-1	Tower Type DQV3				
4-1.1	Basic body (500-4x1272 DQV3)	10	body		
4-1.2	Body extension 7.5 m (500-4x1272 DQV3)	4	body		
4-1.3	Leg extension 1.5 m (500-4x1272 DQV3)	8	leg		
4-1.4	Leg extension 3.0 m (500-4x1272 DQV3)	4	leg		
4-1.5	Leg extension 4.5 m (500-4x1272 DQV3)	4	leg		
4-1.6	Leg extension 6.0 m (500-4x1272 DQV3)	8	leg		
4-1.7	Leg extension 7.5 m (500-4x1272 DQV3)	8	leg		
4-1.8	Leg extension 9.0 m (500-4x1272 DQV3)	6	leg		
4-1.9	Leg extension 10.5 m (500-4x1272 DQV3)	2	leg		

Item No.	Description	Qty.	Unit	Supply of Equipment	
				Local Supply	
				Ex-works Price (excluding VAT)	
				Baht	
				Unit Price	Amount
4-2	Tower Type DQV9				
4-2.1	Basic body with 0°- 3° arm (500-4x1272 DQV9(3))	6	body		
4-2.2	Body extension 7.5 m (500-4x1272 DQV9)	2	body		
4-2.3	Body extension 15.0 m (500-4x1272 DQV9)	2	body		
4-2.4	Leg extension 1.5 m (500-4x1272 DQV9)	4	leg		
4-2.5	Leg extension 3.0 m (500-4x1272 DQV9)	2	leg		
4-2.6	Leg extension 4.5 m (500-4x1272 DQV9)	2	leg		
4-2.7	Leg extension 6.0 m (500-4x1272 DQV9)	4	leg		
4-2.8	Leg extension 7.5 m (500-4x1272 DQV9)	6	leg		
4-2.9	Leg extension 9.0 m (500-4x1272 DQV9)	4	leg		
4-2.10	Leg extension 10.5 m (500-4x1272 DQV9)	2	leg		
Total Price for Schedule 4				Baht	

INVITATION TO BID NO. NPUP-TOWER-01
Schedule 5 : SUPPLY OF TENSION TOWER
SUPPLY OF TRANSMISSION LINE STEEL TOWER

TRANSMISSION SYSTEM DEVELOPMENT IN THE AREA OF NAN PHRAE AND UTTARADIT PROVINCES FOR POWER PURCHASE FROM LAO PDR PROJECTS

IMPORTANT:

1. In addition to Article A-5. Fabrications, Item j. Markings of Specification No.C-2 (Revision 6), all individual pieces shall also be marked with the work "ຄຸຟຸ" together with designations shown on detailed drawings.

Item No.	Description	Qty.	Unit	Supply of Equipment	
				Local Supply	
				Ex-works Price (excluding VAT) Baht	
				Unit Price	Amount
5-1	Tower Type DQT20				
5-1.1	Basic body (500-4x1272 DQT20)	8	body		
5-1.2	Body extension 7.5 m (500-4x1272 DQT20)	2	body		
5-1.3	Leg extension 1.5 m (500-4x1272 DQT20)	2	leg		
5-1.4	Leg extension 3.0 m (500-4x1272 DQT20)	6	leg		
5-1.5	Leg extension 4.5 m (500-4x1272 DQT20)	8	leg		
5-1.6	Leg extension 6.0 m (500-4x1272 DQT20)	8	leg		
5-1.7	Leg extension 7.5 m (500-4x1272 DQT20)	4	leg		
5-1.8	Leg extension 9.0 m (500-4x1272 DQT20)	2	leg		
5-1.9	Leg extension 10.5 m (500-4x1272 DQT20)	2	leg		

Item No.	Description	Qty.	Unit	Supply of Equipment	
				Local Supply	
				Ex-works Price (excluding VAT)	
				Baht	
				Unit Price	Amount
5-2	Tower Type DQT40				
5-2.1	Basic body (500-4x1272 DQT40)	1	body		
5-2.2	Leg extension 3.0 m (500-4x1272 DQT40)	2	leg		
5-2.3	Leg extension 4.5 m (500-4x1272 DQT40)	1	leg		
5-2.4	Leg extension 7.5 m (500-4x1272 DQT40)	1	leg		
5-3	Tower Type DQT60				
5-3.1	Basic body (500-4x1272 DQT60)	2	body		
5-3.2	Leg extension 3.0 m (500-4x1272 DQT60)	2	leg		
5-3.3	Leg extension 4.5 m (500-4x1272 DQT60)	2	leg		
5-3.4	Leg extension 6.0 m (500-4x1272 DQT60)	2	leg		
5-3.5	Leg extension 7.5 m (500-4x1272 DQT60)	1	leg		
5-3.6	Leg extension 9.0 m (500-4x1272 DQT60)	1	leg		

Item No.	Description	Qty.	Unit	Supply of Equipment	
				Local Supply	
				Ex-works Price (excluding VAT)	
				Baht	
				Unit Price	Amount
5-4	Tower Type DQT90				
5-4.1	Basic body (500-4x1272 DQT90) - Terminal	2	body		
5-4.2	Body extension 7.5 m (500-4x1272 DQT90)	2	body		
5-4.3	Leg extension 3.0 m (500-4x1272 DQT90)	2	leg		
5-4.4	Leg extension 7.5 m (500-4x1272 DQT90)	2	leg		
5-4.5	Leg extension 10.5 m (500-4x1272 DQT90)	4	leg		
5-5	Tower Type DQTR				
5-5.1	Basic body (500-4x1272 DQTR)	2	body		
5-5.2	Body extension 7.5 m (500-4x1272 DQTR)	2	body		
5-5.3	Leg extension 3.0 m (500-4x1272 DQTR)	2	leg		
5-5.4	Leg extension 4.5 m (500-4x1272 DQTR)	2	leg		
5-5.5	Leg extension 6.0 m (500-4x1272 DQTR)	2	leg		
5-5.6	Leg extension 10.5 m (500-4x1272 DQTR)	2	leg		
Total Price for Schedule 5				Baht	

INVITATION TO BID NO. NPUP-TOWER-01
Schedule 6 : SUPPLY OF TENSION TOWER
SUPPLY OF TRANSMISSION LINE STEEL TOWER

TRANSMISSION SYSTEM DEVELOPMENT IN THE AREA OF NAN PHRAE AND UTTARADIT PROVINCES FOR POWER PURCHASE FROM LAO PDR PROJECTS

IMPORTANT:

1. In addition to Article A-5. Fabrications, Item j. Markings of Specification No.C-2 (Revision 6), all individual pieces shall also be marked with the work "ກຟຟ" together with designations shown on detailed drawings.

Item No.	Description	Qty.	Unit	Supply of Equipment	
				Local Supply	
				Ex-works Price (excluding VAT) Baht	
				Unit Price	Amount
6-1	Tower Type DQT40				
6-1.1	Basic body (500-4x1272 DQT40)	1	body		
6-1.2	Leg extension 6.0 m (500-4x1272 DQT40)	1	leg		
6-1.3	Leg extension 7.5 m (500-4x1272 DQT40)	3	leg		
6-2	Tower Type DQT60				
6-2.1	Basic body (500-4x1272 DQT60)	2	body		
6-2.2	Leg extension 3.0 m (500-4x1272 DQT60)	4	leg		
6-2.3	Leg extension 10.5 m (500-4x1272 DQT60)	4	leg		
Total Price for Schedule 6				Baht	

DRAFT

PART 2: PROPOSAL DATA

PLEASE FILL OUT AND RETURN WITH YOUR PROPOSAL

GALVANIZED STEEL TOWERS			Bidder	
PROPOSAL DATA			Item No.	
Name and country of tower fabricator			1	
			2 (if any)	
Location of tower fabricating plants			1	
			2 (if any)	
Location of tower test facility				
Description	Applicable Standard		Make and country of origins	
	Structural steel	High strength structural steel		
MATERIAL	Rolled shapes			
	Plates			
	Connection bolts & nuts			
	Lock nuts			
	U-bolts or shackles			
	Step bolts & nuts			
	Ladders			
	Spring washers			
GALVANIZING	TOWER	Standard		
		Weight of zinc coating g/m ²	Thickness < 3.2 mm	3.2 mm ≤ Thickness < 4.8 mm
			average.....minimum.....	average.....minimum.....
			4.8 mm ≤ Thickness < 6.4 mm	Thickness 6.4 mm and over
			average.....minimum.....	average.....minimum.....
	BOLTS, NUTS AND LOCK NUTS	Standard		
		Weight of zinc coating g/m ²	average.....	minimum.....
		Method of coating for bolt	☐ hot-dipped ☐ other (state).....	
		Method of coating for nuts and lock nuts	☐ hot-dipped ☐ other (state).....	
		Threads in nuts	☐ Tapped before galvanized ☐ Tapped after galvanized	
		Retapping of nuts after galvanized	☐ yes ☐ no	
	SPRING WASHERS	Standard		
		Method of coating	☐ hot-dipped ☐ other (state).....	
		Weight of zinc coating g/m ²	Thickness < 4.76 mm	4.76 mm ≤ Thickness ≤ 6.35 mm
			average.....minimum.....	average.....minimum.....
	DESIGN METHOD	☐ Three-dimensional indeterminate method : Computer program..... Developed by..... ☐ Other method : 		

PLEASE FILL OUT AND RETURN WITH YOUR PROPOSAL

GALVANIZED STEEL TOWERS				Bidder											
PROPOSAL DATA				Item No.											
TOWER TYPE	WEIGHTS IN KILOGRAMS														
	BASIC BODY	7.5 m. BODY EXTENSION	15.0 m. BODY EXTENSION	SINGLE LEG EXTENSION						STUB					
				1.5 m	3.0 m	4.5 m	6.0 m	7.5 m	9.0 m	10.5 m	CS	CIII	CIV	CV	PILE
DQV3															
DQV9(3)															
DQT20															
DQT40															
DQT60															
DQT90 (Terminal)															
DQTR															
TOTAL ESTIMATED WEIGHT TO BE SUPPLIED FOR THIS PROJECT INCLUDING SPARE TOWERS															
Complete tower = Basic Body + Body Extension (if required) + 4 Leg Extensions.															

PROPOSAL DATA
RECORDS OF PAST SUCCESSFUL SUPPLY AND UNDER CURRENT COMMITMENT
OF
STEEL TOWERS

(Name of Manufacturer)

Fabricating Capacity _____ Tons/year

Galvanizing Capacity _____ Tons/year

<u>Item</u>	<u>Name of Transmission Line</u>	<u>Voltage</u> <u>kV</u>	<u>Weight</u> <u>Tons</u>	<u>Utility/Purchaser</u>	<u>Date of</u> <u>Contract</u>	<u>Date of</u> <u>Completion</u> <u>of Delivery</u>
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

(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):

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Confirmed :

Firm :

By : _____

Title :

PART 3: DELIVERY SCHEDULE AND DISTRIBUTION LIST

INVITATION TO BID NO. NPUP-TOWER-01

Delivery Schedule and Distribution List

Transmission System Development in the area of Nan Phrae and Uttaradit provinces for Power Purchase from Lao PDR Projects

Schedule 1: SUPPLY OF STUB ANGLE FOR SUSPENSION TOWER

Item No.	Description	Qty	Unit	Job no.	Transmission Line	Delivery Required by EGAT (within months after confirmation of Letter of Award of Contract)
						Ex-works
1-1	Stub angle (500-4x1272 DQV3)	10	tower	NPUP-01-L01	500 kV Border (Nan) - Nan CCT. No.3 and CCT. No.4	3
1-2	Stub angle (500-4x1272 DQV9)	6	tower			
END						

DRAFT

INVITATION TO BID NO. NPUP-TOWER-01

Delivery Schedule and Distribution List

Transmission System Development in the area of Nan Phrae and Uttaradit provinces for Power Purchase from Lao PDR Projects

Schedule 2: SUPPLY OF STUB ANGLE FOR TENSION TOWER

Item No.	Description	Qty	Unit	Job no.	Transmission Line	Delivery Required by EGAT (within months after confirmation of Letter of Award of Contract)
						Ex-works
2-1	Stub angle (500-4x1272 DQT20)	8	tower	NPUP-01-L01	500 kV Border (Nan) - Nan CCT. No.3 and CCT. No.4	5
2-2	Stub angle (500-4x1272 DQT40)	1	tower			
2-3	Stub angle (500-4x1272 DQT60)	2	tower			
2-4	Stub angle (500-4x1272 DQT90)	2	tower			
2-5	Stub angle (500-4x1272 DQTR)	2	tower			
END						

INVITATION TO BID NO. NPUP-TOWER-01

Delivery Schedule and Distribution List

Transmission System Development in the area of Nan Phrae and Uttaradit provinces for Power Purchase from Lao PDR Projects

Schedule 3: SUPPLY OF STUB ANGLE FOR TENSION TOWER

Item No.	Description	Qty	Unit	Job no.	Transmission Line	Delivery Required by EGAT (within months after confirmation of Letter of Award of Contract)
						Ex-works
3-1	Stub angle (500-4x1272 DQT40)	1	tower	NPUP-01-L08	500 kV Border (Nan) - Nan CCT. No.1 and CCT. No.2	5
3-2	Stub angle (500-4x1272 DQT60)	2	tower			
END						

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INVITATION TO BID NO. NPUP-TOWER-01

Delivery Schedule and Distribution List

Transmission System Development in the area of Nan Phrae and Uttaradit provinces for Power Purchase from Lao PDR Projects

Schedule 4: SUPPLY OF SUSPENSION TOWER

Item No.	Description	Qty	Unit	Job no.	Transmission Line	Delivery Required by EGAT (within months after confirmation of Letter of Award of Contract)
						Ex-works
4-1	Tower Type DQV3			NPUP-01-L01	500 kV Border (Nan) - Nan CCT. No.3 and CCT. No.4	6
4-1.1	Basic body (500-4x1272 DQV3)	10	body			
4-1.2	Body extension 7.5 m (500-4x1272 DQV3)	4	body			
4-1.3	Leg extension 1.5 m (500-4x1272 DQV3)	8	leg			
4-1.4	Leg extension 3.0 m (500-4x1272 DQV3)	4	leg			
4-1.5	Leg extension 4.5 m (500-4x1272 DQV3)	4	leg			
4-1.6	Leg extension 6.0 m (500-4x1272 DQV3)	8	leg			
4-1.7	Leg extension 7.5 m (500-4x1272 DQV3)	8	leg			
4-1.8	Leg extension 9.0 m (500-4x1272 DQV3)	6	leg			
4-1.9	Leg extension 10.5 m (500-4x1272 DQV3)	2	leg			
4-2	Tower Type DQV9					
4-2.1	Basic body with 0°- 3° arm (500-4x1272 DQV9(3))	6	body			
4-2.2	Body extension 7.5 m (500-4x1272 DQV9)	2	body			
4-2.3	Body extension 15.0 m (500-4x1272 DQV9)	2	body			
4-2.4	Leg extension 1.5 m (500-4x1272 DQV9)	4	leg			
4-2.5	Leg extension 3.0 m (500-4x1272 DQV9)	2	leg			
4-2.6	Leg extension 4.5 m (500-4x1272 DQV9)	2	leg			
4-2.7	Leg extension 6.0 m (500-4x1272 DQV9)	4	leg			
4-2.8	Leg extension 7.5 m (500-4x1272 DQV9)	6	leg			
4-2.9	Leg extension 9.0 m (500-4x1272 DQV9)	4	leg			
4-2.10	Leg extension 10.5 m (500-4x1272 DQV9)	2	leg			
END						

INVITATION TO BID NO. NPUP-TOWER-01

Delivery Schedule and Distribution List

Transmission System Development in the area of Nan Phrae and Uttaradit provinces for Power Purchase from Lao PDR Projects

Schedule 5: SUPPLY OF TENSION TOWER

Item No.	Description	Qty	Unit	Job no.	Transmission Line	Delivery Required by EGAT (within months after confirmation of Letter of Award of Contract)
						Ex-works
5-1	Tower Type DQT20			NPUP-01-L01	500 kV Border (Nan) - Nan CCT. No.3 and CCT. No.4	9
5-1.1	Basic body (500-4x1272 DQT20)	8	body			
5-1.2	Body extension 7.5 m (500-4x1272 DQT20)	2	body			
5-1.3	Leg extension 1.5 m (500-4x1272 DQT20)	2	leg			
5-1.4	Leg extension 3.0 m (500-4x1272 DQT20)	6	leg			
5-1.5	Leg extension 4.5 m (500-4x1272 DQT20)	8	leg			
5-1.6	Leg extension 6.0 m (500-4x1272 DQT20)	8	leg			
5-1.7	Leg extension 7.5 m (500-4x1272 DQT20)	4	leg			
5-1.8	Leg extension 9.0 m (500-4x1272 DQT20)	2	leg			
5-1.9	Leg extension 10.5 m (500-4x1272 DQT20)	2	leg			
5-2	Tower Type DQT40					
5-2.1	Basic body (500-4x1272 DQT40)	1	body			
5-2.2	Leg extension 3.0 m (500-4x1272 DQT40)	2	leg			
5-2.3	Leg extension 4.5 m (500-4x1272 DQT40)	1	leg			
5-2.4	Leg extension 7.5 m (500-4x1272 DQT40)	1	leg			
5-3	Tower Type DQT60					
5-3.1	Basic body (500-4x1272 DQT60)	2	body			
5-3.2	Leg extension 3.0 m (500-4x1272 DQT60)	2	leg			
5-3.3	Leg extension 4.5 m (500-4x1272 DQT60)	2	leg			
5-3.4	Leg extension 6.0 m (500-4x1272 DQT60)	2	leg			
5-3.5	Leg extension 7.5 m (500-4x1272 DQT60)	1	leg			
5-3.6	Leg extension 9.0 m (500-4x1272 DQT60)	1	leg			

INVITATION TO BID NO. NPUP-TOWER-01

Delivery Schedule and Distribution List

Transmission System Development in the area of Nan Phrae and Uttaradit provinces for Power Purchase from Lao PDR Projects

Schedule 5: SUPPLY OF TENSION TOWER

Item No.	Description	Qty	Unit	Job no.	Transmission Line	Delivery Required by EGAT (within months after confirmation of Letter of Award of Contract)
						Ex-works
5-4	Tower Type DQT90			NPUP-01-L01	500 kV Border (Nan) - Nan CCT. No.3 and CCT. No.4	9
5-4.1	Basic body (500-4x1272 DQT90) - Terminal	2	body			
5-4.2	Body extension 7.5 m (500-4x1272 DQT90)	2	body			
5-4.3	Leg extension 3.0 m (500-4x1272 DQT90)	2	leg			
5-4.4	Leg extension 7.5 m (500-4x1272 DQT90)	2	leg			
5-4.5	Leg extension 10.5 m (500-4x1272 DQT90)	4	leg			
5-5	Tower Type DQTR					
5-5.1	Basic body (500-4x1272 DQTR)	2	body			
5-5.2	Body extension 7.5 m (500-4x1272 DQTR)	2	body			
5-5.3	Leg extension 3.0 m (500-4x1272 DQTR)	2	leg			
5-5.4	Leg extension 4.5 m (500-4x1272 DQTR)	2	leg			
5-5.5	Leg extension 6.0 m (500-4x1272 DQTR)	2	leg			
5-5.6	Leg extension 10.5 m (500-4x1272 DQTR)	2	leg			
END						

INVITATION TO BID NO. NPUP-TOWER-01

Delivery Schedule and Distribution List

Transmission System Development in the area of Nan Phrae and Uttaradit provinces for Power Purchase from Lao PDR Projects

Schedule 6: SUPPLY OF TENSION TOWER

Item No.	Description	Qty	Unit	Job no.	Transmission Line	Delivery Required by EGAT (within months after confirmation of Letter of Award of Contract)
						Ex-works
6-1	Tower Type DQT40			NPUP-01-L08	500 kV Border (Nan) - Nan CCT. No.1 and CCT. No.2	9
6-1.1	Basic body (500-4x1272 DQT40)	1	body			
6-1.2	Leg extension 6.0 m (500-4x1272 DQT40)	1	leg			
6-1.3	Leg extension 7.5 m (500-4x1272 DQT40)	3	leg			
6-2	Tower Type DQT60					
6-2.1	Basic body (500-4x1272 DQT60)	2	body			
6-2.2	Leg extension 3.0 m (500-4x1272 DQT60)	4	leg			
6-2.3	Leg extension 10.5 m (500-4x1272 DQT60)	4	leg			
END						

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SECTION D
CONTRACT

CONTRACT

SUPPLY OF TRANSMISSION LINE STEEL TOWER TRANSMISSION SYSTEM DEVELOPMENT IN THE AREA OF NAN PHRAE AND UTTARADIT PROVINCES FOR POWER PURCHASE FROM LAO PDR PROJECTS

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 *letters submitted electronically or electronic mails (E-mails)* 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 _____
(_____)

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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, even though 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

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, even though 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 rising 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 uncopyrighted 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, round up to the nearest whole number, 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, round up to the nearest whole number, 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 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 or a cashier cheque, 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 : -

Container Dimensions

Height 2.59 m.

Width 2.44 m.

Length 6.05 m.

Door Dimensions

Height 2.28 m.

Width 2.33 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 Division***, 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 Division***, Marine Department as requested by the Contractor.

The Contractor is, therefore, required to immediately contact ***the Maritime Promotion Division***, 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 Division***, 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 Division, Marine Department at telephone No. 66 2233 1311-8 extension 387 and facsimile No. 66 2639 4778, <https://maritimepromotion.md.go.th/>***

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 ***letter submitted electronically or by electronic mail (E-mail)*** 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 ***letter submitted electronically or by electronic mail (E-mail)*** 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, round up to the nearest whole number, 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	√(1)	-
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.

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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 ***letter submitted electronically or by electronic mail (E-mail)*** immediately the date upon which he has received the original letter of credit ***to be*** 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.

After each payment is made, the Contractor or beneficiary shall issue and submit the receipt to EGAT at e-mail : FFMS@egat.co.th within three (3) calendar days upon receipt of such payment. The details of receipt shall include but not be limited to the following:

- ***Company name and address***
- ***The receipt date of payment***
- ***Lists of Goods/Services the payment is made for***
- ***Payment amount in numbers and in words***
- ***Recipient signature***

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, round up to the nearest whole number, of the total Contract Price or ten (10) per cent, round up to the nearest whole number, 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, round up to the nearest whole number, of the Contract Price of Equipment under the extended guarantee.

The maintenance security shall be in the form of a cash deposit, 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 or a cashier cheque, 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 ten (10) per cent, round up to the nearest whole number, of the total Contract Price or ten (10) per cent, round up to the nearest whole number, 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 confirmation of Letter of Award of Contract
Quality Assurance Program (If requested by EGAT)	1 (-)	- (-)	Within 60 Days after confirmation of Letter of Award of Contract
Drawings or Documents “RELAY AND EQUIPMENT INSTRUCTION MANUAL”	1 (-)	- (-)	Within 90 Days after confirmation of Letter of Award of Contract
Drawings or Documents “FOR APPROVAL”	1 (1)	- (-)	Within 90 Days after confirmation of Letter of Award of Contract
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 confirmation of Letter of Award of Contract
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 confirmation of Letter of Award of Contract
Quality Assurance Program (If requested by EGAT)	1 (-)	- (-)	Within 60 Days after confirmation of Letter of Award of Contract
Drawings or Documents "FOR REFERENCE"	4 (2)	- (-)	Within 90 Days after confirmation of Letter of Award of Contract
Drawings or Documents "FOR APPROVAL"	4 (-)	- (-)	Within 60 Days for foundation, steel supporting structure (if any) and within 90 Days for others after confirmation of Letter of Award of Contract
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 confirmation of Letter of Award of Contract
Test Procedure (Factory Test)	1 (-)	- (-)	Within 150 Days after confirmation of Letter of Award of Contract
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.

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 No. L-500 kV (Revision 1)	Construction of 500 kV Transmission Line, April 2001 (With amendment and additional Specifications)	
	-Section A - 500 kV LATTICE STEEL TOWERS	A1-A16
	-Amendment No. 1	1-2
	-Amendment No. 2	1-7
	-Amendment No. 4	1-8

Section A

500 kV LATTICE STEEL TOWERS

A-1. General Instructions

This specification covers the design, shop detailing, and fabrication of 500 kV lattice steel transmission towers. EGAT may choose:

- a. to furnish design drawings and to require the Contractor to provide shop detailing and fabrication services; in such cases the provisions of Article A-3, Designs do not apply (Except as otherwise indicated.) but all other provisions do apply.
- b. to furnish only loading trees and critical electrical clearance dimensions and to require design, shop detailing and fabrication by the Contractor; in such cases all of the requirements of this specification apply.
- c. to furnish existing shop detail drawings and to require only materials supply and fabrication services in order to promote uniformity of appearance and /or standardization of structure types; in such cases the provisions of Article A-3, Design and A-4, Detailing do not apply but all other provisions do apply.

The Contractor shall assume full responsibility for the adequacy and accuracy of that portion of the work that he is required to provide.

All materials, designs, details, fabrications and tests shall comply with the requirements described hereafter and on the drawings.

All designs and details shall be subject to approval by EGAT. EGAT shall have the right to require the Contractor, without additional cost to EGAT, to make any changes in designs and details necessary to make the construction conform to the Contract Documents.

All materials shall be brand new. Any steel member with the trace of hole filling shall not be used.

No omission or ambiguity on the drawings or in these specifications will relieve the Contractor from the responsibility of furnishing first class materials and workmanship. Should any inaccuracy be found, any further work done before these discrepancies are corrected, will be at the Contractor's risk.

A-2. Materials

Materials shall be as follows:

- a. Rolled Shapes and Plates. All materials shall be hot-rolled of structural and/or high-strength structural steel.
 - (1) Structural Steel. Structural steel shall conform to ASTM A36.
 - (2) High-Strength Structural Steel. High-strength structural steel shall conform to ASTM A441 or ASTM A572 grade 50. All high strength shapes and plates shall have a guaranteed minimum yield strength of 50 ksi (3,515 kg/sqcm).
 - (3) Steel Grade Substitution. Steel rolled for and released as structural grade shall not be used as a substitute for high strength grade regardless of test values.

Steel rolled for high-strength grade may be used for structural grade if it meets the required,specification.
- b. Connection Bolts and Nuts. All connection bolts and nuts shall conform to ASTM A394.
- c. Cable Attachment Devices. All cable attachment devices shall conform to ASTM A36 or ASTM A441 or ASTM A572 grade 50.
- d. Locking Devices. Lock washers shall be carbon steel conforming to ASA B27.1.

Locknuts shall be Palnuts or M-F nuts or approved equal, and shall conform to appropriate International Standards Organization (ISO) and Industrial Fasteners Institute (IFI) for Lock Nut Specifications.
- e. Anchor Rods. Anchor rods shall conform to ASTM A449. Nuts for anchor rods shall be ASTM A563, grade C.
- f. Step Bolts. Step bolts shall conform to ASTM A307.
- g. Ladders. Ladder steel shall conform to ASTM A36.
- h. Tower Signs. Tower signs, consisting of aerial patrol signs, phasing signs and danger signs shall be made of mild steel (See Article A-4.g). The thickness shall not be less than 2 mm.

A-3. Designs

Designs shall be as follows:

- a. Tower Outline. The outlines of the towers shall, in general, conform to those indicated on the drawings, and shall be such as to provide the required minimum clearance between conductors, and between conductors and tower steel, indicated in the clearance diagrams.

Towers shall be designed for leg extensions of heights indicated on the drawings. Where tower body extensions are called for, the leg extensions shall be designed to be used interchangeably with either the basic tower body or body extensions. The design of tower members shall take in to consideration the use of any combination of leg extension heights up to a maximum leg extension height differential of six meters.

The included angle between any two connecting stressed members shall not be less than 15 degrees. Redundant members shall be so oriented with respect to the main members which they brace to provide sufficient restraint against buckling and shall be capable of supporting an axial tensile or compressive load of at least 2.5% of the maximum Computed Compressive load in the main member, applied perpendicular to the axis of the main member.

- b. Design Methods. Designs shall be in accordance with the ASCE Manual 52, "Guide for Design of Steel Transmission Towers.", Second Edition except as noted in these specifications.

The Contractor is required to use a three-dimensional indeterminate stiffness method of analysis for tower design. Any computer program to be employed, shall be prepared or approved by a recognized institute.

EGAT will use the ICES-STRUDL II or Bonneville Power Administration Tower Design System Computer Program for checking the tower designs of the Contractor.

If any other method of analysis is employed by the Contractor, he shall agree to make any change to meet the requirements of EGAT's three-dimensional analysis specified above without additional cost to EGAT.

- c. Loads. The loads used in the design of the tower shall be as specified in the loading diagrams.

- d. Unit Stresses. Unit stresses used in design shall be as follows:

<u>Stresses</u>	<u>Ultimate Stresses Allowed in Design</u>
-----------------	--

Members and Gussets:

Buckling	See Drawing No. TP-131
Tension on Net Section	1.00 Fy
Bearing on Bolts	1.80 Fy, but not to exceed 1.00 Fu.

Bolts:

Shear	0.60 Fu
Bearing	1.00 Fu

Remarks : Fy = Yield point.

Fu = Ultimate tensile stress.

In computing the net section for tension members, the diameter of the bolt hole shall be taken as 1.5 mm greater than the nominal diameter of the bolt. The determination of net section area shall be as specified in the ASCE, Guide for Design for Steel Transmission Towers.

- e. Limit of Effective Slenderness Ratio. The effective slenderness ratios of members shall not exceed the following limits:

Main leg members and main compression members in crossarms	120
Other members having computed compressive stresses	200
Secondary members without computed compressive stresses	250
Tension only members	375

Built-up members composed of two or more rolled shapes shall be connected with stitch bolts such that the slenderness ratio of either shape, between bolts, does not exceed the governing slenderness ratio of the built-up member as a whole.

- f. Minimum Thickness and Size of Steel Members. Minimum thickness (t) and sizes of steel members of towers shall be as follows:

Legs and main compression members in crossarms, mm	8
All members having computed stresses, mm	5
Secondary members (redundants) without computed stresses, mm	5
Gusset plates, mm	6
Minimum flange width of angles for use with 16 mm bolts only, mm	45
Minimum flange width of angles for use with 20 mm bolts only, mm	60

Furthermore, the minimum flange width of the connected leg of the angle section shall be such that the bolt head or nut does not bear on the fillet.

In order to facilitate transportation and handling, the length of any structural member should not exceed 8 meters.

- g. Connections.

- (1) Bolts. All connections shall be bolted. Bolts shall bear on the shank to the extent that not more than one full thread shall be in bearing. Rivets shall not be used. Welding may be used subject to the approval of EGAT.

For structural connections, only one bolt size per tower is permitted. The minimum bolt diameter shall be 16mm and the minimum number of bolts at each connection of a stressed member shall be two, except when the computed stress is less than one-half the capacity of a single bolt, in which case, a single bolt connection will be acceptable.

- (2) Connections and Splices. The number of splices shall be kept to a minimum. Connections shall develop the force due to the design load but not less than 70 % of the effective strength of the member based on the kind of stress that governs the selection of the member.

h. Design Drawings and Calculation. The design drawings shall show the following data and information:

- (1) Scaled line diagram of the tower including all redundant bracing members and their sizes completely dimensioned and in compliance with all clearance requirements.
- (2) All loadings and their manners of application including the determination of wind load on tower and ladder, - if any. Wind load on towers shall be applied at each panel point along the height of the towers.
- (3) Tables showing :
 - (a) Tensile or compressive stress in each member for each loading case and the maximum (critical) tensile and compressive stresses with associated loading case.
 - (b) The effective slenderness ratios, net tensile areas, calculated capacities and ratio of calculated capacities to maximum computed stresses for each member and connection.
 - (c) Size and type of steel for each member and number of bolts required for its connection.
 - (d) The calculated weight of the complete galvanized tower.
 - (e) The vertical compression and uplift reactions and corresponding horizontal shears at each leg of all towers for all loading cases.

i. Tower Erection and Maintenance Loading. Horizontal members, and members within 15° of horizontal, (with the exception of horizontal diaphragms in the tower body) shall be designed to support the weight of one man with construction tools at midspan without permanent deformation. This weight shall be taken as 150 kilograms (ultimate). This bending load need not be combined with member axial loads resulting from the basic tower loading conditions.

A-4. Detailing

Detailing shall be as follows:

- a. General. Tower dimensions, framing, member sizes and length, number, size and length of bolts, thickness of each filler, and other necessary details to fabricate each piece shall be shown on the approved detail drawings. Once approved by EGAT, no detailing changes shall be made without the written approval of EGAT.

All diagonals and struts shall be in one piece where practicable. All double diagonal web system members shall be connected at their point of intersection by at least one bolt.

Lowest bolt hole in stub for connection of the main diagonal member shall be at 50 mm above the top of concrete.

- b. Joints. All joints shall be detailed so that eccentricities are kept to a minimum.

Contact surfaces between members at joints shall be completely filled by fillers of proper thickness. Bevelled washers shall be furnished, where required, for bolted connections where the slopes of the mating surfaces of the connected members is substantially different.

Gusset plates, where used, are to be designed by the Contractor preparing the shop details, and shall meet the requirements of Article A-3.

- c. Bolt Spacing. Minimum bolt spacing and edge distance shall be as follows:

<u>Nominal Bolt Diameter</u>	<u>Bolt Spacing</u>		<u>Minimum Edge Distance</u>	
	<u>Minimum</u>	<u>Maximum</u>	<u>Rolled Edge</u>	<u>Sheared Edge</u>
mm	mm	mm	mm	mm
16	45	160	22	28
20	55	200	25	32

- d. Step Bolts. Step bolts shall be 16 mm diameter and shall have round or hexagonal head. Each step bolt shall be provided with two hexagonal nuts, two plain washers and one locking device. The minimum bolt length and length of unthreaded portion shall be 180 and 125 mm respectively. Step bolts shall not be used as connection bolts.

The step bolts shall be spaced alternatively on the inner gauge line on each face of the angle about 40 cm on centers unless otherwise specified. They shall be furnished for one leg of each tower from a point approximately 2.5 m above the top of concrete to the base elevation of the tower and (1) On single circuit towers: from the base elevation to the peak of the tower; (2) On double-circuit towers: from the base elevation to a point approximately 1.2 m above the bottom of the ladder (See Article A-4 f. Ladders).

- e. Cable Attachment Devices. Cable attachment devices shall be suitably furnished to suspend or terminate insulator strings or ground wire assemblies. The devices shall be capable of withstanding all specified cable loads with corresponding tower overload factors.
- f. Ladders. Ladders are required on double circuit towers. Ladders shall be fastened securely to the tower with sufficient intermediate supports to furnish a safe and rigid structure for climbing. Ladders shall be centered on a face of the tower which is perpendicular to the line (transverse face) and shall extend from the base elevation up to the peak of the tower. Rungs shall be spaced approximately 35 cm on centers.
- g. Tower Signs. The Contractor shall furnish all materials for tower signs as shown on Dwg. No. TP-150, including all bolts, nuts, washers, and supporting structures if required, for attaching tower signs to the towers as specified in the structure list.

The colors of figure and background shall be as described on Dwg. No. TP-150 and shall be weather-proof, baked enamel finish paint, vitreous or stove enamel.

The Contractor is required to make holes in the tower members for attaching tower signs at the locations described hereunder.

- (1) Aerial Patrol Signs. Aerial patrol signs shall be attached to upper member of the top crossarm or bridge.
- (2) Phasing Signs. Phasing signs shall be attached to upper member of each conductor crossarm or bridge.
- (3) Danger Signs. Danger signs shall be attached to bracing members at a level about one meter above top of concrete.
- (4) Circuit Name Signs. Circuit name signs shall be attached to upper member of the top crossarm or bridge.

- h. Detail Drawings. Detail drawings shall be complete with sizes and detail dimensions of all tower members. Drawings shall include all body and leg extensions, whether or not they are to be actually used for construction. At each joint, there shall be the number, size and length of bolts, number and size of fillers and detail dimensions of gusset plate, if any.

A proper cross-index shall be furnished, correlating the tower part numbers with the tower type and component and the drawing number.

- i. Bill of Material. Bill of material shall give the size, length and galvanized weight of each member and the total weights of body, body extension, leg extension and stub. It shall also include the number of bolts, nuts and washers per structure.

A-5. Fabrication

Fabrication of material shall be in accordance with the latest revision of "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings" published by the American Institute of Steel Construction (AISC). Fabrication shall not commence until approval of drawings and completion of successful tower tests unless otherwise directed by EGAT.

- a. Workmanship. Workmanship shall be first class throughout. All pieces must be straight, true to detail drawings and free from lamination flaws and other defects. All clipping, back-cuts, grindings, bends, holes and etc. must be true to detail drawings and free of burrs.

All identical pieces bearing the same erection number must be exactly interchangeable with each other and interchangeable in their relative position in all towers or structures of which they form a part.

Threads of bolts and nuts shall be cleanly roiled or cut and the face and head of nut shall be truly at right angle to the axis of the bolt.

- b. Bolts. Bolts shall be full-size in the shanks. The shanks shall be round and free of projected fins. The bolt heads shall be hexagonal, full proportions on all sides, properly centered on the shank, and have a bearing surface which is perpendicular to the axis of the bolt, of full area, free of burrs and reasonably smooth.
- c. Nuts and Locking Devices. Nuts shall be hexagonal and of dimensions adequate to develop full strength of the bolts. The bearing face of each nut shall be perpendicular to the axis of the threads, free of burrs and projections, and shall have chamfered corners.

All nuts shall be securely locked by the use of locknuts or spring lock washers or by other means approved by EGAT. The nuts and locknuts shall run freely (hand fit) for the entire length of the galvanized bolts.

The dimension of the spring lock washers shall meet the following requirements:

Nominal	Basic	Maximum Average	
<u>Washer Size</u>	<u>Inside Diameter</u>	<u>Outside Diameter</u>	<u>Thickness</u>
mm	mm	mm	mm
16	16.2	27.4	3.5
20	20.2	33.6	4.0

- d. Shearing and Cutting. Materials may be sheared to length, but the ends, unless otherwise noted, must be square with the flanges and faces and free of burrs so that difficulty of assembly caused by interference with other members at the time of assembling the steel tower shall not occur.

The use of a burning torch is permissible for cutting members providing all irregular edges are trimmed smooth before galvanizing. Stresses shall not be transmitted into the metal through a burned surface. The material adjacent to a burned surface for a distance equal to the thickness of the material shall not be considered a part of the net section for tension members. The use of a burning torch for cutting bolt holes will not be allowed.

- e. Punching and Drilling. Holes are to be punched with racks and jigs employed to ensure accuracy throughout. The punches and dies for this work must be maintained sufficiently sharp so as to produce clean round holes normal to the plane of material, free of burrs, folds, depressed or upset edges.

Special care is to be exercised to ensure exact spacing of holes and their distance from back of angle and to end of piece. Any member having holes or cut more than 0.8 mm from correct position will be subject to rejection. No welding, filling or plugging will be permitted unless approved by EGAT.

Holes may be punched up to a thickness equal to the hole diameter minus 1.6 mm for structural steel and the hole diameter minus 4.7 mm for high-strength structural steel, but, in mild steel over 19 mm thick and in high-strength structural steel over 16 mm thick holes must be drilled or subpunched and reamed.

Holes in bent members which may be affected by the bending operation shall be laid out and punched or drilled after bending. Holes which are elongated or otherwise distorted by bending will not be accepted.

The diameter of bolt holes shall not exceed the bolt diameter plus 1.5 mm except holes for embedded anchor rods, shall be approximately 6 to 7 mm larger than the bolt diameter.

- f. Bending. All bending of structural steel shall be done in accordance with AISC. Methods for bending utilizing heat shall be approved by EGAT.
- g. Welding. All welding shall be performed in accordance with "The Structural Welding Code", AWS D1.1, of the American Welding Society. A shielded arc-welding process shall be used. All welds shall be made in such a manner as to minimize residual shrinkage stresses. When extremely thick plates are welded (such as baseplates), pre-heating may be necessary to avoid formation of shrinkage cracks. If not previously qualified, the welding process and the welding operators employed in performing the work covered by the Contract Documents shall be qualified in accordance with the American Welding Society Standard Qualification Procedure. No field welding will be allowed.
- h. Markings. All individual pieces shall be marked with the correct designations shown on the approved detail drawings. Markings shall be done by stamping the marks into the metal before galvanizing, and details shall be clearly legible after galvanizing. The number and letter shall be a minimum of 12 mm in height. After galvanizing, marks shall be circled or bracketed with black paint. In designating members on drawings, the Contractor shall endeavor to use as few designations as possible, and each member of identical size and detail shall have the same designation, regardless of its position in the structure.

The member numbers shall be successively grouped on individual detail drawings. The groups of member numbers shall be indicated on the drawings.

- i. Cleaning and Galvanizing.
 - (1) Cleaning. After fabrication has been completed and accepted, all materials shall be clean of rust, loose scale, dirt, oil, grease and other foreign substances.
 - (2) Galvanizing. Unless otherwise indicated on the drawings, all materials shall be hot-dip galvanized after fabrication and cleaning.

Galvanizing for structural steel products shall meet the requirements of ASTM A123. In addition, welded assemblies, which may be particularly susceptible to cracking and/or distortion, shall be galvanized and tested in accordance with ASTM A143. All holes in material shall be free of excess spelter after galvanizing.

Galvanizing for bolts, step bolts, U-bolts, shackles, nuts locknuts, fillers, washers, spring washers and similar hardware shall meet the requirements of ASTM A 153 as follows:

Class of Material	Minimum Weight of Zinc Coating (g/m ²) of Surface	
	Average of Specimens Tested	Any Individual Specimen
Class C - Bolts (over 9.52 mm in diameter) and similar articles. Washers 4.76 to 6.35 mm thick	381	305
Class D - Washers under 4.76 mm thick	305	259

Excess spelter shall be removed by appropriate means acceptable to EGAT.

Nuts and locknuts shall be galvanized after threading. Retapping of nuts and locknuts after galvanizing, if required to insure free running of nut on bolt, shall be such that sufficient protective zinc or tapping oil will remain on threads in nuts and locknuts so as to prevent corrosion of the threads prior to tower erection.

Galvanized steel members shall be dipped into solution of dichromate after galvanizing for prevention of white rust during transportation and storage.

- (3) Uniformity of Coating. The uniformity of coating test shall be made in accordance with ASTM A239. The minimum repetition times for one minute dip in uniformity test shall be as follows:

Steel shapes and plates.....6

Bolts, nuts and similar hardware.....4

- (4) Minor Repair. Materials on which galvanizing has been damaged shall be redipped unless, in the opinion of EGAT, the damage is local and can be repaired by applying a coating of galvanizing repair paint or spraying.

Where such repair is authorized, the damaged area shall be cleaned by wiping with clean rags saturated with mineral spirits of xylene, followed by wire brushing. After wire brushing, the area shall be recleaned with solvent to remove residue, and shall be given one brush coat of galvanizing repair paint. The percentage of pure zinc by weight in dry film of galvanizing repair paint shall not be less than 85. Thickness shall be in accordance with manufacturers recommendations and as approved by EGAT.

- j. Shop Assembly. One tower of each type and height, including every combination of leg extensions, shall be assembled in the shop to such an extent as to ensure proper field erection. Towers that have been previously assembled for load testing will not be required to be reassembled in the shop, except as necessary to prove the satisfactory fit-up of every combination of body and leg extension. Reaming of unfair holes will not be permitted. No drifting will be allowed in assembling.

If any errors on the drawings or fabrication are discovered all incorrect drawings shall be revised and the corrected part refabricated and reassembled. All revised drawings shall be resubmitted to EGAT for approval.

- k. Quality Assurance Testing. The Contractor shall furnish with his bid a detailed Quality Assurance Procedure, and shall be responsible for performing all tests and inspections required during the production of the towers.

The Contractor shall identify all materials, including bolts and nuts, used on EGAT project on the appropriate mill test reports and/or material certifications, and shall furnish the mill test reports and/or certifications to EGAT.

The Contractor shall make dimensional checks of all structural materials for conformity to ASTM A6.

The Contractor shall make a visual inspection of all materials before and after galvanizing. Embrittlement tests shall be made in accordance with ASTM A143. Uniformity of coating tests shall be made in accordance with ASTM A239. Thickness of coating tests shall be made in accordance with ASTM A90. Size of test "lot" and number of tests shall be in accordance with the appropriate ASTM standards.

All full penetration welds (such as between stub angle and baseplate) shall be tested using either ultrasonic or radiographic techniques; testing shall cover the entire length of weld. The ultrasonic procedure shall be capable of demonstrating weld quality as required by AWS D1.1. Doubtful indications from ultrasonic inspections shall be checked by using the radiographic rejection criteria as set forth in AWS D1.1.

All baseplate to stub angle welds shall be ultrasonically inspected both before and after galvanizing.

All other welds shall be checked for visible defects and cracks as determined by magnetic particle or dye penetrant inspection.

In addition to above inspection and tests, the Contractor is required to perform the following tests at his own expense on samples selected at random by and at the presentation of EGAT or EGAT's representatives.

- a. Physical tests on samples of structural steel sections. The tests to be carried out shall include yield strength, ultimate tensile strength and percentage elongation. One set of tests shall be carried out for each 250 tons of steel passing through the fabrication plant.
- b. Galvanizing tests on samples of structural steel sections. The tests to be carried out shall include determination of weight of zinc coating, adherence of zinc coating and uniformity of zinc coating. One set of tests shall be carried out for each 250 tons of steel passing through the fabricating plant.
- c. Mechanical property and galvanizing tests on samples of bolts and nuts shall be carried out in accordance with the requirements of ASTM A394.

A-6. Tower Load Test

Full scale load tests shall be performed on a prototype of each of the towers as specified. Load tests shall be made at the manufacturer's plant or at such location as may be mutually agreed on for each type of tower to be tested.

The Contractor shall give EGAT not less than 30 days advance notice, in writing or by wire, of the date when test towers will be ready for tests. EGAT reserves the right to eliminate the requirement for performing any or all tests. Should EGAT exercise this right, the applicable unit prices for performing the test will be deducted from the total contract price. The Contractor will not be entitled to any additional compensation by reason of such elimination.

Each test shall be performed in accordance with the following requirements:

- a. Tower. The tower shall be fabricated from approved detail drawings in a manner as close to final production procedures as is practicable. The tower shall be complete in every detail.
- b. Erection. The tower shall be erected on a rigid foundation using the specified tower bolts and nuts which shall be tightened to the specified torque.
- c. Rigging. The Contractor shall submit for EGAT's approval, diagrams showing the proposed methods of applying loads and measuring deflections.
- d. Loading. All test loads corresponding to conductor and overhead ground wire loading shall be applied directly to the regular attachment devices provided for these loads. Test loads equivalent to wind loads on the tower and ladder, if any, shall be applied where convenient and in such a manner that the summations of applied load and overturning moment are as close as possible to the actual behavior as designed. An extra compression member is not allowed for use in applying wind loads on tower. To ensure application of full-test loads to the tower, friction losses in rigging shall be computed and shall be added to the rigging loads.
- e. Load Programs. The Contractor shall program the tests to demonstrate that the towers will carry all design loads and conditions specified in the loading diagrams. Test wind loads on the tower shall be the same as applied in design calculation.
- f. Deflection Measurements. Deflections shall be recorded at the beginning and end of each loading period to provide longitudinal and transverse deflections and torsional deflection at all cable attachment points and at least one intermediate point of tower body.

- g. Design Load Tests. Loads for any loading condition shall be applied in increments of 50, 75, 90, 95 and 100 percent of the full design loads. Each load increment shall be maintained for not less than two minutes for each assumption except that under maximum (full) design loads, loads shall be maintained for a period of five minutes. During the period in which the increment of loading is being held, there shall be no slacking off of the loads. Should it become necessary to adjust the loading, the two or five minute period shall start after the loading is stabilized and constant. All test loads shall be removed completely before the loads for testing under a different loading condition are applied.
- h. Destruction Tests. After the successful completion of the load tests, the tower shall be further tested to destruction by increasing the transverse loads, under the loading case specified by EGAT, in increments not to exceed five per cent of full design transverse loads. The vertical and/or longitudinal load(s) shall be kept constant at their full design values. Each load increment shall be held at least five minutes while deflections are being recorded.
- i. Modification of Tower Components. Any conspicuous yielding or permanent deformation or any failure of any part of the tower under any of the tests specified in Item g shall be considered a defect. If a defect develops, the Contractor and/or EGAT representative shall modify the design of the tower and submit it to EGAT for approval. The modified tower shall then be retested.

The expenses associated with redesign and retest will be borne by the Contractor if made necessary by a defect in the Contractor's work; the expenses associated with redesign and retest will be borne by EGAT. if made necessary by a defect in the design or drawings furnished by EGAT.

- J. Materials Tests. Steel materials used for tested towers shall be subject to tension or bend tests in accordance with ASTM A370. Tests shall be performed by the Contractor at no additional cost to EGAT. The test specimens shall be selected as follows:
- (1) Two sets selected from the failed members of each tested tower.
 - (2) Two sets randomly selected from undisturbed members of each tested tower.
- k. Reports. The Contractor shall furnish four certified copies of full reports of all tower and material tests, the calibration of the dynamometers or gauges, including clear photographs of the test set-ups and nature of all failures, diagrams showing deflection of towers at each interval of loadings, detail diagrams showing the manner in which all the loads were applied and deflection records.

AMENDMENT NO.1
SPECIFICATIONS NO. L-500 kV (REVISION 1)
CONSTRUCTION OF 500 kV TRANSMISSION LINE

APRIL 2001

The following amendment shall be made with the entitled specifications.

1. **Section A. 500 kV Lattice Steel Towers**, revise as follows :

- a) On page A1, **Article A-1. General Instructions**, revise item c. of this article to read as follows :

"c. to furnish existing shop detailed drawings and to require only materials supply and fabrication services in order to promote uniformity of appearance and/or standardization of structure types; in such cases the provisions of Article A-3. Design, and A-4. Detailing do not apply but all other provisions do apply.

However, the Contractor shall carefully scrutinize EGAT's furnished drawings, make minor modifications as necessary and submit all revised drawings to EGAT for review and approval. The full responsibility for adequacy and accuracy of all detailed fabrication/erection drawings of all tower types shall rest with the Contractor. The Contractor shall have no right to claim for any additional compensation as a result of his misinterpretation, inaccuracies, errors or omissions in checking the drawings not complied with the design requirements."

- b) On page A2, **Article A-2 Materials**, revise item a. of the article to read as follows :

"a. **Rolled Shapes and Plates**. All materials shall be hot-rolled of structural and/or high-strength structural steel.

- (1) **Structural Steel**. Structural steel shall conform to ASTM A36.

Structural steels conforming to TIS 1227 grade SS400 or TIS 1227 grade SM400 are accepted for use as equivalent to structural steels conforming to ASTM A36.

High-strength Structural Steel. High-strength structural steel shall conform to ASTM A572 grade 50. All high strength shapes and plates shall have a guaranteed minimum yield strength of 50 ksi (3,515 kg/sq.cm).

High-strength structural steels conforming to TIS 1227 grade SS540 to TIS1227 grade SM520 are accepted for use as equivalent to high-strength structural steels conforming to ASTM A572 grade 50.

- (2) Steel Grade Substitution. Steel rolled for and released as structural grade shall not be used as a substitute for high-strength grade regardless of test values.

Steel rolled for high-strength grade may be used for structural grade if it meets the required specifications.

AMENDMENT NO. 2
SPECIFICATION NO. L-500 kV (REVISION 1)
CONSTRUCTION OF 500 kV TRANSMISSION LINE
APRIL 2001

The following amendment shall be made with the entitled specifications.

1. **Section B. Conductor**, revise as follows:

- a) On page B1, **Article B-1. General**, delete this article in its entirety and replace with the following :

"B-1. General

This Specification covers the detail requirements for the design, fabrication, test and shipping of aluminum conductor, concentric-lay-stranded, coated steel-reinforced for use as subconductors of a four bundled conductor system. All requirements for the ASTM or TIS Specifications shall be applicable unless superseded or modified by this Specification.

It is intended that the conductor covered by this Specification shall be suitable for both tension and slack stringing. Any conductor which, when properly threaded, exhibits "bird caging" or popped strands during stringing may be rejected."

- b) On page B1, **Article B-2. Standard**, delete this article in its entirety and replace with the following :

"B-2. Standards

The materials covered under this Specification shall conform to the following standards and latest applicable standards referenced therein, except as specified herein.

ASTM B230 Specification for Aluminum Wire, EC-H19 for Electrical Purposes.

ASTM B232 Specification for Aluminum Conductors, Concentric-Lay-Stranded Coated Steel-Reinforced.

ASTM B549 Specification for Concentric-Lay-Stranded Aluminum Conductors, Aluminum-Clad Steel-Reinforced.

ASTM B498 Specification for Zinc-Coated (Galvanized) Steel Core Wire for Aluminum Conductors, Steel Reinforced.

ASTM B502 Specification for Aluminum-Clad Steel Core Wire for Aluminum Conductors, Aluminum-Clad Steel Reinforced.

ASTM B354 Standard Definitions of Terms Relating to Uninsulated Metallic Electrical Conductors.

NEMA Pub. 107 Methods of Measurement of Radio Influence Voltage (RIV)

IEEE Std. 524 Guide to the Installation of Overhead Transmission Line Conductors.

TIS 85 Specification for Round Wire Concentric Lay Overhead Electrical Stranded Conductors

TIS 2222 Specification for Hard-Draw Aluminum Wires for Overhead Line Conductors

TIS 2221 Specification for Zinc-Coated Steel Wires for Stranded Conductors ”

- c) On pages B1 and B2, **Article B-3. Conductor Characteristics**, delete this article in its entirety and replace with the following:

“B-3. Conductor Characteristics

- a) Aluminum Conductor, Steel Reinforced (ACSR/GA). The conductor to be furnished shall be aluminum conductor, concentric-lay-stranded, reinforced with Class A zinc coated steel wire and shall conform to the general characteristics shown in Table 1B.1.
- b) Aluminum Conductor, Aluminum-Clad, Steel Reinforced (ACSR/AW). The conductor to be furnished shall be aluminum conductor, concentric-lay-stranded, reinforced with aluminum-clad steel wire and shall conform to the general characteristics shown in Table 1B.1.

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TABLE 1B.1
CONDUCTOR CHARACTERISTICS

Description		795 kcmil	795 kcmil	1272 MCM	1272 MCM	1272 MCM	1272 MCM
		ACSR/GA	ACSR/AW	ACSR/GA	ACSR/GA	ACSR/AW	ACSR/AW
Complete Conductor :							
Code name		CONDOR	CONDOR	-	PHEASANT	-	PHEASANT
Nominal aluminum area	cmil	795,000	795,000	1,272,000	1,272,000	1,272,000	1,272,000
Outside diameter	mm	27.73	27.73	33.91	35.10	33.91	35.10
Cross-section area	mm ²	455.0	455.0	677.8	726.2	677.8	726.2
Stranding :							
Aluminum							
- Number		54	54	42	54	42	54
- Diameter	mm	3.08	3.08	4.42	3.90	4.42	3.90
Steel							
- Number		7	7	7	19	7	19
- Diameter	mm	3.08	3.08	2.46	2.34	2.46	2.34
Minimum breaking strength	kg	12,800	13,290	14,050	19,770	13,820	19,232
Approximate weight	kg/m	1.523	1.459	2.040	2.433	2.006	2.336
Nominal length :							
returnable metal reel	m	3,500	3,500	2,400	2,400	2,400	2,400
non-returnable wooden reel	m	1,750	1,750	1,200	-	1,200	-
Length of lay (Aluminum wire layers) :							
First (Outside)		10 - 13	10 - 13	10 - 13	10 - 13	10 - 13	10 - 13
Second		10 - 16	10 - 16	10 - 16	10 - 16	10 - 16	10 - 16
Third (Inside)		10 - 17	10 - 17	10 - 17	10 - 17	10 - 17	10 - 17
Steel wire layer		18 - 30	18 - 30	18 - 30	18-30 (6strand) 16-24 (12strand)	18 - 30	18-30 (6strand) 16-24 (12strand)
Component Aluminum Wire :							
Number		54	54	42	54	42	54
Diameter	mm	3.08	3.08	4.42	3.90	4.42	3.90
Minimum elongation in 254 mm (average)	%	1.8	1.8	2.0	2.0	2.0	2.0
Minimum tensile strength (average)	kg/mm ²	17.58	17.58	16.87	16.83	16.87	16.83
Component Steel Wire :							
Number		7	7	7	19	7	19
Diameter	mm	3.08	3.08	2.46	2.34	2.46	2.34
Minimum elongation in 254 mm (average)	%	4.0	1.5	3.5	3.5	1.5	1.5
Minimum stress at 1 per cent extension	kg/mm ²	127	123	130	130	123	123
Minimum tensile strength	kg/mm ²	144	137	144	144	137	137
Minimum weight of zinc coating	g/m ²	259	-	229	230	-	-
Minimum weight of aluminum coating	g/m ²	-	439	-	-	349	349
			(or Aluminum thickness ≥ 10% of wire radius)			(or Aluminum thickness ≥ 10% of wire radius)	(or Aluminum thickness ≥ 10% of wire radius)

- d) On page B4, **Article B-5. Tests and Reports**, item a. **Component Wires**, delete this item in its entirety and replace with the following:

"a. Component Wires

- (1) Aluminum wire, before stranding, shall be tested in accordance with the requirements of ASTM B230 or TIS 2222.
- (2) Zinc-coated steel wire, before stranding, shall be tested in accordance with the requirements of ASTM B498 or TIS 2221.
- (3) Aluminum-clad steel wire, before stranding, shall be tested in accordance with the requirements of ASTM B502."

2. Section D. Insulators and Hardware, revise as follows:

- a) On pages D2 and D3, Article D-3. Detail Requirements for Insulators, item b. Suspension Type Insulators, sub-item (1). Dimensions and Characteristics, delete this sub-item in its entirety and replace with the following:

- "(1) Dimensions and Characteristics. Dimensions and characteristics of each type of insulator shall be in accordance with the following:

<u>Particular</u>		<u>Standard Type</u>			<u>Fog Type</u>	
ANSI Class		52-4	52-8	52-11	-	-
Dimensions:						
Maximum disc diameter	mm	273	298	311	298	330
Unit spacing	mm	146	146	156	146	178
Minimum leakage distance	mm	292	305	381	432	545
Mechanical Values:						
Combined mechanical and electrical strength	kg	6,800	16,300	22,600	16,300	22,600
Mechanical impact strength	m-kg	0.63	1.04	1.04	1.04	1.04
Tension proof	kg	3,400	8,150	11,300	8,150	11,300
Time load	kg	4,500	10,880	13,600	10,880	13,600
Electrical Values:						
Low-frequency dry flashover	kV	80	80	80	80	80
Low-frequency wet flashover	kV	50	50	50	50	50
Critical impulse flashover,						
Positive	kV	125	125	140	125	140
Negative	kV	130	130	140	130	140
Low-frequency puncture	kV	110	110	125	110	125

<u>Particular</u>		<u>Standard Type</u>			<u>Fog Type</u>	
		52-4	52-8	52-11	-	-
ANSI Class						
Radio-Influence Voltage Data:						
Low-frequency test voltage, rms to ground	kV	10	10	10	10	10
Maximum RIV at 1000 kHz	V	50	50	50	50	50
Coupling Type:		-	K	K	K	K
Glaze Color:		brown	grey or brown	grey or brown	K	K
(In case porcelain insulators are supplied)						
<u>Note</u> : Specific glaze color shall be as specified in the Contract "						

b) Article D-7. Tests, revise as follows:

(1) Article a. Complete Conductor Insulator and Hardware Assemblies, revise as follows:

(i) On page D8, item (1) Corona and RIV Tests. Sub-item (c)(5) for Test Arrangement, delete this item in its entirety and replace with the following:

"(5) The test arrangement shall consist of a four conductor bundle configuration. The length of the conductor to be used shall be approved by EGAT. The conductor to be used for the tests shall be provided by the Contractor at his own expense and shall be in clean and good conditions."

(ii) On page D10, item (2) Lightning Impulse, Switching Surge and Power Frequency Flashover Tests. Sub-item (c). Test Arrangement, delete this item in its entirety and replace with the following:

"(c) Test Arrangement. Simulation arrangement for these tests shall be as follows:

(1) Assembly 3 shall be tested on a full-scale mock-up of a DL(3°) tower. This assembly shall be fixed at a swing angle which results in a conductor to tower clearance of 4 meters for these tests.

(2) Assemblies 14 or 14A and 17 shall be tested on a full-scale mock-up of the DT40 tower."

(2) On page D11, Article b. Complete Shield Wire Insulator and Hardware Assemblies, item (1) Type of Test Assemblies, delete this item in its entirety and replace with the following:

"(1) Type of Test Assemblies. A complete set of each of the following assemblies shall be subject to test.

<u>Type of Assembly</u>	<u>Reference Assembly</u>
Shield wire (insulated) suspension assembly	1 or 1A
Shield wire (insulated) deadend assembly	11 or 11A "

- c) On pages D13 and D14, Article c. Insulators, revise item (4) Power Arc Test, item (5) Thermal – Mechanical Performance Test, and item (6) Steep Wave Front Impulse Test, as well as add item (7) Pollution Test, to read as follows:

- “(4) Power Arc Test. Three strings of insulators, each containing six units randomly selected from the first lot brought forth for acceptance, shall be assembled in a vertical configuration without conductors for each 52-8, 52-11, and fog type of insulator. The strings shall be energized at the bottom and grounded at the top. The insulator strings shall be subject to a 50 hertz power arc of 20,000 amps rms sustained for five cycles. The insulators shall be tensioned to 40 per cent of their rated strength prior to initiation of the arc and this tension shall be maintained for the duration of the arc and for five minutes following its extinction. There shall be no separation of cap and pin during this portion of the test.

After arcing, each string of insulators shall be mechanically tested in accordance with paragraph 5.1 of ANSI C29.1, except that the load may be increased rapidly to only 45 per cent of the rated strength of the insulator. The rate of increase of load from 45 per cent to failure shall be as given in Table 1 of ANSI C29.1. If any insulator fails at less than 60 per cent of its rated strength, the insulator design fails to meet these specifications.

- (5) Thermal – Mechanical Performance Test. Ten insulator units of ANSI Class 52-8, ANSI Class 52-11, and Fog Type shall be selected for testing at random from the first lot brought forth for acceptance. The test shall be performed in accordance with all requirements of Clause 3 of IEC Publication 575: Thermal – Mechanical Performance Test and Mechanical Performance Test on String Insulator Units except that the concluding stage of the test shall be the combined mechanical and electrical strength test of ANSI C29.1 and the criteria of judgement for acceptance shall be as follows:

$$3 \leq Q = (R - R_s)/S$$

Where

Q = Criteria of judgement for acceptance

R = Mean value obtained on the sample of ten insulator units tested

R_s = Rated mechanical and electrical strength value of the insulator

S = Standard deviation for the ten insulator units tested

Each value measured shall not be lower than the specified mechanical and electrical strength. In addition, electrical puncture shall not occur before reaching ultimate failure. The results of the Thermal-Mechanical Performance Test shall match the results of the ordinary combined mechanical and electrical strength test of paragraph D-7.c(2), and the fracture pattern shall not change.

- (6) Steep Wave Front Impulse Test. Ten (10) insulator units of each suspension type insulator of ANSI Class 52-8, ANSI Class 52-11, and Fog Type shall be selected by EGAT at random from the first lot brought forth for acceptance. These units shall be tested as follows:

- (a) The insulator units shall be subjected to five successive positive impulse flashovers followed by five successive negative impulse flashovers. Each wave impulse shall have an effective rate of rise of 2,500 kV per microsecond. These insulators shall be tested singly.

- (b) Each unit shall then be subjected to three flashovers of the low frequency dry flashover test of ANSI C29.1 and shall have a flashover value not less than 95% of the rated value.
 - (c) Upon failure of any one unit to pass either the steep wave front of the dry flashover test, and additional quantity of twenty (20) randomly selected units shall be tested in accordance with (a) and (b) above.
 - (d) Failure of any one unit of the second group of samples to pass either test shall constitute failure of the insulator design and evidence that the requirements of this specification are not met.
- (7) Pollution Test. Three (3) strings of insulators, each containing nine (9) units randomly selected from the first lot brought to be tested for acceptance, shall be assembled in a vertical configuration without conductors for each ANSI Class 52-8, 52-11, and fog type of insulator. The test shall be performed on the salt fog method or the solid layer method in accordance with all requirements of IEC Standard 60507 (Artificial Pollution Tests on High-Voltage Insulators to be used on A.C. Systems) and the leakage current shall be measured during this pollution test. The test method for insulator discs on transmission line shall be determined by EGAT. The criteria of judgment for acceptance shall be as follows:

For withstand test of all methods :

- (a) No flashover occurs during three (3) consecutive tests performed on three (3) strings of insulators at specified test voltage
where $\text{Specified test voltage} = 9 * \text{Withstand voltage for each unit}$
(value specified in proposal data)
the degree of pollution test (ESDD) shall be determined by EGAT.
- (b) If only one flashover occurs, the fourth test shall be performed and the insulator then passes the test if no flashover occurs.
- (c) The highest leakage current pulse amplitudes occurring on a polluted insulator throughout the duration of all individual withstand tests in withstand conditions shall be not more than those specified in Appendix A of IEC Standard 60507.

AMENDMENT NO. 4
SPECIFICATION NO. L-500 kV (REVISION 1)
CONSTRUCTION OF 500 KV TRANSMISSION LINE
APRIL 2001

The following amendment shall be made with the entitled specifications.

1. **Section D. Insulator and Hardware, Article D-7. Tests, Item a. Complete Conductor Insulator and Hardware Assemblies**, revise as follows:
- a) On page D7, **revise sub-item (1) Corona and RIV Tests, sub-sub-item (a) Type of Test Assemblies**, revise this sub-sub-item to read as follows:

“(a) Type of Test Assemblies. A complete set of each of the following assemblies or EGAT’s requirement shall be tested to satisfy the requirements specified.

<u>Type of Assembly</u>	<u>Reference Assembly</u>
Conductor suspension assemblies "V-String"	3D, 5D, 8D, 9D 19D and 20D
Conductor deadend assemblies	13D, 14D OR 13AD and 15D
Jumper support assembly - "V-String"	-
Jumper support assembly 17 "I-String"	17D "

(b) Test Station. The test station shall be subject to EGAT's approval. Such test station shall possess an excellent and wide reputation, having at least 10 years of experience in conducting electrical performance tests of insulators, hardware and complete insulator and hardware assemblies including extensive knowledge and experience in conducting tests at the 500 kV voltage level.

(c) Test Arrangement. Before performance of any corona and RIV test the Contractor shall submit detail drawings showing the assemblies to be tested to EGAT for approval. The drawings shall be complete and show the arrangement of all hardware, insulators suspension unit with armor rod installed and any accessories such as weights which will be used in the actual test. The drawings shall show the calculated corona inception voltage, distance from the ground plane, dimensions of the laboratory and location of the test specimen with respect to hereby large pieces of equipment. Test arrangements shall be in accordance with the following requirements:

(1) Corona observation and RIV measurements shall be made in a darkened and quiet laboratory or other suitable location approved by EGAT.

(2) The test shall be performed on a simulation arrangement of the tower that will actually be used. If the test is to be performed in an outdoor laboratory, the assemblies shall be placed on a mock-up of the ground plane that simulates the tower to be actually used. The mock-up configuration shall include complete tower window.

(3) Each conductor suspension and conductor deadend assembly to be tested shall be completely assembled with hardware, insulators and conductors in accordance with the drawings approved by EGAT.

(4) The conductor dead end assembly shall be tested complete with compression dead-ends, jumper terminals and a partial jumper loop.

(5) The test arrangement shall consist of a four conductor bundle configuration of same type in the contract or aluminum tube with same diameter of that conductor. The type and length of conductor or tube to be used shall be approved by EGAT. The conductor or tube to be used for the tests shall be provided by the Contractor at his own expense and shall be in clean and good conditions.

(6) It is intended that the basis for establishing the corona levels of these assemblies in clean and dry condition shall be by comparison with the corona inception level of the conductor when in clean and dry condition. The geometry of the test with single phase voltage shall be such as to reproduce the electrical surface gradients on the conductors which would be obtained when in the geometry of 3-phase voltages of the actual line.

(d) Test Procedure. Test shall be performed in accordance with the following requirements:

(1) Before performing the test, the Contractor shall submit a proposed voltage range to be applied during the test to EGAT for approval.

(2) Install 1 (one) type of hardware assemblies from the list in a(1)(a) with complete dimension as shown in approved drawing by EGAT except that grading ring is not included.

(3) Perform the pretest with the following procedure:

a. Apply a starting voltage above the visual corona level until the visual corona appears.

b. The voltage shall be reduced slowly while visual corona just disappears in turn from each identifiable item of the assembly, and until the assembly as a whole is free from visual corona. These levels shall be photographed with a minimum one minute time exposure, and voltage maintained on each assembly for a minimum of five minutes.

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(4) Perform the test with the following procedure:

- a. Apply a starting voltage above the visual corona level until the visual corona appears.
- b. The voltage shall be reduced slowly while visual corona just disappears in turn from each identifiable item of the assembly, and until the assembly as a whole is free from visual corona. These levels shall be photographed with a minimum one minute time exposure, and voltage maintained on each assembly for a minimum of five minutes.
- c. RIV readings shall be recorded at each voltage level with at least consist of voltage level of 280 kV, 300 kV, 320 kV and 340 kV. A curve of ambient RIV shall be obtained up to the maximum test voltage.

The RIV measurements including definitions, test conditions and test circuit shall be made in accordance with NEMA Standard 107 or an equivalent approved by EGAT.

(5) The first criterion for acceptance of the hardware assemblies, or of any item thereof, shall meet all three of the following conditions.

- a. In the test mention in (4)b: all visual corona just disappears at a voltage not less than the apparent corona level shown in hardware assemblies proposal data of the conductors, both hardware and conductors being observed simultaneously.
- b. In the test mention in (4)c: RIV reading at 320 kV is not more than the RIV state in the hardware assemblies proposal data.
- c. In the test mention in (4)c: when a graph of RIV reading against the voltage level of 280 kV, 300 kV, 320 kV and 340 kV is plotted, slope of the line pass through the 280 kV, 300 kV, 320 kV is the same to slope of the line pass through the 300 kV, 320 kV, 340 kV

(6) At the same type of hardware assemblies, install the grading ring and then perform the procedure in (3), (4) and (5) respectively with additions.

- a. Visual corona just disappears at a voltage not less than the voltage in (5a)
- b. RIV reading at 320 kV is not more than the RIV in (5b)

(7) The hardware assemblies satisfied by the first criterion for acceptance (5) and the second criterion for acceptance (6) pass the corona RIV test. Otherwise, the hardware assemblies fail the corona RIV test.

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(e) Modification of Hardware Components. Any component of hardware or portion thereof failed to meet the requirements specified above shall be modified or replaced to the satisfaction of EGAT at the Contractor's expense. The entire group of assemblies shall then be retested at the Contractor's expense.

Modification of Hardware Components can only made at once for each hardware assemblies type. If a modification are made but failure to meet the requirements is still occurred, The hardware assemblies shall be rejected.

- b) On page D9, **sub-item (2) Lightning Impulse, Switching Surge and Power Frequency Flashover Tests, sub-sub-item (a) Type of Test Assemblies**, revise this sub-sub-item to read as follows:

“(a) Type of Test Assemblies. Each of the following insulator assemblies shall be subject to test.

<u>Type of Assembly</u>	<u>Reference Assembly</u>
	<u>4x1272 MCM</u>
Conductor suspension assemblies “45°/45° V-String”	3D
Conductor deadend assemblies	14D
Jumper support assembly “I-String”	17D ”

- c) On page D10, **sub-item (2) Lightning Impulse, Switching Surge and Power Frequency Flashover Tests, sub-sub-item (c) Test Arrangement**, revise this sub-sub-item to read as follows:

“(c) Test Arrangement. Simulation arrangement for these tests shall be as follows:

- (1) Assembly 3D shall be tested on a full-scale mock-up of a DL(3°) or DQV3 tower. This assembly shall be fixed at a swing angle which results in a conductor to tower clearance of 4 meters for these tests.
- (2) Assemblies 14D and 17D shall be tested on a full-scale mock-up of the DT40 or DQT40 tower. ”

2. **Section HH. Air Navigation Obstruction Marking and Lighting**, pages HH2 through HH5, **Article HH-3. Marking of Overhead Shield wire and HH-4. Lighting of Steel Towers**, delete this article in its entirety and replace with the following:

“HH-3. Marking of Overhead Shield wire

Where required, the overhead shield wires shall be marked with orange and white colored fiber glass spheres. The spheres shall be 60 to 80 cm in diameter. Any metal parts, if used, for holding the spheres in position shall not cause corrosion or harmful effects to the overhead shield wire.

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The position of the spheres shall meet the following requirements:

- a. The spheres on the two overhead shield wires of any span shall be so staggered that the maximum distance between any two spheres is not greater than 40 m.
- b. The first and the last spheres in any span shall be approximately 10 m from the towers defining the span.

HH-4. Lighting of Steel Towers

The Contractor shall furnish lighting system for installation on towers in accordance with the following detailed requirements:

1. Lighting of Obstacles. Where Obstacle Lights are required, they will be installed on steel towers as shown in drawings attached in the Contract Documents, equipped with solar energy generator. For completeness of the lighting system installation, the Contractor shall furnish and install all conduits, conduit fittings, outlets, wiring, lighting fixtures, lamps, control and protection devices, including any other materials as necessary for Obstacle Lights. Nominal voltage of the lighting system shall be appropriate for the direct current source. All equipment shall be products of recognized manufacturers who regularly supply lighting equipment and solar energy generator. All work shall be performed in accordance with the standard practice for weather proof installation. All metal parts shall be rust-resistance or hot-dipped zinc galvanized materials.
 - a. Obstacle Lights. The characteristics of obstacle lights shall meet requirements indicated in this specification of Lighting of Obstacles and International Civil Aviation Organization (ICAO) International Standards and Recommended Practices for Aerodromes (Annex 14, Volume I). The obstacle light shall show a succession of red flashes and be equipped with one bulb for operation and spare bulb enclosed in aviation red color lens globe. The spare bulb shall replace the out bulb by means of an automatic control rotating bulb changer. The efficient LED or other lighting technology shall be allowed to be used when their characteristics of light meet requirements including the long life time, resistance to weather corrosion conforming to the related international standard and ability to operate continuously under environmental conditions of application on high voltage transmission line. Detailed specifications shall be as follows:
 - (1) Obstacle light on Top of tower for transmission tower higher than 45 meters above ground level and Crossing tower.

Light Type	Medium-intensity, Type B
Operating voltage	48.0 / 24.0 volt D.C. or equivalent
Effective intensity of red light	Not less than 2000 CD
Flashing frequency, approx.	Between 20 and 60 flashes per minute

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Lens	300 mm red tempered glass, single piece Fresnel vertical divergence at least 5° at 1/10 peak intensity
Mounting base	Corrosion – resistance cast alloy

- (2) Obstacle light on Top of tower for transmission tower having a height not exceeding 45 meters above ground level and other position of installation being specified in drawings for Crossing tower.

Light Type	Low-intensity, Type B
Operating voltage	48.0 / 24.0 volt D.C. or equivalent
Effective intensity of red light	Not less than 32 CD
Lens	155 mm red arorylic, single piece Fresnel vertical divergence at least 4° at 50% intensity
Mounting base	Corrosion – resistance cast alloy

- (3) Obstacle light for other transmission tower being specified in drawings attached to the Contract Documents.

Light Type	Low-intensity, Type A
Operating voltage	24.0 volt D.C. or equivalent
Effective intensity of red light	Not less than 10 CD
Lens	155 mm red arorylic, single piece Fresnel vertical divergence at least 4° at 50% intensity
Mounting base	Corrosion – resistance cast alloy

b. Control. The Obstacle lights shall be switched by a photoelectric control and load contactor. The photoelectric control shall provide automatic switching of contactor so that the lights will be turned on and off at a sky intensity level approximately 35 foot-candles and 60 foot-candles, respectively.

The Obstacle lights shall be installed in the manner to ensure vision from aircraft at any normal angle of approach. The equipment with solid state devices shall be designed to withstand transient voltage by including or separating surge protection devices.

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2. Power Supply Circuit Breaker. Circuit breaker for termination of the tower lighting circuits shall be automatic, fuse less, thermally operated, 2-pole, 125 volt D.C., interrupting power rating not less than 1.0 kA and thermal overload current as shown in the drawings attached in the Contract Documents. The deviation of lighting circuits shall be considered with the appropriation of the installed equipment and shall be approved by EGAT.
3. Power Supply Source. The units of power supply for lighting system shall be in accordance with those specified in the drawings.
 - a. Battery. Battery shall be of sealed lead acid battery, and capable to stand in service without need of water addition throughout battery life period. The batteries in association with the solar panel shall be sized for the nominal load under normal condition and additionally shall be sized for at least 120 hours stand by operation (one day operation and four days stand-by) under condition of no sun days. Each battery shall have capacity of containing not less than 100 ampere hours at 100 hours and self-discharging not less than 5 ampere hours per month. The battery container shall be made of high quality polypropylene.
 - b. Battery Charge and Discharge Control. Battery charge and discharge controller shall be matched with D.C. supply voltage of the system. Charge controller cut-off voltage shall be adjustable between 115 – 120% of rated voltage. Discharge controller cut-off voltage shall be 87.5% of rated voltage and initial discharge shall not be less than 104% of rated voltage.
 - c. Solar Energy Generator. Solar energy generator for generating D.C. power to charge battery shall consist of one or more than one set of a unit of one solar cell contained in one panel. Each solar cell shall not be less than 36 silicon photovoltaic cells. Silicon wafers shall be positioned in two closely fitted plates molded of borosilicate crown glass or high transmittivity of unused infrared. A blocking diode shall be provided to prevent power feedback from the battery bank at night. Solar module frame shall be made of highly corrosion-resistant aluminium alloy. The front and back glass surfaces shall be able to withstand damage from humidity, salt water and abrasion. Detailed specifications shall be as follows:

Power	Not less than 50 watts at 25°C
Open circuit voltage	Not less than 21 volts
Terminals/output connection	Naval brass coated with tin or equivalent, enclosed in water proof box
Fixing solar cell in panel	Solar cell shall be fixed in panel by suitable mounting with bolts in array frames and the position of solar cell shall be able to provide terminals connected in series/parallel.
Solar generator panel	15 degrees angle from the horizontal plane and facing south

Computer simulated sizing of batteries and solar panel shall be provided by supplier for EGAT's approval, where sizing is performed based on meteorological data of the applicable location during, at least, the last one year.

4. Solar Regulator. Solar regulator shall be provided with overcharge, deep discharge and reverse current protection, reverse polarity connection of solar panels and reverse polarity connection batteries. The solar regulator housing shall also be provided with termination facilities for batteries, short circuit protection of batteries and isolation of system for maintenance purpose.
5. Lighting Cable and Conduit. The lighting cable shall be insulated by single conductor. Sizes of lighting cable and conduit are as shown in the drawings. Positive and negative polarity shall be red and black respectively. The Connection wiring lead shall be standard joint wiring with protected insulation suitable to use in conduit. The conduit shall be of galvanized corrugated steel, covered with polyvinyl chloride (PVC).
6. Battery and Necessary Equipment Cabinet. The battery and necessary equipment cabinet shall be made of hot-dip galvanized steel, weather proof and well ventilation designed, with opened and locked door. "

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SECTION J
DRAWINGS

J. DRAWINGS

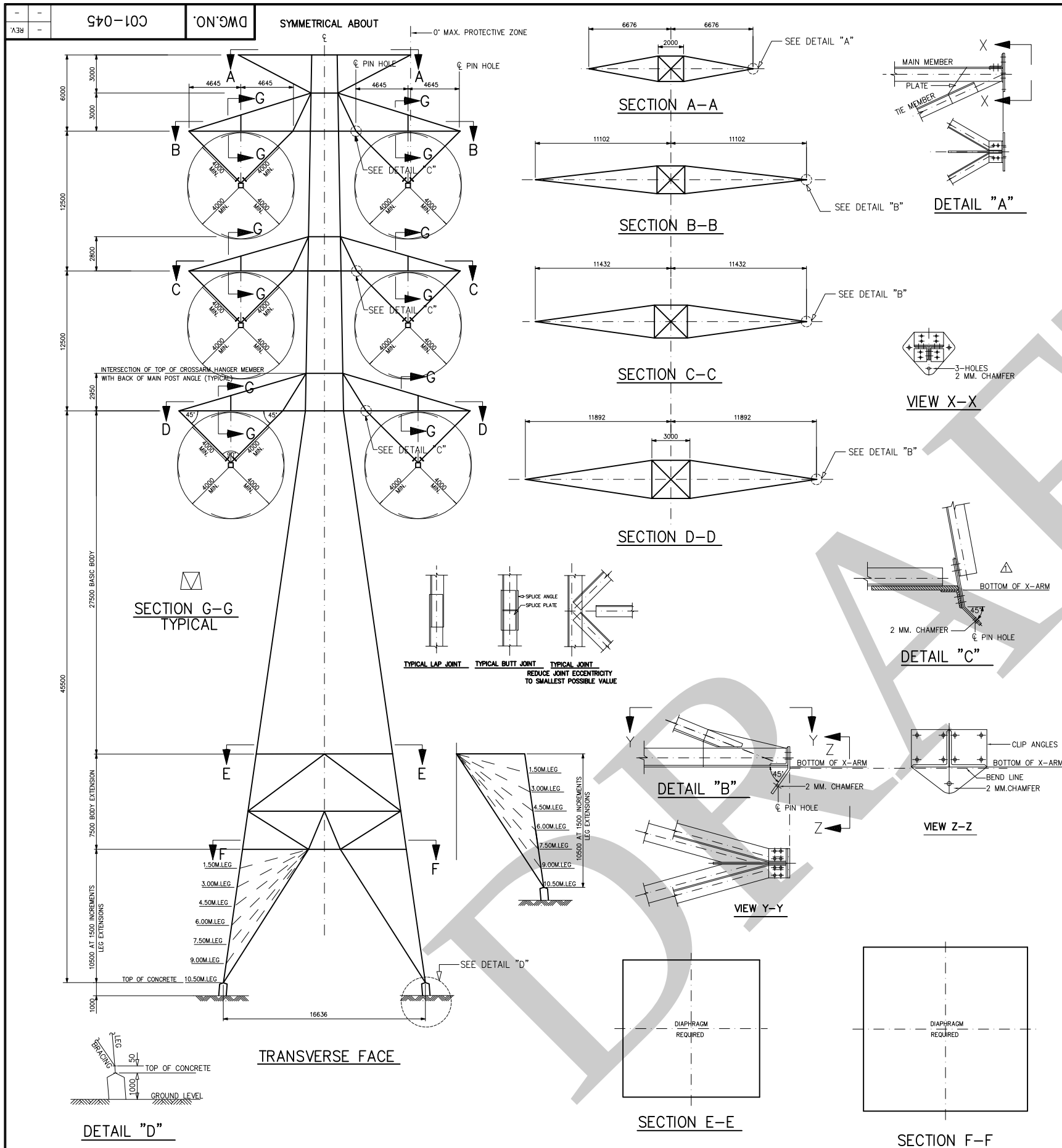
J-1. Drawings

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

Dwg. No.	Description
C01-045	CONFIGURATION AND DESIGN CRITERIA TOWER TYPE DQV3
C01-046 (Rev.1)	CONFIGURATION AND DESIGN CRITERIA TOWER TYPE DQV9(3)
C01-048	CONFIGURATION AND DESIGN CRITERIA TOWER TYPE DQTR
C01-049	CONFIGURATION AND DESIGN CRITERIA TOWER TYPE DQT20
C01-050	CONFIGURATION AND DESIGN CRITERIA TOWER TYPE DQT40
C01-051	CONFIGURATION AND DESIGN CRITERIA TOWER TYPE DQT60
C01-052	CONFIGURATION AND DESIGN CRITERIA TOWER TYPE DQT90
C02-003	LOADING DIAGRAM TOWER TYPE DQV3
C02-004	LOADING DIAGRAM TOWER TYPE DQV3
C02-005	LOADING DIAGRAM TOWER TYPE DQV9
C02-006	LOADING DIAGRAM TOWER TYPE DQV9
C02-007	LOADING DIAGRAM TOWER TYPE DQT20
C02-008	LOADING DIAGRAM TOWER TYPE DQT20
C02-009	LOADING DIAGRAM TOWER TYPE DQT40
C02-010	LOADING DIAGRAM TOWER TYPE DQT40
C02-011	LOADING DIAGRAM TOWER TYPE DQT60
C02-012	LOADING DIAGRAM TOWER TYPE DQT60
C02-013	LOADING DIAGRAM TOWER TYPE DQT60
C02-014	LOADING DIAGRAM TOWER TYPE DQT60
C02-015	LOADING DIAGRAM TOWER TYPE DQT60
C02-016	LOADING DIAGRAM TOWER TYPE DQT60
C02-017	LOADING DIAGRAM TOWER TYPE DQT90
C02-018	LOADING DIAGRAM TOWER TYPE DQT90
C02-019	LOADING DIAGRAM TOWER TYPE DQT90
C02-020	LOADING DIAGRAM TOWER TYPE DQT90
C02-021	LOADING DIAGRAM TOWER TYPE DQT90

Dwg. No.	Description
C02-022	LOADING DIAGRAM TOWER TYPE DQT90
C02-023	LOADING DIAGRAM TOWER TYPE DQTR
C02-024	LOADING DIAGRAM TOWER TYPE DQTR

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LOADING CASES

- EXTREME TRANSVERSE WIND**
ALL WIRES INTACT AT 27°C, FINAL WIRE TENSION. WITH A TRANSVERSE WIND OF 140 KG/M²
ACTING ON SHIELD WIRES, 115 KG/M² ON CONDUCTORS, 156 KG/M² ON TOWER AND INSULATORS. L.F.=1.15 (SEE NOTES B, D)
- EXTREME LONGITUDINAL WIND**
ALL WIRES INTACT AT 27°C, FINAL WIRE TENSIONS. WITH A LONGITUDINAL WIND OF 156 KG/M²
ACTING ON TRANSVERSE FACES OF THE TOWER, NO WINDS ON WIRES. L.F.=1.15 (SEE NOTES B, D)
- EXTREME OBLIQUE WIND**
ALL WIRES INTACT AT 27°C, FINAL WIRE TENSIONS WITH A TRANSVERSE WIND OF 140 KG/M²
ACTING ON SHIELD WIRES, 115 KG/M² ON CONDUCTORS, 156 KG/M² ON TOWER
AND INSULATOR, WIND BLOWING AT 75°, 60° AND 45° TO LINE. L.F.=1.15
(SEE NOTES A, B, D)
- FAILURE CONTAINMENT**
ALL WIRES INTACT AT 27°C FINAL WIRE TENSIONS. WITH A TRANSVERSE WIND OF 91 KG/M²
ON SHIELD WIRES, 76 KG/M² ON CONDUCTORS, 101.5 KG/M² ON TOWER AND INSULATOR, PLUS AN UNBALANCED LONGITUDINAL LOAD
APPLIED AT ANY ONE WIRE ATTACHMENT LOCATIONS EQUAL TO 100% IN THE TENSION IN THE SHIELD WIRE OR 70%
OF THE TENSION IN THE CONDUCTOR PHASE BUNDLE. (SEE NOTE E)
- STRINGING AND MAINTENANCE**
ALL WIRES INTACT AT 4°C INITIAL WIRE TENSIONS. WITH A TRANSVERSE WIND OF 27.5 KG/M² ACTING ON SHIELD WIRES, 23 KG/M²
ON CONDUCTORS, 29.4 KG/M² ON TOWER AND INSULATORS. WITH AN ADDITIONAL VERTICAL LOAD AT ANT OR ALL OF THE WIRE ATTACHMENT
POINTS SIMULTANEOUSLY OF 1,000 KG. PLUS 33% OF THE SHIELD WIRE OR PHASE BUNDLE TENSION. AND WITH AN ADDITIONAL LONGITUDINAL
LOAD ANY ONE WIRE ATTACHMENT LOCATION SIMULTANEOUSLY OF 50% OF THE SHIELD WIRE OR PHASE BUNDLE TENSION. (SEE NOTES E, F)
- HIGH INTENSITY**
ALL WIRES INTACT AT 27°C, FINAL WIRE TENSIONS. PRESSURE OF 306.25 KG/M² ACTING ON TOWER AND INSULATORS WITH NO WIND ON
SHIELD WIRE OR CONDUCTORS. WIND BLOWING AT 90°, 75°, 60°, 45°, 0° TO LINE. (SEE NOTE B)

NOTES

- FOR WIND AT ANGLE θ TO WIRES. WIND PRESSURE TO BE REDUCED BY $\sin^2(\theta)$
- WIND PRESSURE ON TOWER APPLIED ON 3.2 TIMES MOST EXPOSED FACE. FOR WIND AT AN ANGLE θ TO A FACE PRESSURE HAS BEEN
ADDITIONALLY INCREASED BY $[1 + 0.2 \times \sin^2(2\theta)]$; WIND LOAD IS ASSUMED IN THE DIRECTION OF THE WIND.
- ALL ELEMENT OF TOWER ARE TO BE DESIGNED TO 0.92 CAPACITY.
- L.F. DENOTED LOAD FACTOR APPLYING TO STATISTIC LOAD SUCH AS WIND LOADS.
- FOR LOADING CASED IV. AND V THE ADDITIONAL LONGITUDINAL LOADS MAY BE ASSUMED TO ACT AT ANY ONE WIRE ATTACHMENT
LOCATIONS.
- LOCATIONS OF THE ADDITIONAL VERTICAL STRINGING LOADS SPECIFIED IN LOADING CASE V ARE INDEPENDENT OF THE
LOCATIONS OF THE ADDITIONAL LONGITUDINAL STRINGING LOADS. APPLY ADDITIONAL LONGITUDINAL LOAD
AT ANY ONE WIRE ATTACHMENT LOCATION.

GENERAL NOTES

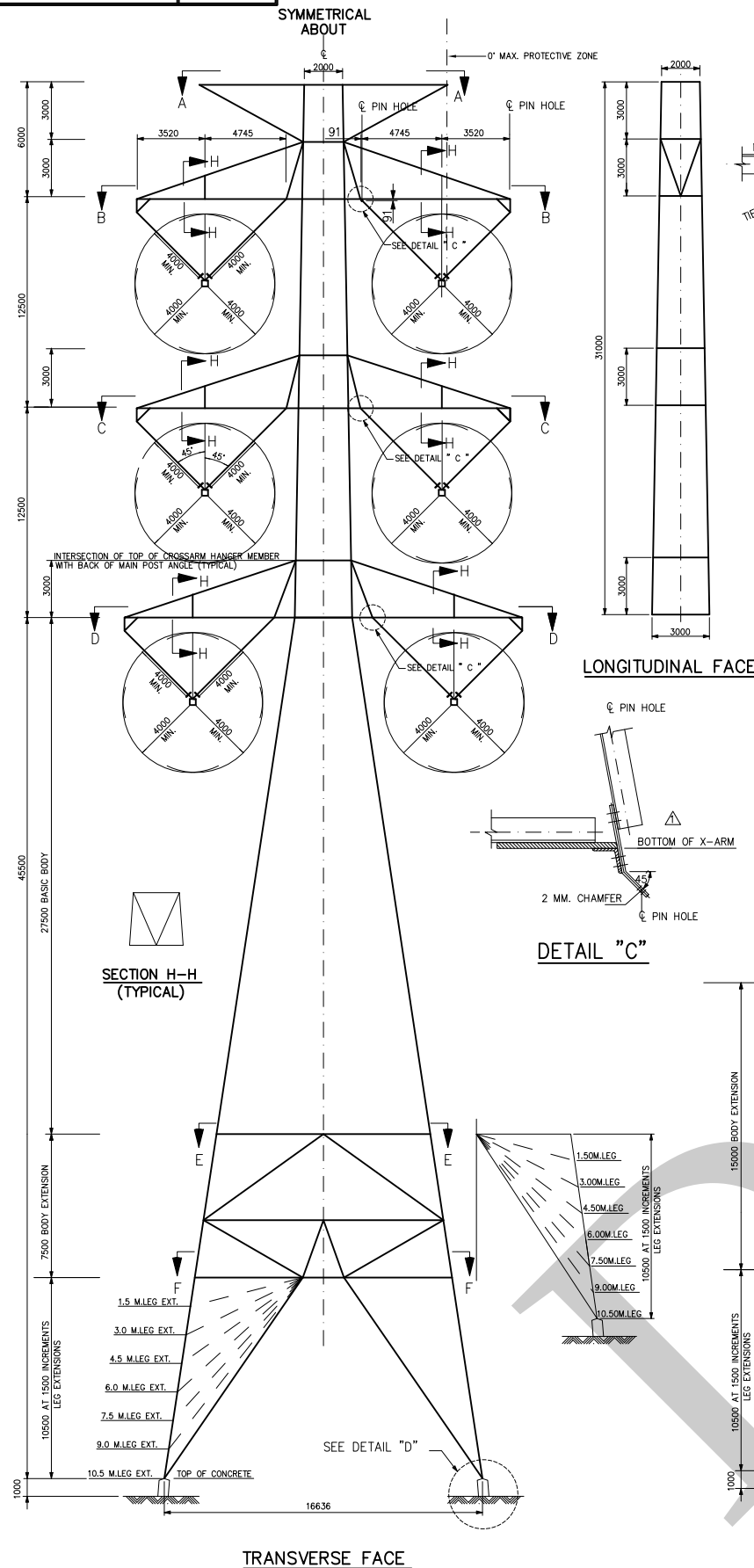
- CLEARANCE DIMENSIONS ARE MINIMUM FROM SURFACE OF STEEL (NOT FROM MEMBER GAGES OR WORKING LINES)
TO THE NEAREST POINT ON THE CONDUCTOR OR CONDUCTOR HARDWARE.
- ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
- ALL DIMENSIONS ON TOWER ARE TO THE WORKING LINES EXCEPT AS OTHERWISE NOTED.
- CONDUCTOR DATA : 1272 MCM, 42/7 ACSR/GA, WT=2.04 KG/M, DIA=33.91 MM, RATED BREAKING STRENGTH=14,050 KG.
(4 SUB-CONDUCTORS PER PHASE BUNDLE)
- SHIELD WIRE DATA : 7 NO.8 ALUMINUM-CLAD STEEL, WT=0.39 KG/M, DIA=9.78 MM, RATED BREAKING STRENGTH=7,227 KG.
OR 3/8 INCH EHS CLASS A, WT=0.406 KG/M, DIA=9.14 MM, RATED BREAKING STRENGTH=6,985 KG.
- TOWER SHALL BE DESIGNED FOR ONE OR BOTH CIRCUITS INSTALLED, FOR THE PURPOSES OF TOWER DESIGN, EACH CIRCUIT SHALL BE
DEFINED AS THE THREE PHASE BUNDLES AND THE CORRESPONDING SHIELD WIRE VERTICALLY ADJACENT TO ONE ANOTHER ON ONE SIDE
OF THE TOWER.
- TOWER SHALL BE DESIGNED FOR MAINTENANCE LOADS (SAME AS HEAVY PHASE VERTICAL LOADS FROM CASE VI) APPLIED DIRECTLY ABOVE
CONDUCTOR SUPPORT POINTS.
- TOWERS ARE DESIGNED FOR USE OF ANY COMBINATION OF LEG EXTENSION HEIGHTS RESULTING IN A MAXIMUM DIFFERENTIAL OF LEG
HEIGHT OF SIX METERS BETWEEN ADJACENT OR DIAGONALLY OPPOSITE LEGS.

TOWER APPLICATIONS

RULING SPAN = 440 M.
MAXIMUM WIND SPAN = 460 M. AT 0° AND 355 M. AT 3°
MAXIMUM WEIGHT SPAN = 690 M.
MAXIMUM DEVIATION ANGLE = 3°
DESIGN CRITERIA BASED ON RIGHT OF WAY = 60 M.
SHIELD WIRE ; 3/8" EHS CLASS A OR 7 NO.8 ALUMINUM-CLAD STEEL OR OPGW 36 CORES (13.5 MM. DIAMETER)
CONDUCTOR ; 4 x 1272 MCM. ACSR/GA

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

ELECTRICITY GENERATING AUTHORITY OF THAILAND									
DRAWN ARKET		RECOMMENDED AND VALIDATED Titipong			DRAWING NAME 500 kV TRANSMISSION LINE		DESCRIPTION OF DETAIL DRAWING CONFIGURATION AND DESIGN CRITERIA TOWER TYPE DQV3		
DESIGNED P.sit		CONCURRED CHIEF, TRANSMISSION LINE ENGINEERING DEPARTMENT			JOB NO.				
VERIFIED Vivat.m		ASSISTANT DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION			REPLACING DWG.NO.		DWG.NO.		C01-045
APPROVED Sangwich		DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION			DATE 24/04/2025		REV.		



LOADING CASES

- EXTREME TRANSVERSE WIND
ALL WIRES INTACT AT 27°C, FINAL WIRE TENSION. WITH A TRANSVERSE WIND OF 140 KG/M² ACTING ON SHIELD WIRES, 115 KG/M² ON CONDUCTORS, 156 KG/M² ON TOWER AND INSULATORS. L.F.=1.15 (SEE NOTES B, D)
- EXTREME LONGITUDINAL WIND
ALL WIRES INTACT AT 27°C, FINAL WIRES TENSIONS. WITH A LONGITUDINAL WIND OF 156 KG/M² ACTING ON TRANSVERSE FACES OF THE TOWER, NO WINDS ON WIRES. L.F.=1.15 (SEE NOTES B, D)
- EXTREME OBLIQUE WIND
ALL WIRES INTACT AT 27°C, FINAL WIRES TENSIONS WITH A TRANSVERSE WIND OF 140 KG/M² ACTING ON SHIELD WIRES, 115 KG/M² ON CONDUCTORS, 156 KG/M² ON TOWER AND INSULATOR, WIND BLOWING AT 75°, 60° AND 45° TO LINE. L.F.=1.15 (SEE NOTES A, B, D)
- FAILURE CONTAINMENT
ALL WIRES INTACT AT 27°C FINAL WIRES TENSIONS. WITH A TRANSVERSE WIND OF 91 KG/M² ON SHIELD WIRES, 76 KG/M² ON CONDUCTORS, 101.5 KG/M² ON TOWER AND INSULATOR, PLUS AN UNBALANCED LONGITUDINAL LOAD APPLIED AT ANY ONE WIRE ATTACHMENT LOCATIONS EQUAL TO 100% IN THE TENSION IN THE SHIELD WIRE OR 70% OF THE TENSION IN THE CONDUCTOR PHASE BUNDLE. (SEE NOTE E)
- STRINGING AND MAINTENANCE
ALL WIRES INTACT AT 4°C INITIAL WIRE TENSIONS. WITH A TRANSVERSE WIND OF 27.5 KG/M² ACTING ON SHIELD WIRES, 23 KG/M² ON CONDUCTORS, 29.4 KG/M² ON TOWER AND INSULATORS. WITH AN ADDITIONAL VERTICAL LOAD AT ANT OR ALL OF THE WIRE ATTACHMENT POINTS SIMULTANEOUSLY OF 1,000 KG. PLUS 33% OF THE SHIELD WIRE OR PHASE BUNDLE TENSION, AND WITH AN ADDITIONAL LONGITUDINAL LOAD ANY ONE WIRE ATTACHMENT LOCATION SIMULTANEOUSLY OF 50% OF THE SHIELD WIRE OR PHASE BUNDLE TENSION. (SEE NOTES E, F)
- HIGH INTENSITY
ALL WIRES INTACT AT 27°C, FINAL WIRE TENSIONS. PRESSURE OF 306.25 KG/M² ACTING ON TOWER AND INSULATORS WITH NO WIND ON SHIELD WIRE OR CONDUCTORS, WIND BLOWING AT 90°, 75°, 60°, 45°, 0° TO LINE. (SEE NOTE B)

NOTES

- FOR WIND AT ANGLE β° TO WIRES. WIND PRESSURE TO BE REDUCED BY $\sin^2(\beta)$
- WIND PRESSURE ON TOWER APPLIED ON 3.2 TIMES MOST EXPOSED FACE. FOR WIND AT AN ANGLE β° TO A FACE PRESSURE HAS BEEN ADDITIONALLY INCREASED BY $[1 + 0.2 \times \sin^2(2\beta)]$; WIND LOAD IS ASSUMED IN THE DIRECTION OF THE WIND.
- ALL ELEMENT OF TOWER ARE TO BE DESIGNED TO 0.92 CAPACITY.
- L.F. DENOTED LOAD FACTOR APPLYING TO STATISTIC LOAD SUCH AS WIND LOADS.
- FOR LOADING CASES IV. AND V THE ADDITIONAL LONGITUDINAL LOADS MAY BE ASSUMED TO ACT AT ANY ONE WIRE ATTACHMENT LOCATIONS.
- LOCATIONS OF THE ADDITIONAL VERTICAL STRINGING LOADS SPECIFIED IN LOADING CASE V ARE INDEPENDENT OF THE LOCATIONS OF THE ADDITIONAL LONGITUDINAL STRINGING LOADS. APPLY ADDITIONAL LONGITUDINAL LOAD AT ANY ONE WIRE ATTACHMENT LOCATION.

GENERAL NOTES

- CLEARANCE DIMENSIONS ARE MINIMUM FROM SURFACE OF STEEL (NOT FROM MEMBER GAGES OR WORKING LINES) TO THE NEAREST POINT ON THE CONDUCTOR OR CONDUCTOR HARDWARE.
- ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
- ALL DIMENSIONS ON TOWER ARE TO THE WORKING LINES EXCEPT AS OTHERWISE NOTED.
- CONDUCTOR DATA : 1272 MCM, 42/7 ACSR/GA, WT=2.04 KG/M, DIA=33.91 MM, RATED BREAKING STRENGTH=14,050 KG. (4 SUB-CONDUCTORS PER PHASE BUNDLE)
- SHIELD WIRE DATA : 7 NO.8 ALUMINUM-CLAD STEEL, WT=0.39 KG/M, DIA=9.78 MM, RATED BREAKING STRENGTH=7,227 KG. OR 3/8 INCH EHS CLASS A , WT=0.406 KG/M, DIA=9.14 MM, RATED BREAKING STRENGTH=6,985 KG.
- TOWER SHALL BE DESIGNED FOR ONE OR BOTH CIRCUITS INSTALLED, FOR THE PURPOSES OF TOWER DESIGN, EACH CIRCUIT SHALL BE DEFINED AS THE THREE PHASE BUNDLES AND THE CORRESPONDING SHIELD WIRE VERTICALLY ADJACENT TO ONE ANOTHER ON ONE SIDE OF THE TOWER.
- TOWER SHALL BE DESIGNED FOR MAINTENANCE LOADS (SAME AS HEAVY PHASE VERTICAL LOADS FROM CASE VI) APPLIED DIRECTLY ABOVE CONDUCTOR SUPPORT POINTS.
- TOWERS ARE DESIGNED FOR USE OF ANY COMBINATION OF LEG EXTENSION HEIGHTS RESULTING IN A MAXIMUM DIFFERENTIAL OF LEG HEIGHT OF SIX METERS BETWEEN ADJACENT OR DIAGONALLY OPPOSITE LEGS.

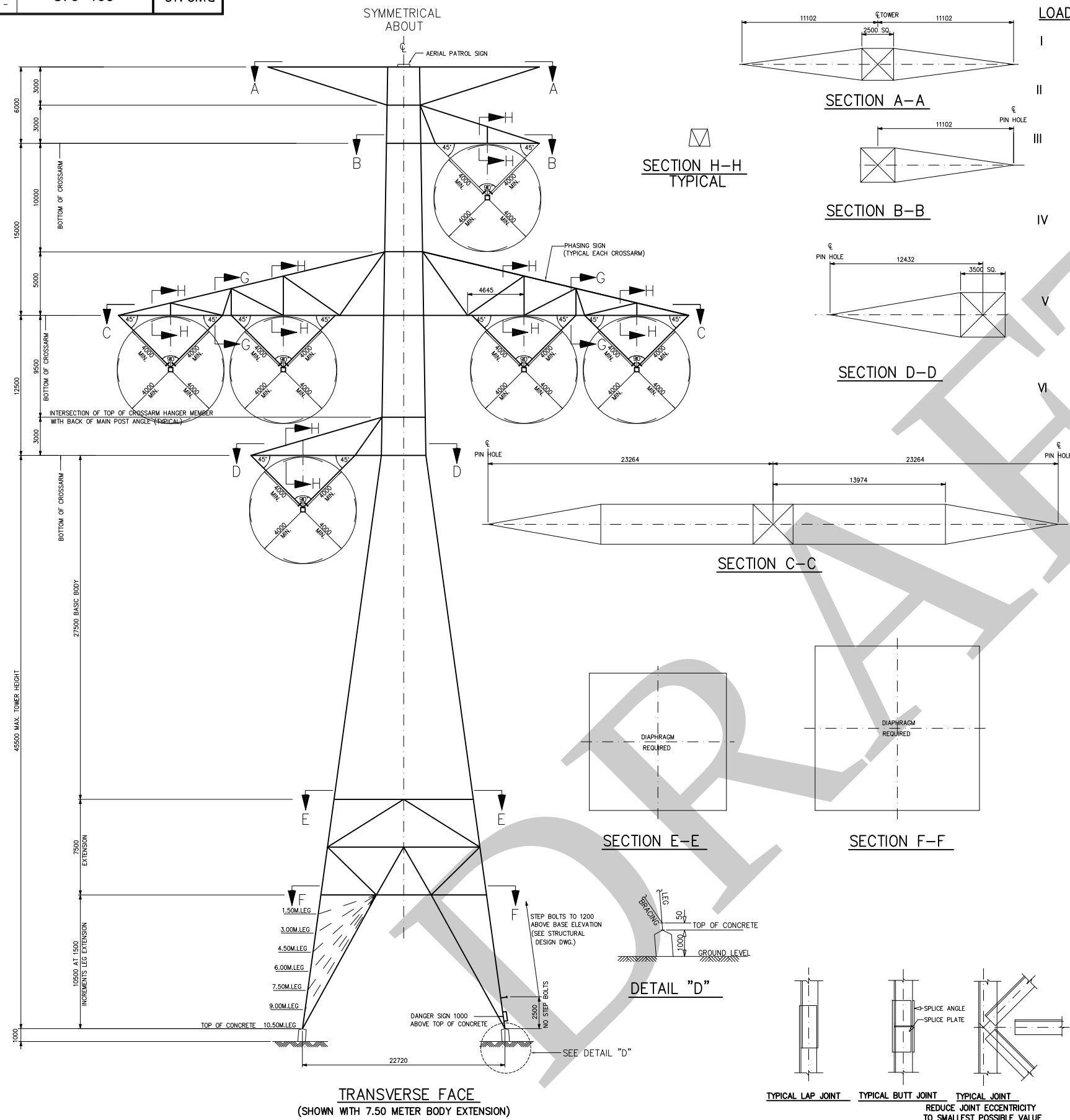
TOWER APPLICATIONS

RULING SPAN = 440 M.
MAXIMUM WIND SPAN = 650 M. AT 0° AND 335 M. AT 9°
MAXIMUM WEIGHT SPAN = 1300 M.
MAXIMUM DEVIATION ANGLE = 9°
DESIGN CRITERIA BASED ON RIGHT OF WAY = 60 M.
SHIELD WIRE : 3/8" EHS CLASS A OR 7 NO.8 ALUMINUM-CLAD STEEL OR OPGW 36 CORES (13.5 MM. DIAMETER)
CONDUCTOR : 4 x 1272 MCM. ACSR/GA

REV.NO.	JOB NO.	JOB DESCRIPTION	DRAWN	DESIGNED	VERIFIED	VALIDATED	RECOMMENDED	CONCURRED	APPROVED	DATE
1		BODY EXTENSION +15.0' ADDED.	ARKET							

ELECTRICITY GENERATING AUTHORITY OF THAILAND

DRAWN	ARKET	RECOMMENDED AND VALIDATED	CHIEF, TRANSMISSION LINE ENGINEERING DEPARTMENT	DRAWING NAME	500 kV TRANSMISSION LINE
DESIGNED	P.sit	CONCURRED	ASSISTANT DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION	DESCRIPTION OF DETAIL DRAWING	CONFIGURATION AND DESIGN CRITERIA TOWER TYPE DQV9(3)
VERIFIED	Vivat.m			JOB NO.	REPLACING DWG.NO.
APPROVED				DWG.NO.	C01-046



LOADING CASES

- I** **EXTREME TRANSVERSE WIND**
ALL WIRES INTACT AT 27°C, FINAL WIRE TENSION. WITH A TRANSVERSE WIND OF 140 KG/M²
ACTING ON SHIELD WIRES, 115 KG/M² ON CONDUCTORS, 156 KG/M² ON TOWER AND INSULATORS. L.F.=1.15 (SEE NOTES B, D)
- II** **EXTREME LONGITUDINAL WIND**
ALL WIRES INTACT AT 27°C, FINAL WIRES TENSIONS. WITH A LONGITUDINAL WIND OF 156 KG/M²
ACTING ON TRANSVERSE FACES OF THE TOWER, NO WINDS ON WIRES. L.F.=1.15 (SEE NOTES B, D)
- III** **EXTREME OBLIQUE WIND**
ALL WIRES INTACT AT 27°C, FINAL WIRES TENSIONS WITH A TRANSVERSE WIND OF 140 KG/M²
ACTING ON SHIELD WIRES, 115 KG/M² ON CONDUCTORS, 156 KG/M² ON TOWER
AND INSULATOR, WIND BLOWING AT 75°, 60° AND 45° TO LINE. L.F.=1.15
(SEE NOTES A, B, D)
- IV** **FAILURE CONTAINMENT**
ALL WIRES INTACT AT 27°C FINAL WIRES TENSIONS. WITH A TRANSVERSE WIND OF 91 KG/M²
ON SHIELD WIRES, 76 KG/M² ON CONDUCTORS, 101.5 KG/M² ON TOWER AND INSULATOR, PLUS AN UNBALANCED LONGITUDINAL
LOAD APPLIED AT ANY ONE WIRE ATTACHMENT LOCATIONS EQUAL TO 100% IN THE TENSION IN THE SHIELD WIRE OR 70%
OF THE TENSION IN THE CONDUCTOR PHASE BUNDLE. (SEE NOTE E)
- V** **STRINGING AND MAINTENANCE**
ALL WIRES INTACT AT 4°C INITIAL WIRE TENSIONS. WITH A TRANSVERSE WIND OF 27.5 KG/M² ACTING ON SHIELD WIRES, 23 KG/M²
ON CONDUCTORS, 29.4 KG/M² ON TOWER AND INSULATORS. WITH AN ADDITIONAL VERTICAL LOAD AT ANT OR ALL OF THE WIRE ATTACHMENT
POINTS SIMULTANEOUSLY OF 1,000 KG. PLUS 33% OF THE SHIELD WIRE OR PHASE BUNDLE TENSION. AND WITH AN ADDITIONAL LONGITUDINAL
LOAD ANY ONE WIRE ATTACHMENT LOCATION SIMULTANEOUSLY OF 50% OF THE SHIELD WIRE OR PHASE BUNDLE TENSION. (SEE NOTES E, F)
- VI** **HIGH INTENSITY**
ALL WIRES INTACT AT 27°C, FINAL WIRE TENSIONS. PRESSURE OF 306.25 KG/M² ACTING ON TOWER AND INSULATORS WITH NO WIND ON
SHIELD WIRE OR CONDUCTORS. WIND BLOWING AT 90°, 75°, 60°, 45°, 0° TO LINE. (SEE NOTE B)

NOTES

- A. FOR WIND AT ANGLE β^* TO WIRES, WIND PRESSURE TO BE REDUCED BY $\sin^2(\beta)$
- B. WIND PRESSURE ON TOWER APPLIED ON 3.2 TIMES MOST EXPOSED FACE. FOR WIND AT AN ANGLE β^* TO A FACE PRESSURE HAS BEEN ADDITIONALLY INCREASED BY $[1 + 0.2 \times \sin^2(2\beta)]$; WIND LOAD IS ASSUMED IN THE DIRECTION OF THE WIND.
- C. ALL ELEMENT OF TOWER ARE TO BE DESIGNED TO 0.92 CAPACITY.
- D. L.F. DENOTED LOAD FACTOR APPLYING TO STATISTIC LOAD SUCH AS WIND LOADS.
- E. FOR LOADING CASED IV. AND V THE ADDITIONAL LONGITUDINAL LOADS MAY BE ASSUMED TO ACT AT ANY ONE WIRE ATTACHMENT LOCATIONS.
- F. LOCATIONS OF THE ADDITIONAL VERTICAL STRINGING LOADS SPECIFIED IN LOADING CASE V ARE INDEPENDENT OF THE LOCATIONS OF THE ADDITIONAL LONGITUDINAL STRINGING LOADS. APPLY ADDITIONAL LONGITUDINAL LOAD AT ANY ONE WIRE ATTACHMENT LOCATION.

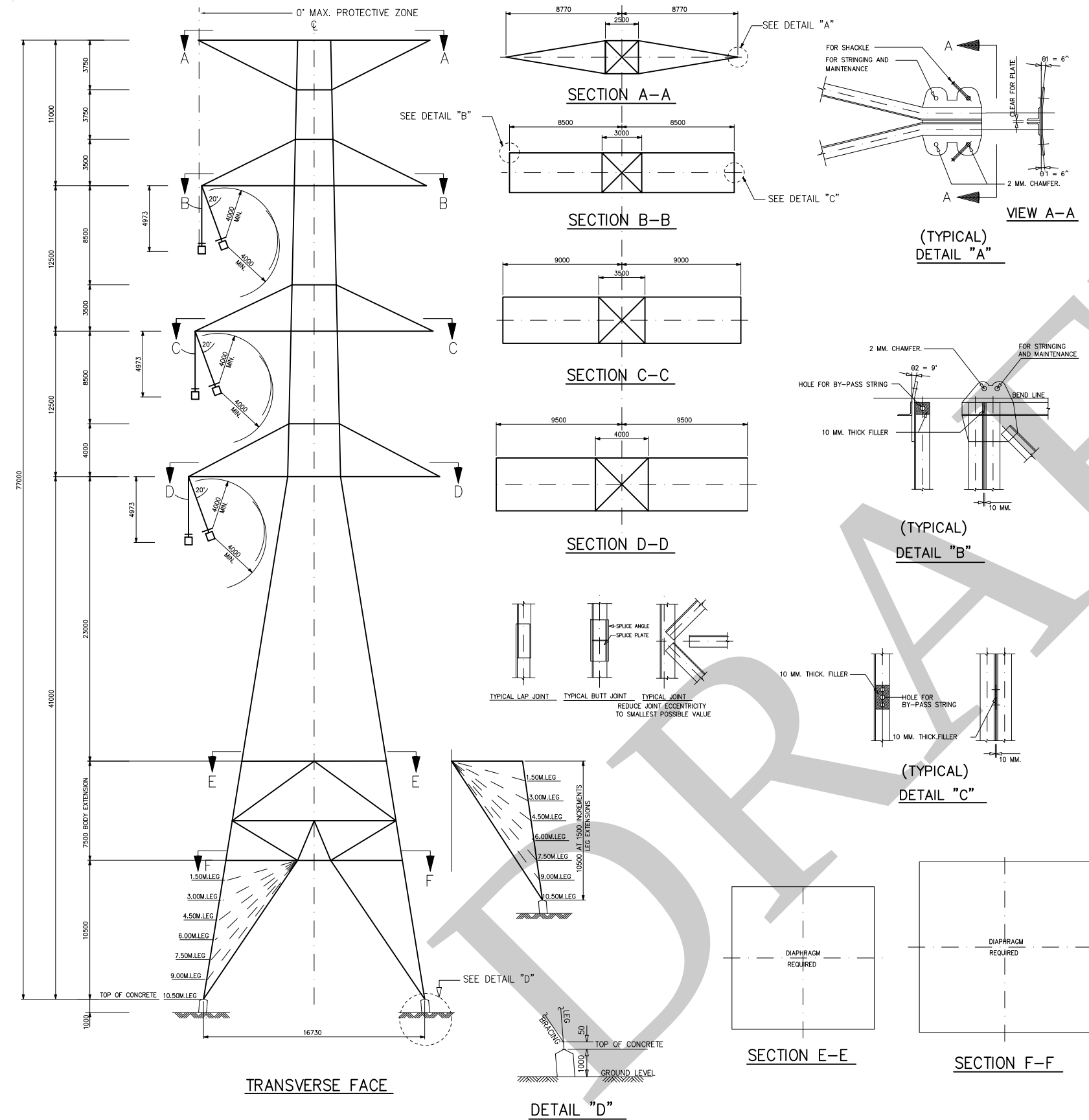
GENERAL NOTES

1. CLEARANCE DIMENSIONS ARE MINIMUM FROM SURFACE OF STEEL (NOT FROM MEMBER GAGES OR WORKING LINES) TO THE NEAREST POINT ON THE CONDUCTOR OR CONDUCTOR HARDWARE.
2. ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
3. ALL DIMENSIONS ON TOWER ARE TO THE WORKING LINES EXCEPT AS OTHERWISE NOTED.
4. CONDUCTOR DATA : 1272 MCM, 42/7 ACSR/GA, WT=2.04 KG/M, DIA=33.91 MM, RATED BREAKING STRENGTH=14,050 KG.
(4 SUB-CONDUCTORS PER PHASE BUNDLE)
5. SHIELD WIRE DATA : 7 NO.8 ALUMINUM-CLAD STEEL, WT=0.39 KG/M, DIA=9.78 MM, RATED BREAKING STRENGTH=7,227 KG.
OR 3/8 INCH EHS CLASS A , WT=0.406 KG/M, DIA=9.14 MM, RATED BREAKING STRENGTH=6,985 KG.
6. TOWER SHALL BE DESIGNED FOR ONE OR BOTH CIRCUITS INSTALLED, FOR THE PURPOSES OF TOWER DESIGN, EACH CIRCUIT SHALL BE DEFINED AS THE THREE PHASE BUNDLES AND THE CORRESPONDING SHIELD WIRE VERTICALLY ADJACENT TO ONE ANOTHER ON ONE SIDE OF THE TOWER.
7. TOWERS ARE DESIGNED FOR USE OF ANY COMBINATION OF LEG EXTENSION HEIGHTS RESULTING IN A MAXIMUM DIFFERENTIAL OF LEG HEIGHT OF SIX METERS BETWEEN ADJACENT OR DIAGONALLY OPPOSITE LEGS.

TOWER APPLICATIONS

RULING SPAN = 440 M.
 MAXIMUM WIND SPAN = 460 M. AT 0° AND 355 M. AT 3°
 MAXIMUM WEIGHT SPAN = 690 M.
 MAXIMUM DEVIATION ANGLE = 3°
 DESIGN CRITERIA BASED ON RIGHT OF WAY = 60 M.
 SHIELD WIRE ; 3/8" EHS CLASS A OR 7 NO.8 ALUMINUM-CLAD STEEL OR OPGW 36 CORES (13.5 MM. DIAMETER)
 CONDUCTOR ; 4 x 1272 MCM. ACSR/GA

												ELECTRICITY GENERATING AUTHORITY OF THAILAND										
												DRAWN	ARJET	RECOMMENDED AND VALIDATED	<i>P.sit</i>	DRAWING NAME	500 kV TRANSMISSION LINE					
												DESIGNED	<i>P.sit</i>		CHEF, TRANSMISSION LINE ENGINEERING DEPARTMENT	DESCRIPTION OF DETAIL DRAWING CONFIGURATION AND DESIGN CRITERIA TOWER TYPE DQTR						
												VERIFIED	<i>Vivat.m</i>		CONCURRED							
												APPROVED	<i>Sorwich</i>		ASSISTANT DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION	JOB NO.	REPLACING DWG.NO.	DWG.NO.	C01-048	-	REV.	
REV.NO.	JOB NO.	JOB DESCRIPTION					DRAWN	DESIGNED	VERIFIED	VALIDATED	RECOMMENDED	CONCURRED	APPROVED	DATE	DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION	DATE	24/04/2025				-	-



LOADING CASES

- I EXTREME TRANSVERSE WIND**
ALL WIRES INTACT AT 27°C, FINAL WIRE TENSION. WITH A TRANSVERSE WIND OF 140 KG/M² ACTING ON SHIELD WIRES, 115 KG/M² ON CONDUCTORS, 156 KG/M² ON TOWER AND INSULATORS. L.F.=1.15 (SEE NOTES B, D)
- II EXTREME LONGITUDINAL WIND**
ALL WIRES INTACT AT 27°C, FINAL WIRES TENSIONS. WITH A LONGITUDINAL WIND OF 156 KG/M² ACTING ON TRANSVERSE FACES OF THE TOWER, NO WINDS ON WIRES. L.F.=1.15 (SEE NOTES B, D)
- III EXTREME OBLIQUE WIND**
ALL WIRES INTACT AT 27°C, FINAL WIRES TENSIONS WITH A TRANSVERSE WIND OF 140 KG/M² ACTING ON SHIELD WIRES, 115 KG/M² ON CONDUCTORS, 156 KG/M² ON TOWER AND INSULATOR, WIND BLOWING AT 75°, 60° AND 45° TO LINE. L.F.=1.15 (SEE NOTES A, B, D)
- IV FAILURE CONTAINMENT**
ALL WIRES INTACT AT 27°C FINAL WIRES TENSIONS. WITH A TRANSVERSE WIND OF 91 KG/M² ON SHIELD WIRES, 76 KG/M² ON CONDUCTORS, 101.5 KG/M² ON TOWER AND INSULATOR, PLUS AN UNBALANCED LONGITUDINAL LOAD EQUAL TO 100% OF THE TENSION IN THE SHIELD WIRE OR CONDUCTOR PHASE BUNDLE. (SEE NOTE E)
- V STRINGING AND MAINTENANCE**
ALL WIRES INTACT AT 4°C INITIAL WIRE TENSIONS. WITH A TRANSVERSE WIND OF 27.5 KG/M² ACTING ON SHIELD WIRES, 23 KG/M² ON CONDUCTORS, 29.4 KG/M² ON TOWER AND INSULATORS. WITH AN ADDITIONAL VERTICAL LOAD AT ANT OR ALL OF THE WIRE ATTACHMENT POINTS OF EITHER ONE (BUT NOT BOTH) OF THE CIRCUITS. THE ADDITIONAL VERTICAL LOAD SHALL BE EQUAL TO 1,500 KG. PLUS 33% OF THE SHIELD WIRE OR PHASE TENSION, SIMULTANEOUSLY, ADDITIONAL LONGITUDINAL LOADS SHALL BE APPLIED AT ANY OR ALL OF THE WIRE ATTACHMENT POINTS OF THE SAME CIRCUIT EQUAL TO 100% OF THE SHIELD WIRE OR PHASE BUNDLE TENSION. (SEE NOTE F)
- VI HIGH INTENSITY**
ALL WIRES INTACT AT 27°C, FINAL WIRE TENSIONS. PRESSURE OF 306.25 KG/M² ACTING ON TOWER AND INSULATORS WITH NO WIND ON SHIELD WIRE OR CONDUCTORS. WIND BLOWING AT 90°, 75°, 60°, 45°, 0° TO LINE. (SEE NOTE B)
- VII UPLIFT LOADS**
CROSSARM MEMBERS WILL BE DESIGNED TO WITHSTAND VERTICAL UPLIFT LOADS EQUAL TO 100% OF THE DESIGN WEIGHT SPAN ACTING ON ALL ATTACHMENT, IN EACH LOADING CASE.

NOTES

- A. FOR WIND AT ANGLE β ° TO WIRES. WIND PRESSURE TO BE REDUCED BY $\sin^2(\beta)$
- B. WIND PRESSURE ON TOWER APPLIED ON 3.2 TIMES MOST EXPOSED FACE. FOR WIND AT AN ANGLE β ° TO A FACE PRESSURE HAS BEEN ADDITIONALLY INCREASED BY $[1 + 0.2 \times \sin^2(2\beta)]$; WIND LOAD IS ASSUMED IN THE DIRECTION OF THE WIND.
- C. ALL ELEMENT OF TOWER ARE TO BE DESIGNED TO 0.79 CAPACITY.
- D. L.F. DENOTED LOAD FACTOR APPLYING TO STATISTIC LOAD SUCH AS WIND LOADS.
- E. FOR LOADING CASED IV. AND V THE ADDITIONAL LONGITUDINAL AND / OR VERTICAL LOADS MAY BE ASSUMED TO ACT AT ANY TWO WIRE ATTACHMENT LOCATIONS SIMULTANEOUSLY IN THE CASE OF BOTH CURCUITS INSTALLED, IN THE CASE OF ONLY ONE CURCUIT INSTALLED, APPLY THE ADDITIONAL LONGITUDINAL AND / OR VERTICAL LOAD AT ANY ONE WIRE ATTACHMENT LOCATION.
- F. LOCATIONS OF THE ADDITIONAL VERTICAL STRINGING LOADS SPECIFIED IN LOADING CASE V ARE INDEPENDENT OF THE LOCATIONS OF THE ADDITIONAL LONGITUDINAL STRINGING LOADS. APPLY ADDITIONAL LONGITUDINAL LOAD AT ANY ONE WIRE ATTACHMENT LOCATION.

GENERAL NOTES

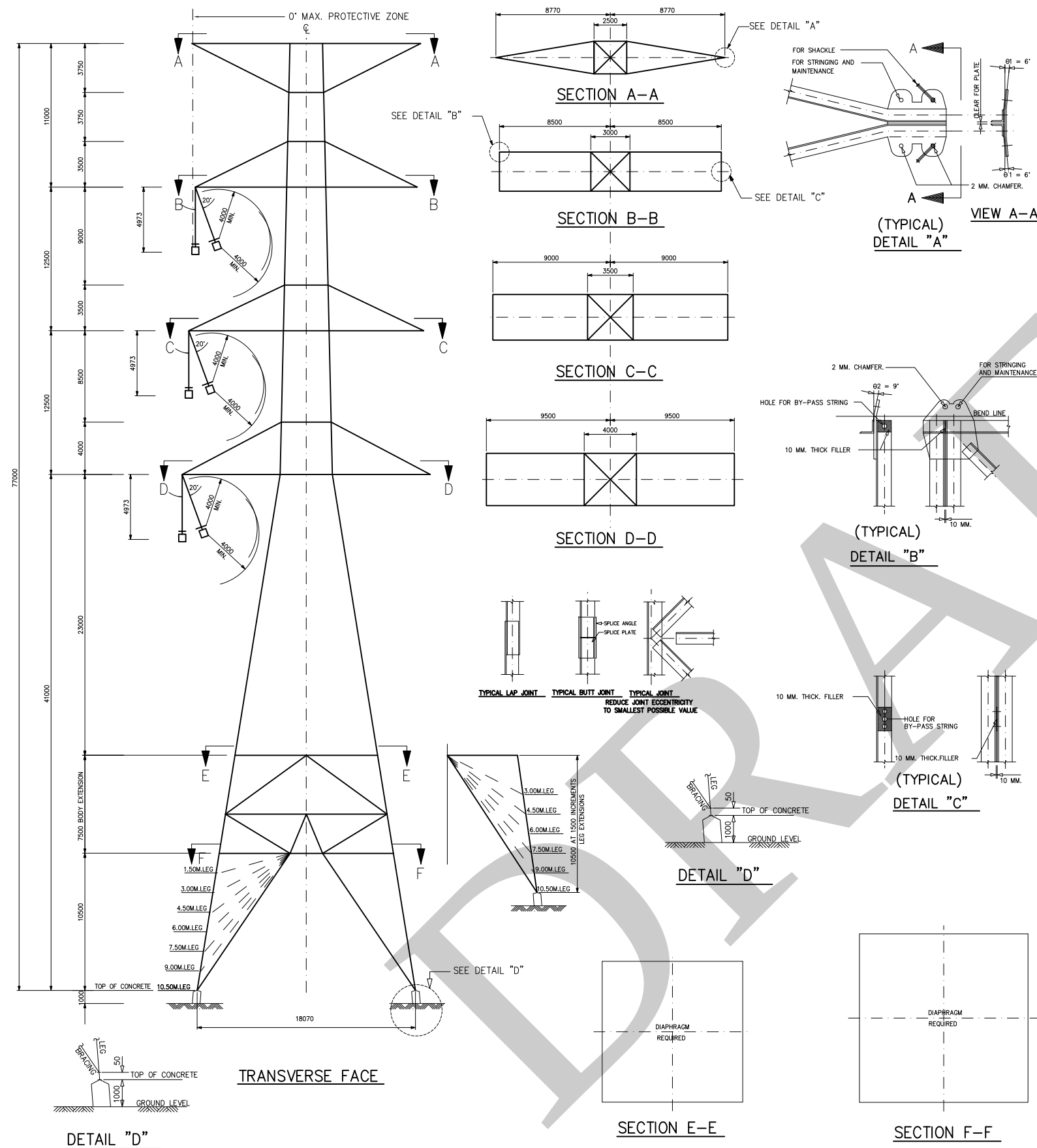
1. CLEARANCE DIMENSIONS ARE MINIMUM FROM SURFACE OF STEEL (NOT FROM MEMBER GAGES OR WORKING LINES) TO THE NEAREST POINT ON THE CONDUCTOR OR CONDUCTOR HARDWARE.
2. ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
3. ALL DIMENSIONS ON TOWER ARE TO THE WORKING LINES EXCEPT AS OTHERWISE NOTED.
4. CONDUCTOR DATA : 1272 MCM, 42/7 ACSR/GA, WT=2.04 KG/M, DIA=33.91 MM, RATED BREAKING STRENGTH=14,050 KG. (4 SUB-CONDUCTORS PER PHASE BUNDLE)
5. SHIELD WIRE DATA : 7 NO.8 ALUMINUM-CLAD STEEL, WT=0.39 KG/M, DIA=9.78 MM, RATED BREAKING STRENGTH=7,227 KG. OR 3/8 INCH EHS CLASS A, WT=0.406 KG/M, DIA=9.14 MM, RATED BREAKING STRENGTH=6,985 KG.
6. TOWER SHALL BE DESIGNED FOR ONE OR BOTH CIRCUITS INSTALLED, FOR THE PURPOSES OF TOWER DESIGN, EACH CIRCUIT SHALL BE DEFINED AS THE THREE PHASE BUNDLES AND THE CORRESPONDING SHIELD WIRE VERTICALLY ADJACENT TO ONE ANOTHER ON ONE SIDE OF THE TOWER.
7. TOWERS ARE DESIGNED FOR USE OF ANY COMBINATION OF LEG EXTENSION HEIGHTS RESULTING IN A MAXIMUM DIFFERENTIAL OF LEG HEIGHT OF SIX METERS BETWEEN ADJACENT OR DIAGONALLY OPPOSITE LEGS.

TOWER APPLICATIONS

RULING SPAN = 440 M.
MAXIMUM WIND SPAN = 460 M. AT 20°
MAXIMUM WEIGHT SPAN = 690 M.
MAXIMUM DEVIATION ANGLE = 20°
DESIGN CRITERIA BASED ON RIGHT OF WAY = 60 M.
SHIELD WIRE : 3/8 EHS CLASS A OR 7 NO.8 ALUMINUM-CLAD STEEL OR OPGW 36 CORES (13.5 MM. DIAMETER)
CONDUCTOR : 4 x 1272 MCM. ACSR/GA

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

ELECTRICITY GENERATING AUTHORITY OF THAILAND									
DRAWN ARKET		RECOMMENDED AND VALIDATED		DRAWING NAME		500 kV TRANSMISSION LINE			
DESIGNED P.sit		CONCURRED		DESCRIPTION OF DETAIL DRAWING		CONFIGURATION AND DESIGN CRITERIA			
VERIFIED V.wat.m		ASSISTANT DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION		TOWER TYPE DQT20					
APPROVED		DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION		DATE 24/04/2025		JOB NO.		REPLACING DWG.NO.	DWG.NO.
									C01-049



LOADING CASES

- I** **EXTREME TRANSVERSE WIND**
ALL WIRES INTACT AT 27°C, FINAL WIRE TENSION. WITH A TRANSVERSE WIND OF 140 KG/M²
ACTING ON SHIELD WIRES, 115 KG/M² ON CONDUCTORS, 156 KG/M² ON TOWER AND INSULATORS. L.F.=1.15 (SEE NOTES B, D)
- II** **EXTREME LONGITUDINAL WIND**
ALL WIRES INTACT AT 27°C, FINAL WIRES TENSIONS. WITH A LONGITUDINAL WIND OF 156 KG/M²
ACTING ON TRANSVERSE FACES OF THE TOWER, NO WINDS ON WIRES. L.F.=1.15 (SEE NOTES B, D)
- III** **EXTREME OBLIQUE WIND**
ALL WIRES INTACT AT 27°C, FINAL WIRES TENSIONS WITH A TRANSVERSE WIND OF 140 KG/M²
ACTING ON SHIELD WIRES, 115 KG/M² ON CONDUCTORS, 156 KG/M² ON TOWER
AND INSULATOR, WIND BLOWING AT 75°, 60° AND 45° TO LINE. L.F.=1.15
(SEE NOTES A, B, D)
- IV** **FAILURE CONTAINMENT**
ALL WIRES INTACT AT 27°C FINAL WIRES TENSIONS. WITH A TRANSVERSE WIND OF 91 KG/M²
ON SHIELD WIRES, 76 KG/M² ON CONDUCTORS, 101.5 KG/M² ON TOWER AND INSULATOR, PLUS AN UNBALANCED LONGITUDINAL LOADS
EQUAL TO 100% OF THE TENSION IN THE SHIELD WIRE OR CONDUCTOR PHASE BUNDLE. (SEE NOTE E)
OF THE TENSION IN THE CONDUCTOR PHASE BUNDLE. (SEE NOTE E)
- V** **STRINGING AND MAINTENANCE**
ALL WIRES INTACT AT 4°C INITIAL WIRE TENSIONS. WITH A TRANSVERSE WIND OF 27.5 KG/M² ACTING ON SHIELD WIRES, 23 KG/M²
ON CONDUCTORS, 29.4 KG/M² ON TOWER AND INSULATORS. WITH AN ADDITIONAL VERTICAL LOAD AT ANT OR ALL OF THE WIRE ATTACHMENT
POINTS OF EITHER ONE (BUT NOT BOTH) OF THE CIRCUITS. THE ADDITIONAL VERTICAL LOAD SHALL BE EQUAL TO 1,500 KG. PLUS 33% OF
THE SHIELD WIRE OR PHASE TENSION, SIMULTANEOUSLY, ADDITIONAL LONGITUDINAL LOADS SHALL BE APPLIED AT ANY OR ALL OF THE
WIRE ATTACHMENT POINTS OF THE SAME CIRCUIT EQUAL TO 100% OF THE SHIELD WIRE OR PHASE BUNDLE TENSION. (SEE NOTE F)
- VI** **HIGH INTENSITY**
ALL WIRES INTACT AT 27°C, FINAL WIRE TENSIONS. PRESSURE OF 306.25 KG/M² ACTING ON TOWER AND INSULATORS WITH NO WIND ON
SHIELD WIRE OR CONDUCTORS. WIND BLOWING AT 90°, 75°, 60°, 45°, 0° TO LINE. (SEE NOTE B)
- VII** **UPLIFT LOADS**
CROSSARM MEMBERS WILL BE DESIGNED TO WITHSTAND VERTICAL UPLIFT CLOUDS EQUAL TO 100% OF THE DESIGN
WEIGHT SPAN ACTING ON ALL ATTACHMENT, IN EACH LOADING CASE.

NOTES

- A. FOR WIND AT ANGLE β^* TO WIRES. WIND PRESSURE TO BE REDUCED BY $\sin^2(\beta)$
- B. WIND PRESSURE ON TOWER APPLIED ON 3.2 TIMES MOST EXPOSED FACE. FOR WIND AT AN ANGLE β^* TO A FACE PRESSURE HAS BEEN ADDITIONALLY INCREASED BY $[1 + 0.2 \times \sin^2(2\beta)]$; WIND LOAD IS ASSUMED IN THE DIRECTION OF THE WIND.
- C. ALL ELEMENT OF TOWER ARE TO BE DESIGNED TO 0.79 CAPACITY.
- D. L.F. DENOTED LOAD FACTOR APPLYING TO STATISTIC LOAD SUCH AS WIND LOADS.
- E. FOR LOADING CASED IV. AND V THE ADDITIONAL LONGITUDINAL AND / OR VERTICAL LOADS MAY BE ASSUMED TO ACT AT ANY TWO WIRE ATTACHMENT LOCATIONS SIMULTANEOUSLY IN THE CASE OF BOTH CURCITS INSTALLED, IN THE CASE OF ONLY ONE CURCUIT INSTALLED, APPLY THE ADDITIONAL LONGITUDINAL AND / OR VERTICAL LOAD AT ANY ONE WIRE ATTACHMENT LOCATION.
- F. LOCATIONS OF THE ADDITIONAL VERTICAL STRINGING LOADS SPECIFIED IN LOADING CASE V ARE INDEPENDENT OF THE LOCATIONS OF THE ADDITIONAL LONGITUDINAL STRINGING LOADS. APPLY ADDITIONAL LONGITUDINAL LOAD AT ANY ONE WIRE ATTACHMENT LOCATION.

GENERAL NOTES

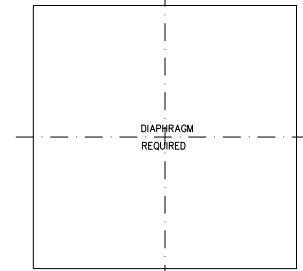
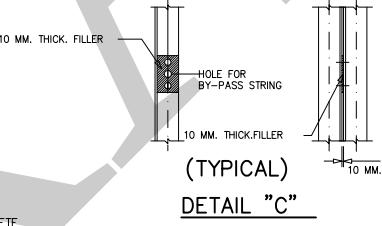
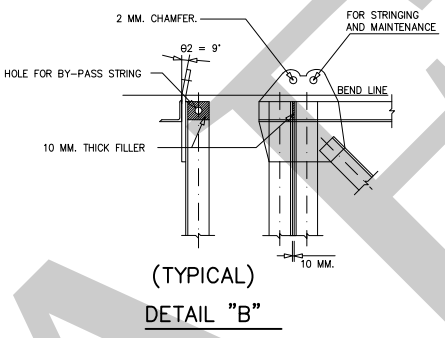
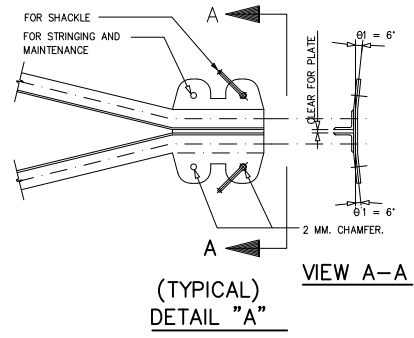
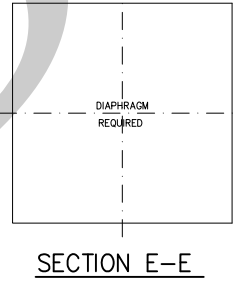
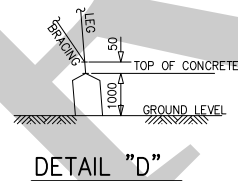
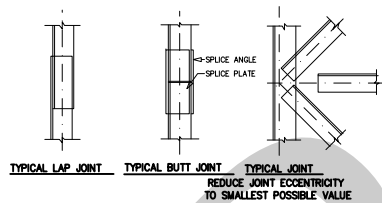
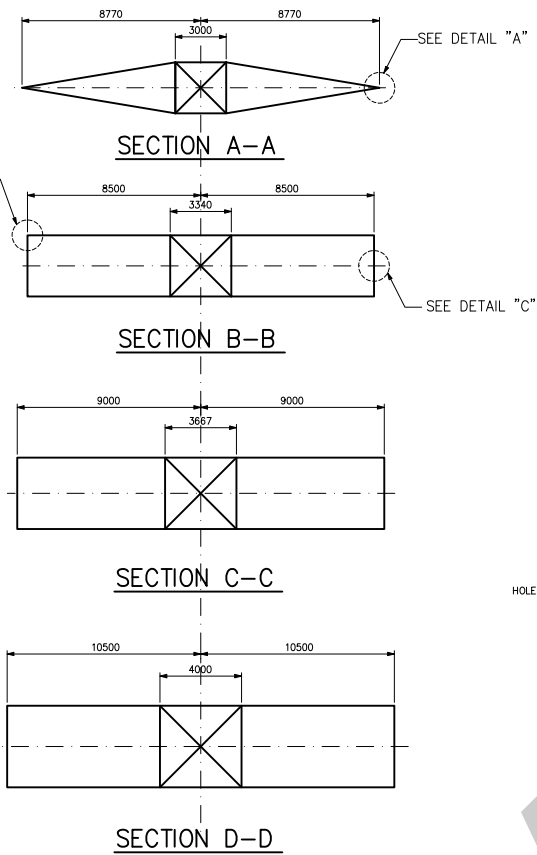
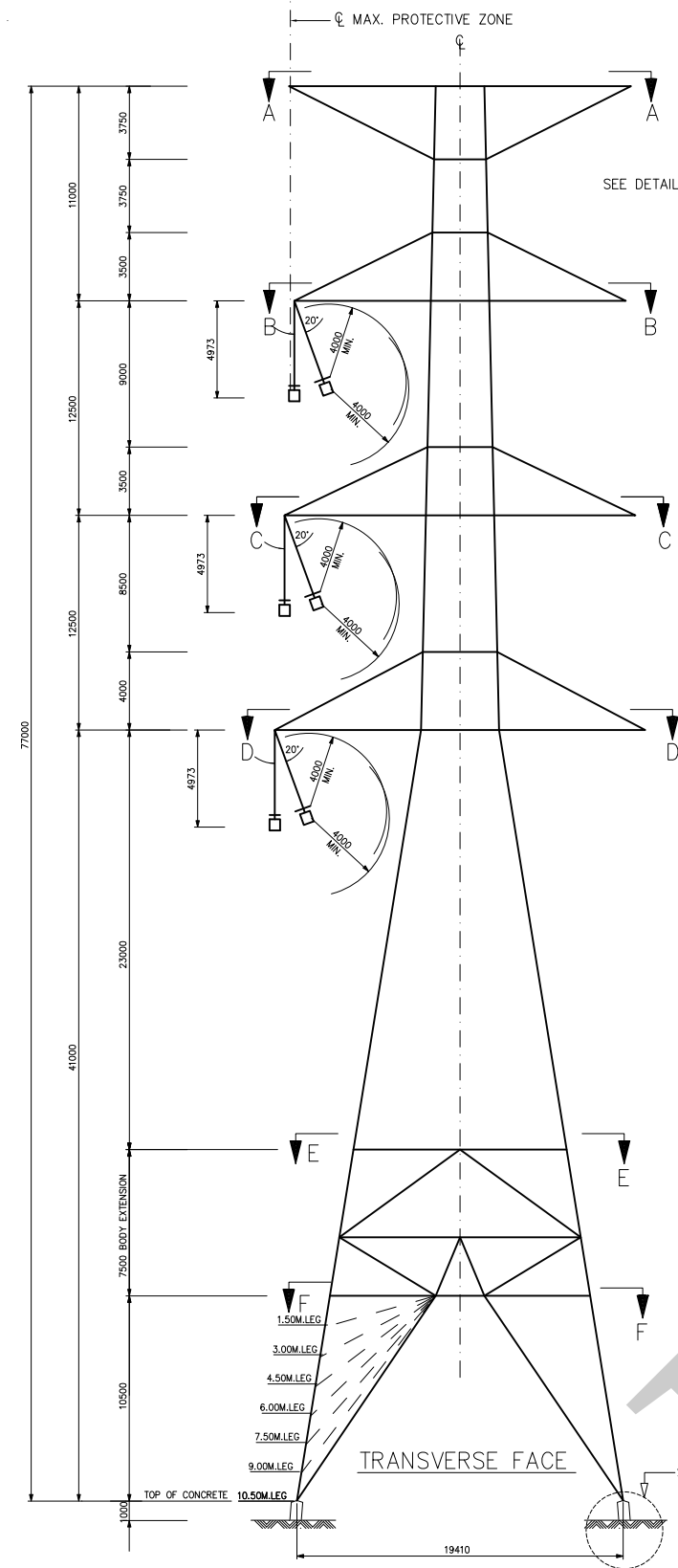
1. CLEARANCE DIMENSIONS ARE MINIMUM FROM SURFACE OF STEEL (NOT FROM MEMBER GAGES OR WORKING LINES) TO THE NEAREST POINT ON THE CONDUCTOR OR CONDUCTOR HARDWARE.
2. ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
3. ALL DIMENSIONS ON TOWER ARE TO THE WORKING LINES EXCEPT AS OTHERWISE NOTED.
4. CONDUCTOR DATA : 1272 MCM, 42/7 ACSR/GA, WT=2.04 KG/M, DIA=33.91 MM, RATED BREAKING STRENGTH=14,050 KG. (4 SUB-CONDUCTORS PER PHASE BUNDLE)
5. SHIELD WIRE DATA : 7 NO.8 ALUMINUM-CLAD STEEL, WT=0.39 KG/M, DIA=9.78 MM, RATED BREAKING STRENGTH=7,227 KG. OR 3/8 INCH EHS CLASS A , WT=0.406 KG/M, DIA=9.14 MM, RATED BREAKING STRENGTH=6,985 KG.
6. TOWER SHALL BE DESIGNED FOR ONE OR BOTH CIRCUITS INSTALLED, FOR THE PURPOSES OF TOWER DESIGN, EACH CIRCUIT SHALL BE DEFINED AS THE THREE PHASE BUNDLES AND THE CORRESPONDING SHIELD WIRE VERTICALLY ADJACENT TO ONE ANOTHER ON ONE SIDE OF THE TOWER.
7. TOWERS ARE DESIGNED FOR USE OF ANY COMBINATION OF LEG EXTENSION HEIGHTS RESULTING IN A MAXIMUM DIFFERENTIAL OF LEG HEIGHT OF SIX METERS BETWEEN ADJACENT OR DIAGONALLY OPPOSITE LEGS.

TOWER APPLICATIONS

RULING SPAN = 440 M.
 MAXIMUM WIND SPAN = 460 M. AT 40°
 MAXIMUM WEIGHT SPAN = 690 M.
 MAXIMUM DEVIATION ANGLE = 40°
 DESIGN CRITERIA BASED ON RIGHT OF WAY = 60 M.
 SHIELD WIRE ; 3/8 EHS CLASS A OR 7 NO.8 ALUMINUM-CLAD STEEL OR OPGW 36 CORES (13.5 MM. DIAMETER)
 CONDUCTOR ; 4 x 1272 MCM. ACSR/GA

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

ELECTRICITY GENERATING AUTHORITY OF THAILAND											
DRAWN		ARKE.T		RECOMMENDED AND VALIDATED		LitiPONG		DRAWING NAME		500 kV TRANSMISSION LINE	
DESIGNED		P.sit		CONCURRED		CHIEF, TRANSMISSION LINE ENGINEERING DEPARTMENT		DESCRIPTION OF DETAIL DRAWING		CONFIGURATION AND DESIGN CRITERIA	
VERIFIED		Vivat.m				ASSISTANT DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION		TOWER TYPE DQT40			
APPROVED		Sapachin		DATE		24/04/2025		JOB NO.		REPLACING DWG.NO.	
		DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION								DWG.NO.	
										C01-050	
										- RE	



LOADING CASES

- EXTREME TRANSVERSE WIND**
ALL WIRES INTACT AT 27°C, FINAL WIRE TENSION. WITH A TRANSVERSE WIND OF 140 KG/M² ACTING ON SHIELD WIRES, 115 KG/M² ON CONDUCTORS, 156 KG/M² ON TOWER AND INSULATORS. L.F.=1.15 (SEE NOTES B, D)
- EXTREME LONGITUDINAL WIND**
ALL WIRES INTACT AT 27°C, FINAL WIRES TENSIONS. WITH A LONGITUDINAL WIND OF 156 KG/M² ACTING ON TRANSVERSE FACES OF THE TOWER, NO WINDS ON WIRES. L.F.=1.15 (SEE NOTES B, D)
- EXTREME OBLIQUE WIND**
ALL WIRES INTACT AT 27°C, FINAL WIRES TENSIONS WITH A TRANSVERSE WIND OF 140 KG/M² ACTING ON SHIELD WIRES, 115 KG/M² ON CONDUCTORS, 156 KG/M² ON TOWER AND INSULATOR, WIND BLOWING AT 75°, 60° AND 45° TO LINE. L.F.=1.15 (SEE NOTES A, B, D)
- FAILURE CONTAINMENT**
ALL WIRES INTACT AT 27°C FINAL WIRES TENSIONS. WITH A TRANSVERSE WIND OF 91 KG/M² ON SHIELD WIRES, 76 KG/M² ON CONDUCTORS, 101.5 KG/M² ON TOWER AND INSULATOR, PLUS AN UNBALANCED LONGITUDINAL LOADS EQUAL TO 100% OF THE TENSION IN THE SHIELD WIRE OR CONDUCTOR PHASE BUNDLE. (SEE NOTE E) OF THE TENSION IN THE CONDUCTOR PHASE BUNDLE. (SEE NOTE E)
- STRINGING AND MAINTENANCE**
ALL WIRES INTACT AT 4°C INITIAL WIRE TENSIONS. WITH A TRANSVERSE WIND OF 27.5 KG/M² ACTING ON SHIELD WIRES, 23 KG/M² ON CONDUCTORS, 29.4 KG/M² ON TOWER AND INSULATORS. WITH AN ADDITIONAL VERTICAL LOAD AT ANT OR ALL OF THE WIRE ATTACHMENT POINTS OF EITHER ONE (BUT NOT BOTH) OF THE CIRCUITS. THE ADDITIONAL VERTICAL LOAD SHALL BE EQUAL TO 1,500 KG. PLUS 33% OF THE SHIELD WIRE OR PHASE TENSION, SIMULTANEOUSLY, ADDITIONAL LONGITUDINAL LOADS SHALL BE APPLIED AT ANY OR ALL OF THE WIRE ATTACHMENT POINTS OF THE SAME CIRCUIT EQUAL TO 100% OF THE SHIELD WIRE OR PHASE BUNDLE TENSION. (SEE NOTE F)
- HIGH INTENSITY**
ALL WIRES INTACT AT 27°C, FINAL WIRE TENSIONS. PRESSURE OF 306.25 KG/M² ACTING ON TOWER AND INSULATORS WITH NO WIND ON SHIELD WIRE OR CONDUCTORS. WIND BLOWING AT 90°, 75°, 60°, 45°, 0° TO LINE. (SEE NOTE B)
- UPLIFT LOADS**
CROSSARM MEMBERS WILL BE DESIGNED TO WITHSTAND VERTICAL UPLIFT CLOADS EQUAL TO 100% OF THE DESIGN WEIGHT SPAN ACTING ON ALL ATTACHMENT, IN EACH LOADING CASE.

NOTES

- FOR WIND AT ANGLE β TO WIRES. WIND PRESSURE TO BE REDUCED BY $\sin^2(\beta)$
- WIND PRESSURE ON TOWER APPLIED ON 3.2 TIMES MOST EXPOSED FACE. FOR WIND AT AN ANGLE β TO A FACE PRESSURE HAS BEEN ADDITIONALLY INCREASED BY $[1+0.2 \times \sin^2(2\beta)]$; WIND LOAD IS ASSUMED IN THE DIRECTION OF THE WIND.
- ALL ELEMENT OF TOWER ARE TO BE DESIGNED TO 0.79 CAPACITY.
- L.F. DENOTED LOAD FACTOR APPLYING TO STATISTIC LOAD SUCH AS WIND LOADS.
- FOR LOADING CASES IV. AND V THE ADDITIONAL LONGITUDINAL AND / OR VERTICAL LOADS MAY BE ASSUMED TO ACT AT ANY TWO WIRE ATTACHMENT LOCATIONS SIMULTANEOUSLY IN THE CASE OF BOTH CIRCUITS INSTALLED, IN THE CASE OF ONLY ONE CIRCUIT INSTALLED, APPLY THE ADDITIONAL LONGITUDINAL AND / OR VERTICAL LOAD AT ANY ONE WIRE ATTACHMENT LOCATION.
- LOCATIONS OF THE ADDITIONAL VERTICAL STRINGING LOADS SPECIFIED IN LOADING CASE V ARE INDEPENDENT OF THE LOCATIONS OF THE ADDITIONAL LONGITUDINAL STRINGING LOADS. APPLY ADDITIONAL LONGITUDINAL LOAD AT ANY ONE WIRE ATTACHMENT LOCATION.

GENERAL NOTES

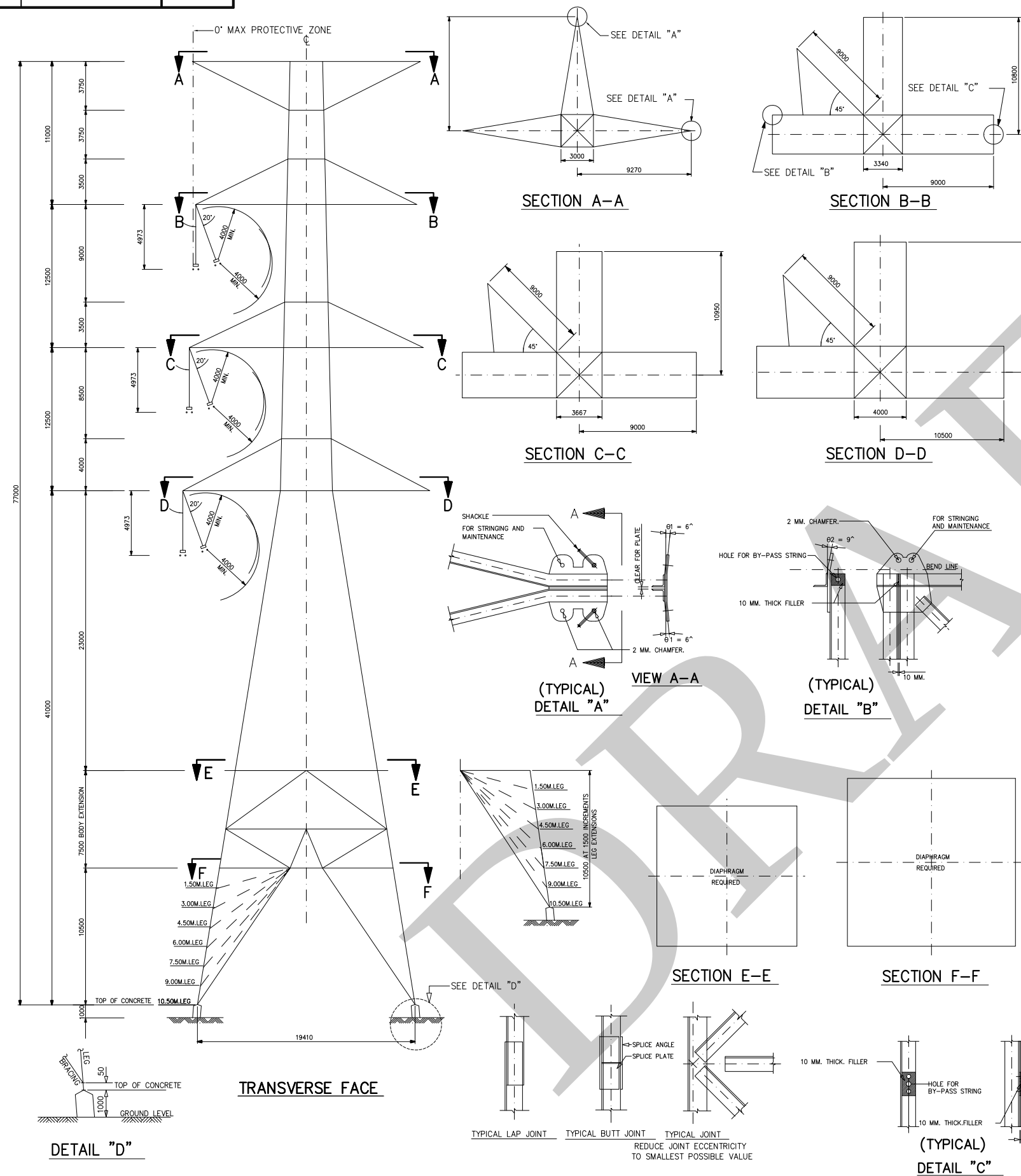
- CLEARANCE DIMENSIONS ARE MINIMUM FROM SURFACE OF STEEL (NOT FROM MEMBER GAGES OR WORKING LINES) TO THE NEAREST POINT ON THE CONDUCTOR OR CONDUCTOR HARDWARE.
- ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
- ALL DIMENSIONS ON TOWER ARE TO THE WORKING LINES EXCEPT AS OTHERWISE NOTED.
- CONDUCTOR DATA : 1272 MCM, 42/7 ACSR/GA, WT=2.04 KG/M, DIA=33.91 MM, RATED BREAKING STRENGTH=14,050 KG. (4 SUB-CONDUCTORS PER PHASE BUNDLE)
- SHIELD WIRE DATA : 7 NO.8 ALUMINUM-CLAD STEEL, WT=0.39 KG/M, DIA=9.78 MM, RATED BREAKING STRENGTH=7,227 KG. OR 3/8 INCH EHS CLASS A , WT=0.406 KG/M, DIA=9.14 MM, RATED BREAKING STRENGTH=6,985 KG.
- TOWER SHALL BE DESIGNED FOR ONE OR BOTH CIRCUITS INSTALLED, FOR THE PURPOSES OF TOWER DESIGN, EACH CIRCUIT SHALL BE DEFINED AS THE THREE PHASE BUNDLES AND THE CORRESPONDING SHIELD WIRE VERTICALLY ADJACENT TO ONE ANOTHER ON ONE SIDE OF THE TOWER.
- TOWERS ARE DESIGNED FOR USE OF ANY COMBINATION OF LEG EXTENSION HEIGHTS RESULTING IN A MAXIMUM DIFFERENTIAL OF LEG HEIGHT OF SIX METERS BETWEEN ADJACENT OR DIAGONALLY OPPOSITE LEGS.

TOWER APPLICATIONS

RULING SPAN = 440 M.
MAXIMUM WIND SPAN = 460 M. AT 60°
MAXIMUM WEIGHT SPAN = 690 M.
MAXIMUM DEVIATION ANGLE = 60°
DESIGN CRITERIA BASED ON RIGHT OF WAY = 60 M.
SHIELD WIRE ; 3/8 EHS CLASS A 7 NO.8 ALUMINUM-CLAD STEEL OR OPGW 36 CORES (13.5 MM. DIAMETER)
CONDUCTOR ; 4 x 1272 MCM. ACSR/GA

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

ELECTRICITY GENERATING AUTHORITY OF THAILAND									
DRAWN	ARKET	RECOMMENDED AND VALIDATED	titipong	DRAWING NAME	500 kV TRANSMISSION LINE				
DESIGNED	P.sit	CONCURRED	CHIEF, TRANSMISSION LINE ENGINEERING DEPARTMENT	DESCRIPTION OF DETAIL DRAWING	CONFIGURATION AND DESIGN CRITERIA TOWER TYPE DQT60				
VERIFIED	Viwat.m	ASSISTANT DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION		JOB NO.	REPLACING DWG. NO.	DWG. NO.	C01-051	REV.	
APPROVED	Sorachich	DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION	DATE 24/04/2025						



LOADING CASES

- I** **EXTREME TRANSVERSE WIND**
ALL WIRES INTACT AT 27°C, FINAL WIRE TENSION. WITH A TRANSVERSE WIND OF 140 KG/M²
ACTING ON SHIELD WIRES, 115 KG/M² ON CONDUCTORS, 156 KG/M² ON TOWER AND INSULATORS. L.F.=1.15 (SEE NOTES B, D)
- II** **EXTREME LONGITUDINAL WIND**
ALL WIRES INTACT AT 27°C, FINAL WIRES TENSIONS. WITH A LONGITUDINAL WIND OF 156 KG/M²
ACTING ON TRANSVERSE FACES OF THE TOWER, NO WINDS ON WIRES. L.F.=1.15 (SEE NOTES B, D)
- III** **EXTREME OBLIQUE WIND**
ALL WIRES INTACT AT 27°C, FINAL WIRES TENSIONS WITH A TRANSVERSE WIND OF 140 KG/M²
ACTING ON SHIELD WIRES, 115 KG/M² ON CONDUCTORS, 156 KG/M² ON TOWER
AND INSULATOR, WIND BLOWING AT 75°, 60° AND 45° TO LINE. L.F.=1.15
(SEE NOTES A, B, D)
- IV** **FAILURE CONTAINMENT**
ALL WIRES INTACT AT 27°C FINAL WIRES TENSIONS. WITH A TRANSVERSE WIND OF 91 KG/M²
ON SHIELD WIRES, 76 KG/M² ON CONDUCTORS, 101.5 KG/M² ON TOWER AND INSULATOR, PLUS AN UNBALANCED LONGITUDINAL LOADS
EQUAL TO 100% OF THE TENSION IN THE SHIELD WIRE OR CONDUCTOR PHASE BUNDLE. (SEE NOTE E)
OF THE TENSION IN THE CONDUCTOR PHASE BUNDLE. (SEE NOTE E)
- V** **STRINGING AND MAINTENANCE**
ALL WIRES INTACT AT 4°C INITIAL WIRE TENSIONS. WITH A TRANSVERSE WIND OF 27.5 KG/M² ACTING ON SHIELD WIRES, 23 KG/M²
ON CONDUCTORS, 29.4 KG/M² ON TOWER AND INSULATORS. WITH AN ADDITIONAL VERTICAL LOAD AT ANT OR ALL OF THE WIRE ATTACHMENT
POINTS OF EITHER ONE (BUT NOT BOTH) OF THE CIRCUITS. THE ADDITIONAL VERTICAL LOAD SHALL BE EQUAL TO 1,500 KG. PLUS 33% OF
THE SHIELD WIRE OR PHASE TENSION, SIMULTANEOUSLY, ADDITIONAL LONGITUDINAL LOADS SHALL BE APPLIED AT ANY OR ALL OF THE
WIRE ATTACHMENT POINTS OF THE SAME CIRCUIT EQUAL TO 100% OF THE SHIELD WIRE OR PHASE BUNDLE TENSION. (SEE NOTE F)
- VI** **HIGH INTENSITY**
ALL WIRES INTACT AT 27°C, FINAL WIRE TENSIONS. PRESSURE OF 306.25 KG/M² ACTING ON TOWER AND INSULATORS WITH NO WIND ON
SHIELD WIRE OR CONDUCTORS. WIND BLOWING AT 90, 75, 60, 45, 0 TO LINE. (SEE NOTE B)
- VII** **UPLIFT LOADS**
CROSSARM MEMBERS WILL BE DESIGNED TO WITHSTAND VERTICAL UPLIFT LOADS EQUAL TO 100% OF THE DESIGN
WEIGHT SPAN ACTING ON ALL ATTACHMENT, IN EACH LOADING CASE.

NOTES

- A. FOR WIND AT ANGLE β' TO WIRES. WIND PRESSURE TO BE REDUCED BY $\sin^2(\beta)$
- B. WIND PRESSURE ON TOWER APPLIED ON 3.2 TIMES MOST EXPOSED FACE. FOR WIND AT AN ANGLE β' TO A FACE PRESSURE HAS BEEN ADDITIONALLY INCREASED BY $[1+0.2 \times \sin^2(2\beta)]$; WIND LOAD IS ASSUMED IN THE DIRECTION OF THE WIND.
- C. ALL ELEMENT OF TOWER ARE TO BE DESIGNED TO 0.79 CAPACITY.
- D. L.F. DENOTED LOAD FACTOR APPLYING TO STATISTIC LOAD SUCH AS WIND LOADS.
- E. FOR LOADING CASED IV. AND V THE ADDITIONAL LONGITUDINAL AND / OR VERTICAL LOADS MAY BE ASSUMED TO ACT AT ANY TWO WIRE ATTACHMENT LOCATIONS SIMULTANEOUSLY IN THE CASE OF BOTH CIRCUITS INSTALLED, IN THE CASE OF ONLY ONE CIRCUIT INSTALLED, APPLY THE ADDITIONAL LONGITUDINAL AND / OR VERTICAL LOAD AT ANY ONE WIRE ATTACHMENT LOCATION.
- F. LOCATIONS OF THE ADDITIONAL VERTICAL STRINGING LOADS SPECIFIED IN LOADING CASE V ARE INDEPENDENT OF THE LOCATIONS OF THE ADDITIONAL LONGITUDINAL STRINGING LOADS. APPLY ADDITIONAL LONGITUDINAL LOAD AT ANY ONE WIRE ATTACHMENT LOCATION.

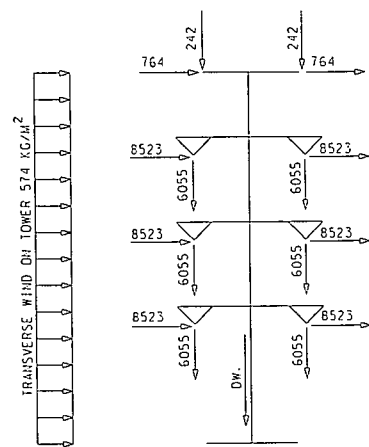
GENERAL NOTES

1. CLEARANCE DIMENSIONS ARE MINIMUM FROM SURFACE OF STEEL (NOT FROM MEMBER GAGES OR WORKING LINES) TO THE NEAREST POINT ON THE CONDUCTOR OR CONDUCTOR HARDWARE.
2. ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
3. ALL DIMENSIONS ON TOWER ARE TO THE WORKING LINES EXCEPT AS OTHERWISE NOTED.
4. CONDUCTOR DATA : 1272 MCM, 42/7 ACSR/GA, WT=2.04 KG/M, DIA=33.91 MM, RATED BREAKING STRENGTH=14,050 KG.
(4 SUB-CONDUCTORS PER PHASE BUNDLE)
5. SHIELD WIRE DATA : 7 NO.8 ALUMINUM-CLAD STEEL, WT=0.39 KG/M, DIA=9.78 MM, RATED BREAKING STRENGTH=7,227 KG.
OR 3/8 INCH EHS CLASS A , WT=0.406 KG/M, DIA=9.14 MM, RATED BREAKING STRENGTH=6,985 KG.
6. TOWER SHALL BE DESIGNED FOR ONE OR BOTH CIRCUITS INSTALLED, FOR THE PURPOSES OF TOWER DESIGN, EACH CIRCUIT SHALL BE DEFINED AS THE THREE PHASE BUNDLES AND THE CORRESPONDING SHIELD WIRE VERTICALLY ADJACENT TO ONE ANOTHER ON ONE SIDE OF THE TOWER.
7. TOWERS ARE DESIGNED FOR USE OF ANY COMBINATION OF LEG EXTENSION HEIGHTS RESULTING IN A MAXIMUM DIFFERENTIAL OF LEG HEIGHT OF SIX METERS BETWEEN ADJACENT OR DIAGONALLY OPPOSITE LEGS.

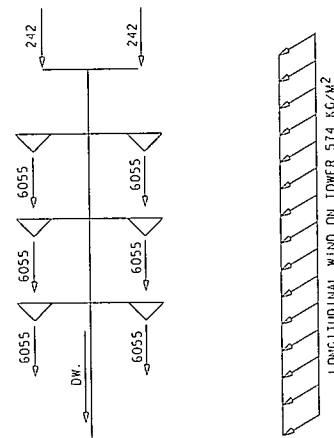
TOWER APPLICATIONS

RULING SPAN = 440 M.
 MAXIMUM WIND SPAN = 460 M. AT 90°
 MAXIMUM WEIGHT SPAN = 690 M.
 MAXIMUM DEVIATION ANGLE = 90°
 DESIGN CRITERIA BASED ON RIGHT OF WAY = 60 M.
 SHIELD WIRE ; 3/8 EHS CLASS A OR 7 NO.8 ALUMINUM-CLAD STEEL OR OPGW 24 CORES (10.5 MM. DIAMETER)
 CONDUCTOR ; 4 x 1272 MCM. ACSR/GA

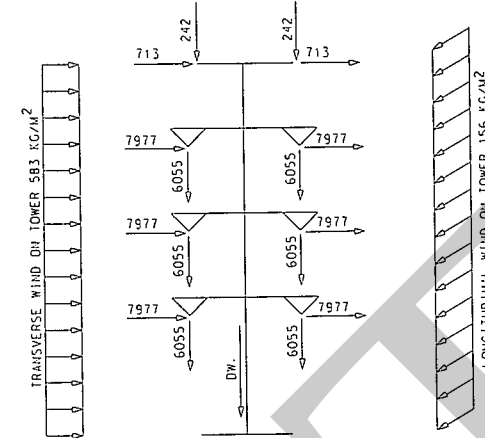
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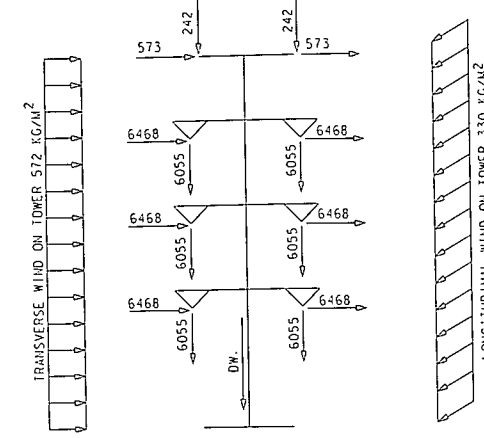
CASE I



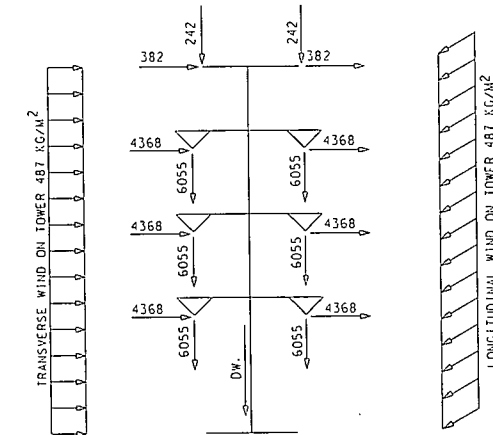
CASE II



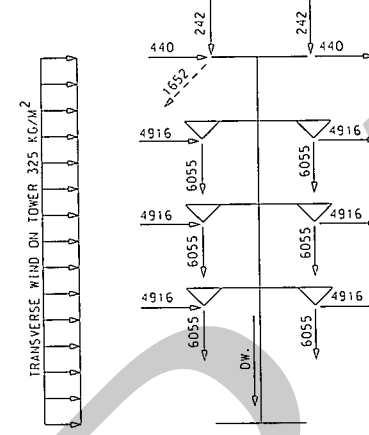
CASE III(1)



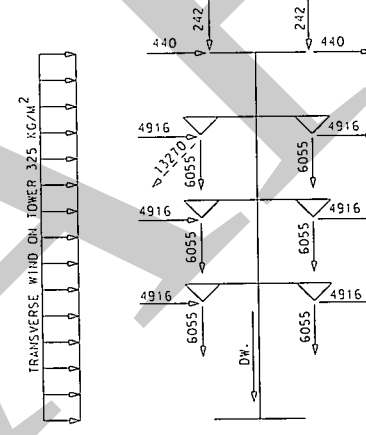
CASE III(2)



CASE III(3)



CASE IV(1)



CASE IV(2)

LOADING CASES

- CASE I EXTREME TRANSVERSE WIND ($\beta = 90^\circ$)
CASE II EXTREME LONGITUDINAL WIND ($\beta = 0^\circ$)
CASE III EXTREME OBLIQUE WIND
(1) $\beta = 75^\circ$
(2) $\beta = 60^\circ$
(3) $\beta = 45^\circ$
CASE IV FAILURE CONTAINMENT
(1) ANY ONE OF OHG. WIRE.
(2) ANY ONE OF CONDUCTOR.

NOTES

- ALL SPECIFIED LOADS ARE DESIGN LOADS (INCLUDING LOAD FACTORS) IN KILOGRAMS EXCEPT AS OTHERWISE INDICATED.
- THE SPECIFIED TRANSVERSE AND/OR LONGITUDINAL WIND ON TOWER SHALL ACT ON THE PROJECTED AREA OF ONE LONGITUDINAL FACE AND/OR ONE TRANSVERSE FACE OF THE TOWER, RESPECTIVELY.
- ALL ELEMENTS OF TOWER, BOTH MEMBERS AND CONNECTIONS, SHALL BE DESIGNED TO 0.92 OF THEIR CAPACITIES.
- β IS THE ANGLE BETWEEN THE WIND DIRECTION AND THE LONGITUDINAL AXIS OF THE TOWER.
- DW. DENOTES DEAD WEIGHT OF THE TOWER.
- THE TOWER SHALL BE DESIGNED FOR USE WITH ANY COMBINATION OF DIFFERENT LEG EXTENSIONS, RESULTING IN A MAXIMUM DIFFERENTIAL OF SIX METERS IN HEIGHT, BETWEEN ADJACENT OR DIAGONALLY OPPOSITE LEGS.

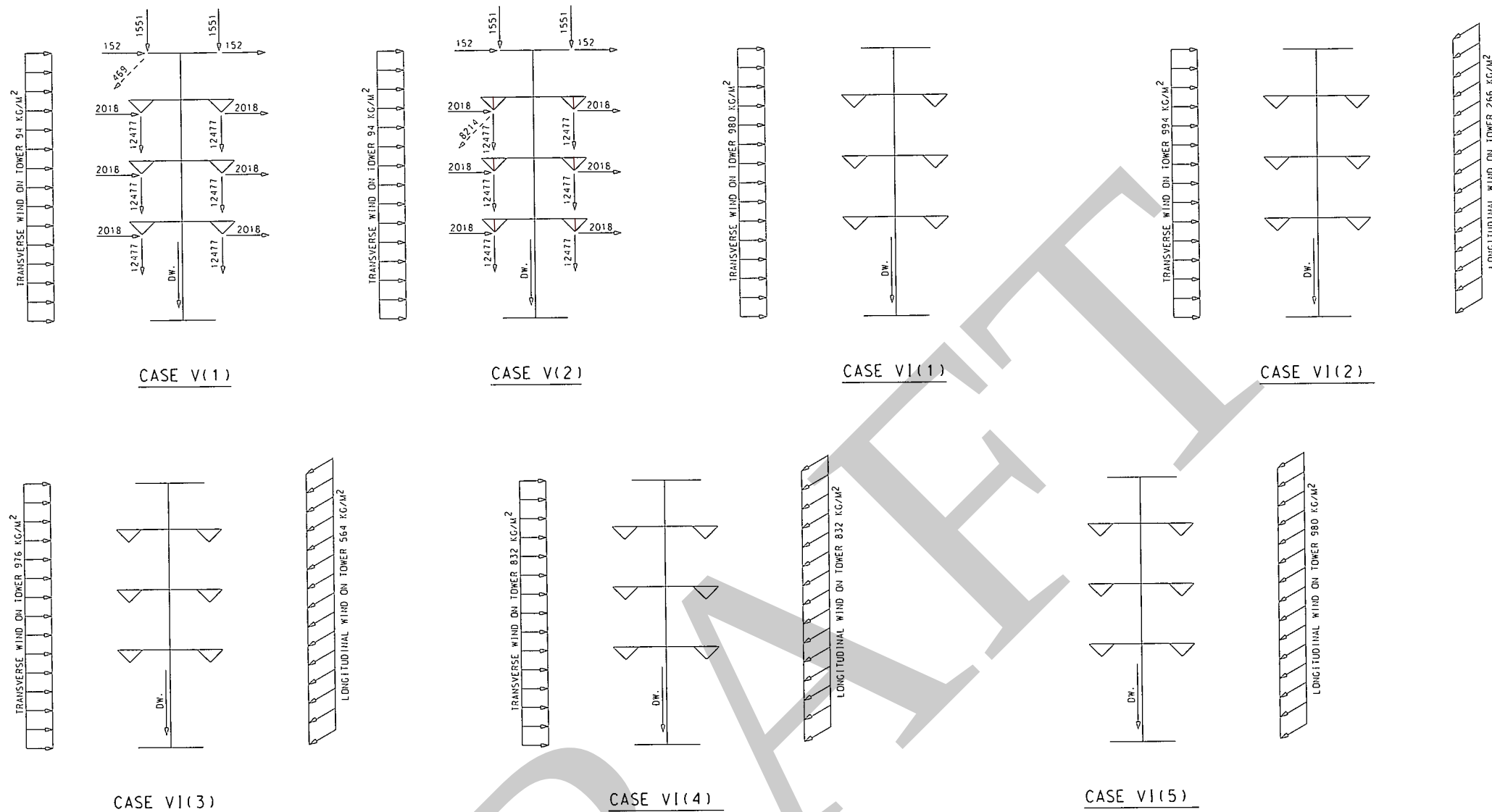
ELECTRICITY GENERATING AUTHORITY OF THAILAND

500 KV TRANSMISSION LINE

LOADING DIAGRAM
TOWER TYPE DOV3

DESIGNED BY SAKUT
VERIFIED BY Than
APPROVED BY
RECOMMENDED BY
CONCURRED BY
DATE

JOB NO. REPLACING Dwg. NO. Dwg. NO. C02 - 003



LOADING CASES

CASE V STRINGING AND/OR MAINTENANCE

- (1) ANY ONE OF OHG. WIRE.
- (2) ANY ONE OF CONDUCTOR.

CASE VI HIGH INTENSITY

- (1) $\beta = 90^\circ$
- (2) $\beta = 75^\circ$
- (3) $\beta = 60^\circ$
- (4) $\beta = 45^\circ$
- (5) $\beta = 0^\circ$

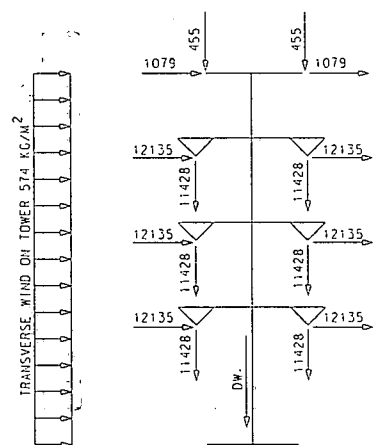
NOTES

1. ALL SPECIFIED LOADS ARE DESIGN LOADS (INCLUDING LOAD FACTORS) IN KILOGRAMS EXCEPT AS OTHERWISE INDICATED.
2. THE SPECIFIED TRANSVERSE AND/OR LONGITUDINAL WIND ON TOWER SHALL ACT ON THE PROJECTED AREA OF ONE LONGITUDINAL FACE AND/OR ONE TRANSVERSE FACE OF THE TOWER, RESPECTIVELY.
3. ALL ELEMENTS OF TOWER, BOTH MEMBERS AND CONNECTIONS, SHALL BE DESIGNED TO 0.92 OF THEIR CAPACITIES.
4. β IS THE ANGLE BETWEEN THE WIND DIRECTION AND THE LONGITUDINAL AXIS OF THE TOWER.
5. DW. DENOTES DEAD WEIGHT OF THE TOWER.
6. THE TOWER SHALL BE DESIGNED FOR USE WITH ANY COMBINATION OF DIFFERENT LEG EXTENSIONS, RESULTING IN A MAXIMUM DIFFERENTIAL OF SIX METERS IN HEIGHT, BETWEEN ADJACENT OR DIAGONALLY OPPOSITE LEGS.

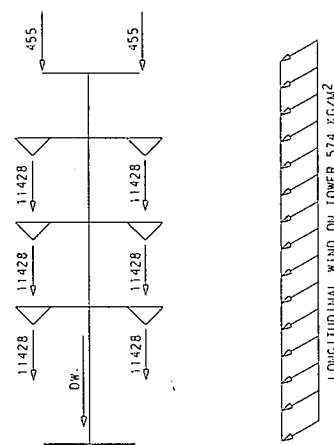
ELECTRICITY GENERATING AUTHORITY OF THAILAND

DRANK	CHALEE	VALIDATED	CHALEE	500 KV TRANSMISSION LINE
DESIGNED	SPRUT	RECOMMENDED	CHALEE	LOADING DIAGRAM
VERIFIED	THAN	CONCURRED	CHALEE	TOWER TYPE DOV3
APPROVED				
ASSISTANT ENGINEER - TRANSMISSION SYSTEM ENGINEERING				

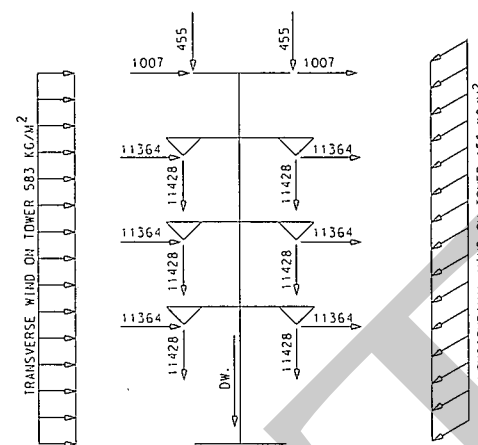
JOB NO. REPLACING DWG. NO. DWG. NO. REV. C02 - 004



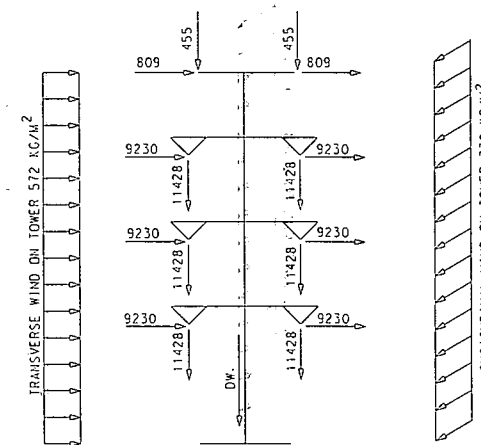
CASE VI(1)
CASE I



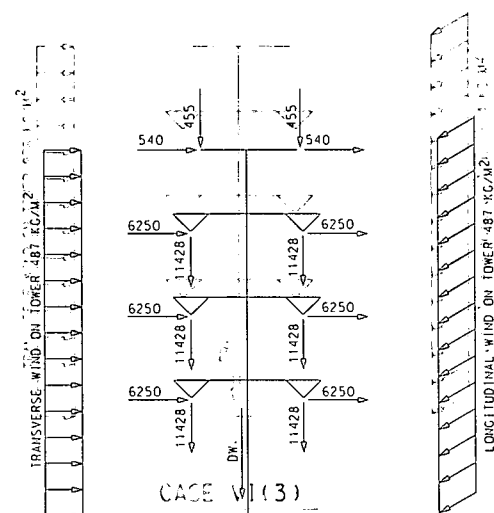
CASE VI(2)
CASE II



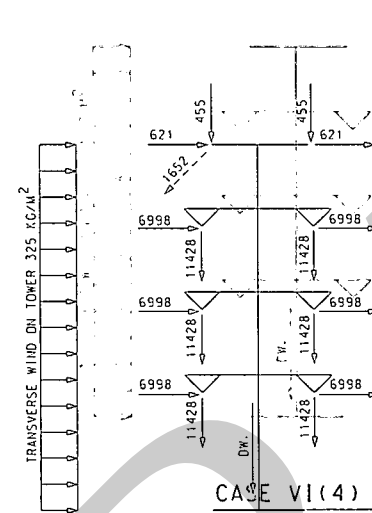
CASE VI(1)
CASE III(1)



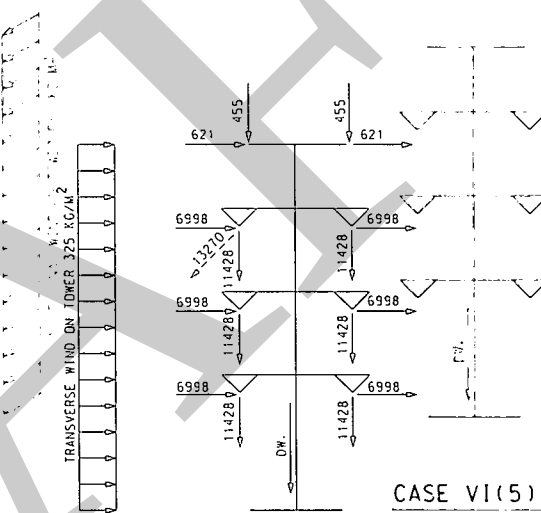
CASE VI(2)
CASE III(2)



CASE VI(1)
CASE III(3)



CASE VI(1)
CASE IV(1)



CASE VI(1)
CASE IV(2)

LOADING CASES

- CASE V - DESIGN FOR MAINTENANCE
- LOADING CASES
- CASE I - EXTREME TRANSVERSE WIND ($\beta = 90^\circ$)
- CASE II - EXTREME LONGITUDINAL WIND ($\beta = 0^\circ$)
- CASE III - EXTREME OBLIQUE WIND
- (1) $\beta = 75^\circ$
- (2) $\beta = 60^\circ$
- (3) $\beta = 45^\circ$
- CASE IV - FAILURE CONTAINMENT
- (1) ANY ONE OF OHG. WIRE.
- (2) ANY ONE OF CONDUCTOR.

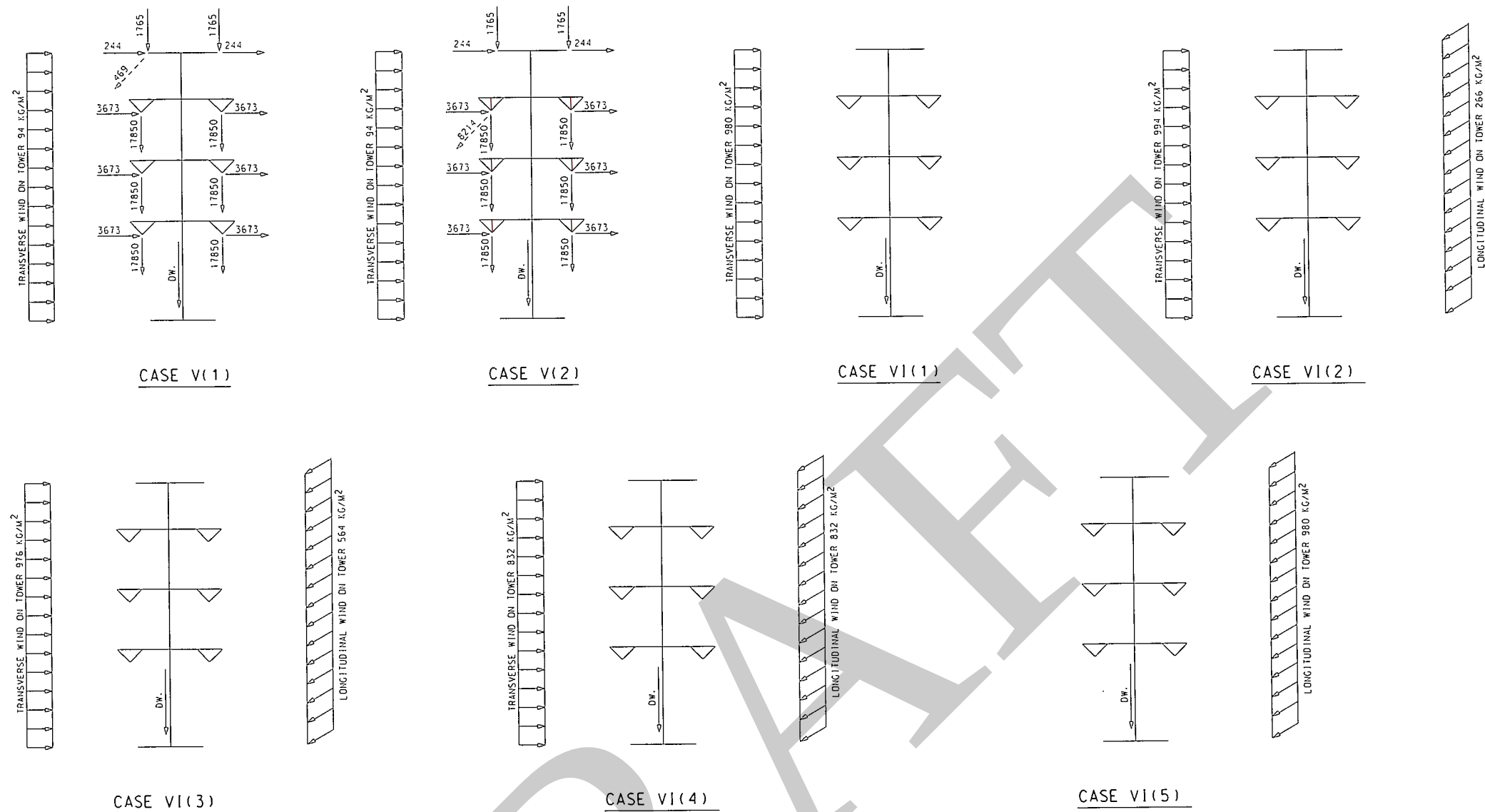
NOTES

- ALL SPECIFIED LOADS ARE DESIGN LOADS (INCLUDING LOAD FACTORS) IN KILOGRAMS EXCEPT AS OTHERWISE INDICATED.
- THE SPECIFIED TRANSVERSE AND/OR LONGITUDINAL WIND ON TOWER SHALL ACT ON THE PROJECTED AREA OF ONE LONGITUDINAL FACE AND/OR ONE TRANSVERSE FACE OF THE TOWER, RESPECTIVELY.
- ALL ELEMENTS OF TOWER, BOTH MEMBERS AND CONNECTIONS, SHALL BE DESIGNED TO 0.92 OF THEIR CAPACITIES.
- β IS THE ANGLE BETWEEN THE WIND DIRECTION AND THE LONGITUDINAL AXIS OF THE TOWER.
- DW. DENOTES DEAD WEIGHT OF THE TOWER.
- THE TOWER SHALL BE DESIGNED FOR USE WITH ANY COMBINATION OF DIFFERENT LEG EXTENSIONS, RESULTING IN A MAXIMUM DIFFERENTIAL OF SIX METERS IN HEIGHT, BETWEEN ADJACENT OR DIAGONALLY OPPOSITE LEGS.

ELECTRICITY GENERATING AUTHORITY OF THAILAND

DESIGNED	SAWIT	VALIDATED	7. Chan 18 MAR 05	500 KV TRANSMISSION LINE
VERIFIED	Chan	RECOMMENDED	CHIEF, TRANSMISSION LINE ENGINEERING DEPARTMENT	LOADING DIAGRAM
APPROVED		CONCURRED	ASST. CHIEF, TRANSMISSION SYSTEM ENGINEERING DIVISION	TOWER TYPE DOV9
JOB NO.			REPLACING DWG. NO.	DWG. NO.
DATE			C02 - 005	

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

CASE V STRINGING AND/OR MAINTENANCE

- (1) ANY ONE OF OHG. WIRE.
- (2) ANY ONE OF CONDUCTOR.

CASE VI HIGH INTENSITY

- (1) $\beta = 90^\circ$
- (2) $\beta = 75^\circ$
- (3) $\beta = 60^\circ$
- (4) $\beta = 45^\circ$
- (5) $\beta = 0^\circ$

NOTES

- ALL SPECIFIED LOADS ARE DESIGN LOADS (INCLUDING LOAD FACTORS) IN KILOGRAMS EXCEPT AS OTHERWISE INDICATED.
- THE SPECIFIED TRANSVERSE AND/OR LONGITUDINAL WIND ON TOWER SHALL ACT ON THE PROJECTED AREA OF ONE LONGITUDINAL FACE AND/OR ONE TRANSVERSE FACE OF THE TOWER, RESPECTIVELY.
- ALL ELEMENTS OF TOWER, BOTH MEMBERS AND CONNECTIONS, SHALL BE DESIGNED TO 0.92 OF THEIR CAPACITIES.
- β IS THE ANGLE BETWEEN THE WIND DIRECTION AND THE LONGITUDINAL AXIS OF THE TOWER.
- DW. DENOTES DEAD WEIGHT OF THE TOWER.
- THE TOWER SHALL BE DESIGNED FOR USE WITH ANY COMBINATION OF DIFFERENT LEG EXTENSIONS, RESULTING IN A MAXIMUM DIFFERENTIAL OF SIX METERS IN HEIGHT, BETWEEN ADJACENT OR DIAGONALLY OPPOSITE LEGS.

9001
SEPTEMBER 2007

ELECTRICITY GENERATING AUTHORITY OF THAILAND

500 KV TRANSMISSION LINE

LOADING DIAGRAM
TOWER TYPE DOV9

DESIGNED SARUT
VERIFIED Than
APPROVED

VALIDATED V. Chan 18 Mar 07
RECOMMENDED
CONCURRED

JOB NO. REPLACING DWG. NO. DWG. NO. C02 - 006 REV.

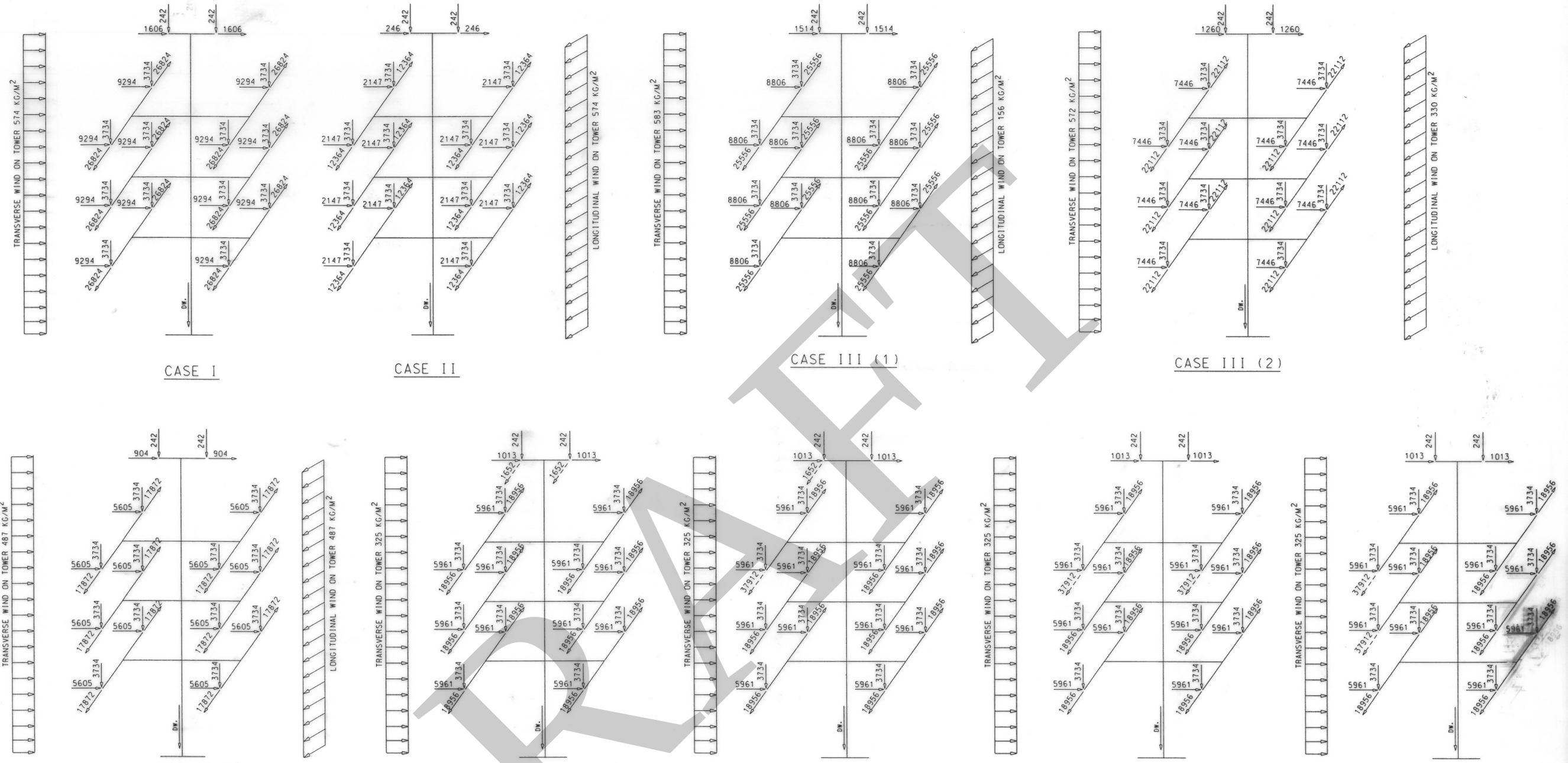
ASSISTANT GOVERNOR - TRANSMISSION SYSTEM ENGINEERING

DATE

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

4x1272 MCM ACSR/GA, RULING SPAN 440 m.

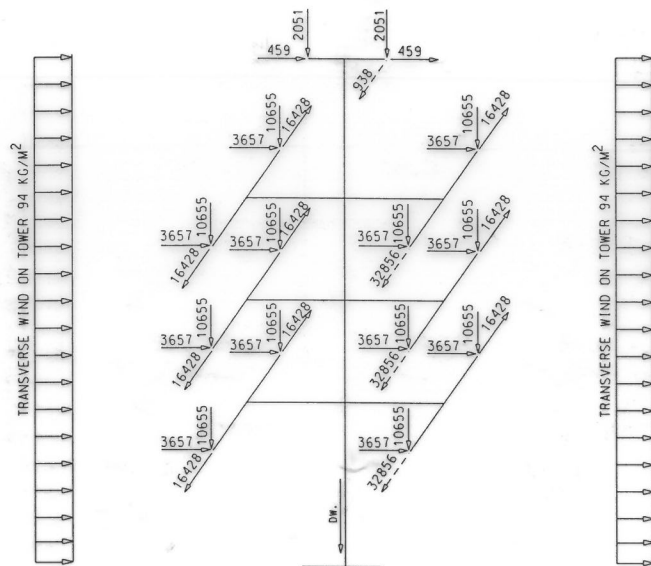
TL890



- LOADING CASES**
- CASE I EXTREME TRANSVERSE WIND ($\beta = 90^\circ$)
- CASE II EXTREME LONGITUDINAL WIND ($\beta = 0^\circ$)
- CASE III EXTREME OBLIQUE WIND
- (1) $\beta = 75^\circ$
- (2) $\beta = 60^\circ$
- (3) $\beta = 45^\circ$
- CASE IV FAILURE CONTAINMENT
- (1) TWO OHG. WIRES.
- (2) ONE OHG. WIRE AND ANY ONE OF TOP CONDUCTORS.
- (3) ONE OHG. WIRE AND ANY ONE OF MIDDLE CONDUCTORS.
- (4) ONE OHG. WIRE AND ANY ONE OF BOTTOM CONDUCTORS.
- (5) TOP CONDUCTORS.
- (6) MIDDLE CONDUCTORS.
- (7) BOTTOM CONDUCTORS.
- (8) TOP AND MIDDLE CONDUCTORS ON THE SAME SIDE.
- (9) TOP AND BOTTOM CONDUCTORS ON THE SAME SIDE.
- (10) MIDDLE AND BOTTOM CONDUCTORS ON THE SAME SIDE.
- NOTES**
1. ALL SPECIFIED LOADS ARE DESIGN LOADS (INCLUDING LOAD FACTORS) IN KILOGRAMS EXCEPT AS OTHERWISE INDICATED.
2. THE SPECIFIED TRANSVERSE AND/OR LONGITUDINAL WIND ON TOWER SHALL ACT ON THE PROJECTED AREA OF ONE LONGITUDINAL FACE AND/OR ONE TRANSVERSE FACE OF THE TOWER, RESPECTIVELY.
3. ALL ELEMENTS OF TOWER, BOTH MEMBERS AND CONNECTIONS, SHALL BE DESIGNED TO 0.79 OF THEIR CAPACITIES.
4. β IS THE ANGLE BETWEEN THE WIND DIRECTION AND THE LONGITUDINAL AXIS OF THE TOWER.
5. DW. DENOTES DEAD WEIGHT OF THE TOWER.
6. THE TOWER SHALL BE DESIGNED FOR USE WITH ANY COMBINATION OF DIFFERENT LEG EXTENSIONS, RESULTING IN A MAXIMUM DIFFERENTIAL OF SIX METERS IN HEIGHT, BETWEEN ADJACENT OR DIAGONALLY OPPOSITE LEGS.

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

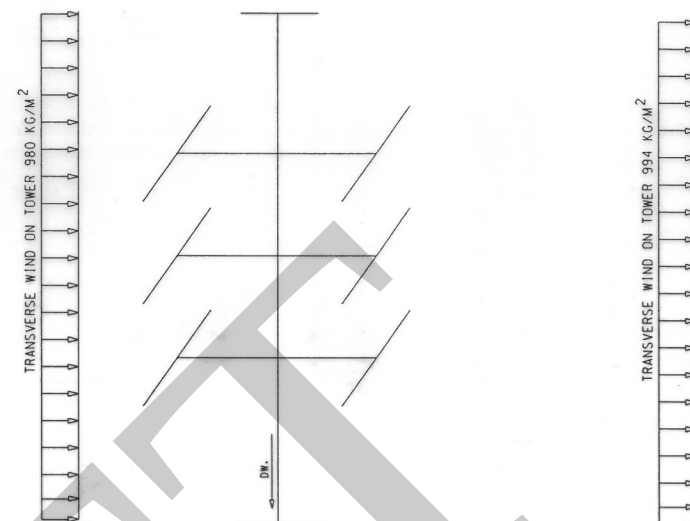
ELECTRICITY GENERATING AUTHORITY OF THAILAND			
500 KV TRANSMISSION LINE			
LOADING DIAGRAM			
TOWER TYPE DOT20			
DRAWN CHALUE	VAL IDATED T. Chalue 18 May '03 CHIEF, TRANSMISSION LINE ENGINEERING DEPARTMENT	JOB NO.	REV.
DESIGNED SARUT	RECOMMENDED ASST. DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION	REPLACING DWG. NO.	C02 - 007
VERIFIED Vhan	CONCURRED DIRECTION, TRANSMISSION SYSTEM ENGINEERING DIVISION	DWG. NO.	
APPROVED	DATE		
ASSISTANT GENERAL - TRANSMISSION SYSTEM ENGINEERING			



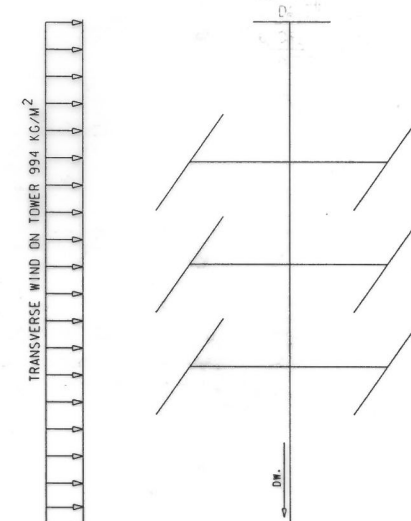
CASE V(1)



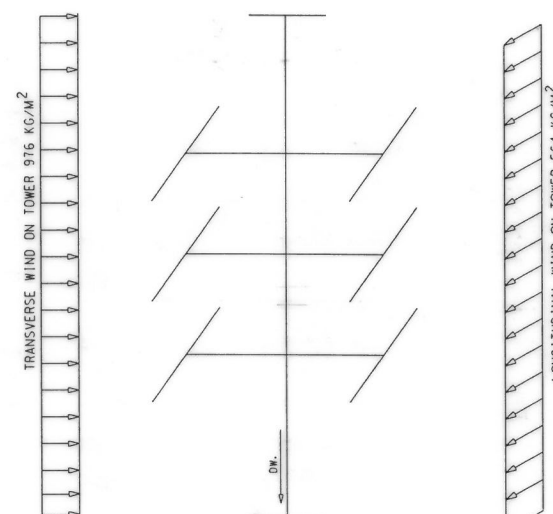
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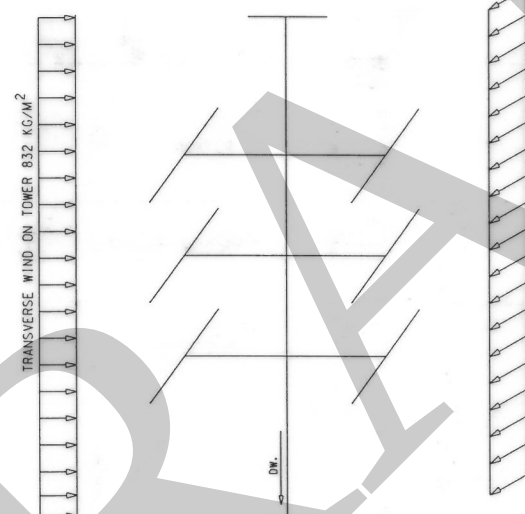
CASE VI(1)



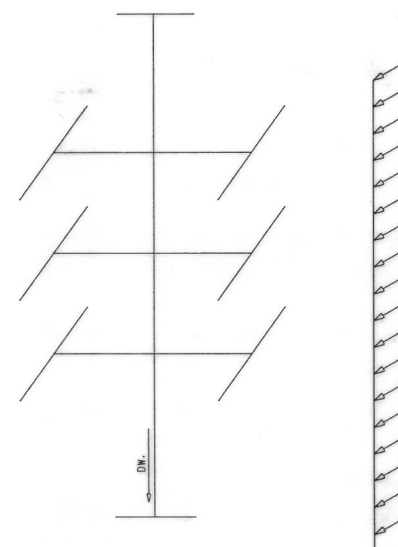
CASE VI(2)



CASE VI(3)



CASE VI(4)



CASE VI(5)

LOADING CASES

CASE V STRINGING AND/OR MAINTENANCE
(1) ONE-CIRCUIT RIGHT SIDE.
(2) ONE-CIRCUIT LEFT SIDE

CASE VI HIGH INTENSITY WIND
(1) $\beta = 90^\circ$
(2) $\beta = 75^\circ$
(3) $\beta = 60^\circ$
(4) $\beta = 45^\circ$
(5) $\beta = 0^\circ$

CASE VII UPLIFT (SEE NOTES 7.)

NOTES

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- DW. DENOTES DEAD WEIGHT OF THE TOWER.
- THE TOWER SHALL BE DESIGNED FOR USE WITH ANY COMBINATION OF DIFFERENT LEG EXTENSIONS, RESULTING IN A MAXIMUM DIFFERENTIAL OF SIX METERS IN HEIGHT, BETWEEN ADJACENT OR DIAGONALLY OPPOSITE LEGS.
- ALL ELEMENTS OF TOWER SHALL BE CAPABLE TO WITHSTAND VERTICAL UPLIFT LOADS EQUAL TO DOWNWARD VERTICAL LOADS SPECIFIED IN EACH LOADING CASE.

ISO
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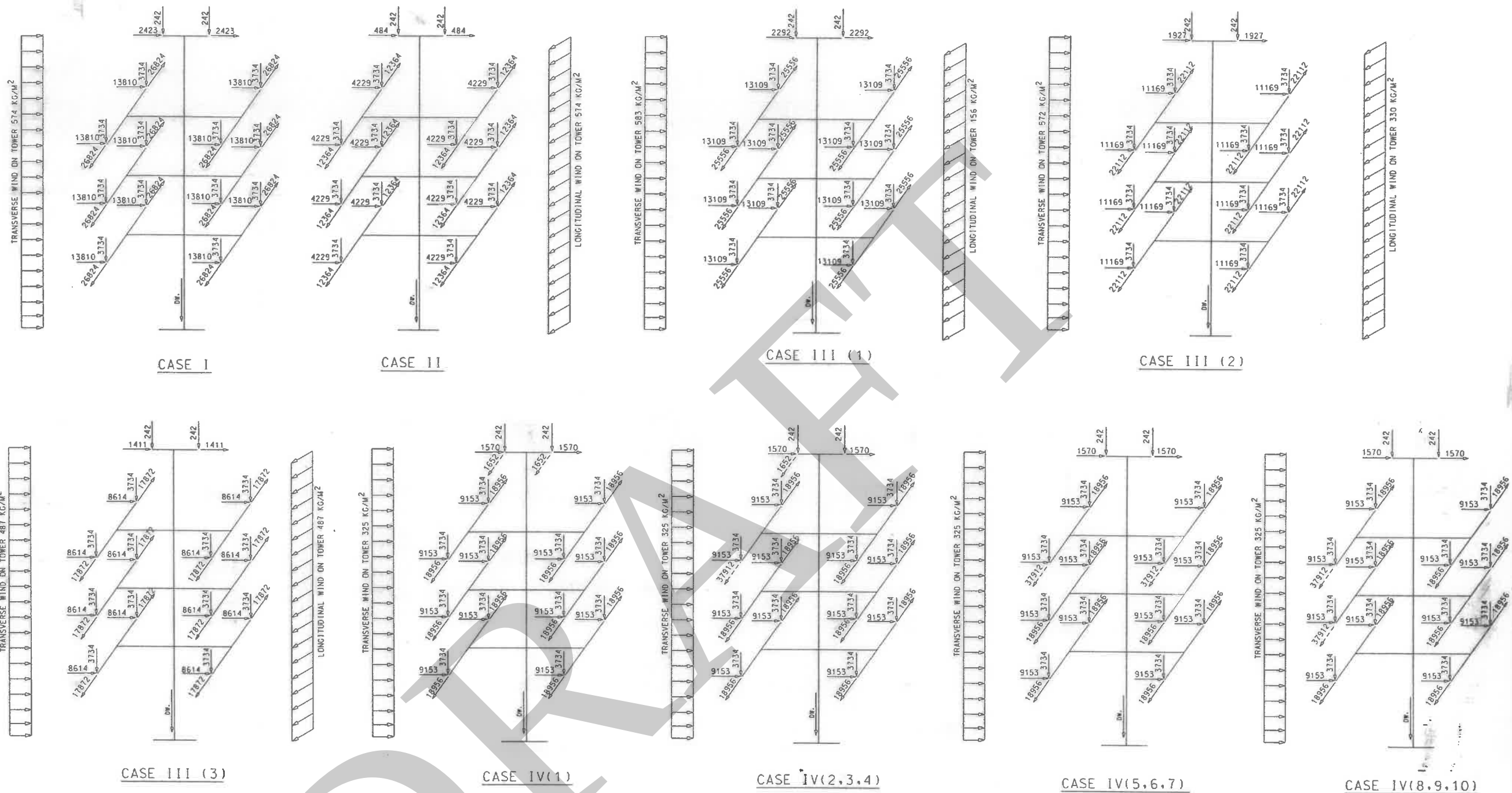
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FILENAME
4x1272 MCM ACSR/GA, RULING SPAN 440 m.
9 SEPTEMBER 2003

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

ELECTRICITY GENERATING AUTHORITY OF THAILAND									
DRAWN		CHALEE	VALIDATED <i>J. Chaiyaporn</i>		500 kV TRANSMISSION LINE				
DESIGNED		<i>ASARUT</i>	RECOMMENDED		CHIEF, TRANSMISSION LINE ENGINEERING DEPARTMENT				
VERIFIED		<i>Than</i>	CONCURRED		LOADING DIAGRAM				
APPROVED					TOWER TYPE DOT20				
			DATE		JOB NO.		REPLACING DWG. NO.		DWG. NO.
ASSISTANT GOVERNOR - TRANSMISSION SYSTEM ENGINEERING					C02 - 008				
					- R				

TL892



LOADING CASES

- CASE I EXTREME TRANSVERSE WIND ($\beta = 90^\circ$)
CASE II EXTREME LONGITUDINAL WIND ($\beta = 0^\circ$)
CASE III EXTREME OBLIQUE WIND

- (1) $\beta = 75^\circ$
(2) $\beta = 60^\circ$
(3) $\beta = 45^\circ$

CASE IV

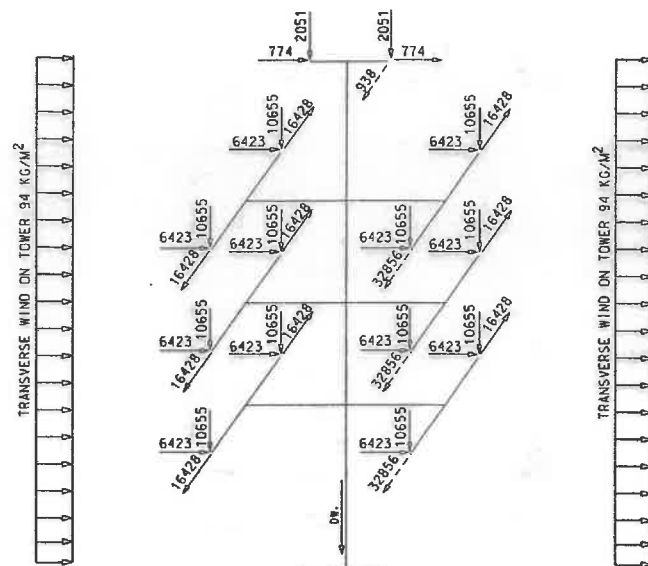
- FAILURE CONTAINMENT
(1) TWO OHG. WIRES.

- (2) ONE OHG. WIRE AND ANY ONE OF TOP CONDUCTORS.
(3) ONE OHG. WIRE AND ANY ONE OF MIDDLE CONDUCTORS.
(4) ONE OHG. WIRE AND ANY ONE OF BOTTOM CONDUCTORS.

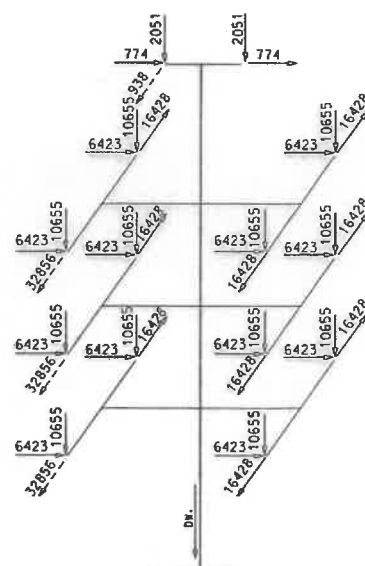
- (5) TOP CONDUCTORS.
(6) MIDDLE CONDUCTORS.
(7) BOTTOM CONDUCTORS.
(8) TOP AND MIDDLE CONDUCTORS ON THE SAME SIDE.
(9) TOP AND BOTTOM CONDUCTORS ON THE SAME SIDE.
(10) MIDDLE AND BOTTOM CONDUCTORS ON THE SAME SIDE.

NOTES

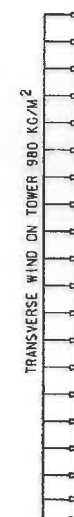
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CASE V(1)



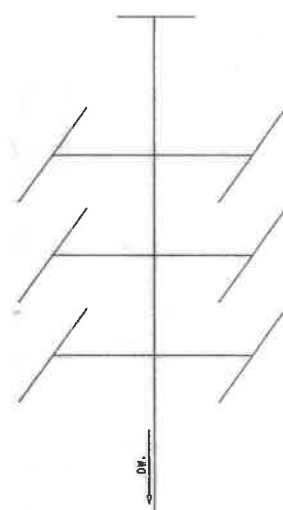
CASE V(2)



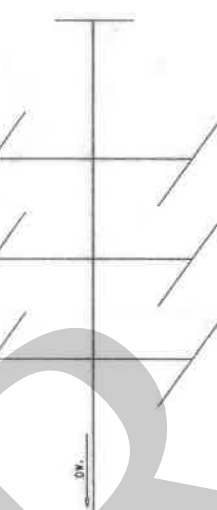
CASE VI(1)



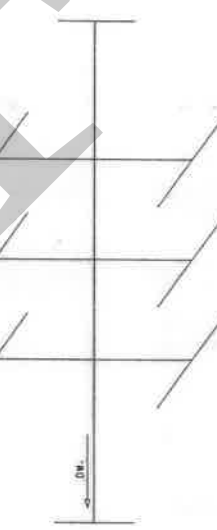
CASE VI(2)



CASE VI(3)



CASE VI(4)



CASE VI(5)



LOADING CASES

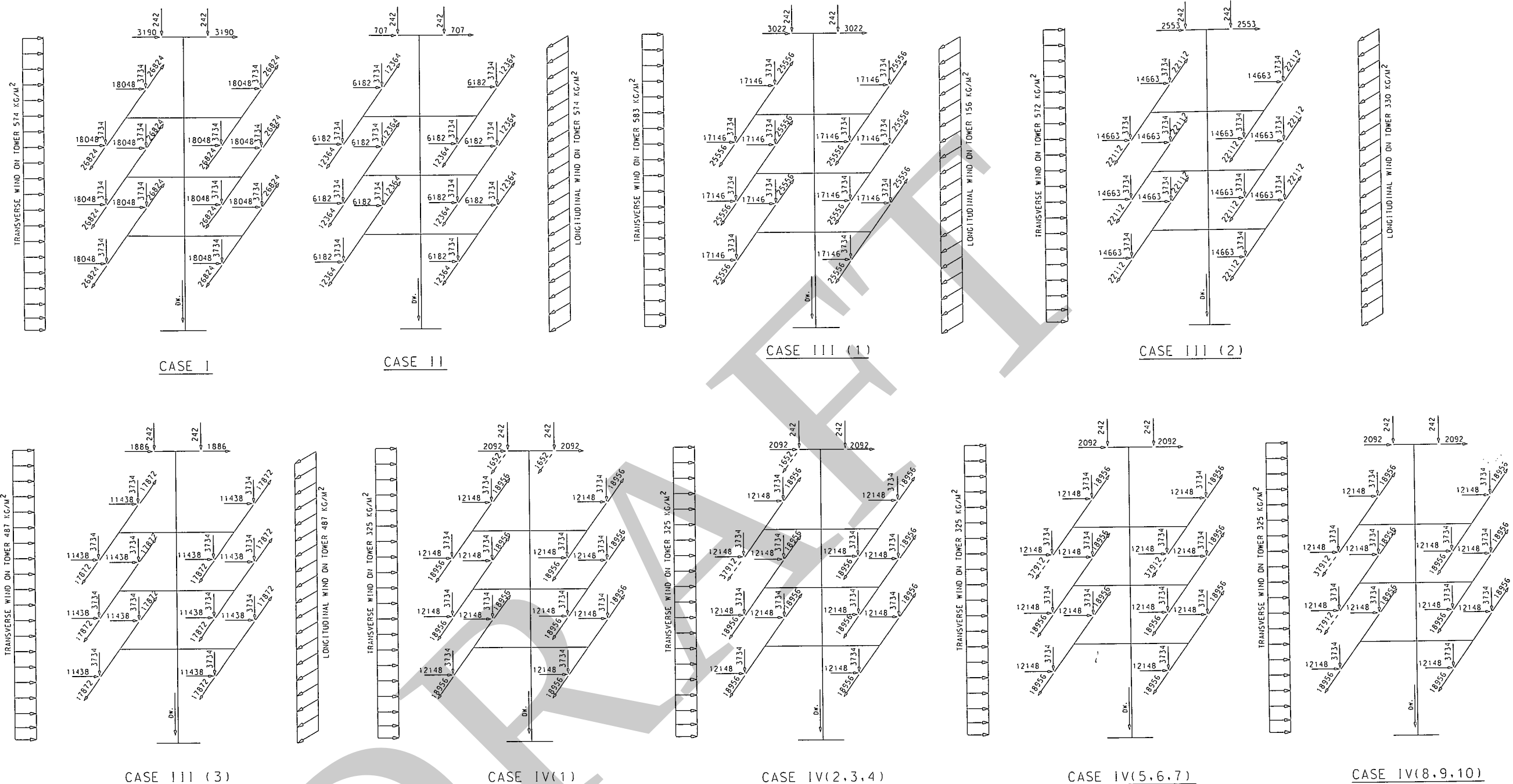
CASE V STRINGING AND/OR MAINTENANCE
(1) ONE-CIRCUIT RIGHT SIDE.
(2) ONE-CIRCUIT LEFT SIDE

CASE VI HIGH INTENSITY WIND
(1) $\beta = 90^\circ$
(2) $\beta = 75^\circ$
(3) $\beta = 60^\circ$
(4) $\beta = 45^\circ$
(5) $\beta = 0^\circ$

CASE VII UPLIFT (SEE NOTES 7.)

NOTES

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LOADING CASES

CASE I EXTREME TRANSVERSE WIND ($\beta = 90^\circ$)

CASE II EXTREME LONGITUDINAL WIND ($\beta = 0^\circ$)

CASE III EXTREME OBLIQUE WIND

(1) $\beta = 75^\circ$

(2) $\beta = 60^\circ$

(3) $\beta = 45^\circ$

CASE IV FAILURE CONTAINMENT

(1) TWO OHG. WIRES.

(2) ONE OHG. WIRE AND ANY ONE OF TOP CONDUCTORS.

(3) ONE OHG. WIRE AND ANY ONE OF MIDDLE CONDUCTORS.

(4) ONE OHG. WIRE AND ANY ONE OF BOTTOM CONDUCTORS.

(5) TOP CONDUCTORS.

(6) MIDDLE CONDUCTORS.

(7) BOTTOM CONDUCTORS.

(8) TOP AND MIDDLE CONDUCTORS ON THE SAME SIDE.

(9) TOP AND BOTTOM CONDUCTORS ON THE SAME SIDE.

(10) MIDDLE AND BOTTOM CONDUCTORS ON THE SAME SIDE.

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ELECTRICITY GENERATING AUTHORITY OF THAILAND

500 kV TRANSMISSION LINE

LOADING DIAGRAM

TOWER TYPE DOT60

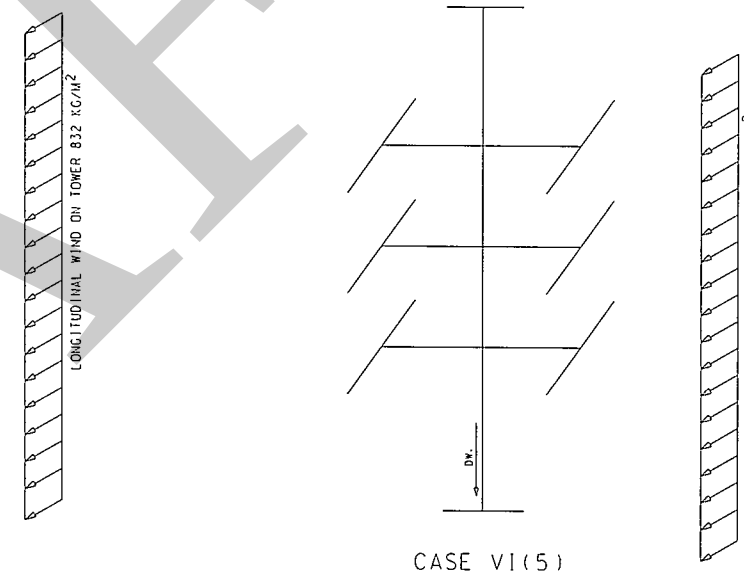
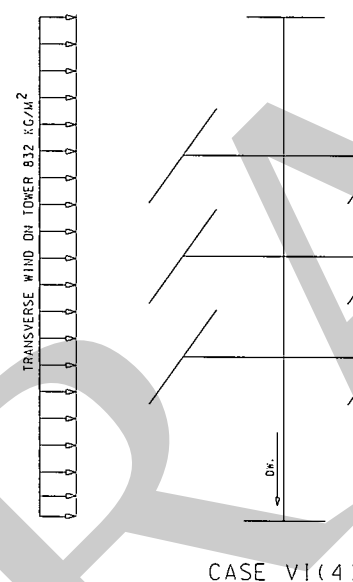
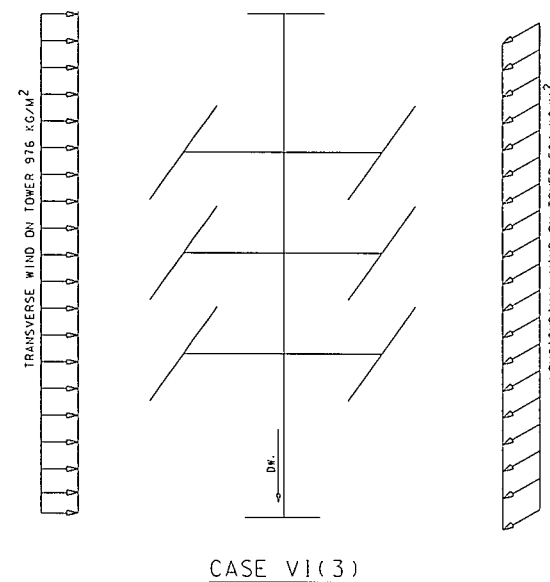
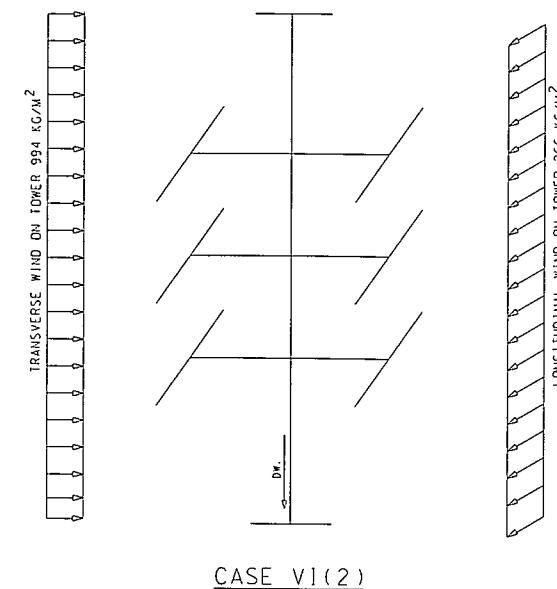
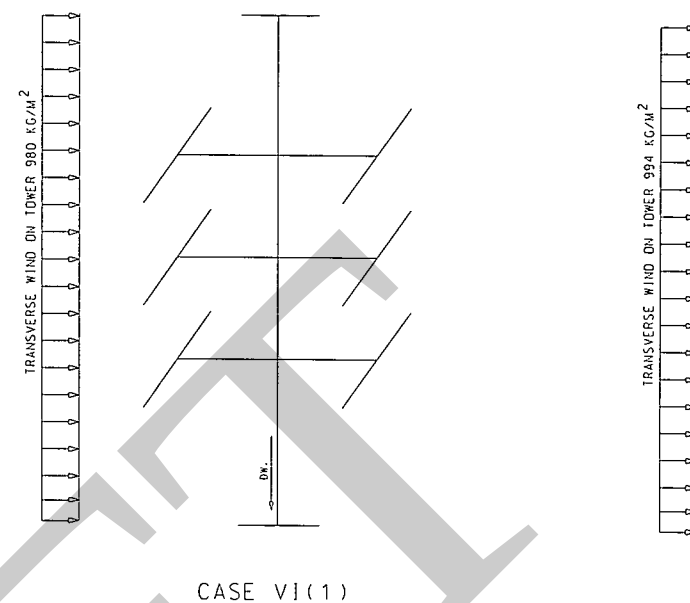
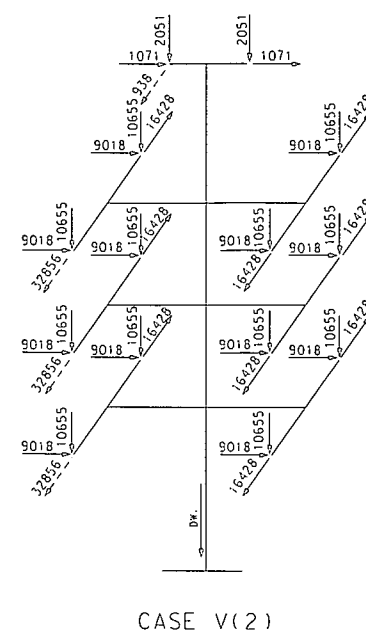
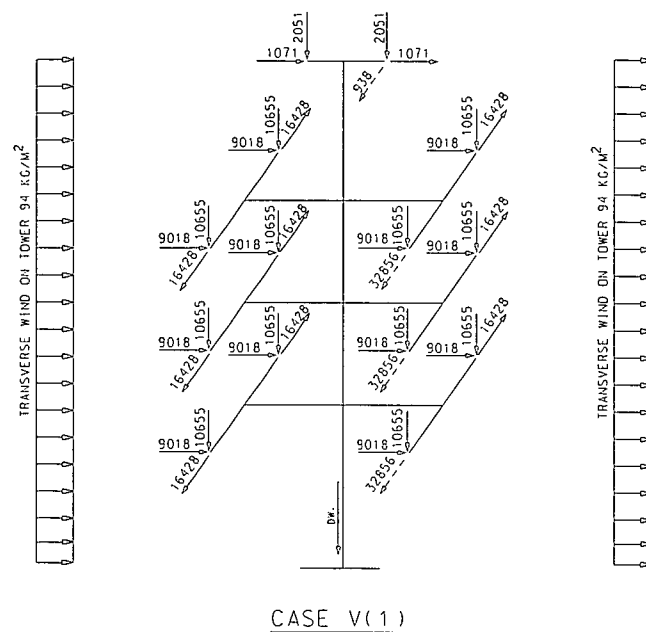
DRAWN CHALEE
DESIGNED SPATIT
VERIFIED Jkan
APPROVED

VALIDATED 18 Mar 01
RECOMMENDED
CONCURRED

JOB NO. REPLACING Dwg. NO. Dwg. NO. C02 - 011 REV.

ASSISTANT ENGINEER - TRANSMISSION SYSTEM ENGINEERING

DATE



LOADING CASES

CASE V STRINGING AND/OR MAINTENANCE
(1) ONE-CIRCUIT RIGHT SIDE.
(2) ONE-CIRCUIT LEFT SIDE

CASE VI HIGH INTENSITY WIND
(1) $\beta = 90^\circ$
(2) $\beta = 75^\circ$
(3) $\beta = 60^\circ$
(4) $\beta = 45^\circ$
(5) $\beta = 0^\circ$

CASE VII UPLIFT (SEE NOTES 7.)

NOTES

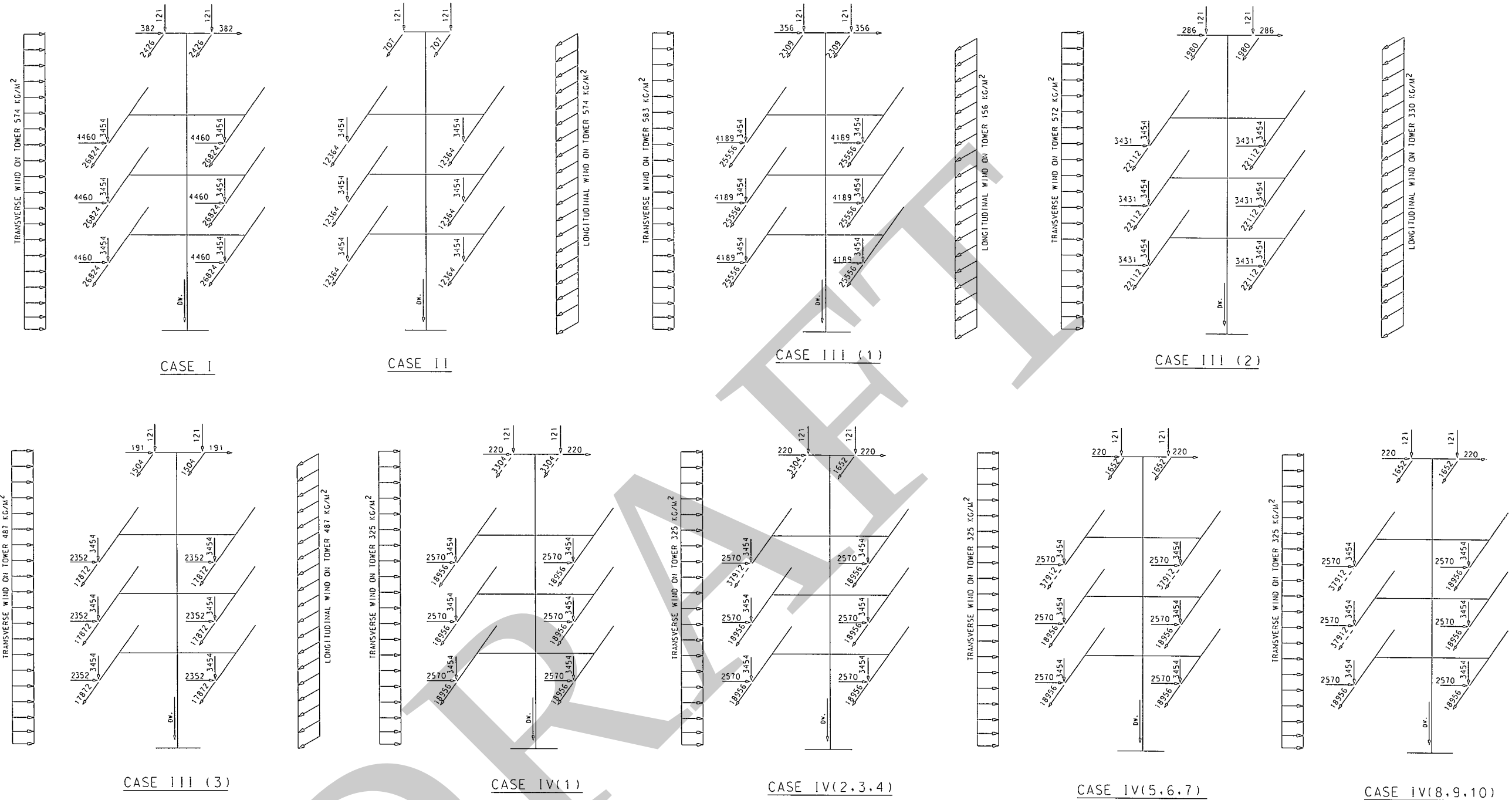
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ELECTRICITY GENERATING AUTHORITY OF THAILAND

DESIGNED	CHALCE	VALIDATED	J. Chay 18 Nov 05	500 kV TRANSMISSION LINE
VERIFIED	SARUT	RECOMMENDED	CHIEF, TRANSMISSION LINE ENGINEERING DEPARTMENT	LOADING DIAGRAM
APPROVED	Than	CONCURRED	ASS. DIR. TRANSMISSION SYSTEM ENGINEERING DIVISION	TOWER TYPE DOT60
DATE		DATE		

REV. NO.	JOB NO.	JOB DESCRIPTION	DRAWN	DESIGNED	VERIFIED	VALIDATED	RECOMMENDED	CONCURRED	APPROVED	DATE
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JOB NO.	REPLACING DWG. NO.	DWG. NO.	REV.
		C02 - 012	



LOADING CASES

- CASE I EXTREME TRANSVERSE WIND ($\beta = 90^\circ$)
CASE II EXTREME LONGITUDINAL WIND ($\beta = 0^\circ$)
CASE III EXTREME OBLIQUE WIND
(1) $\beta = 75^\circ$
(2) $\beta = 60^\circ$
(3) $\beta = 45^\circ$
CASE IV FAILURE CONTAINMENT
(1) TWO OHG. WIRES.
(2) ONE OHG. WIRE AND ANY ONE OF TOP CONDUCTORS.
(3) ONE OHG. WIRE AND ANY ONE OF MIDDLE CONDUCTORS.
(4) ONE OHG. WIRE AND ANY ONE OF BOTTOM CONDUCTORS.

- (5) TOP CONDUCTORS.
(6) MIDDLE CONDUCTORS.
(7) BOTTOM CONDUCTORS.
(8) TOP AND MIDDLE CONDUCTORS ON THE SAME SIDE.
(9) TOP AND BOTTOM CONDUCTORS ON THE SAME SIDE.
(10) MIDDLE AND BOTTOM CONDUCTORS ON THE SAME SIDE.

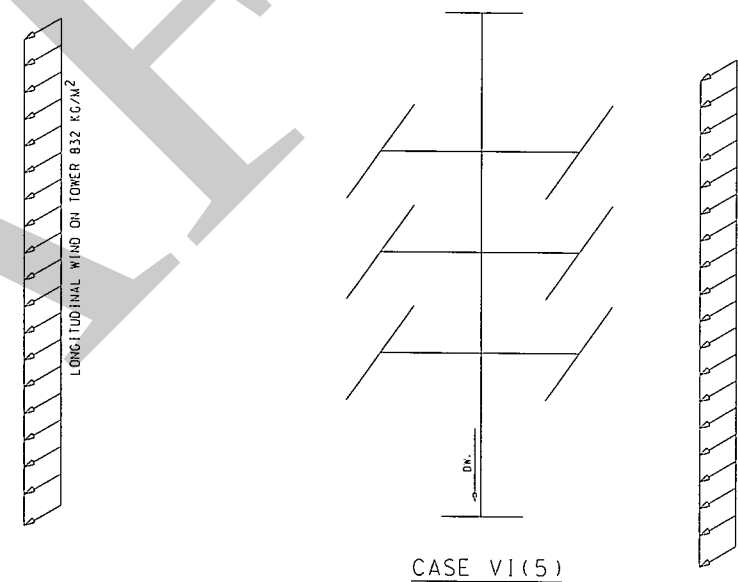
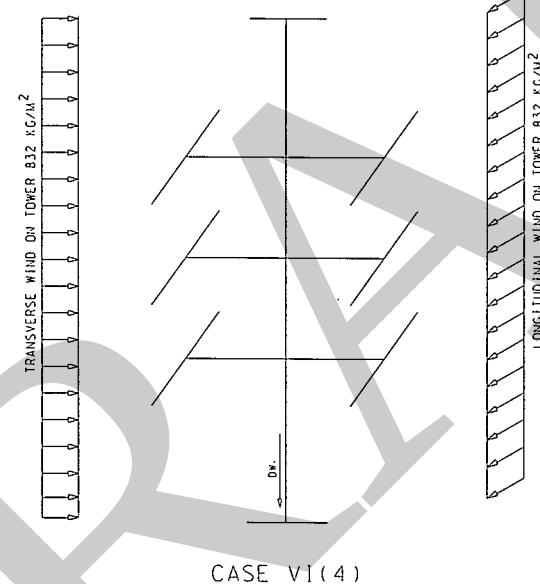
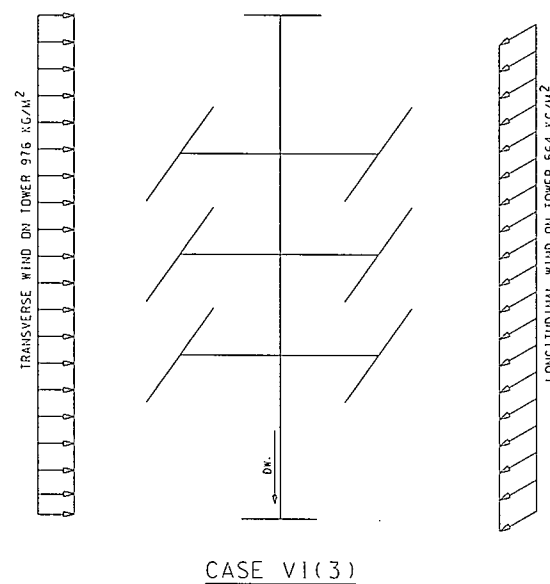
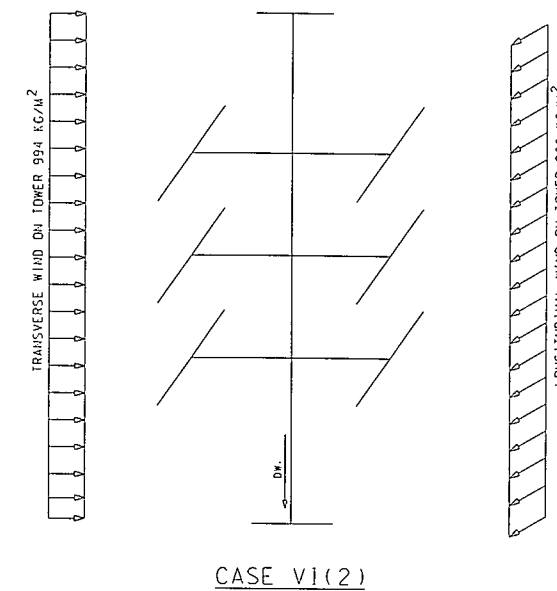
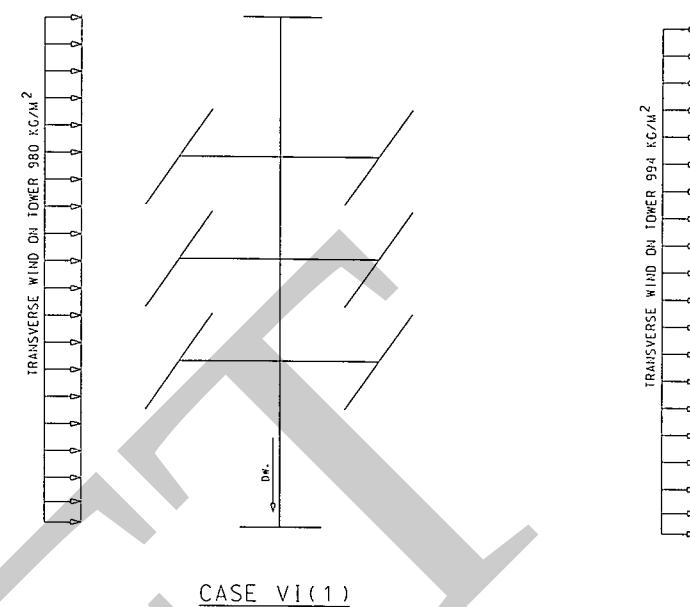
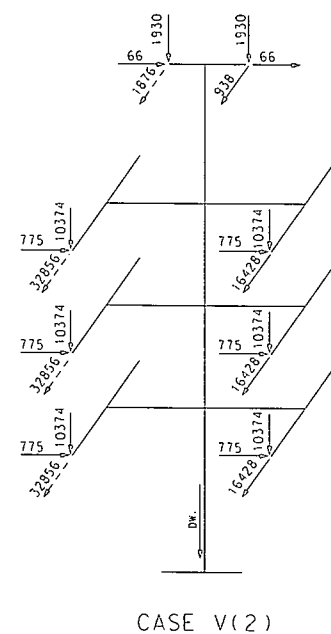
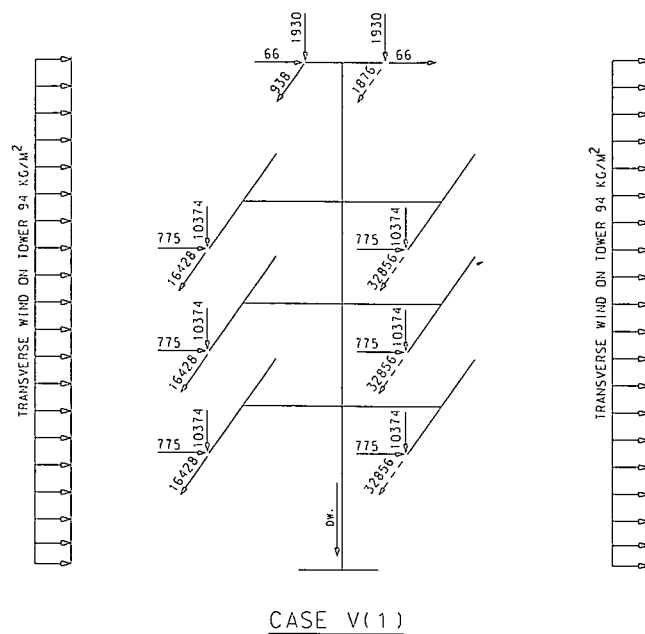
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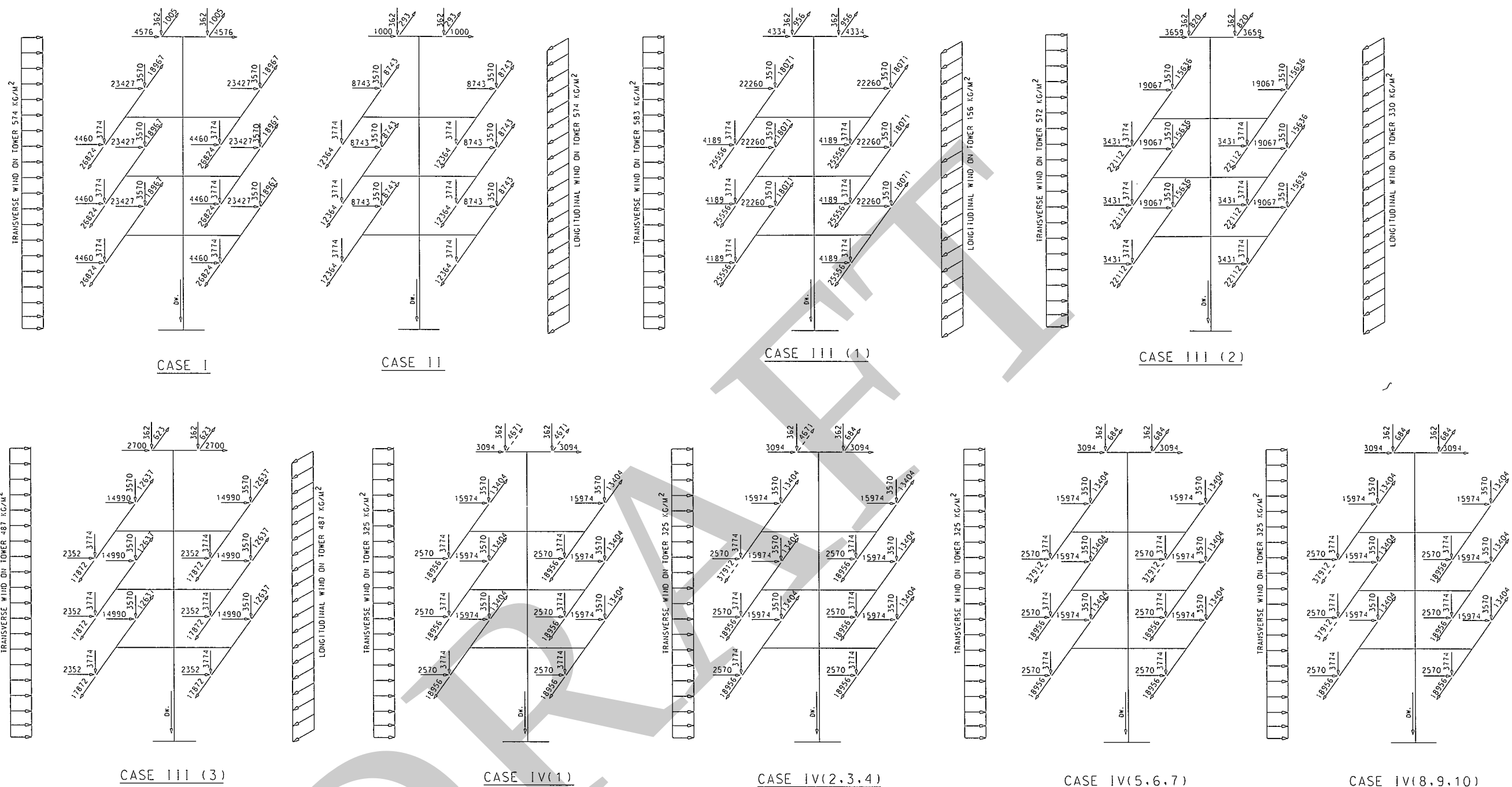
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FOR 0° + COMPLETE DEADEND CASE

ELECTRICITY GENERATING AUTHORITY OF THAILAND

DESIGNED	CHALEE	VALIDATED	CHALEE	500 kV TRANSMISSION LINE
DESIGNED	SARUT	RECOMMENDED	CHALEE	LOADING DIAGRAM
VERIFIED	THAN	CONCURRED	CHALEE	TOWER TYPE DOT60
APPROVED				
REPLACING DWG. NO.	DWG. NO.	REV.		





LOADING CASES

CASE I EXTREME TRANSVERSE WIND ($\beta = 90^\circ$)

CASE II EXTREME LONGITUDINAL WIND ($\beta = 0^\circ$)

CASE III EXTREME OBLIQUE WIND

(1) $\beta = 75^\circ$

(2) $\beta = 60^\circ$

(3) $\beta = 45^\circ$

CASE IV FAILURE CONTAINMENT

(1) TWO OHG. WIRES.

(2) ONE OHG. WIRE AND ANY ONE OF TOP CONDUCTORS.

(3) ONE OHG. WIRE AND ANY ONE OF MIDDLE CONDUCTORS.

(4) ONE OHG. WIRE AND ANY ONE OF BOTTOM CONDUCTORS.

(5) TOP CONDUCTORS.

(6) MIDDLE CONDUCTORS.

(7) BOTTOM CONDUCTORS.

(8) TOP AND MIDDLE CONDUCTORS ON THE SAME SIDE.

(9) TOP AND BOTTOM CONDUCTORS ON THE SAME SIDE.

(10) MIDDLE AND BOTTOM CONDUCTORS ON THE SAME SIDE.

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FOR $0^\circ + 45^\circ$ SLACK SPAN CASE

ELECTRICITY GENERATING AUTHORITY OF THAILAND

500 kV TRANSMISSION LINE

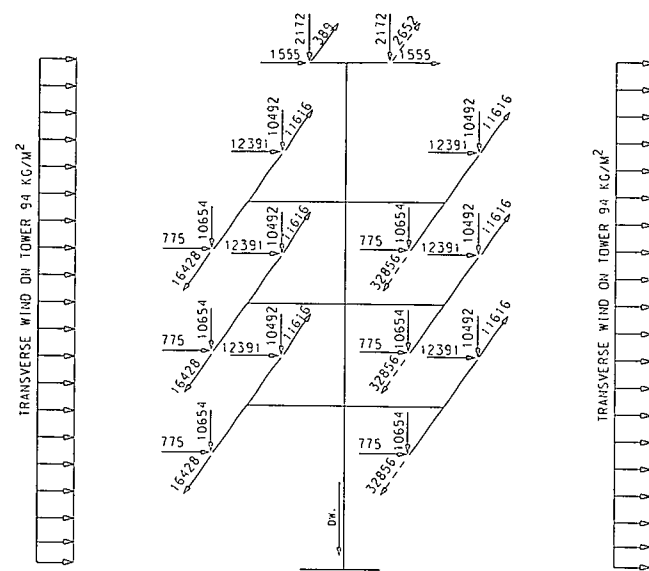
LOADING DIAGRAM

TOWER TYPE DOT60

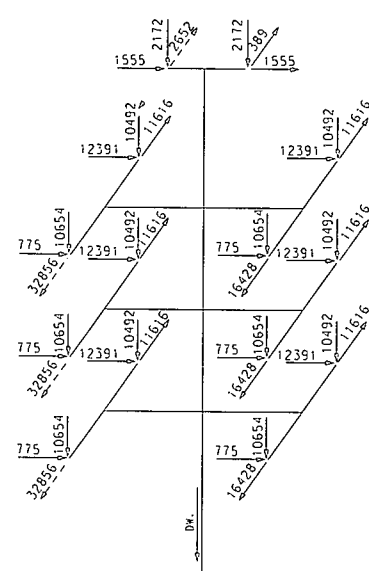
DRAWN CHALCE	VALIDATED Chang 18 Mar 05	RECOMMENDED CHIEF, TRANSMISSION LINE ENGINEERING DEPARTMENT
DESIGNED SARUT	VERIFIED ASST. DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION	CONCURRED DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION
APPROVED	DATE	JOB NO.
REPLACING DWG. NO.	DWG. NO.	REV.

C02 - 015

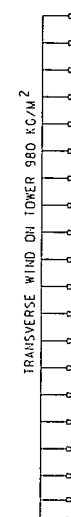
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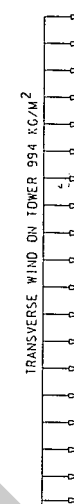
CASE V(1)



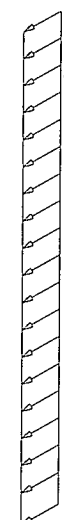
CASE V(2)



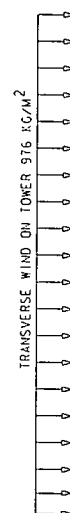
CASE VI(1)



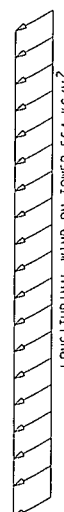
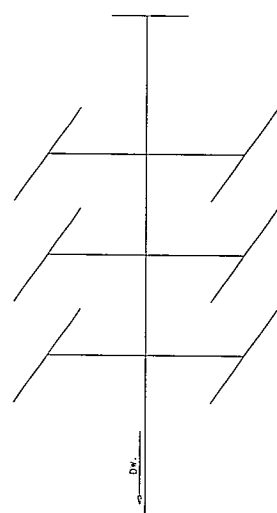
CASE VI(2)



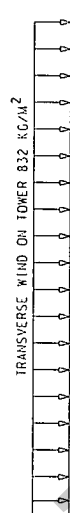
LONGITUDINAL WIND ON TOWER 266 KG/M²



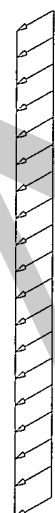
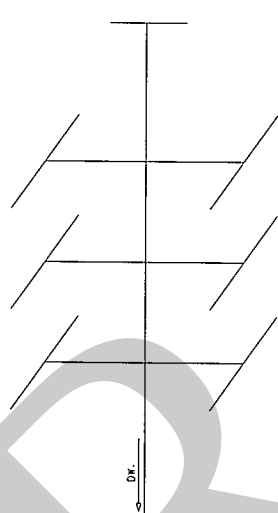
CASE VI(3)



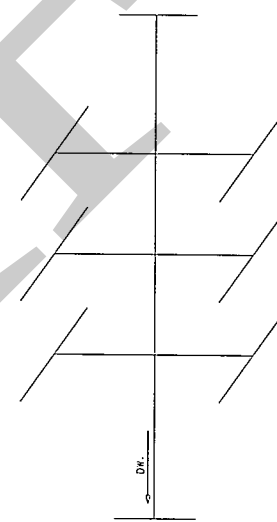
LONGITUDINAL WIND ON TOWER 564 KG/M²



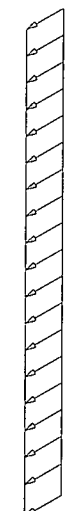
CASE VI(4)



LONGITUDINAL WIND ON TOWER 832 KG/M²



CASE VI(5)



LONGITUDINAL WIND ON TOWER 980 KG/M²

LOADING CASES

CASE V STRINGING AND/OR MAINTENANCE
(1) ONE-CIRCUIT RIGHT SIDE.
(2) ONE-CIRCUIT LEFT SIDE

CASE VI HIGH INTENSITY WIND
(1) $\beta = 90^\circ$
(2) $\beta = 75^\circ$
(3) $\beta = 60^\circ$
(4) $\beta = 45^\circ$
(5) $\beta = 0^\circ$

CASE VII UPLIFT (SEE NOTES 7.)

FOR $0^\circ + 45^\circ$ SLACK SPAN CASE

NOTES

- ALL SPECIFIED LOADS ARE DESIGN LOADS (INCLUDING LOAD FACTORS) IN KILOGRAMS EXCEPT AS OTHERWISE INDICATED.
- THE SPECIFIED TRANSVERSE AND/OR LONGITUDINAL WIND ON TOWER SHALL ACT ON THE PROJECTED AREA OF ONE LONGITUDINAL FACE AND/OR ONE TRANSVERSE FACE OF THE TOWER, RESPECTIVELY.
- ALL ELEMENTS OF TOWER, BOTH MEMBERS AND CONNECTIONS, SHALL BE DESIGNED TO 0.79 OF THEIR CAPACITIES.
- β IS THE ANGLE BETWEEN THE WIND DIRECTION AND THE LONGITUDINAL AXIS OF THE TOWER.
- DW. DENOTES DEAD WEIGHT OF THE TOWER.
- THE TOWER SHALL BE DESIGNED FOR USE WITH ANY COMBINATION OF DIFFERENT LEG EXTENSIONS, RESULTING IN A MAXIMUM DIFFERENTIAL OF SIX METERS IN HEIGHT, BETWEEN ADJACENT OR DIAGONALLY OPPOSITE LEGS.
- ALL ELEMENTS OF TOWER SHALL BE CAPABLE TO WITHSTAND VERTICAL UPLIFT LOADS EQUAL TO DOWNWARD VERTICAL LOADS SPECIFIED IN EACH LOADING CASE.

ELECTRICITY GENERATING AUTHORITY OF THAILAND

DESIGNED BY CHALEC

VALIDATED BY *Chaiyaporn*

DESIGNED BY SARUT

RECOMMENDED BY *Chaiyaporn*

VERIFIED BY *Tham*

CONCURRED BY *Chaiyaporn*

APPROVED BY *Chaiyaporn*

DATE

500 kV TRANSMISSION LINE

LOADING DIAGRAM

TOWER TYPE DOT60

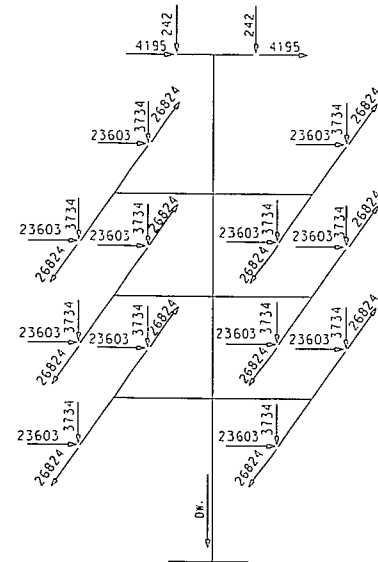
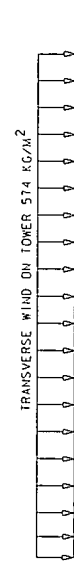
JOB NO.

REPLACING DWG. NO.

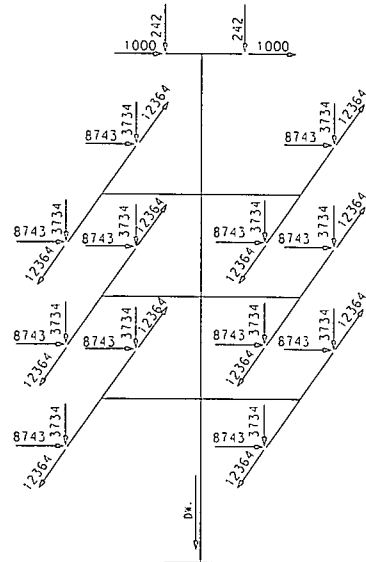
DWG. NO.

C02 - 016

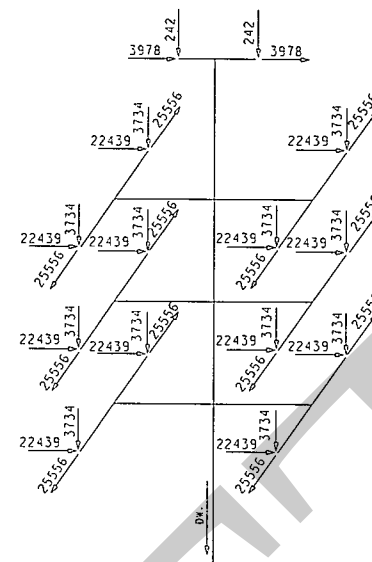
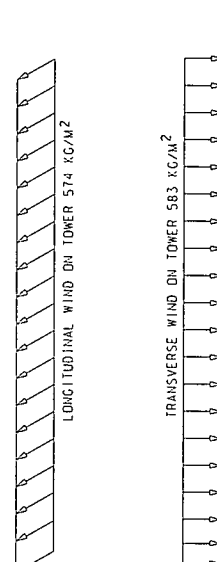
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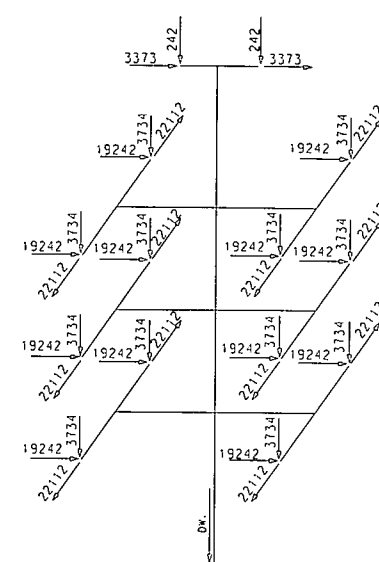
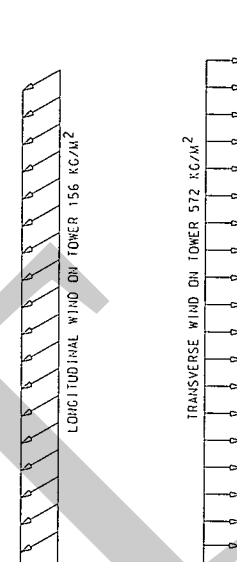
CASE I



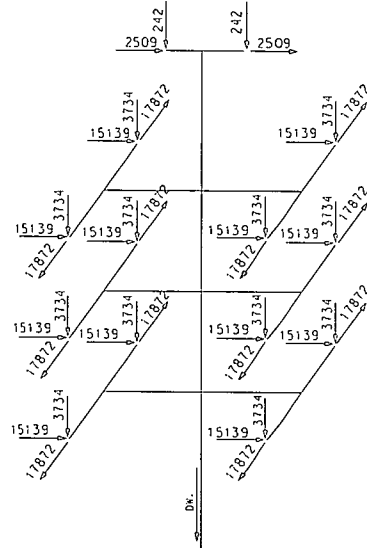
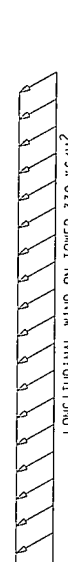
CASE II



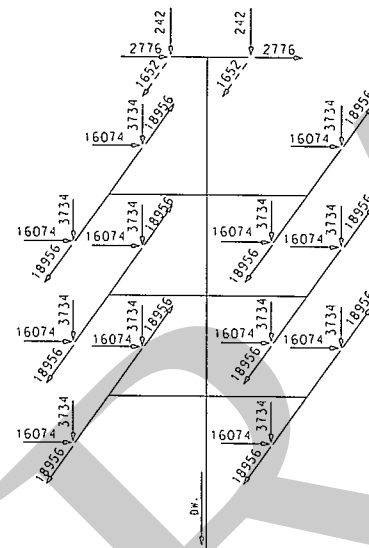
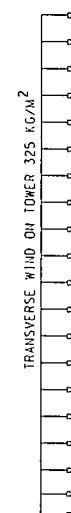
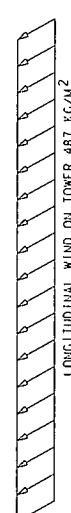
CASE III (1)



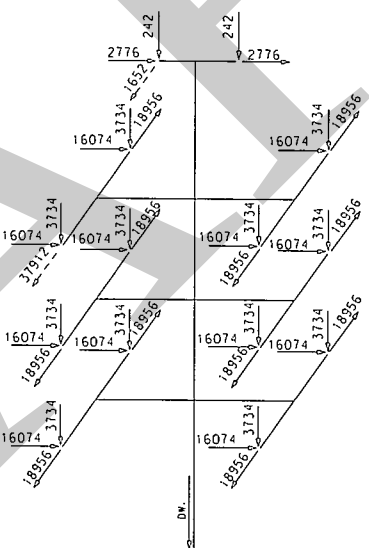
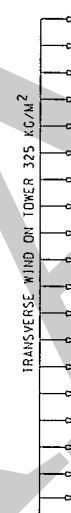
CASE III (2)



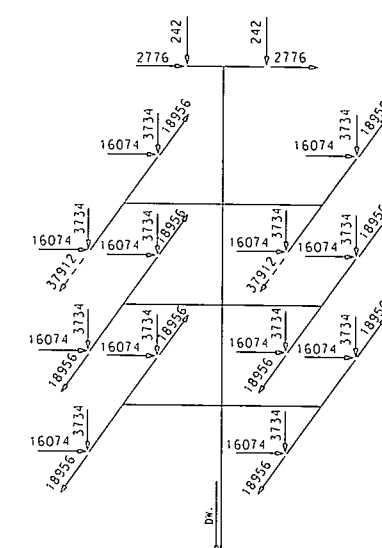
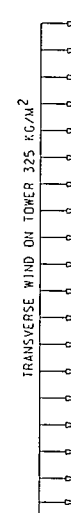
CASE III (3)



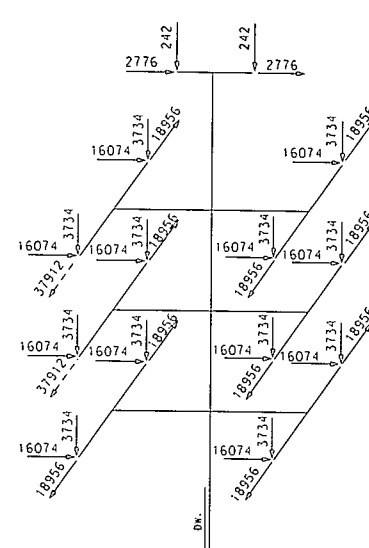
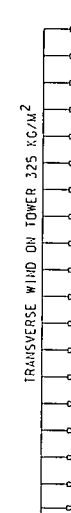
CASE IV (1)



CASE IV (2,3,4)



CASE IV (5,6,7)



CASE IV (8,9,10)

LOADING CASES

- CASE I EXTREME TRANSVERSE WIND ($\beta = 90^\circ$)
CASE II EXTREME LONGITUDINAL WIND ($\beta = 0^\circ$)
CASE III EXTREME OBLIQUE WIND
(1) $\beta = 75^\circ$
(2) $\beta = 60^\circ$
(3) $\beta = 45^\circ$
CASE IV FAILURE CONTAINMENT
(1) TWO OHG. WIRES.
(2) ONE OHG. WIRE AND ANY ONE OF TOP CONDUCTORS.
(3) ONE OHG. WIRE AND ANY ONE OF MIDDLE CONDUCTORS.
(4) ONE OHG. WIRE AND ANY ONE OF BOTTOM CONDUCTORS.

- (5) TOP CONDUCTORS.
(6) MIDDLE CONDUCTORS.
(7) BOTTOM CONDUCTORS.
(8) TOP AND MIDDLE CONDUCTORS ON THE SAME SIDE.
(9) TOP AND BOTTOM CONDUCTORS ON THE SAME SIDE.
(10) MIDDLE AND BOTTOM CONDUCTORS ON THE SAME SIDE.

NOTES

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- DW. DENOTES DEAD WEIGHT OF THE TOWER.
- THE TOWER SHALL BE DESIGNED FOR USE WITH ANY COMBINATION OF DIFFERENT LEG EXTENSIONS, RESULTING IN A MAXIMUM DIFFERENTIAL OF SIX METERS IN HEIGHT, BETWEEN ADJACENT OR DIAGONALLY OPPOSITE LEGS.

ELECTRICITY GENERATING AUTHORITY OF THAILAND

500 KV TRANSMISSION LINE

LOADING DIAGRAM

TOWER TYPE DOT90

DRAWN CHALEE
DESIGNED SARUT
VERIFIED THAN
APPROVED

VALIDATED
RECOMMENDED
CONCURRED

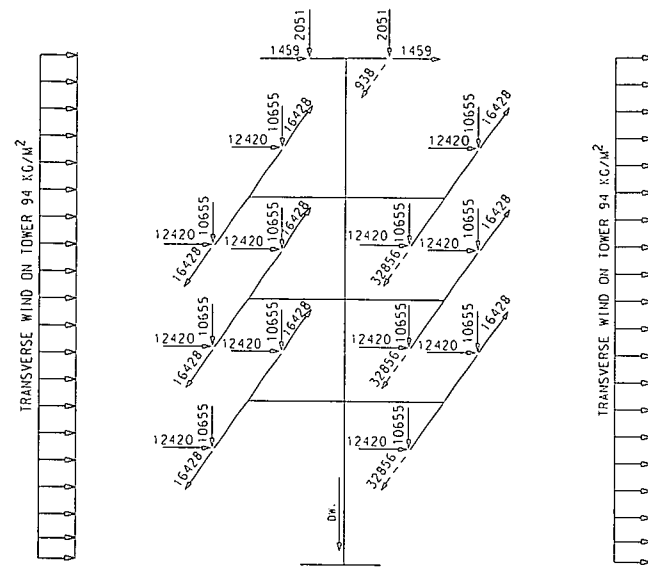
JOB NO. REPLACING DWG. NO. DWG. NO.

ASSISTANT CHIEF - TRANSMISSION SYSTEM ENGINEERING

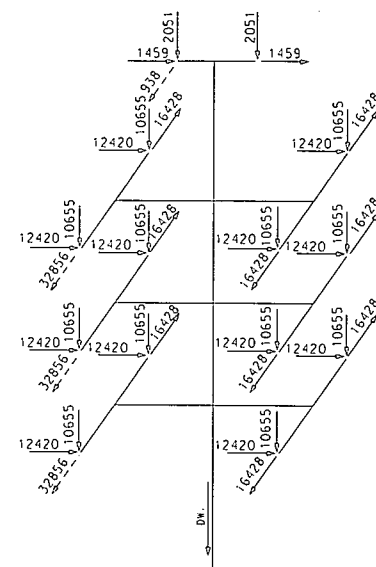
DATE

C02 - 017

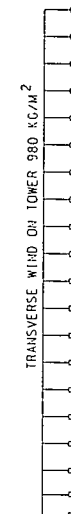
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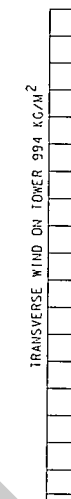
CASE V(1)



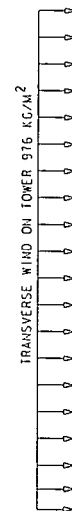
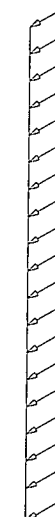
CASE V(2)



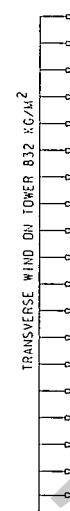
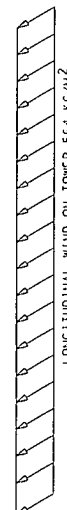
CASE VI(1)



CASE VI(2)



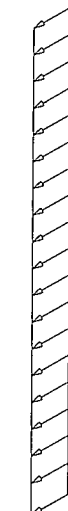
CASE VI(3)



CASE VI(4)



CASE VI(5)



LOADING CASES

CASE V STRINGING AND/OR MAINTENANCE
(1) ONE-CIRCUIT RIGHT SIDE.
(2) ONE-CIRCUIT LEFT SIDE

CASE VI HIGH INTENSITY WIND
(1) $\beta = 90^\circ$
(2) $\beta = 75^\circ$
(3) $\beta = 60^\circ$
(4) $\beta = 45^\circ$
(5) $\beta = 0^\circ$

CASE VII UPLIFT (SEE NOTES 7.)

NOTES

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ELECTRICITY GENERATING AUTHORITY OF THAILAND

500 KV TRANSMISSION LINE

LOADING DIAGRAM

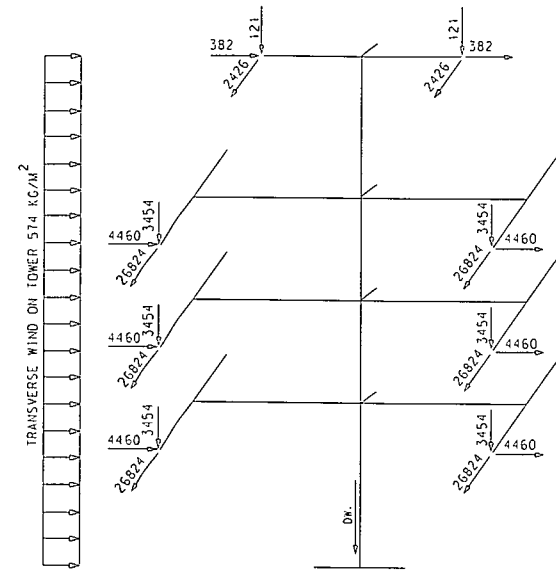
TOWER TYPE DOT90

DRAWN CHALEE
DESIGNED SPAT
VERIFIED Than
APPROVED
DATE

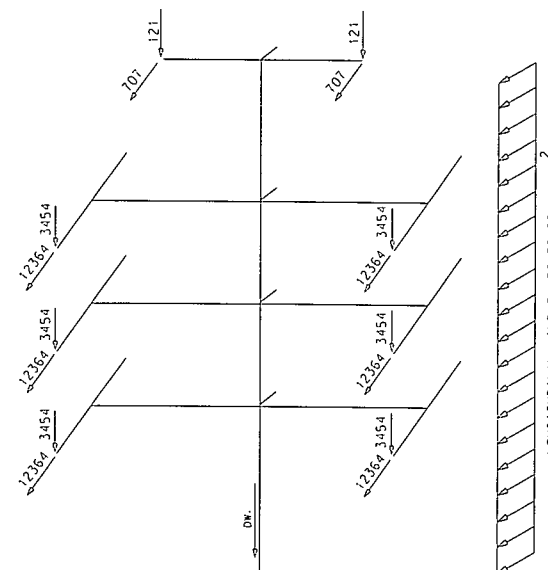
JOB NO. REPLACING DWG. NO. DWG. NO. REV.

C02 - 018

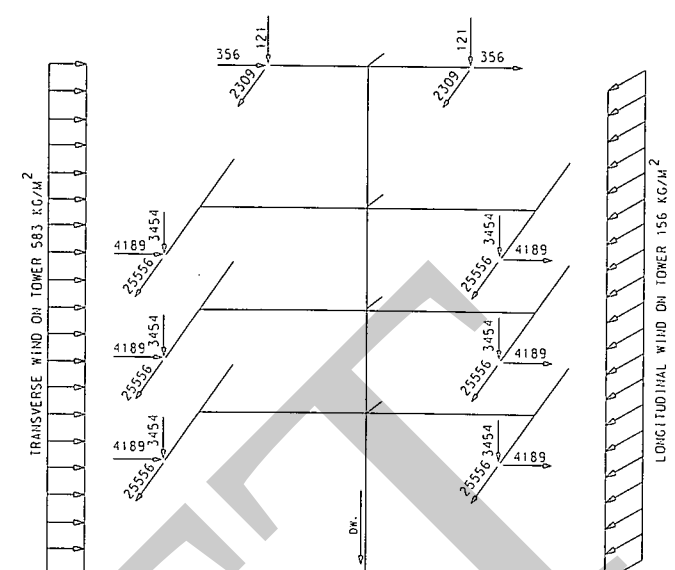
11902



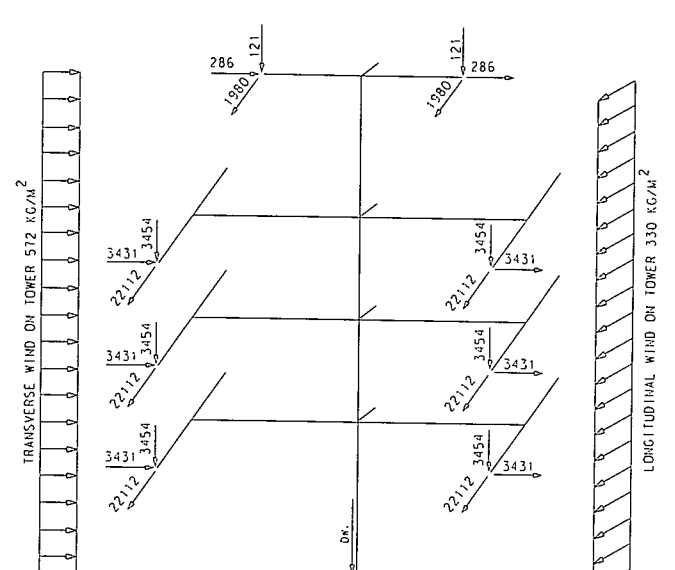
CASE I



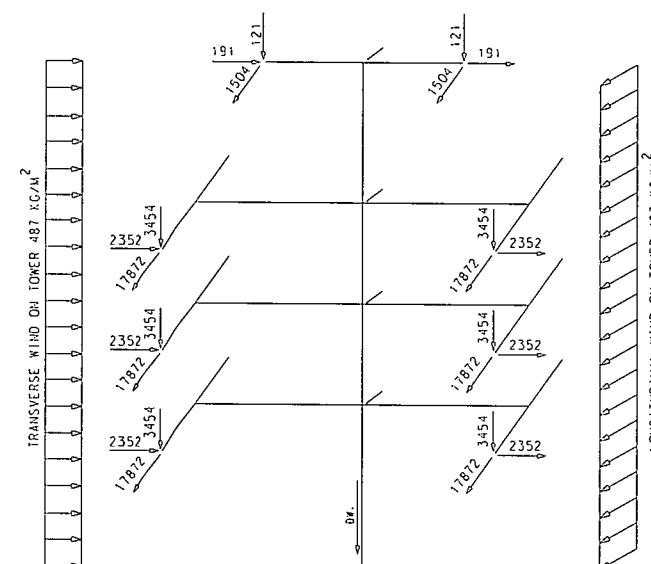
CASE II



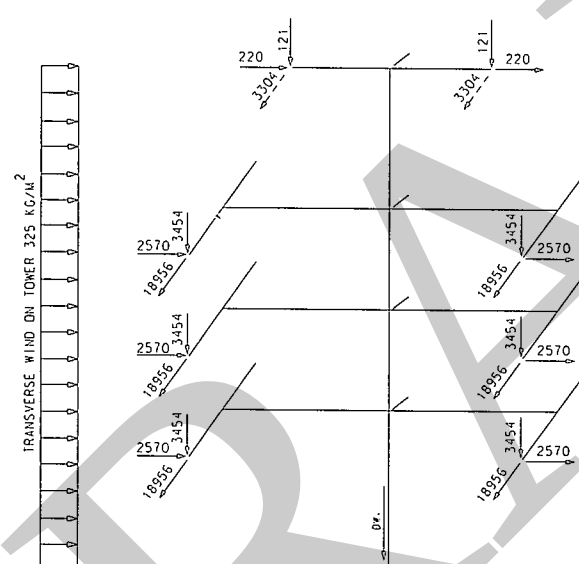
CASE III(1)



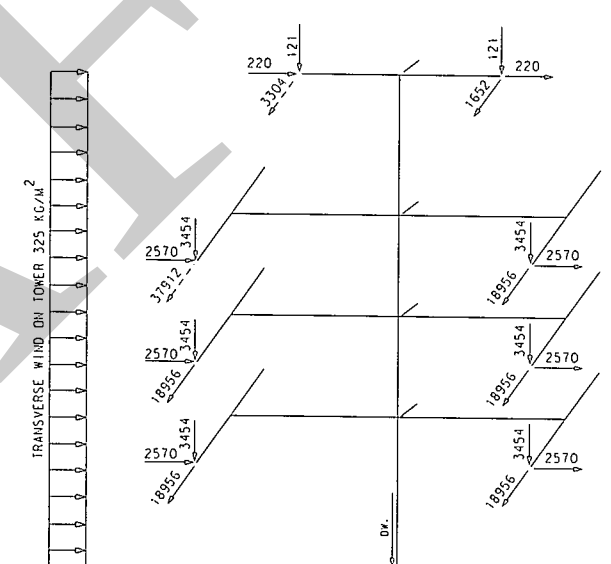
CASE III(2)



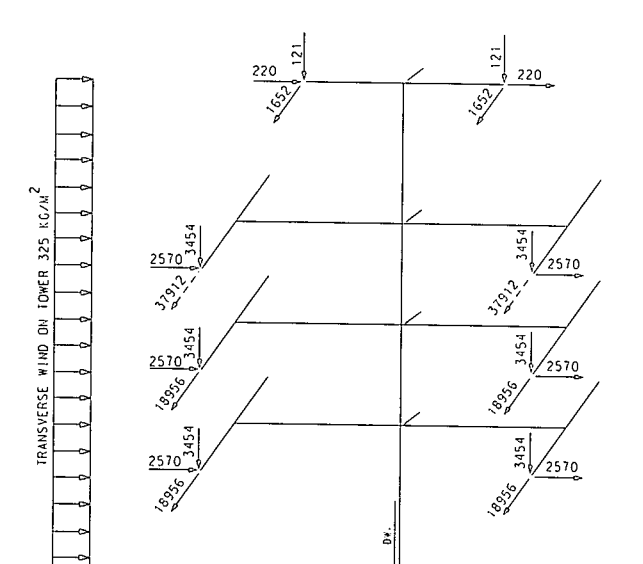
CASE III(3)



CASE IV(1)



CASE IV(2,3,4)



CASE IV(5,6,7)

LOADING CASES

- CASE I EXTREME TRANSVERSE WIND ($\beta = 90^\circ$)
- CASE II EXTREME LONGITUDINAL WIND ($\beta = 0^\circ$)
- CASE III EXTREME OBLIQUE WIND
 - (1) $\beta = 75^\circ$
 - (2) $\beta = 60^\circ$
 - (3) $\beta = 45^\circ$
- CASE IV FAILURE CONTAINMENT
 - (1) TWO OHG. WIRES.
 - (2) ONE OHG. WIRE AND ANY ONE OF TOP CONDUCTORS.
 - (3) ONE OHG. WIRE AND ANY ONE OF MIDDLE CONDUCTORS.
 - (4) ONE OHG. WIRE AND ANY ONE OF BOTTOM CONDUCTORS.

- (5) TOP CONDUCTORS.
- (6) MIDDLE CONDUCTORS.
- (7) BOTTOM CONDUCTORS.

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FOR 0° + COMPLETE DEADEND CASE



ELECTRICITY GENERATING AUTHORITY OF THAILAND

500 kV TRANSMISSION LINE

LOADING DIAGRAM

TOWER TYPE DOT90

DESIGNED BY **SABUT**
 VERIFIED BY **Chan**
 APPROVED BY **Chan**

DATE: **18 Nov 1991**
 REVISION: **01**

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

4x1272 MCM ACSR/GA - RULING SPAN 440 M.

ASSISTANT GOVERNOR - TRANSMISSION SYSTEM ENGINEERING

DATE

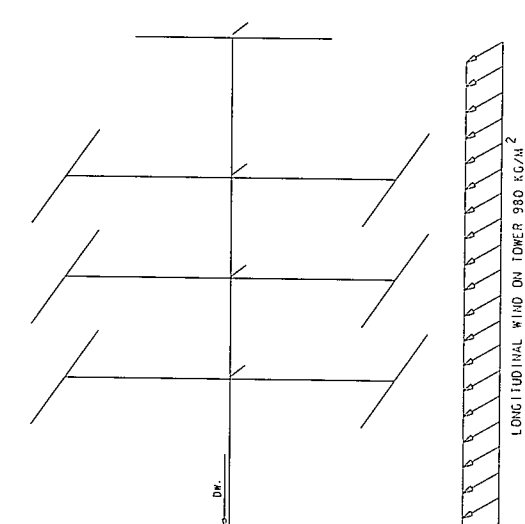
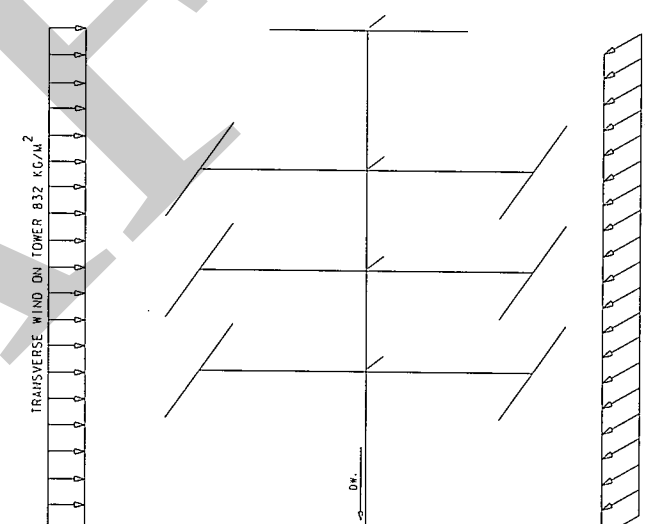
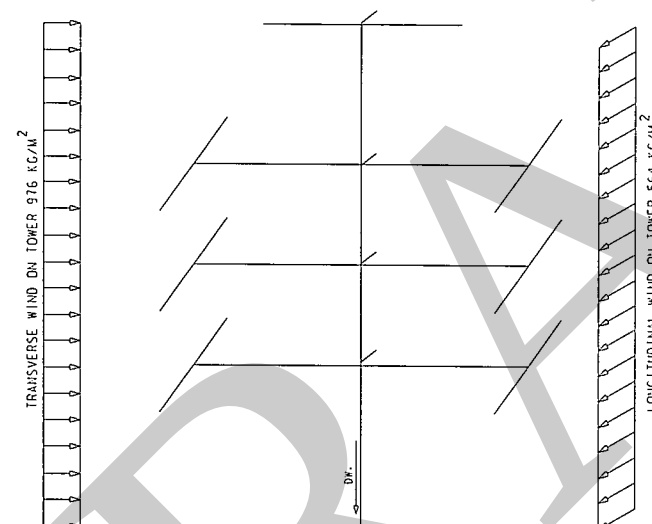
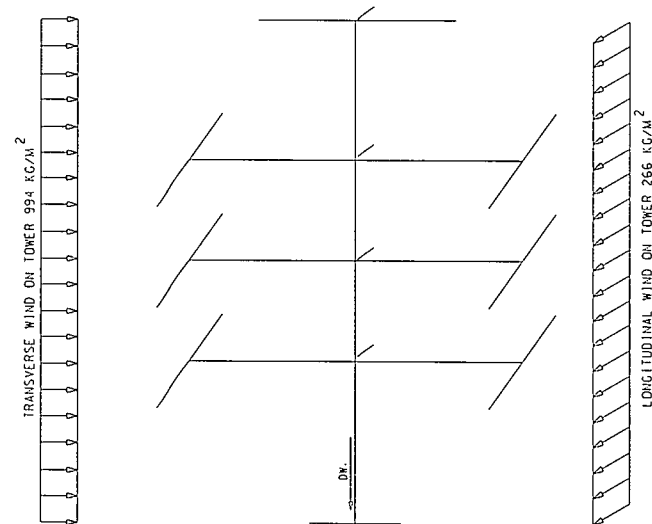
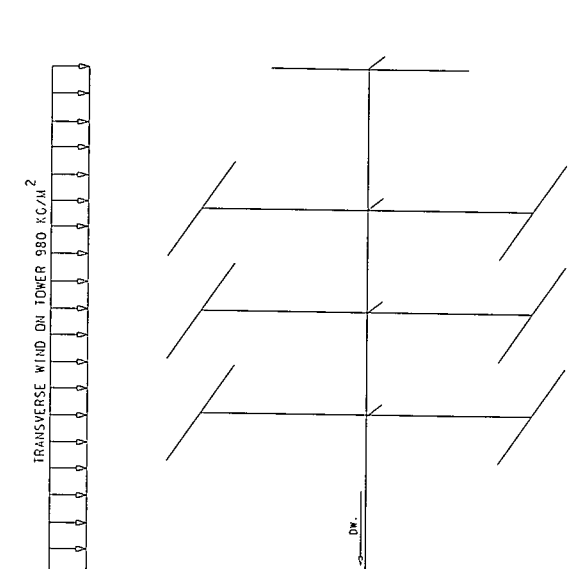
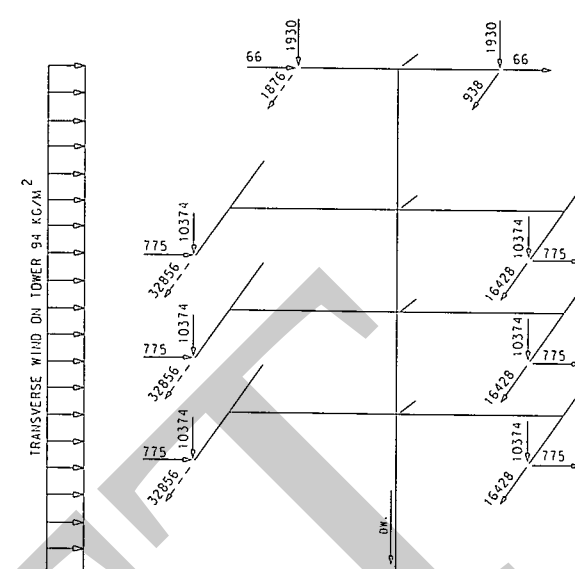
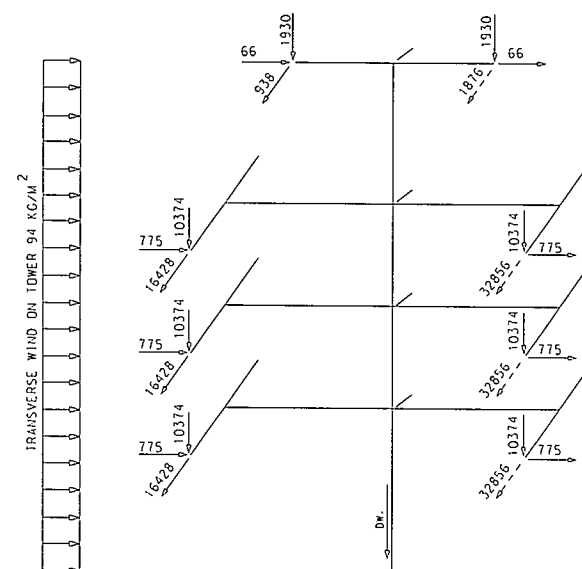
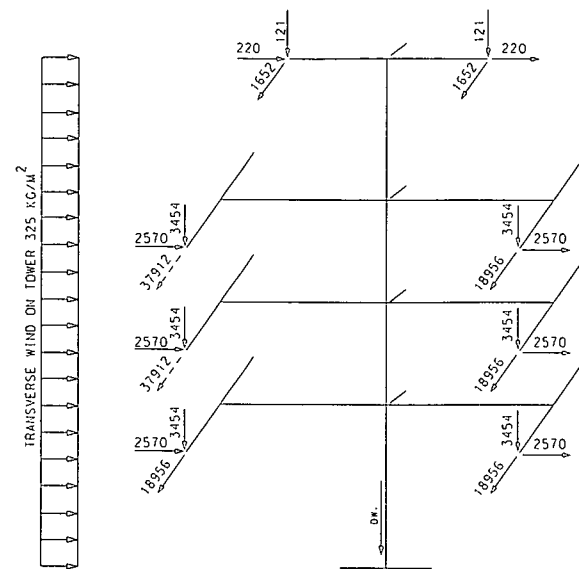
JOB NO.

REPLACING DWG. NO.

DWG. NO.

C02 - 019

11903



LOADING CASES

- (8) TOP AND MIDDLE CONDUCTORS ON THE SAME SIDE.
(9) TOP AND BOTTOM CONDUCTORS ON THE SAME SIDE.
(10) MIDDLE AND BOTTOM CONDUCTORS ON THE SAME SIDE.
- CASE V STRINGING AND/OR MAINTENANCE
(1) ONE CURCUIT RIGHT SIDE.
(2) ONE CURCUIT LEFT SIDE.

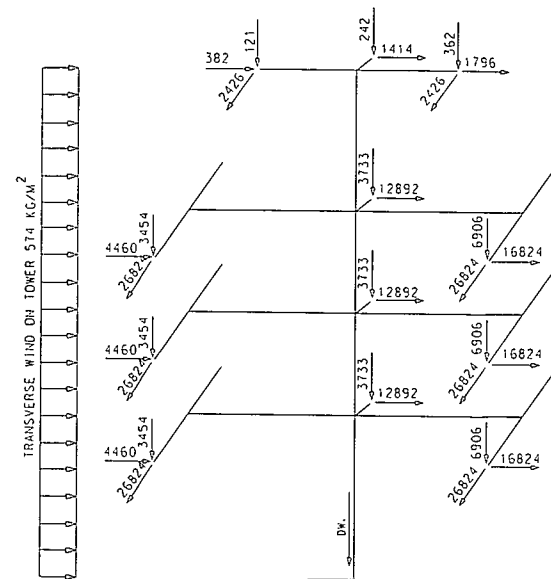
- CASE VI HIGH INTENSITY WIND
- (1) $\beta = 90^\circ$
(2) $\beta = 75^\circ$
(3) $\beta = 60^\circ$
(4) $\beta = 45^\circ$
(5) $\beta = 0^\circ$
- CASE VII UPLIFT (SEE NOTES 7.)

NOTES

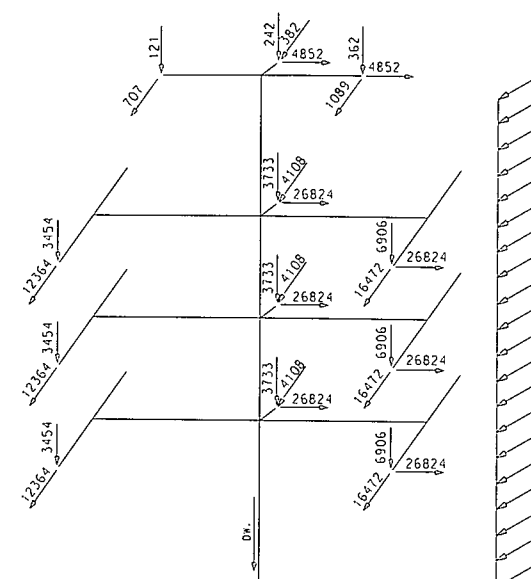
1. ALL SPECIFIED LOADS ARE DESIGN LOADS (INCLUDING LOAD FACTORS) IN KILOGRAMS EXCEPT AS OTHERWISE INDICATED.
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4. β IS THE ANGLE BETWEEN THE WIND DIRECTION AND THE LONGITUDINAL AXIS OF THE TOWER.
5. DW. DENOTES DEAD WEIGHT OF THE TOWER.
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7. ALL ELEMENTS OF TOWER SHALL BE CAPABLE TO WITHSTAND VERTICAL UPLIFT LOADS EQUAL TO DOWNWARD VERTICAL LOADS SPECIFIED IN EACH LOADING CASE.

FOR 0° + COMPLETE DEADEND CASE

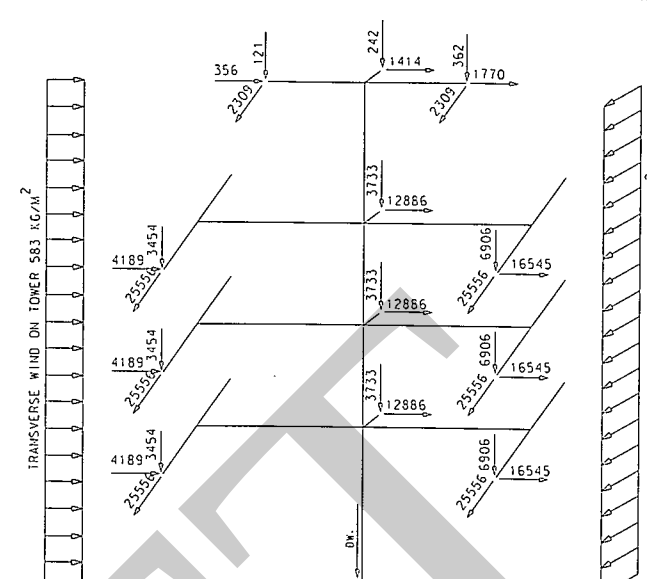
ELECTRICITY GENERATING AUTHORITY OF THAILAND				
DRAWN	CHALEE	VALIDATED	500 KV TRANSMISSION LINE	
DESIGNED	SARUT	RECOMMENDED	LOADING DIAGRAM	
VERIFIED	Than	CONCURRED	TOWER TYPE DOT90	
APPROVED			JOB NO.	REPLACING DWG. NO.
ASSISTANT CHIEF - TRANSMISSION SYSTEM ENGINEERING				DWG. NO.
DATE				REV.



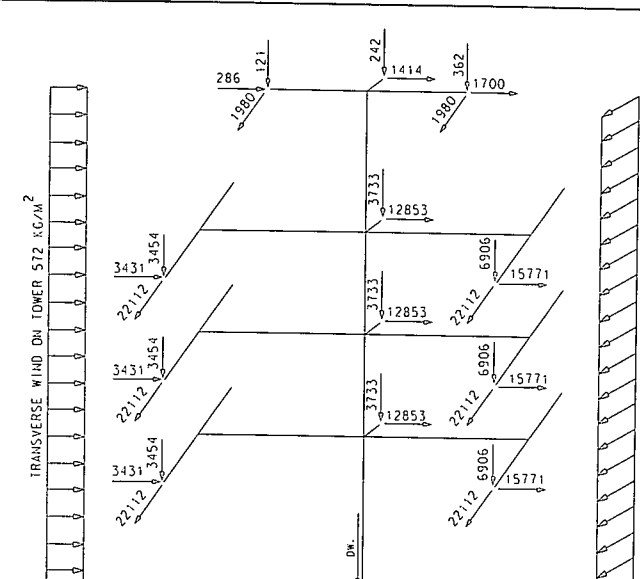
CASE I



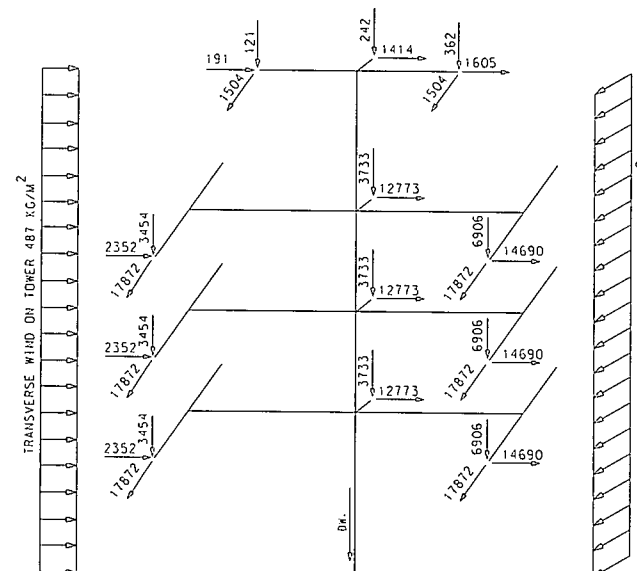
CASE II



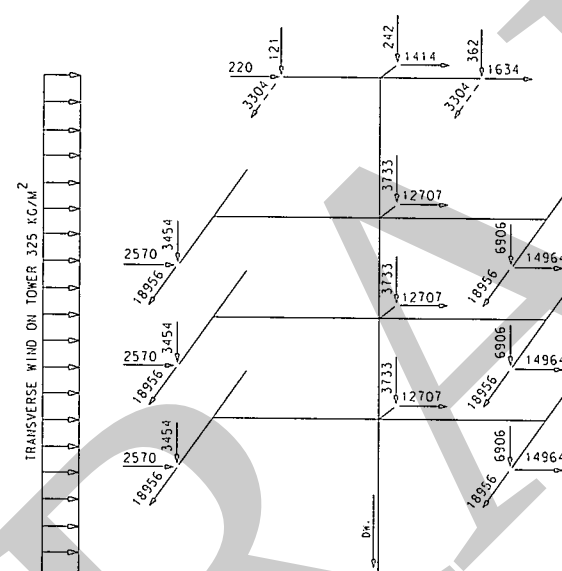
CASE III(1)



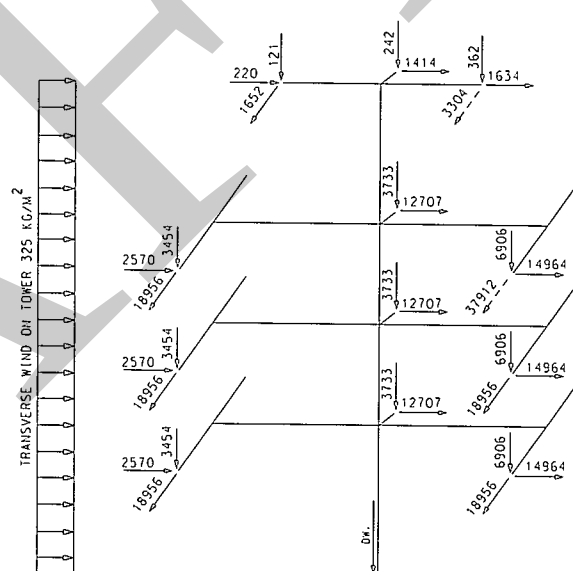
CASE III(2)



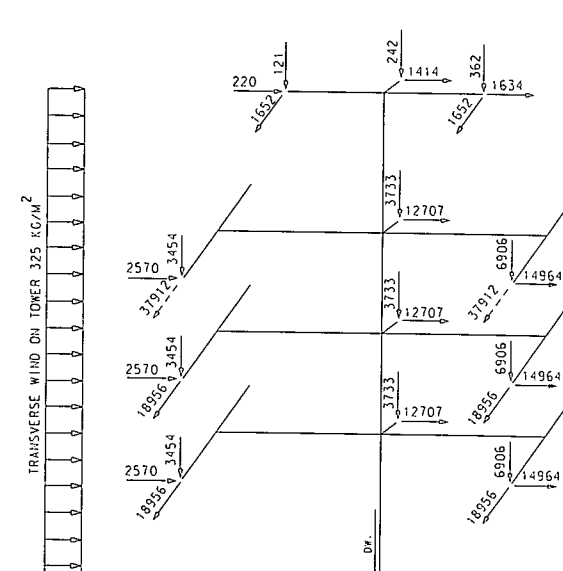
CASE III(3)



CASE IV(1)



CASE IV(2,3,4)



CASE IV(5,6,7)

LOADING CASES

CASE I EXTREME TRANSVERSE WIND ($\beta = 90^\circ$)
CASE II EXTREME LONGITUDINAL WIND ($\beta = 0^\circ$)
CASE III EXTREME OBLIQUE WIND

- (1) $\beta = 75^\circ$
- (2) $\beta = 60^\circ$
- (3) $\beta = 45^\circ$

CASE IV FAILURE CONTAINMENT

- (1) TWO OHG. WIRES.
- (2) ONE OHG. WIRE AND ANY ONE OF TOP CONDUCTORS.
- (3) ONE OHG. WIRE AND ANY ONE OF MIDDLE CONDUCTORS.
- (4) ONE OHG. WIRE AND ANY ONE OF BOTTOM CONDUCTORS.

- (5) TOP CONDUCTORS.
- (6) MIDDLE CONDUCTORS.
- (7) BOTTOM CONDUCTORS.

NOTES

1. ALL SPECIFIED LOADS ARE DESIGN LOADS (INCLUDING LOAD FACTORS) IN KILOGRAMS EXCEPT AS OTHERWISE INDICATED.
2. THE SPECIFIED TRANSVERSE AND/OR LONGITUDINAL WIND ON TOWER SHALL ACT ON THE PROJECTED AREA OF ONE LONGITUDINAL FACE AND/OR ONE TRANSVERSE FACE OF THE TOWER, RESPECTIVELY.
3. ALL ELEMENTS OF TOWER, BOTH MEMBERS AND CONNECTIONS, SHALL BE DESIGNED TO 0.79 OF THEIR CAPACITIES.
4. β IS THE ANGLE BETWEEN THE WIND DIRECTION AND THE LONGITUDINAL AXIS OF THE TOWER.
5. DW. DENOTES DEAD WEIGHT OF THE TOWER.
6. THE TOWER SHALL BE DESIGNED FOR USE WITH ANY COMBINATION OF DIFFERENT LEG EXTENSIONS, RESULTING IN A MAXIMUM DIFFERENTIAL OF SIX METERS IN HEIGHT, BETWEEN ADJACENT OR DIAGONALLY OPPOSITE LEGS.

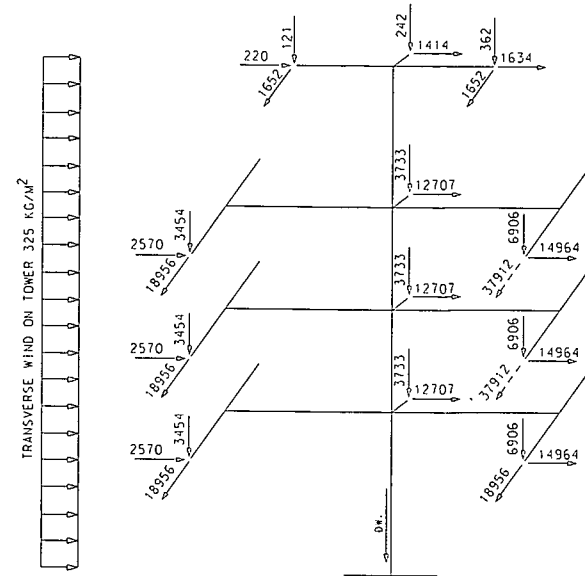
FOR $0^\circ + 90^\circ$ SLACK SPAN CASE

9001

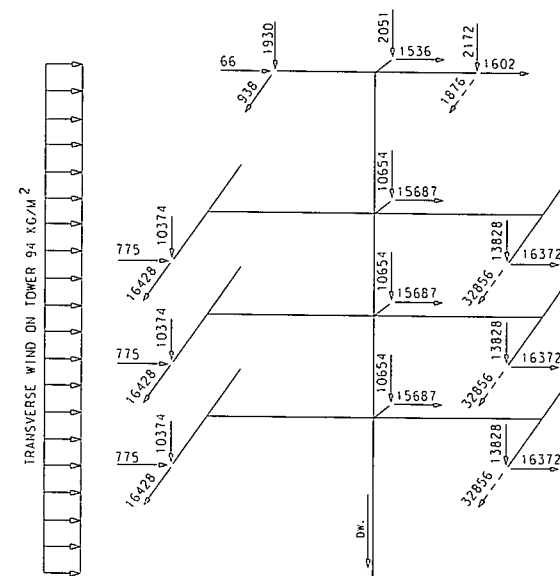
REV. NO.	JOB NO.	JOB DESCRIPTION	DRAWN	DESIGNED	VERIFIED	VALIDATED	RECOMMENDED	CONCURRED	APPROVED	DATE

ELECTRICITY GENERATING AUTHORITY OF THAILAND									
500 kV TRANSMISSION LINE									
LOADING DIAGRAM									
TOWER TYPE DOT90									
DRAWN	CHALEE	VALIDATED	Y. Chaiy 18/11/65	RECOMMENDED		CONCURRED		JOB NO.	
DESIGNED	SARUT							REPLACING DWG. NO.	
VERIFIED								DWG. NO.	
APPROVED									

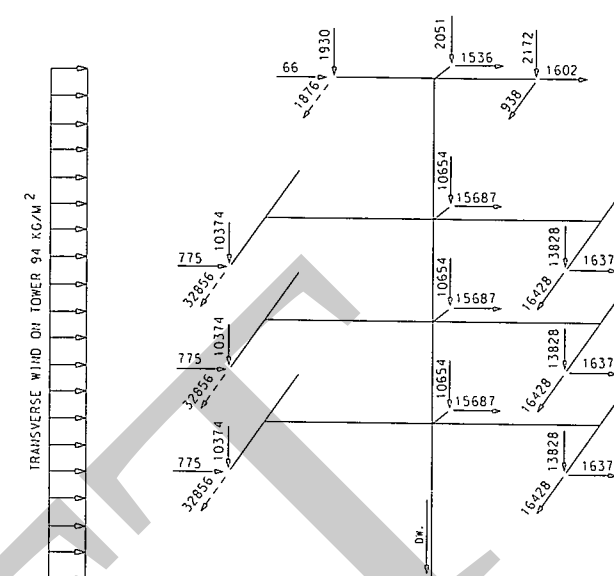
C02 - 021



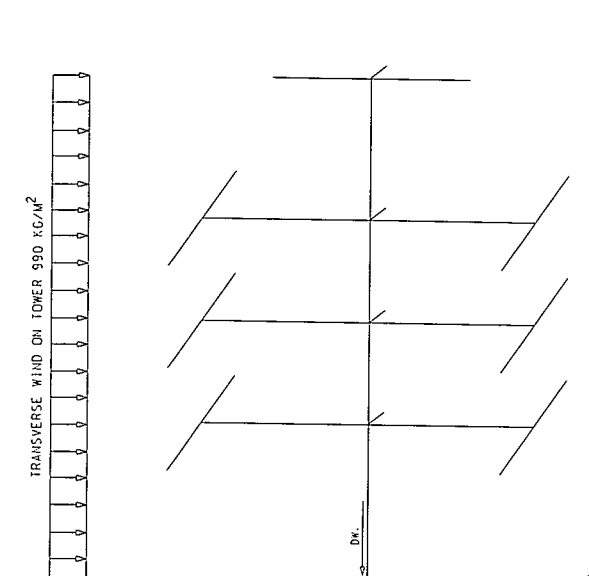
CASE IV(8,9,10)



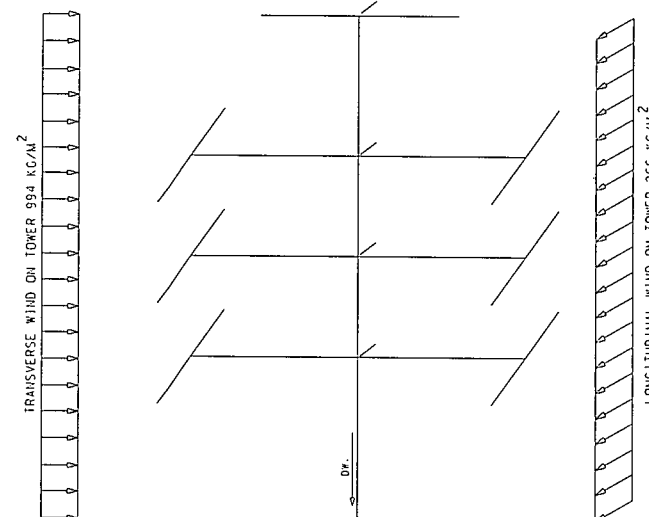
CASE V(1)



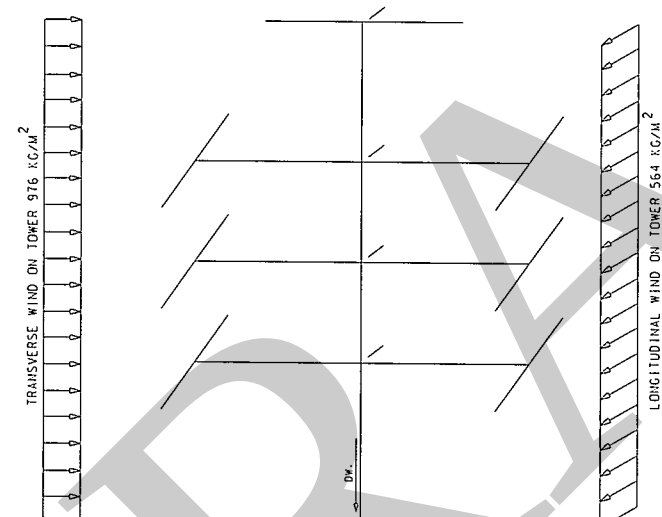
CASE V(2)



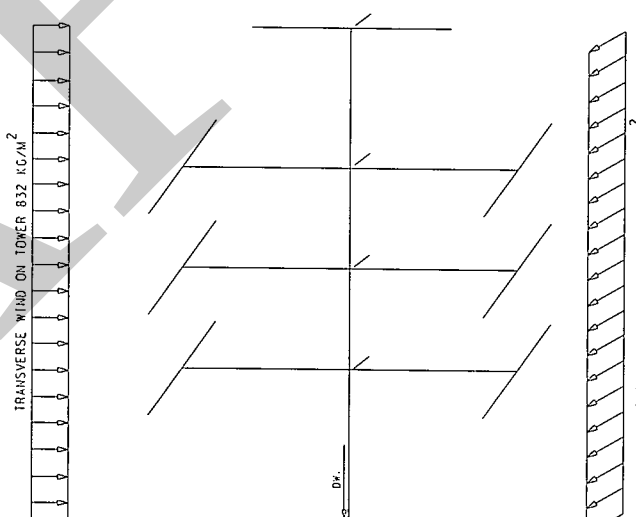
CASE VI(1)



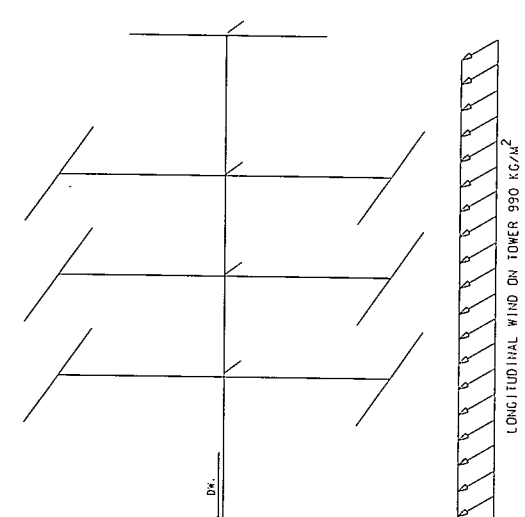
CASE VI(2)



CASE VI(3)



CASE VI(4)



CASE VI(5)

LOADING CASES

- CASE V STRINGING AND/OR MAINTENANCE
 (1) ONE-CIRCUIT RIGHT SIDE.
 (2) ONE-CIRCUIT LEFT SIDE.
- (8) TOP AND MIDDLE CONDUCTORS ON THE SAME SIDE.
 (9) TOP AND BOTTOM CONDUCTORS ON THE SAME SIDE.
 (10) MIDDLE AND BOTTOM CONDUCTORS ON THE SAME SIDE.

- CASE VI HIGH INTENSITY WIND
 (1) $\beta = 90^\circ$
 (2) $\beta = 75^\circ$
 (3) $\beta = 60^\circ$
 (4) $\beta = 45^\circ$
 (5) $\beta = 0^\circ$

CASE VII UPLIFT (SEE NOTES 7.)

NOTES

- ALL SPECIFIED LOADS ARE DESIGN LOADS (INCLUDING LOAD FACTORS) IN KILOGRAMS EXCEPT AS OTHERWISE INDICATED.
- THE SPECIFIED TRANSVERSE AND/OR LONGITUDINAL WIND ON TOWER SHALL ACT ON THE PROJECTED AREA OF ONE LONGITUDINAL FACE AND/OR ONE TRANSVERSE FACE OF THE TOWER, RESPECTIVELY.
- ALL ELEMENTS OF TOWER, BOTH MEMBERS AND CONNECTIONS, SHALL BE DESIGNED TO 0.79 OF THEIR CAPACITIES.
- β IS THE ANGLE BETWEEN THE WIND DIRECTION AND THE LONGITUDINAL AXIS OF THE TOWER.
- DW. DENOTES DEAD WEIGHT OF THE TOWER.
- THE TOWER SHALL BE DESIGNED FOR USE WITH ANY COMBINATION OF DIFFERENT LEG EXTENSIONS, RESULTING IN A MAXIMUM DIFFERENTIAL OF SIX METERS IN HEIGHT, BETWEEN ADJACENT OR DIAGONALLY OPPOSITE LEGS.
- ALL ELEMENTS OF TOWER SHALL BE CAPABLE TO WITHSTAND VERTICAL UPLIFT LOADS EQUAL TO DOWNWARD VERTICAL LOADS SPECIFIED IN EACH LOADING CASE.

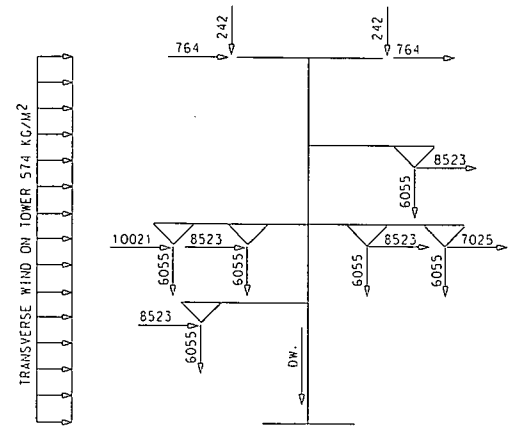
FOR $0^\circ + 90^\circ$ SLACK SPAN CASE

ELECTRICITY GENERATING AUTHORITY OF THAILAND

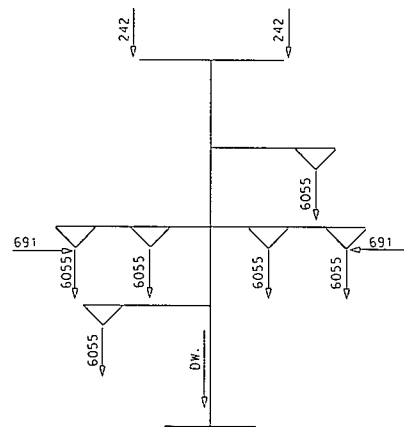
DESIGNED	CHALEE	VALIDATED	CHALEE
VERIFIED	SAWAT	RECOMMENDED	CHALEE
APPROVED	THAN	CONCURRED	CHALEE
DATE		DATE	

500 KV TRANSMISSION LINE
 LOADING DIAGRAM
 TOWER TYPE DOT90

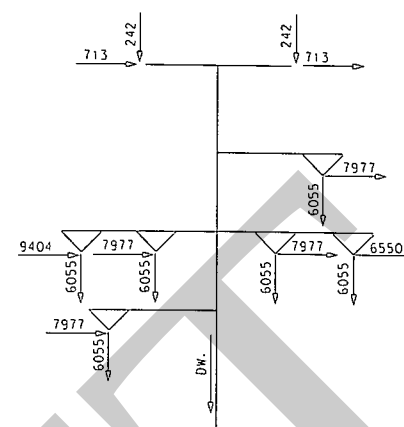
REV. NO. C02 - 022



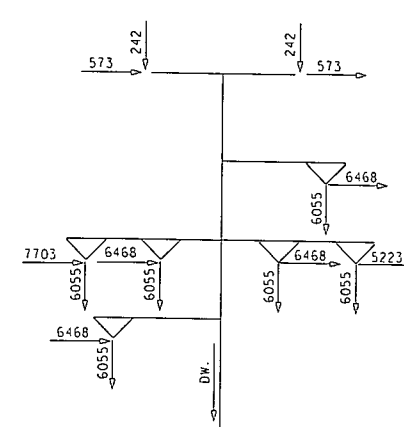
CASE I



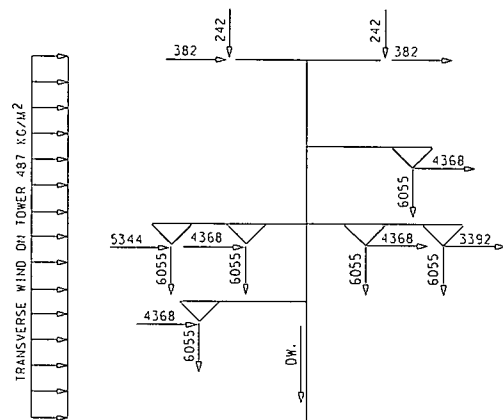
CASE II



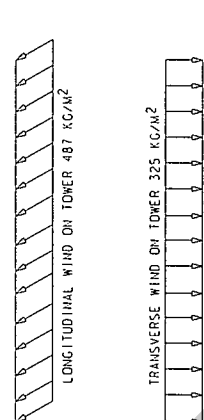
CASE III(1)



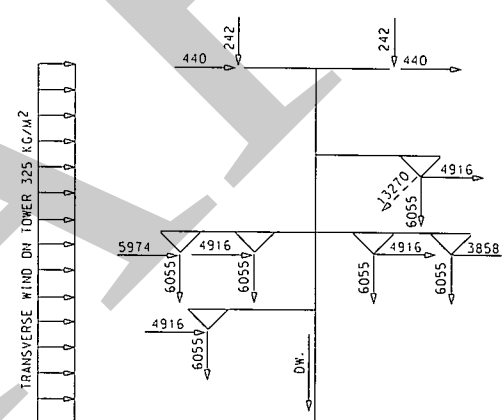
CASE III(2)



CASE III(3)



CASE IV(1)



CASE IV(2)

LOADING CASES

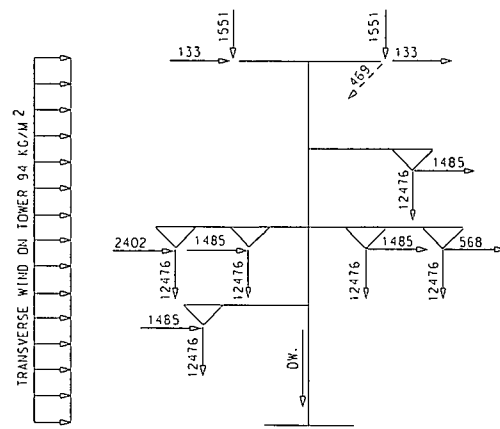
- CASE I EXTREME TRANSVERSE WIND ($\beta = 90^\circ$)
- CASE II EXTREME LONGITUDINAL WIND ($\beta = 0^\circ$)
- CASE III EXTREME OBLIQUE WIND
 - (1) $\beta = 75^\circ$
 - (2) $\beta = 60^\circ$
 - (3) $\beta = 45^\circ$
- CASE IV FAILURE CONTAINMENT
 - (1) ANY ONE OF OHG. WIRE.
 - (2) ANY ONE OF CONDUCTOR.

NOTES

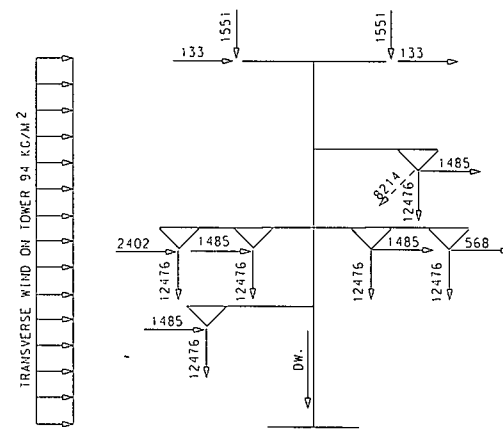
1. ALL SPECIFIED LOADS ARE DESIGN LOADS (INCLUDING LOAD FACTORS) IN KILOGRAMS EXCEPT AS OTHERWISE INDICATED.
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3. ALL ELEMENTS OF TOWER, BOTH MEMBERS AND CONNECTIONS, SHALL BE DESIGNED TO 0.92 OF THEIR CAPACITIES.
4. β IS THE ANGLE BETWEEN THE WIND DIRECTION AND THE LONGITUDINAL AXIS OF THE TOWER.
5. DW. DENOTES DEAD WEIGHT OF THE TOWER.
6. THE TOWER SHALL BE DESIGNED FOR USE WITH ANY COMBINATION OF DIFFERENT LEG EXTENSIONS, RESULTING IN A MAXIMUM DIFFERENTIAL OF SIX METERS IN HEIGHT, BETWEEN ADJACENT OR DIAGONALLY OPPOSITE LEGS.

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

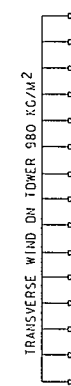
ELECTRICITY GENERATING AUTHORITY OF THAILAND			
500 kV TRANSMISSION LINE			
LOADING DIAGRAM			
TOWER TYPE DOTR			
DRAWN CHALEE	VALIDATED 18/07/2007	RECOMMENDED 18/07/2007	
DESIGNED SARUT	VERIFIED THAI	CONCURRED	
APPROVED		DATE	
JOB NO.		REPLACING DWG. NO.	
C02 - 023		REV.	



CASE V(1)



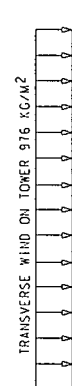
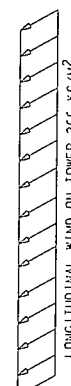
CASE V(2)



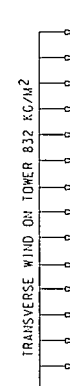
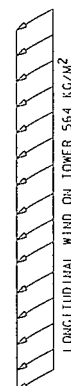
CASE VI(1)



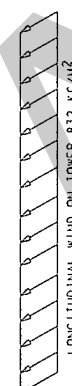
CASE VI(2)



CASE VI(4)



CASE VI(6)



CASE VI(7)



LOADING CASES

CASE V STRINGING AND/OR MAINTENANCE
(1) ANY ONE OF OHG. WIRE.
(2) ANY ONE OF CONDUCTOR.

CASE VI HIGH INTENSITY WIND
(1) $\beta = 90^\circ$
(2) $\beta = 75^\circ$
(3) $\beta = 60^\circ$
(4) $\beta = 45^\circ$
(5) $\beta = 0^\circ$

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