Annexure 15: Supporting related to ERS

TO,
JAIGAD POWER TRANSCO LTD |
OFF CHIPLUN-GUHAGAR ROAD |
AT-MIRJOLI | POST- CHIPLUN- 415605 |
MAHARASHTRA | INDIA |

Kind Attention: Mr. Vaibhav Sansare

Ref No. : MEPL/JTPL/22-23/2311

Date: 23/11/2022 Page: 1 of 1

Subject : Proposal for Aluminium Modular ERS System suitable for 400KV Power Lines
Reference : (1) Telephonic Communication with Mr. Siddharth (+91-93211 90214)

Dear Sir,

Reference to the above, we humbly thank you for giving our company an opportunity to submit budgetary quotation for your requirement. Kindly refer below -

OFFER

Sr.	Items	Qty	Total Amount (Rs.)
1	**Aluminium Modular ERS System Set:** • Fit for 400KV Line bypass & Restoration • Total 2nos. of ERS Poles material per Set • 2nos. of 400KV Quad bundle Tension ERS Towers possible from Set material	1 Set	3,75,00,000.00
2	**Standard ERS Tower Erection Tools Set** (1Set is offered to erect 1-ERS Poles at a time)	1 Set	
3	**ERS Design Software with 1-yrs Free up gradation & support**	1 Nos.	
4	**20ft Storage Containers for ERS material**	2 Nos.	
5	**5days Field Installation & ERS software Trainings at your site**	1 Nos.	
	Total F.O.R Amount =		3,75,00,000.00
	18% GST Amount =		67,50,000.00
	Final Amount =		**4,42,50,000.00**

EMERGENCY RESTORATION SYSTEM

Client: - Jaigad Power Transmission Limited

Advait Reference No.: - AIL/ERS/QUOTE/2024-25/JPTL/15102024/Rev00

Enquiry Reference: - Email from Mr Nikhil Deshmukh

Date: - 15th October 2024

Greetings from ***Advait Infratech Ltd.***

We have joined hands with CSIR-SERC to offer cost effective ERS for transmission lines for Indian Electricity Utilities. Ours is the first indigenously developed ERS meeting the international standard of IEEE 1070 and is capable to hold single circuit transmission lines as per loadings based on IS 802-2015.

This system can be used to create a parallel transmission line network by By-passing the existing transmission line under construction, repair, maintenance, replacement or expansion. Our system includes modules made up of Aluminium Alloy material making them light in weight and hence forth easy for site erection. The guy wire supporting the system also comes with a variety of anchoring solutions that can be used across a variety of soil

Figure 1 - Original Single Circuit Transmission Line

Figure 2 - Original Single Circuit Transmission Line with Damaged Tower

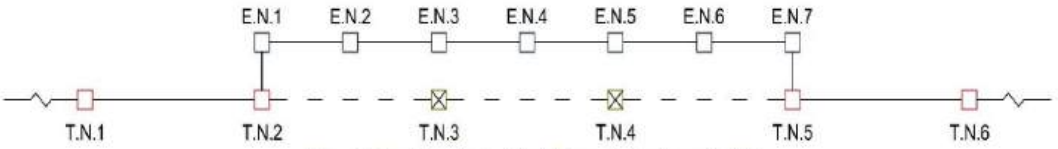
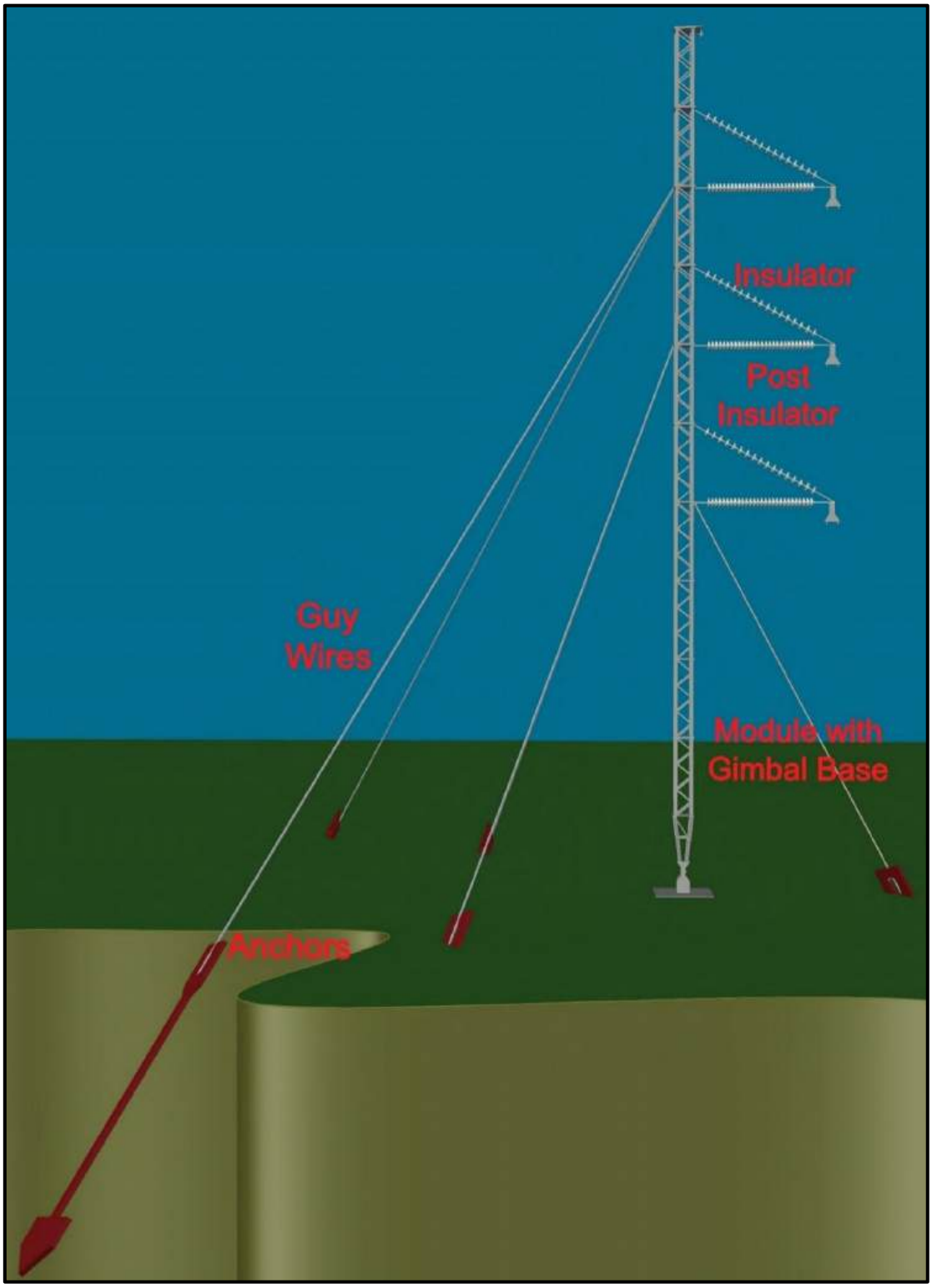


Figure 3 - Tentative Single Circuit Transmission Line with ERS

T.N. = Transmission Tower No.
E.N. = ERS Tower No.


Insulator
Post
Insulator
Guy
Wires
Module with
Gimbal Base
Anchors

GENERAL SPECIFICATIONS

Sr. No.	Components	Remarks
A	ERS Tower Structures	
1	Aluminium Modules	All the modules will be fabricated from Aluminium Alloy Material of grade AL-6061-T6 and tested according to IEEE 1070 standard. We have 3 sizes 2.1m, 4.3m and 6.4m
2	Gimble Joint & Base Plate Arrangement	Made up of suitable material capable to transmit the structural loads to ground safely and efficiently.
3	Nuts and Bolts	Suitable for connection between different modules and tested according to IEEE 1070 standard.
4	Structural Accessories	Including Guy Connection Plate, Insulator Connection Plate, Earth wire Hardware Connection Plate and all the items required to completely assemble the structure.
B	Insulators	
1	Composite Line Insulators	These would be used as tension insulators and as bracings with post insulators. These would be as per IEC 61109 or equivalent (of minimum mechanical strength of 120kN)
2	Line Post Insulators	Composite Line Post Insulators would be as per IEC 61952 or equivalent (of compressive strength of minimum 90kN)
3	Strain Insulator for guys	Strain Insulators would be as per IEC 61109 or equivalent (of minimum strength of 150kN). These would be required where guy wire would create a hindrance in electrical clearance with the conductor.
Sr. No.	**Components**	**Remarks**
C	Hardware	

1	Suspension Assembly Hardware for Conductors	Including all the components to attach conductor with the Insulator
2	Earth wire Suspension Assembly	Including all the components to attach Earth wire with the Structure
3	Tension Assembly Hardware for Conductors	Including all the components to attach conductor with the Insulator
4	Earth wire Tension Assembly	Including all the components to attach Earth wire with the Structure
5	Miscellaneous Accessories	Including Chain links, turn-buckle to adjust and form complete insulated cross arm assembly as per requirement.
D	Guy Wire & It's Hardware	
1	Guy Cable	Steel Cable of minimum UTS of 150kN with standard length of 70m.
2	Preformed Armoured Grip OR Bulldog grip	Suitable size in order to form the guy wire loop.
3	Wire Rope Thimble	Ordinary Galvanized thimbles as per IS 2315 or equivalent with size suitable for guy wire diameter.
4	Guy Wire Hardware Assembly	Other components in order to assemble guy wire
E	Anchor & It's Hardware	
1	Bat Anchors and assembly or Equivalent	Generally, for Normal Soil. These are equivalent to Manta Ray type of Anchors
2	Large Plate Anchors & Assembly	Generally, for Loose or Soft Soil
3	Cross Plate Anchors and Assembly	Generally, for Normal Soil
4	Helix Anchors & Assembly	Generally, for Loose or Marshy Soil
5	Rock Anchors & Assembly	Generally, for Rocky Areas
Sr. No.	**Components**	**Remarks**

F	Equipment & Tools	1 Set of tools required to erect the complete structure & install the anchors. These would also include the tools that would be required to remove the anchors. Our list is excluding any crane or heavy hydraulic machines.
G	Software of PLS-Pole	The software of PLS-Pole (Mast Module) by Powerline Systems is provided with the package

Note: - Above are a general specification which are given only for reference. Actual specifications and quantity of each component would vary as per client's requirement.

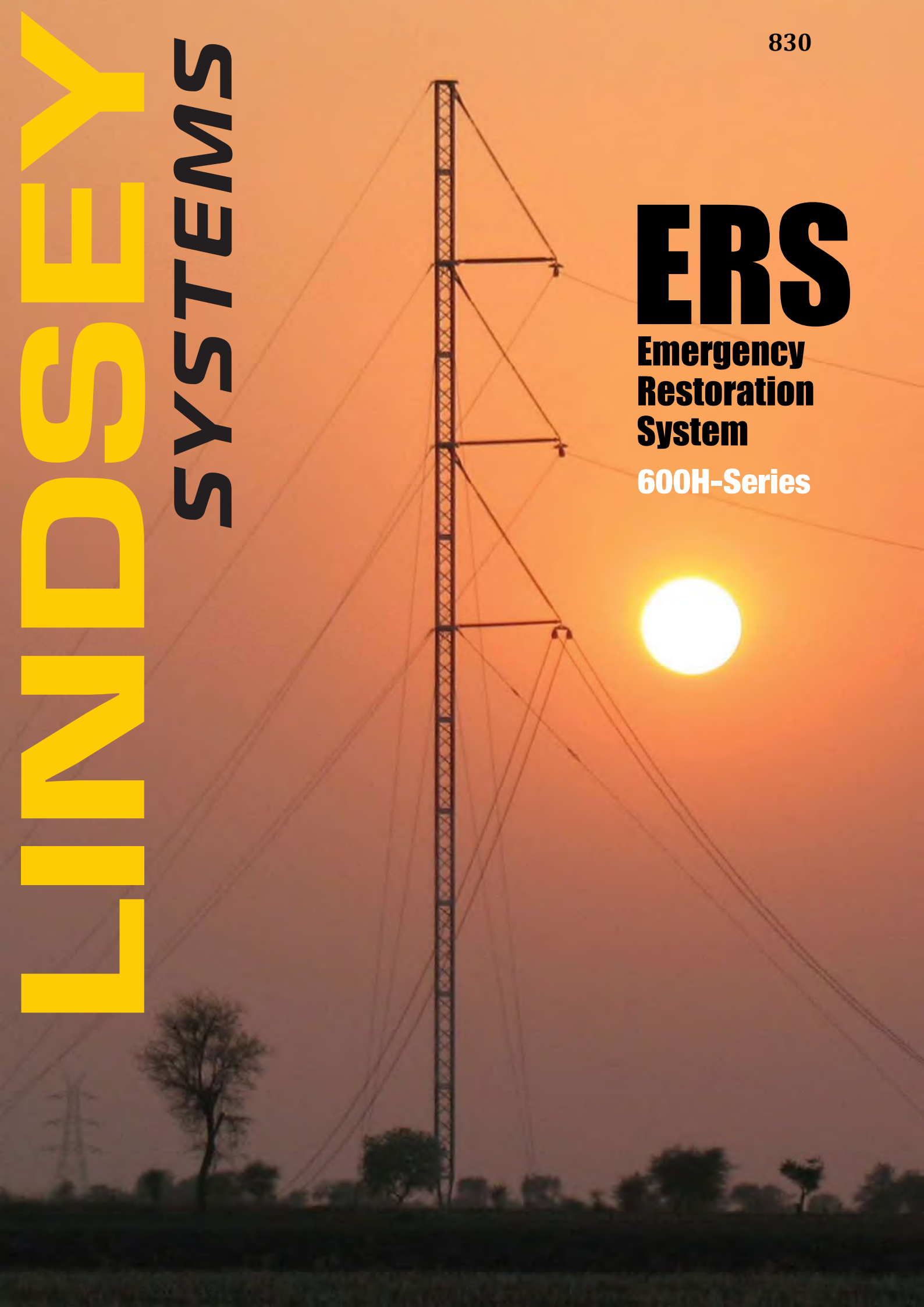
LINDSEY SYSTEMS

830

ERS

Emergency Restoration System

600H-Series



PERRY JOHNSON REGISTRARS, INC.

Certificate of Registration

Perry Johnson Registrars, Inc., has audited the Quality Management System of:

Lindsey Manufacturing Co. dba Lindsey Systems

760 North Georgia Avenue, Azusa, CA 91702 United States

(This single site has more than one location. See appendix for details.)

(Hereinafter called the Organization) and hereby declares that Organization is in conformance with:

ISO 9001:2015

This Registration is in respect to the following scope:

Design and Manufacture of Transmission and Distribution Products, Monitoring Devices and Systems Primarily for the Electric Utility Industry

This Registration is granted subject to the system rules governing the Registration referred to above, and the Organization hereby covenants with the Assessment body duty to observe and comply with the said rules.

PERRY JOHNSON REGISTRARS, INC.

ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17021-1 MANAGEMENT SYSTEMS CERTIFICATION BODY

Terry Boboige, President

Perry Johnson Registrars, Inc. (PJR)
755 West Big Beaver Road, Suite 1340
Troy, Michigan 48084
(248) 358-3388

The validity of this certificate is dependent upon ongoing surveillance.

Effective Date: August 14, 2024
Expiration Date: August 13, 2027

Certificate No.: C2024-03331

Proposal for Lindsey Emergency Restoration System 600H Structures

Prepared for:
JAIGAD POWER TRANSCO LIMITED

INDIA

October 08, 2024

Lindsey Systems
760 N. Georgia Ave. P.O. Box 877 Azusa, CA 91702 U.S.A Phone: (626) 969-3471 Fax: (626) 969-3177
e-mail: mail@Lindsey-usa.comwww.Lindsey-usa.com

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1 CONTENTS

PROPOSAL

Lindsey Systems is pleased to provide a proposal for our 600H-series Emergency Restoration System (ERS) structures.

2 ABOUT LINDSEY ERS STRUCTURES

Since 1982 Lindsey ERS structures have been the leading choice of utilities, contractors, and EPC firms around the world both to provide for rapid restoration of unscheduled transmission tower outages, and for use during scheduled construction and maintenance projects. In fact, Lindsey developed the original 1070-Series ERS in conjunction with five utilities. Lindsey's motto, "Touching High Voltage Every Day," is also a reflection of this.

In addition to ERS structures, Lindsey produces HV and EHV hardware, transmission line monitoring systems, transmission line security systems, and high accuracy medium-voltage current and voltage sensors for both overhead and underground applications. Lindsey products do touch high voltage every day. And they have done so for over 70 years.

It is this deep experience with utilities that Lindsey has brought to the Series-600H ERS structures. Key features resulting from direct utility field personnel input, include:

- Lightweight, open lattice design.
    - The open lattice design of the Series-600H provides a comfortable climbing environment for linemen. This eliminates the need to carry portable footrests needed with designs present linemen with narrow edged, curved footholds.
    - Open lattice design ensures even the heaviest system components weight less than 100 kg, ensuring easy manual portability in even the most inhospitable environments.
    - Compatibility with all commercially available fall arrest systems. Open lattice construction allows line crews to use the fall arrest system they have trained with and are familiar with. No proprietary fall arrest system is required.

- Wide cross sections.
    - Wide cross sections mean superior buckling resistance. The Lindsey Series-600H offers more than twice the strength-to-weight ratio of towers with narrower cross sections. Superior buckling strength provides better performance of tall structures under high loads.
    - The wide cross section of the Series-600H provides the ability of up to 4 linemen to work at the same level. This is a critical safety and work practice issue when dealing with complicated installations.
- All welded aluminum construction.
    - Aluminum has been the standard for ERS. Aluminum ensures light weight; a critical feature to ensure ease of handling and fast installation when deploying in the field. Aluminum is also corrosion resistant. ERS structures are designed for both long term storage, deployment in sometimes brutal and primitive environments, and are intended to be un-installed and stored for reuse. Aluminum ensures that the nicks and dings which will invariable occur from such use will not result in corrosion as would occur with steel structures.

Lindsey ERS structures are intended for temporary use. However, their robust design is the reason many utilities have left them in continuous service; some structures have been in continuous service for over twenty years.

3 SUMMARY OF PROPOSAL

In accordance with your request, Lindsey Systems is pleased to submit the following **budgetary quotation** for one (1) complete set of 400kV Emergency Restoration Structures (ERS), and three set of hardware assembly for 600H Lindsey ERS. With these materials you should be able to build the following structures:

Two (2) 400kV Single Circuit 0°- 20° Suspension Towers with-OHGW.

See drawing ER-ASY-13642-HVT-400 Conductor Height =22m. (2 conductors / phase)

Total height of Tower = 40m.

OR

Two (2) 400kV Single Circuit 0°- 60° Tension Towers with-OHGW.

See drawing ER-ASY-13652-DET-400 Conductor Height = 22m. (2 conductors / phase)

Total height of Tower = 40m

4 STRUCTURE TYPES

Material supplied with Lindsey ERS sets can be configured to build a wide variety of structure types. Following is a brief description of the most common versions of these structures.

4.1 HORIZONTAL-VEE

Horizontal Vee structures are among the most commonly built ERS structure. They can be built to hold one, two or three phases and are commonly used to bypass a single circuit, or a double circuit, one structure on either side. They use a “vee” shaped combination of a post insulator and a suspension insulator to support the conductor. They are used for pure suspension to moderate angle running-angle applications.

4.2 RUNNING ANGLE

Running angles are very much like horizontal-vee structures except the line angle is more pronounced, eliminating the need for the post insulator.

4.3 DELTA

This is essentially the same as a horizontal vee except one phase is on the opposite side of the other two. One advantage if this structure is its shorter overall height and smaller right-of-way requirement. This structure is mainly used for suspension only applications.

4.4 DEAD END (TENSION) TOWERS

On the left, three shorter single-phase structures are used to provide dead-end terminations to phase conductors. Both three-phase and single-phase dead-ends can be built. Single-phase structures are shorter and easier to guy. The use of single-phase dead-ends also provides much greater flexibly in placement and less complex conductor routings than three-phase dead-ends.

A three-phase full tension tower is shown on the right. Note the four-bundle conductor load on one side, transitioning to a two-bundle on the other side. This is a useful practice during bypasses as a way of reducing conductor load.

4.5 CHAINETTE STRUCTURES

Two ERS columns can be used using suspension insulators only to construct two-phase (i.e. HVDC) or three-phase chainette structures. Chainettes are used for suspension applications particularly where the transmission line is built with horizontal phase construction (side-by-side phases).

Other advantages of chainette structures include:

- The ERS columns themselves can provide the leverage to lift the phase conductors into place.
- Very strong compared to horizontal vee structures and therefore are ideal for long spans or heavy conductor loads.

4.6 FOUR-COLUMN STRUCTURES

Four ERS columns can be used with suspension insulators to construct three-phase suspension structures especially for lines using horizontal phase construction (side-by-side phases). This is an exceptionally strong configuration, is ideal for very tall applications, and can support very heavy conductor loads and long spans. They may be applied at fairly large line angles. This type of structure also allows the ERS columns themselves to provide the leverage to lift the phase conductors into place.

4.7 HERRINGBONE STRUCTURES

Two ERS columns can be used using suspension insulators only to construct one-, two- or three-phase V-string structures. The concept is similar to the Chainette structure but ideal for lines with vertical phase construction. Advantages are the same as for Chainettes:

- The ERS columns themselves can provide the leverage to lift the phase conductors into place.
- Very strong compared to horizontal vee structures and therefore are ideal for long spans or heavy conductor loads.
- Can be applied at greater line angles than horizontal vee structures.

5 MATERIAL DESCRIPTION

ERS systems are typically packaged and sold in “sets.” There is no industry standard or definition as to the meaning of a set. A set typically includes all the parts necessary to build a specified number of ERS structures at one or more voltages, and of one or more types of structure configurations. Typical parts included in a set may include:

- ERS structure foundations and support gimbals
- ERS structure column sections
- Guy plates
- Insulators
- Conductor hardware
- Anchors, guy wires, and associated hardware

IN addition, the following Installation tool kits may be included the Proposal. These may include:

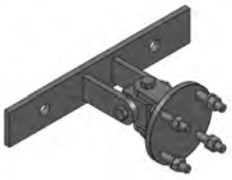
- Gin poles and/or erection jibs for hand erection of the structures
- Working platforms
- Anchor installation tools
- Miscellaneous hand tools

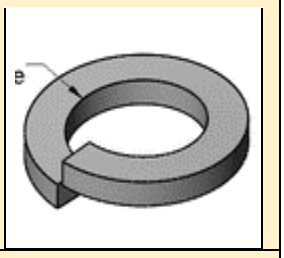
Lindsey’s ProSpot ERS structure analysis software and field training are also usually quoted as a separate line items.

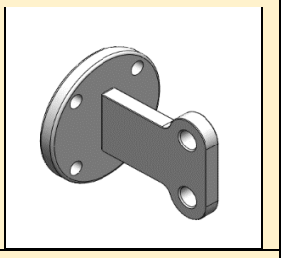
5.1 SERIES-600H ERS STRUCTURE COMPONENTS

Following is a description of all the items that may be included with the Series-600H ERS. Consult the BOQ Section of this proposal for a list of all items included in this Proposal.

Item/Description	P/N	Image
FOUNDATION *The Foundation is made from 1.2m by 1.2m aluminum plate and is designed to be placed directly on the ground to provide bearing support. The design of the Lindsey Foundation allows for several rigging attachment points used for erection of the columns or for raising the conductors.*	**7254**	
GIMBAL TOWER *The Gimbal or articulating joint acts as a universal joint eliminating torsion loading of the final structure and allowing the assembled column to be rotated from the horizontal plane to the vertical position from any position.*	**7224**	

ERS TOWER SECTIONS 600L *All column sections are fabricated from lightweight, high strength structural aluminum alloy. The all-welded construction insures easy handling and eliminates the loss of small bolted pieces.*	**7262 (2.9m)** **7263 (1.45m)**	
OHGW BRACKET ERS TOWER *This bracket mounts to the top of the completed tower to support overhead ground wires.*	**7264**	
4WAY 45DEG GUY PLATE 600ERS *High Strength Guy Plates are made from structural aluminum plate and directly transfer the insulator loads across the structure and into guy wire loads. Each attachment hole is designed to hold a 134kN load. The Guy Plates are attached to the four (4) holes between or on the top of each column section using high strength M24x3x210 galvanized bolts. The edges of this guy plate is bent at a 45 degree angle for better alignment with ground connected guys.*	**7268**	
0 0 GUY PLATE 600 ERS *This is the same as the 4WAY 45 DEG GUY PLATE except the plate is flat. This is commonly used for multiple column structures such as herringbone and chainette designs were structural guy wires are used to connect the columns. This can also be used on top of 45 degree guy plates to provide additional guy attachment points at the same level.*	**7269**	
POST INSULATOR SUPPORT *This attaches to the top or bottom of any tower section and provides an attachment point for post insulators, most commonly used on horizontal vee structures. The design of the post insulator support provides a universal pivot point for the post insulator, eliminating bending moments on the post insulator and thus increasing the insulator's buckling strength.*	**7267**	
M24X3X210 BOLT HH MTRC 8.8 GALV *Lindsey Series-600H ERS use only one size bolt, provided in two lengths. This is the longer bolt (210mm) as is used for all connections except from the foundation to the gimbal or a guy plate mounted to the very top of a structure.*	**7250/210**	

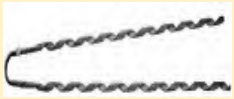
M24X3X80 BOLT HH MTRC TAP 8.8 GALV *Lindsey Series-600H ERS use only one size bolt, provided in two lengths. This is the shorter bolt (80mm) as is used for to connect the foundation to the gimbal or a guy plate mounted to the very top of a structure.*	**7249**	
M24X3 NUT HEX MTRC GALV *This nut is used with all bolts.*	**7249-1**	
M24 WASHER LOCK MTRC GALV *This lock washer is used with all bolts.*	**7249-2**	
60KIP ANCHOR SHACKLE GALV *The anchor shackles are used in various locations associated with anchoring and line hardware connections.*	**3262BNC**	
60KIP CHAIN LINK GALV 080-63505 *The chain links are used in various locations associated with anchoring and line hardware connections.*	**3405**	
35KIP 7/8X12 TURNBUCKLE EYE EYE Turnbuckles are used to permanently remove slack from anchor wires.	**3790EE**	

END CAP ADAPTER GALV *This connects to the end of a post insulator and provides connection points for conductor hardware (conductor clamps, yoke plates, etc.)*	**R-10850**	
EXTENSION STRAP SET INSULATOR *These hold the suspension insulator in a horizontal-vee assembly and provide a restoring moment for the assembly under longitudinal loads.*	**7273/600**	
25KIP CLAMP SUSPENSION W SY This is a wye clevis socket eye conductor clamp. Designed for ACSR conductors ranging from 19 – 30mm (0.75 – 1.19 inches) in diameter. The clamps bodies and keepers are manufactured from light weight, high strength A 356-T6 aluminum alloy. U-bolts, nuts, lock washers and clevis pins are hot dip galvanized steel.	**1336SY**	
30KIP CLAMP QUAD STRAIN W SE YCE *Lindsey's 17008SY Series Quadrant Strain Clamps is recommended for ACSR or all aluminum conductor from 12.7 – 30 mm (0.50 – 1.20 inches). The clamp bodies and keepers are manufactured from lightweight, high strength A356-T6 aluminum alloy. U-Bolts, nuts, lock washers and clevis pins are hot dip galvanized steel. Humpback cotter keys are stainless steel.*	**1708SY**	
18KIP CLAMP SUSPENSION *This is a ductile iron suspension clamp for use with steel overhead ground/static wires.*	**1329**	
15KIP QUAD CLAMP W SE YCB GALV *This is a ductile iron strain clamp for use with steel overhead ground/static wires.*	**1701SY**	

INSULATOR SUSPENSION *Suitably rated, light weight, non-ceramic suspension insulators are supplied with Lindsey ERS structures. These insulators conform to all applicable electrical and mechanical tests as required by both ANSI and IEC standards.*	**7003-104CH**	
INSULATOR POST *Suitably rated, light weight, non-ceramic post insulators are supplied with Lindsey ERS structures. These insulators conform to all applicable electrical and mechanical tests as required by both ANSI and IEC standards.*	**7003-212CH**	
KIT OF BOLTS FOR POST INSULATORS *Appropriate bolt kits are supplied for connecting and mounting suspension and post insulators.*	**7003-196**	
TBAR FOUNDATION STAKE GALVANIZED *These are stakes used to hold the ERS foundation plate from slipping during assembly.*	**R-14304**	
30KIP GUY STRAIN INSULATOR 103IN *Guy strain insulators are connected in series with guy wires to ensure that the electrically grounded guy wires do not interfere electrically with the phase conductors as they make connection to the ERS tower guy plates.*	**7900/103**	
20FT ERS STORAGE CONTAINER *One or more of these 20' ocean going containers will be supplied to hold all of the material supplied with the ERS kit.*	**R-16431**	

5.2 SERIES-600H GUYING HARDWARE

Following is a description of all guying hardware items that <<may be or are ??>> included with the Series-600H ERS:

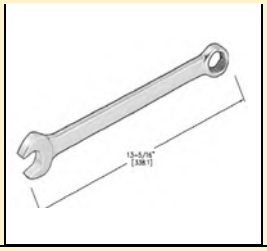
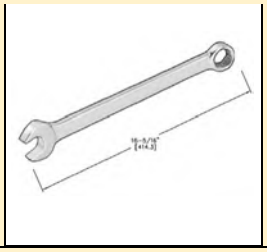
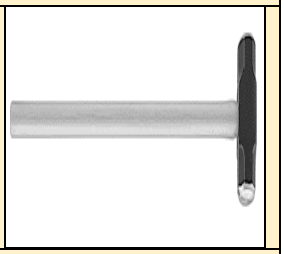
9/16DIAXxx EHS GUYWIRE STL GA *Only flexible multi-strand guy wire is provided with Lindsey ERS structures for easy handling in the field. Guy wire may be supplied in reels or pre-cut lengths.*	**7045**	
5/8 THIMBLE WIRE ROPE *These thimbles protect guy wires (wire ropes) from damage as they pass through anchor connectors.*	**7950**	
TE-1T TRIPLE THIMBLE EYE *This eye attaches to the end of anchor extension rods and provides the ability to support three anchor wire fitted with thimbles.*	**R-16624-3**	
BIG GRIP DEADEND *These are preformed grips to designee to attached to the stranded guy wire provided with Lindsey ERS structures.*	**R-13467**	
20KIP MANTA RAY STYLE ANCHOR *These hydraulically installed self-locking type anchors can be installed in 15-20 minutes. The advantage of these type anchors, besides their speed of installation in normal soils, is that they are proof tested during installation. Anchor installation kits are commonly supplied with these types of anchors as part of the optional ERS Tool Kit.*	**R-16624 or R-16624-1**	
CROSS PLATE ANCHOR ASSEMBLEY *Cross plate anchors are a very common and universal anchoring method, requiring minimal installation equipment.*	**R-13193**	

TRIPLE HELIX ANCHOR *For normal or low-density soil conditions, i.e. swamp or peat, high strength triple helix screw anchors can be provided*.	**R-14384**	
ROCK ANCHOR ASSEMBLY *For use in anchoring guy wires into rock.*	**R-16978**	
ANCHOR EXTENSION RODS SAR10A 1INX7FT ROD 1-8UNC ENDS *These are 2.1m (7 foot) extension rods supplied to provide connection between anchors and the attachment point for the connected ground wire. They may be connected end to end as required.*	**R-16624-2**	
ANCHOR EXTENSION RODS 1X3 1/2FT ROD SAR 10C *These are 1 m (3.5 foot) extension rods supplied to provide connection between anchors and the attachment point for the connected ground wire. They may be connected end to end as required.*	**R-16624-4**	
ANCHOR EXTENSION ROD COUPLING NUTS 1-8 *These coupling nuts are used to connect anchor extension rods as required.*	**R-16624-5**	

5.3 SERIES-600H ERS TYPICAL TOOL SET COMPONENTS

Following is a description of all the items that <<may be or are ??>> included the Series-600H ERS tool sets:

GIN POLE 600 SERIES *The Gin Pole is designed to support manual installation of ERS. Made from aluminum alloy, the gin pole is supported on one corner of a column section and allows for the lifting of column sections to the top of the structure. All necessary snatch blocks and rigging ropes are included. The gin pole davit arm keeps loads clear of the structure while being raised by manpower, or a capstan with hydraulic power unit.*	**7271**	
T516 GRIPHOIST W 150FT CABLE *Griphoists are portable manual hoists with traversing wire rope. These lever operated wire rope hoists are the ideal solution for tightening temporary guys for ERS structures. These hoists are portable, strong and can be used in any orientation. The design of these hoists allow for a virtual unlimited lift or pull, the limit of which is determined only by the length of wire rope inserted into it and they have built in overload protection.*	**R-16513**	
CAPSTAN AND FOOTPEDAL *The 1-ton hydraulic capstan winch with foot pedals is used to lift column sections, insulators, etc., in conjunction with use of the gin pole and all manual installation methods. The capstan is capable of being powered by the same hydraulic power unit which is used to install manta-ray style anchors.*	**7004H**	
5/8X600FT SPL 3 STRD POLYESTER ROPE *This rope is used with the capstan and gin pole to lift material (column sections, insulators) up the ERS column as it is being constructed using manual methods.*	**R-15738**	
HANDLING BLOCK *The handling block, or snatch-block, is used with the capstan and gin pole to help guide the lifting rope as it routes from the foundation to the top of the structure.*	**R-16884**	
15IN RATCHET 1/2 DRIVE *This ratcheting socket drive is used to tighten bolts used with the ERS structure.*	**T-1006**	

1/2" SQ. Dr 75mm Deep Socket, 36mm *This socket is used with the above wrench to tighten bolts used with the ERS structure.*	**T-1007**	
36MM COMBINATION WRENCH *Used for tightening*	**T-1008**	
24MM COMBINATION WRENCH *Used for tightening*	**T-1009**	
30MM COMBINATION WRENCH *Used for tightening*	**T-1017**	
12IN CRESCENT WRENCH *Used for tightening*	**T-1005**	
SLEDGE HAMMER 10LB *Used to drive foundation stakes into the ground.*	**R-15037**	
3TON CHAIN HOIST *Used when adjusting the guys or when side guying a column during erection. Eliminates the need for block and tackle that do not have a positive stop.*	**R-15107**	

ANCHOR PULLING EYE ALUMINUM *This is used to connect the construction yoke to an anchor rod. The offset eye allows for connection to the three-ton chain hoist for tightening and connection of the guy grip. The pulling eye can be disassembled after use.*	**R-17103-10**	
AUTOMATIC WIRE GRIP *Use the automatic wire grip to hold the guy wire and is used with the chain hoist to properly tension the guy wire before permanently attaching with preformed grips and guy thimbles.*	**R-14301**	
10FT NYLON SLING *Slings are used for a variety of lifting tasks. This sling has a 85kN maximum capacity.*	**R-14303**	
6FT GREEN SLING ENDLESS ROUND *Slings are used for a variety of lifting tasks. This sling has a 47kN maximum capacity.*	**R-17105**	
CONDUCTOR LIFTING HOOK *This is used to assist lifting conductors out of single or bundled stringing travelers.*	**R-14305**	
ERS CONSTRUCTION YOKE PLATE *The construction yoke plate is used to provide spacing between temporary guys and permanent guys during the connection of permanent guys to an anchor rod. This simplifies the guying process.*	**7272**	

PIN EXTRACTOR *This is for use in removing foundation stakes after dismantling an ERS structure.*	**R-19431**	
6TON HYDRAULIC WIRE CUTTER *For use in gutting guy wire to length.*	**R-15258**	
TOOL BOX ERS *Used to conveniently store and hold miscellaneous tools.*	**R-17798**	

5.4 SERIES-600H ERS MANTA-RAY TYPE ANCHOR INSTALLATION TOOL SET COMPONENTS

Following is a description of all the items that <<may be or are ??>> included with the optional Manta-Ray type Anchor Installation Tool Set:

MANTA RAY INSTALLATION TOOL SET with HPU This is a complete tool set for installing and locking manta-ray type anchors.	**R-16625**	SEE COMPONENTS PHOTOS BELOW
STL HP8BA HYDRAULIC POWER UNIT (HPU) *18HP gasoline power hydraulic power unit with an output capacity of 5 or 8 GPM (20 or 30 LPM).*	**R-16625-1**	
BR87130 HYDRAULIC BREAKER DRIVE HAMMER *This is used to drive the manta-ray type anchor heads into the soil. The driving steel (below) is attached to the hammer and the anchor head is attached to the driving steel.*	**R-16625-2**	
HOSE SETS HC-16-25 For use in connecting the hydraulic output from the HPU to the drive hammer or capstan with foot pedal.	R-16625-3	
LL 1 ANCHOR LOCKER *This device is used to load lock manta-ray type anchor heads and proof test the anchor.*	**R-16625-4**	
SGC 14 DRIVING STEEL SET *This is a complete set of driving steel used to drive manta-ray type anchor heads into normal soil and will drive an anchor to a depth of 2.4m (8 feet).*	**R-16625-5**	

SG 2 EXTENSION *This is a 0.8m (33 inch) extension to the driving steel set above.*	**R-16625-6**	
SG 3 RADIUS TIP *This is a spare tip that fits into the manta-ray style anchor head. One of these is included in the Driving Steel Kit.*	**R-16625-8**	
SG 14 SHANK *This is a spare shank that fits into the hydraulic driving hammer. One of these is included in the Driving Steel Kit.*	**R-16625-9**	
SG 4 COUPLER *This is used to connect driving steel extension rods to the existing driving steel, radius tips and shanks.*	**R-16625-7**	

5.5 SERIES-600H ERS STORAGE CONTAINERS

ERS systems are intended for rapid deployment in times of emergency. Lindsey 600H-Series ERS systems are shipped in standard 20-foot ocean cargo storage containers, ensuring all ERS system components are kept together and readily transportable to site. These containers are part of the ERS system and designed to hold all ERS material until such time that they must be deployed to a work site

20FT ERS TOOLING CONTAINER *These specially fitted tool containers are provided when optional construction tools are ordered.*	**R-16001**	

20FT ERS STORAGE CONTAINER *These standard containers contain ERS tower components, associated insulators and hardware, anchors and guy wire.*	**R-16431**	

6 PROSPOT® ERS DESIGN SOFTWARE

ProSpot® ERS design software is specifically for ERS systems and allows for rapid configuration and design of ERS towers in the field or in the office. ProSpot works with all series of Lindsey ERS structures. Lindsey ProSpot advantages include:

- FAIL SAFE output – A Lindsey exclusive: If the design parameters selected will not result in a stable structure, no results are generated. No need for interpretation of pages of data. Only with ProSpot do you know that if you see it, you can build it.
- Fast selection of tower types; no complex set up. Design any tower, whether or not originally envisioned at the time of the original ERS system purchase.
- Limited input data requirements for fast design.
- One page output containing plan and elevation views and all critical loading parameters.
- No annual licensing fee, eliminating on-going software costs.
- May be freely copied within your organization, eliminating the need to purchase expensive software for casual users.

7 TRAINING

Lindsey offers a comprehensive one (1) Week (4-5 working days) Emergency Restoration System training session. This includes one day of training for engineers on the use Lindsey's ProSpot® ERS design software, and four days field training for linemen and supervisors on mutually agreed training dates.

Training is conducted at the purchaser's facilities for the time period as specified. Training includes field training imparting first-hand knowledge about the assembly of modular structures, erecting of structures, guying and anchoring. Specific instructions will be given for installation of ERS using cranes, gin pole and hydraulic hoisting equipment. Before the training is scheduled, Lindsey and the Purchaser will mutually agree on the structure types and methods which will be used during the hands-on instruction.

The training will also include training on Lindsey's ProSpot ERS design software to ensure engineers can determine the capabilities of the structures. Input of data will be demonstrated, and ProSpot will provide analysis of restoration structures, including foundation and anchoring forces.

Due to the interactive nature of the services to be provided, assistance from the Purchaser is required to achieve a successful training session. Purchaser will need to coordinate with Lindsey's trainers ahead of the training date to ensure that the proper facilities, equipment, tools and materials, are available. Ideally anchors should be pre-installed and tested. These preparations will allow the planned training activities to occur within the allotted training time.

COMPLETE DESCRIPTION OF THE PROPOSED MATERIALS AND SERVICES

DETAILED LISTING OF ALL PROPOSED MATERIALS AND SERVICES FOR TWO (2) SUSPENSION OR TWO (2) TENSION 600H ERS TOWERS

10/8/2024

Item No.	Lindsey Part No.	Description	Qty.
	E.R.S. Structure Components		
1	7254	FOUNDATION PLATE	2
2	7224	RIGID GIMBAL	2
3	7262	2.90m COLUMN	26
4	7264	OVERHEAD GROUND WIRE BRACKET	2
5	7268	45/45 DEG 4-WAY GUY PLATE	8
6	7269	0/0 DEG GUY PLATE	8
7	R-25756	POST INSULATOR SUPPORT	6
8	7250-210	ERS BOLT M24 x 3 x 210 (INC.20% EXTRA)	146
9	7249	ERS BOLT M24 x 3 x 80 (INC.20% EXTRA)	42
10	7249-1	M24 x 3 HEX NUT GALV. (INC.20% EXTRA)	188
11	7249-2	M24 LOCKWASHER GALV. (INC.20% EXTRA)	188
	E.R.S. Training & Computer Programs		
12	7001	ERS Computer Analysis Programs	1
13	7002	ERS On-Site Training (weeks)	1
	Conductor and Guying Hardware		
14	3262BNC	ANCHOR SHACKLE	128
15	3405	CHAIN LINK	60
16	3790EE	7/8 x 12" EYE-EYE TURNBUCKLE	27
16	R-9058	30 KIP TRIANGULAR YOKE PLATE	7
17	7273/785	HANGER STRAMPS ASSY 78-1/2	6
18	R-25757	INSULATOR BLADE ADAPTER	7
19	R-11271/230	30 KIP STRAP LINK23"	7
20	1420/143SY	EHV Suspension Clamp 30.5-36.3mm	14
21	1710SY	CONDUCTOR STRAIN CLAMP 18.0-35.6mm	27
22	1329	OHGW SUSP. CLAMP	3
23	1701SY	OHGW STRAIN CLMP	5
	Insulators		
24	7003-143CH	SUSPENSION INSULATOR	32
25	7003-144CH	POST INSULATOR	7
26	7003-202	KIT OF BOLTS FOR POST INSULATOR	8

Item No.	Lindsey Part No.	Description	Qty.
	Guy Wire Components		
27	7950	THIMBLE CLEVIS	47
28	R-13467	PLP DEAD-END GUY GRIP	94
29	7045/L	9/16" DIA. EHS GUY WIRE (M)	4000
30	7900/103	GUY STRAIN INSULATOR	22

	Anchor Assemblies		
31	R-13193	CROSS PLATE ANCHOR ASSEMBLY	34
	Each Set Consists of the Following Items		Qty/Set
	R-13193-1	TRIPLE EYE ANCHORE ROD	1
	R-13193-2	CROSS PLATE ANCHOR HEAD	1
32	R-16624	MANTA RAY ANCHOR ASSEMBLY	34
	Each Set Consists of the Following Items		Qty/Set
	R-16624-1	MANTA RAY-1 ANCHOR	1
	R-16624-2	SAR10A 1"X 7FT ROD	1
	R-16624-3	TE-1T TRIPLE THIMBLE EYE	1
	R-16624-4	SAR10C 1" X 3.5 FT ROD	1
	R-16624-5	C-1 NUT	1
33	R-16978	ROCK ANCHOR ASSEMBLY	16
	Each Set Consists of the Following Items		Qty/Set
	R-16978-1	ROCK ANCHOR HEAD	1
	R-16978-2	1"(25) X 12" (305)THREADED ROD	1
	R-16978-3	TRIPLE THIMBLE EYE	1

Item No.	Lindsey Part No.	Description	Qty.
	Accessories		
34	R-20079	ASSEMBLY & ERECTION TOOL SET 600 Series	1
	Each Set Consists of the Following Items		Qty/Set
34.01	7271	600H Gin Pole	1
34.02	R-16513	2 ton Tirfor Griphoist	8
34.03	7004H	Capstan with Foot Pedal	1
34.04	R-15738	5/8" Polyester Rope, 600' Spool	6
34.05	R-16884	Snatch Block for 5/8" rope	5
34.06	T-1006	1/2" Square Drive Ratchet	6
34.07	T-1007	1/2" SQ. Drive Deep Socket, 36mm	6
34.08	T-1008	15"-12 Point Box Wrench, 36mm	6
34.09	T-1009	24mm Combination Wrench	6
34.1	T-1017	30mm Combination Wrench	6
34.11	T-1005	12" Adjustable Spanner Wrench	3
34.12	R-15037	10-12 LB. Sledge Hammer	2
34.13	R-15107	3 Ton Chain Hoist	6
34.14	R-17103-10	Pulling Eye	12
34.15	R-14301	Automatic Wire Grip	8
34.16	R-14302	10 ft. Metal Sling	2
34.17	R-14303	10 ft. Nylon Sling	2
34.18	R-17105	6' (1.8m) Endless Rd. Sling (Green)	8
34.19	R-14305	Conductor Lifting Hook	3
34.2	7272	Anchor Construction Yoke Plate	6
34.21	7274/350	Workman's Platform	1
34.22	R-15258	6 Ton Hydraulic Wire Cutter	1
34.23	R-21645	Fall Arrest Life Line System Kit with Safety Belt	3
34.24	R-17798	Tools Box	1
35	R-16625	MANTA RAY INST. TOOLS SET & HPU	1
	Each Set Consists of the Following Items		Qty/Set
	R-16625-1	HPU-18-8 Hydraulic Power Unit, 18hp	1
	R-16625-2	HB90-14 Hammer	1
	7004-5	Hose Sets HC-16-25	2
	R-16625-4	LL-1 Load Locker	1
	R-16625-5	SGC-14 Drive Steel Set	1
	R-16625-6	SG2 Extension (3ft)	3
	R-16625-7	SG4 Couplers	4
	R-16625-8	SG3 Radius Tip	1
	R-16625-9	SG-14 1 1/4" Shank	1

36	R-16979	ROCK DRILL TOOL SET	1
	Each Set Consists of the Following Items		Qty/Set
	R-16979-1	Rock Drill Stainley HD45(Uses R-16625-1)	
	R-16979-2	7/8" x 2'	1
	R-16979-3	7/8 "x 4'	1
	R-16979-4	Couplers	2
	R-16979-5	1" Shank	1
	R-16979-6	1 3/4" Carbide Bits	5
	R-16979-7	Bearing Plate	1

Accessories (CONTINUED)

37	R-14304	FOUNDATIONS STAKES 1.2 Mts.	11
38	R-16001	20 ft. INSULATOR / HARDWARE STORAGE CONTAINER	1
39	R-16431	20 ft. STORAGE CONTAINER FOR TOWER SECTIONS.	2

Table
Recommended Spare Parts

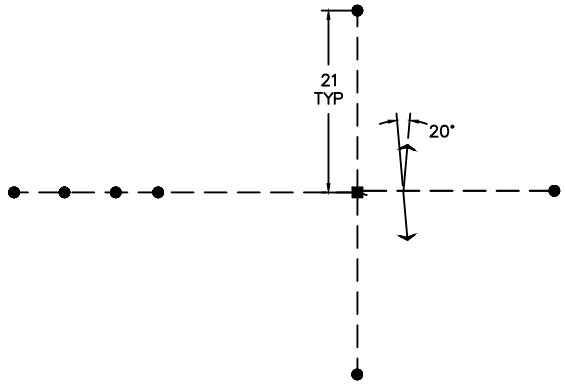
ERS Structure Components		0%
ERS Nuts, Bolts and Lockwashers		30%
Conductor and Insulator Hardware		10%
Insulators and Corona Rings		5%
Guy Wire Components:		
	Thimbles and PLP Grips	30%
	Guy Wire	30%
	Guy Strain Insulators	10%
Anchors:		
	Normal Soil Anchors	30%
	Swamp Anchors	30%
	Rock Anchors	30%

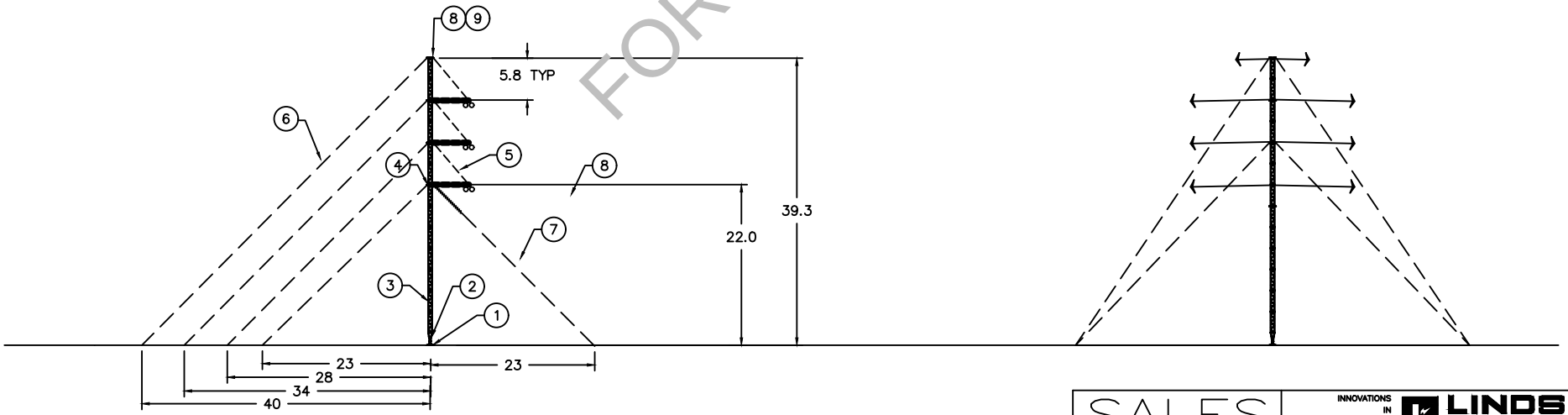
10 DRAWINGS

REVISIONS		
LTR	DESCRIPTION	ENG/DATE
1	INITIAL SALES DRAWING SUBMITTAL	P.L. 3/5/19

ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION	MAT'L	WT.EA. KGS.
1	1	7254	FOUNDATION PLATE	AL	60
2	1	7224	RIGID GIMBAL	AL	77
3	13	7262	2.9m COLUMN SECTION	AL	95
4	4	7268	45°/ 45° 4-WAY GUY PLATE	AL	24
5	3	ER-ASY-13642-HVH-400	HORIZONTAL VEE HRDWR ASSY.	–	–
6	8	R-19588-3	GUY WIRE ASSY.	–	–
7	1	R-19588-4	INSULATED GUY WIRE ASSY.	–	–
8	1	R-19588-2	OHGW HW ASSEMBLY.	–	–
9	1	7264	OHGW BRACKET	–	–

TOTAL GUYS	9
TOTAL ANCHORS	7
TOTAL GUY WIRE REQD.	800M



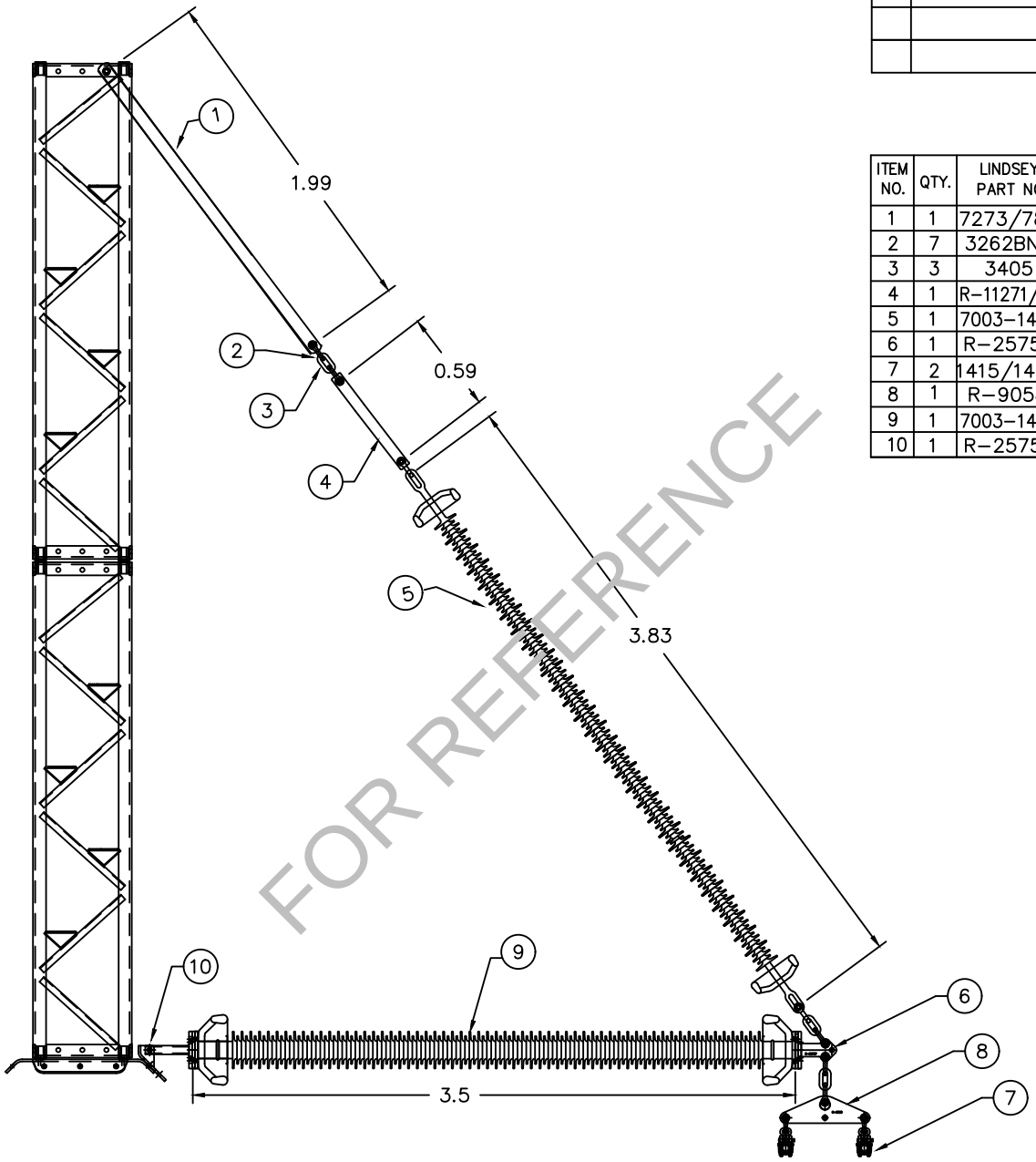


* MAXIMUM CONDUCTOR HEIGHT SHOWN.
1. ALL DIMENSIONS ARE IN METERS
NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (626) 969-3471			
APPROVALS	DATE	400kV 20° HORIZONTAL-VEE			
DRAWN PAUL LARA	3/5/19				
ENGINEER EMIDGIO AGUILERA	XXXX	SIZE B	SCALE 1:600	DWG ER-ASY-13642-HVT-400	REV 2
REF. jAIGAD Power Transco India					

REVISIONS		
LTR	DESCRIPTION	BY/DATE

860



ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION
1	1	7273/785	78–1/2 [1993.9]
2	7	3262BNC	ANCHOR SHACKLE
3	3	3405	CHAIN LINK
4	1	R–11271/230	EXTENSION LINK 23"
5	1	7003–143CH	SUSPENSION INSULATOR
6	1	R–25757	INSULATOR BLADE ADAPTOR
7	2	1415/143SY	SUSPENSION CLAMP ASSY.
8	1	R–9058	30 KIP TRI YOKE PLATE
9	1	7003–144CH	POST INSULATOR w/CORONA RING
10	1	R–25756	POST INSULATOR SUPPORT

SALES

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

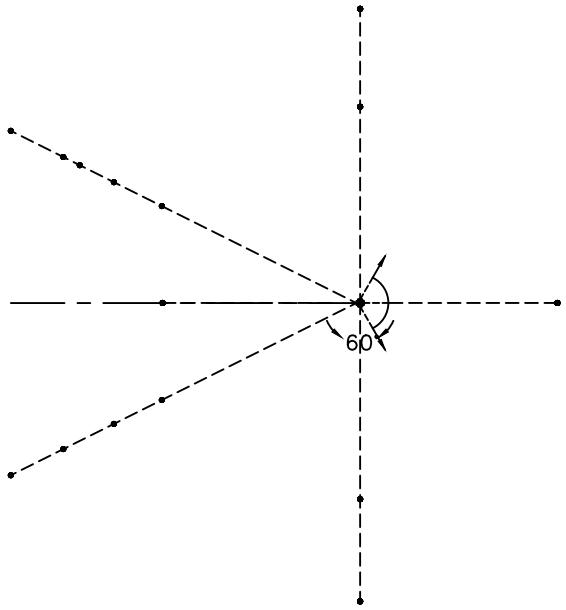
LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

APPROVALS	DATE
DRAWN HARUT AVETISYAN	8/23/2022
ENGINEER	XXXX
REF.Jaigad Power Transco India	

400kV HORIZONTAL VEE HARDWARE ASSY.

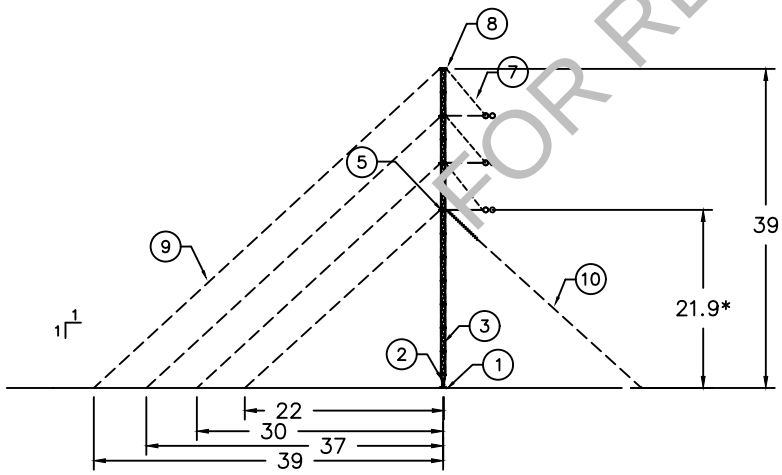
SIZE	SCALE	DWG	REV
B	1: 30	ER-ASY-13642-HVH-400	2

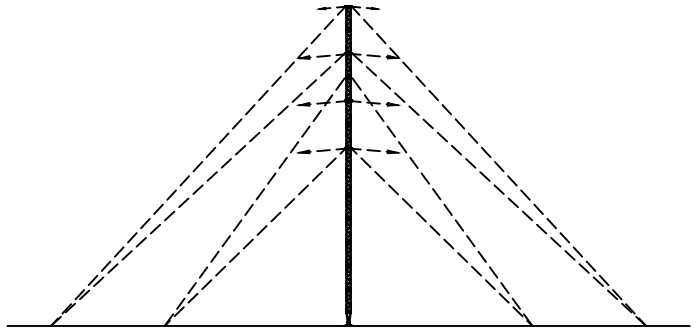
REVISIONS 861		
LTR	DESCRIPTION	ENG/DATE
1	INITIAL SALES DRAWING RELEASE	P.L. 7/11/11



ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION	MAT'L	WT.EA. KGS.
1	1	7254	FOUNDATION PLATE	AL	60
2	1	7224	RIGID GIMBAL	AL	77
3	13	7262	2.9m COLUMN SECTION	AL	95
4	4	7269	0°/ 0° GUY PLATE	AL	24
5	4	7268	45°/ 45° GUY PLATE	AL	24
6	0	7225	BOX SECTION	AL	44
7	3	ER-ASY-13652-DEH-400	DEAD-END HARDWARE ASSY.	–	–
8	2	R-19589-2	OHGW STRAIN	–	–
9	17	R-19588-3	ANCHOR GUY WIRE ASSY.	–	–
10	1	R-19588-4	INSULATED GUY WIRE ASSY.		

TOTAL GUYS	18
TOTAL ANCHORS	13
TOTAL GUY WIRE REQD.	1200M





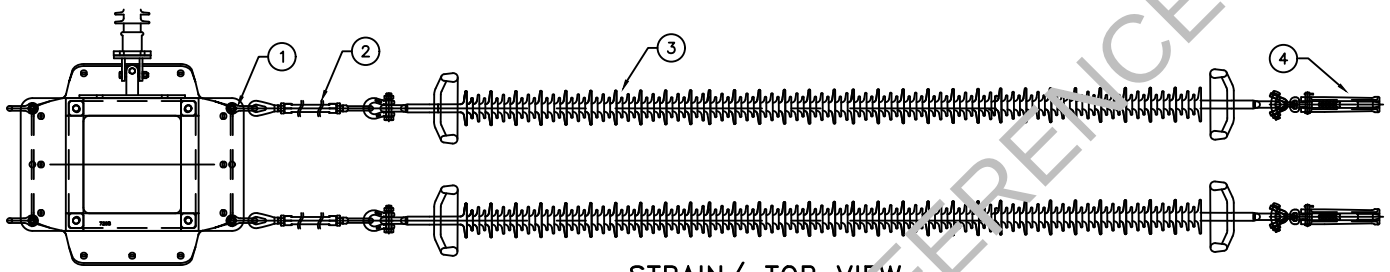
* MAXIMUM CONDUCTOR HEIGHT SHOWN.
1. ALL DIMENSIONS ARE IN METERS
NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	400kV 60° SINGLE CIRCUIT DEAD-END W/ OHGW			
DRAWN PAUL LARA	7/11/11				
ENGINEER SERGIO CORTEZ	7/11/11	SIZE B	SCALE 1:700	DWG ER-ASY-13652-DET-400	REV 2
REF. Jaigad Power Transco India					

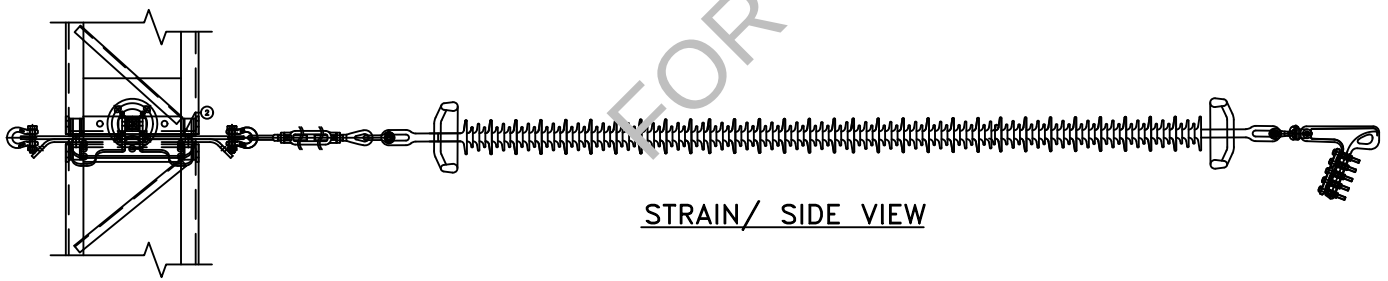
REVISIONS		
LTR	DESCRIPTION	BY/DATE
	862	

ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION
1	4	3262BNC	ANCHOR SHACKLE
2	2	3790EE	36KIP EYE-EYE TURNBACKLE
3	2	7003-143CH	SUSPENSION INSULATOR WITH COR. RING
4	2	1710SY	STRAIN DEAD END CLUMP

NOTE:
FOR JUMPER ASSY. SEE DRAWING # ER-ASY-12912-DEJ-400



STRAIN/ TOP VIEW

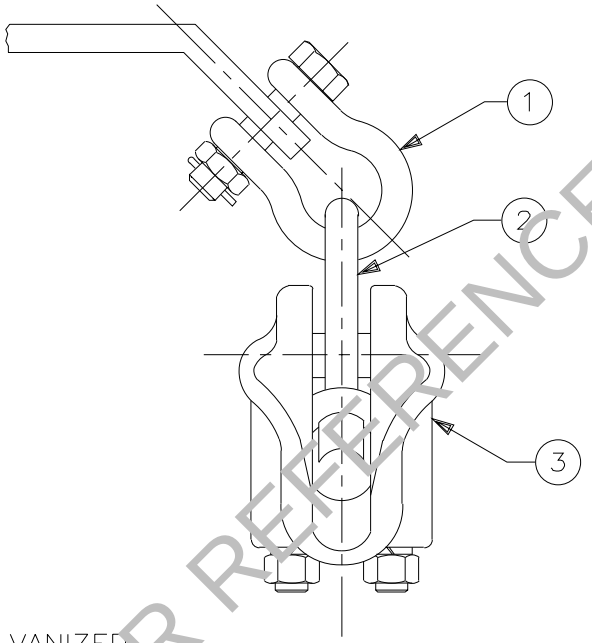


STRAIN/ SIDE VIEW

NOTES: UNLESS OTHERWISE SPECIFIED

SALES					
APPROVALS	DATE	INNOVATIONS IN TRANSMISSION AND DISTRIBUTION	LINDSEY MANUFACTURING COMPANY 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471		
DRAWN HARUT AVETISYAN	8/23/2022	400kV DEAD - END HARDWARE ASSY.			
ENGINEER	XXXX	SIZE B	SCALE 1:30	DWG ER-ASY-13652-DEH-400	REV

ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION	MAT'L	WT.EA. KGS.
1	1	3262 BNC	60 KIP ANCHOR SHACKLE	FS	1.2
2	1	3405	60 KIP CHAIN LINK	FS	0.7
3	1	1329	18 KIP SUSP. CLAMP .20" –.63"	FS	1.4



GENERAL NOTES:

1. ALL FERROUS PARTS ARE HOT DIP GALVANIZED PER ASTM A–123.
2. ALL FERROUS FASTENERS ARE HOT DIP GALVANIZED PER ASTM A–153.
3. ALL COTTER KEYS ARE HUMPBACK STAINLESS STEEL (TYPE 304).

USED ON NUMBERS

NO.	DATE	BY	APP.	DESCRIPTION
				REVISIONS

–STRENGTH– LBS. | REQ–

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

TITLE: OVER HEAD GROUND WIRE ASSEMBLY

TOLERANCES UNLESS OTHERWISE NOTED	FRACTIONS	DECIMALS	
CAST			
FORGE			
MACHINE			
FABRICATION			

WEIGHT		
ASMB–	RAW	FIN.

MATERIAL	FINISH
SEE TABLE	SEE TABLE

NOTE! DO–NOT SCALE DRAWING
BREAK ALL SHARP EDGES

APP.	
CHK.	
DRG.	S.C.
	02/21/06

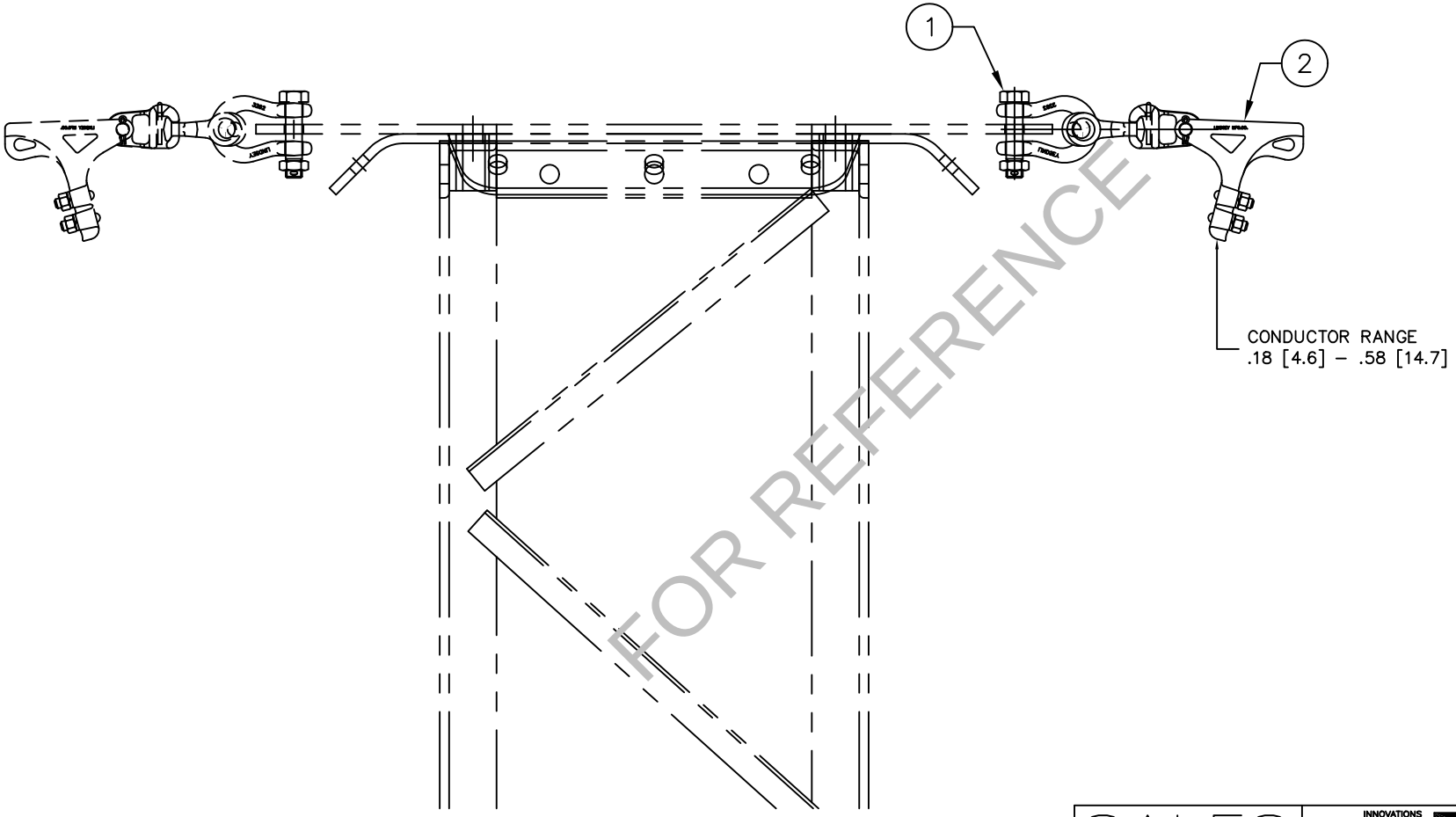
SCALE	NUMBER
NONE	

LAST–REVISION NO.	DATE
1	08/01/06

DRAWING–NUMBER
R–19588–2

ITEM	P/N	DESCRIPTION	QTY.
1	3262BNC	60 KIP ANCHOR SHACKLE	1
2	1701SY	15 KIP QUAD. CLAMP W/SE/YC	1

REVISIONS		
LTR	DESCRIPTION	BY/DATE
1	INITIAL SALES DRAWING RELEASE	P.L. 8/31/06



3. ALL COTTER KEYS ARE HUMPBACK STAINLESS STEEL (TYPE 304).
2. ALL FERROUS FASTENERES ARE HOT DIP GALVANIZED PER ASTM STD. A–153.
1. AL LFERROUS PARTS ARE HOT DIP GALVANIZED PER AST STD. A–123.

NOTES: UNLESS OTHERWISE SPECIFIED

SALES

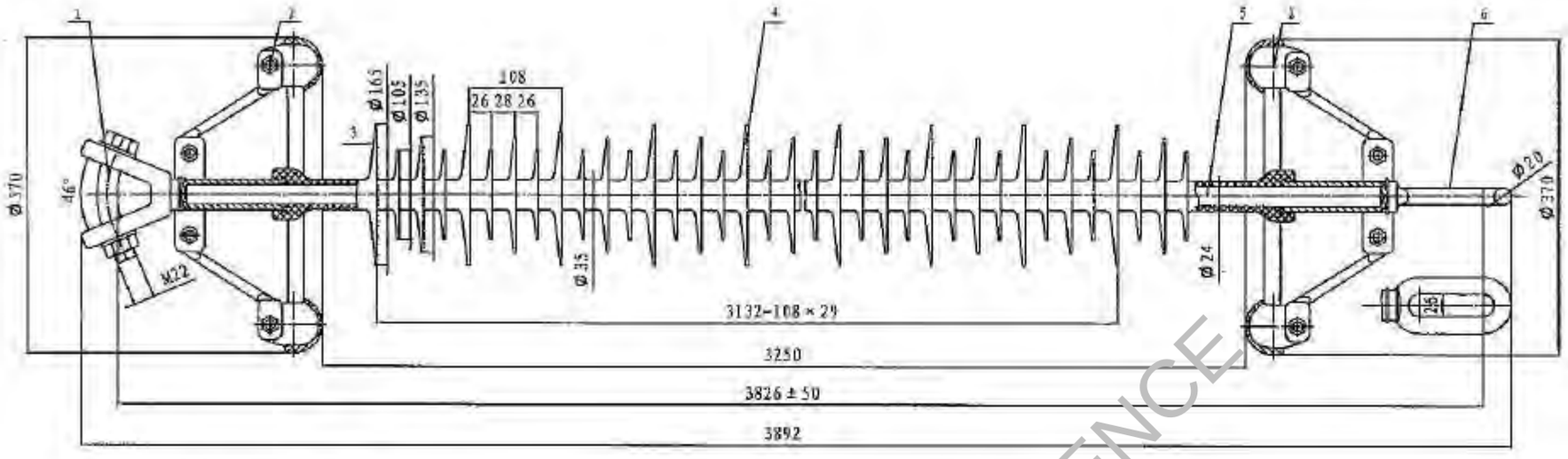
APPROVALS	DATE
DRAWN PAUL LARA	8/31/06
CHECKED SERGIO CORTEZ	8/31/06
ENGINEER SERGIO CORTEZ	8/31/06

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

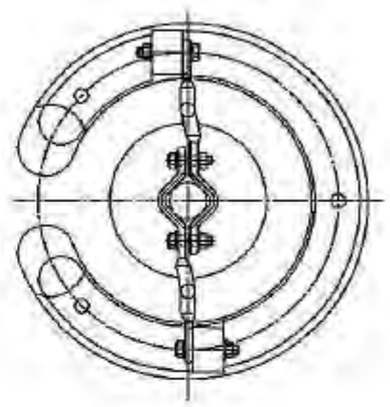
LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

OVERHEAD GROUND WIRE STRAIN HARDWARE ASSY.

SIZE	SCALE	DWG	REV
B	1:6	R-19589-2	1



Right view



Technical Specifications

Electrical data

(1)Rated Voltage :	400 kV
(2)Maximum Voltage :	420 kV
(3)Power Frequency Withstand Voltage (Dry/Wet) :	820/680 kV
(4)Power Frequency Flashover Voltage (Dry/Wet) :	880/780 kV
(5)Switching surge Withstand Voltage (Wet) :	1050 kV
(6)Impulse Withstand Voltage (Dry)(Pos./Neg.):	1550/1650 kV (Peak)
(7)Impulse Flashover Voltage (Pos./Neg.):	1750/1850 kV (Peak)
(8)Minimum Corona Extinction Voltage (rms) Under Dry condition:	320kV
(9)RIV at 1 MHz for phase to earth voltage under 305kV dry condition:	Max. 1000 Micro volt

Mark:

CHANG JIANG ®
长号
400kV/160kN

JIANGSU XIANGYUAN ELECTRIC EQUIPMENT CO., LTD.

Mechanical data

(1)Specified Mechanical Tensile Load	160kN
(2)Routine Test Load	80 kN

Dimensions

(1)Section Length	3826mm
(2)Arcing Distance	3250mm
(3)Min Creepage Distance	13020mm
(4)Shed Spacing(between major sheds)	108mm
(5)Core Rod Diameter	24mm

Color: Light Grey

Standards: IEC 61109.

7003-143

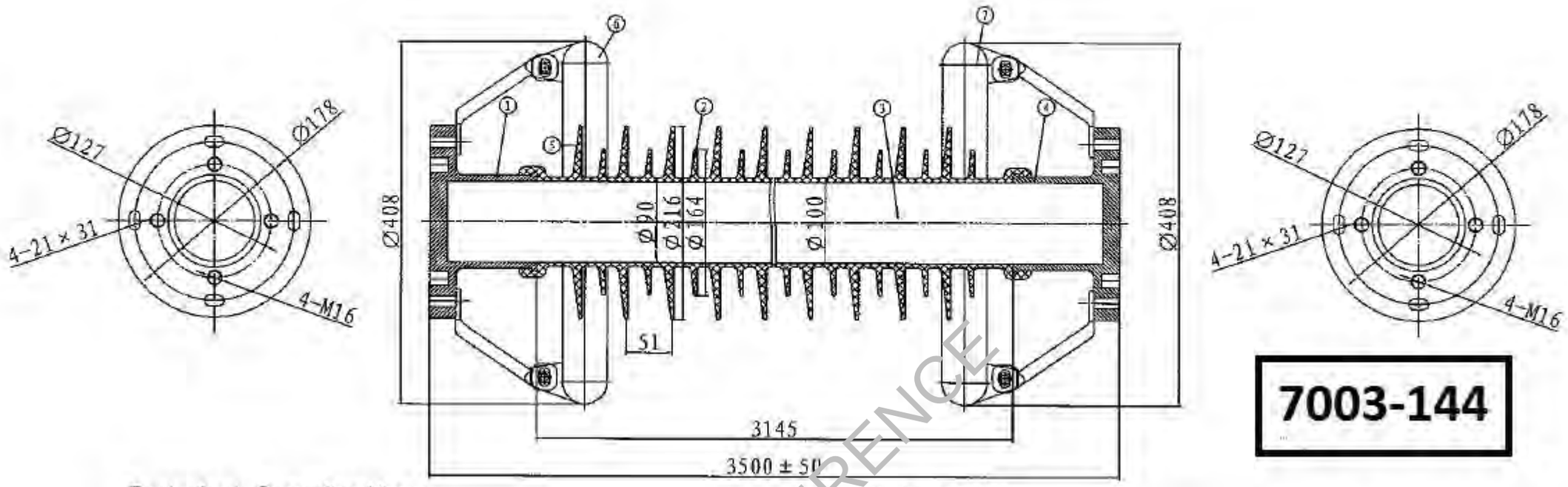
Item	Description	Material	Qty	Weight	Model/Remark
6	Eye	Forged Steel	1	2.35kg	Hot-dip galvanized
5	Core Rod	Glass-fiber Reinforced Epoxy Resin		3.58kg	ECR Rod Ø24
4	Housing	Silicone Rubber	1	13.51kg	Color:Light grey
3	Mark		1		
2	Grading ring	Aluminum Alloy	2	2.72kg/set	Connectors, nuts bolts and washers etc. included
1	Y-clevis	Forged Steel	1	2.55kg	Hot-dip galvanized

NOTES	REV	DESCRIPTION OF REVISION	INITIALS	DATE

JIANGSU XIANGYUAN ELECTRIC EQUIPMENT CO., LTD | DATE OF ISSUE: Aug 07th,2012

400kV Composite Suspension/Tension Insulator

DRN. BY			Drawing NO: 400kV-201120807-2	Sheet 1 of 1
CHE. BY			Model: FXBW-400/160-3826	In millimeter
APP. BY			APPROX NET WEIGHT: 27kg	SCALE-NTS



7003-144

Technical Specifications

Electrical data

(1)Rated Voltage :	400 kV
(2)Maximum Voltage :	420 kV
(3)Power Frequency Withstand Voltage (Dry/Wet) :	820/680 kV
(4)Power Frequency Flashover Voltage (Dry/Wet) :	880/780 kV
(5)Switching surge Withstand Voltage (Wet) :	1050 kV
(6)Impulse Withstand Voltage (Dry) (Pos./Neg.):	1550/1550 kV (Peak)
(7)Impulse Flashover Voltage (Pos./Neg.):	1750/1850 kV (Peak)
(8)Minimum Corona Extinction Voltage (rms) Under Dry condition:	320kV
(9)RIV at 1 MHz for phase to earth voltage under 305kV dry condition:	Max.1000 Micro volt
(10)Dimensions of the metal fitting accord with client's request	

Mechanical data

(1)Specified Mechanical Bending Load	5 kN
(2)Max. Design Cantilever Load	2.5kN
(3)Specified Mechanical Tensile Load	120kN
(4)Specified Mechanical Compression Load	90kN

Dimensions

(1)Section Length	3500mm
(2)Arcing Distance	3145mm
(3)Min Creepage Distance	13020mm
(4)Shed Spacing(between major sheds)	51mm
(5)Core Rod Diameter	90mm

Color: Light Grey

Standards: IEC 61109

Mark:

CHANG GONG ®

400kV/5kN

JIANGSU XIANGYUAN ELECTRIC EQUIPMENT CO., LTD.

Item	Description	Material	Qty	Weight	Remark
7	Grading ring	Aluminum Alloy	1	3.5kg	
6	Grading ring	Aluminum Alloy	1	3.5kg	
5	Mark		1		
4	Bottom Fitting	Cast Steel	1	5.80kg	Hot-dip galvanized
3	Core Rod	Glass fiber reinforced Epoxy Resin	1	48.68kg	Rod Ø90
2	Weathersheds	Silicone Rubber	1	28.98kg	Color: Light Grey
1	Top Fitting	Cast Steel	1	5.80kg	Hot-dip galvanized

NOTES	REV	DESCRIPTION OF REVISION	INITIALS	DATE

JIANGSU XIANGYUAN ELECTRIC EQUIPMENT CO., LTD. | DATE OF ISSUE: Aug 07th,2012

400kV Composite Station Post Insulator

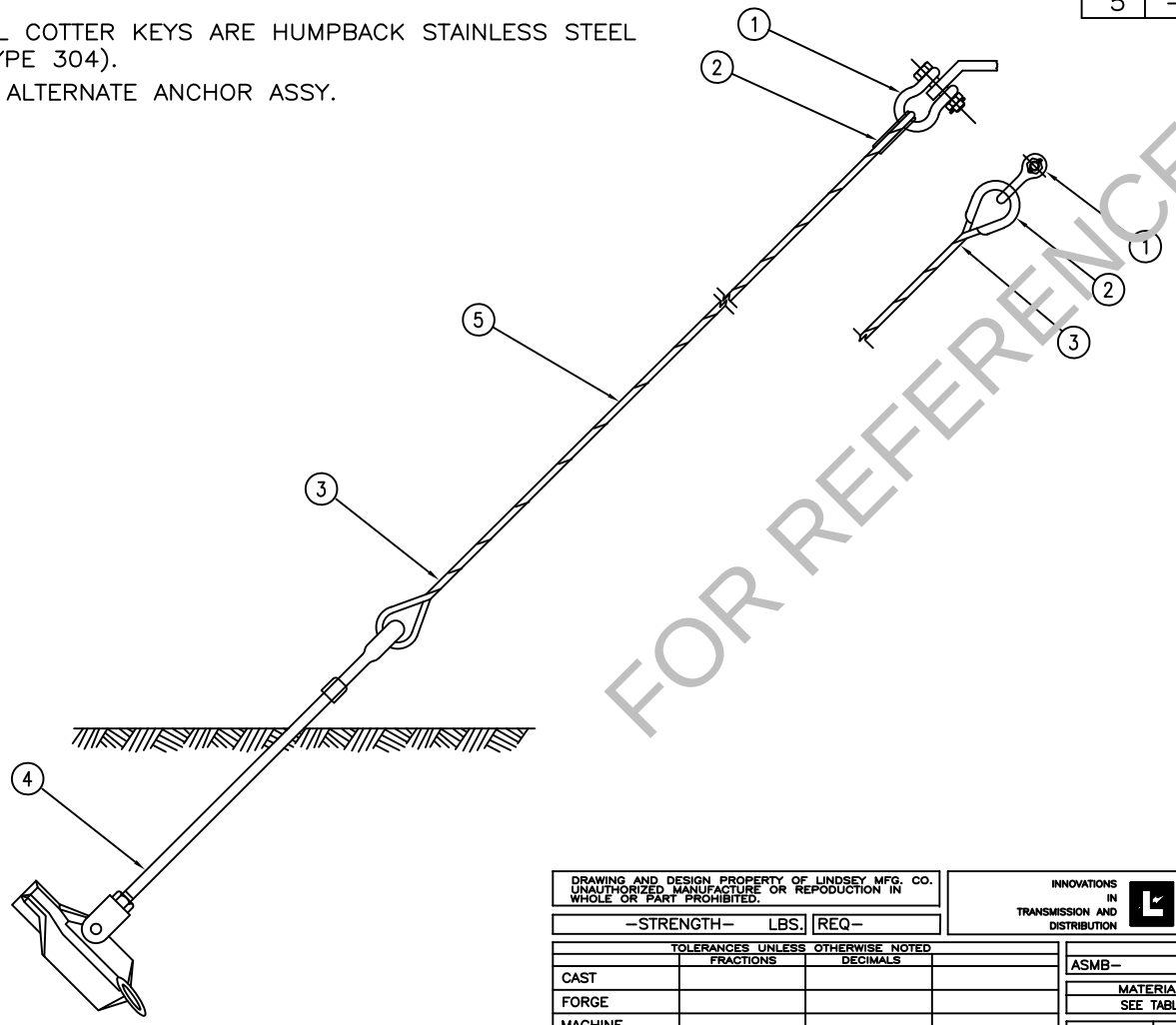
DRN. BY			Drowing NO: 400kV-20120807-1	
CHE. BY			Model: FZSW-400/5	In millimeter
APP. BY			APPROX NET WEIGHT: 96.4kg	SCALE: NTS

GENERAL NOTES:

1. ALL FERROUS PARTS ARE HOT DIP GALVANIZED PER ASTM A–123.
2. ALL FERROUS FASTENERS ARE HOT DIP GALVANIZED PER ASTM A–153.
3. ALL COTTER KEYS ARE HUMPBACK STAINLESS STEEL (TYPE 304).

* OR ALTERNATE ANCHOR ASSY.

ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION	MAT'L	WT.EA. KGS.
1	1	3262 BNC	60 KIP ANCHOR SHACKLE	FS	1.2
2	1	7950	WIRE ROPE THIMBLE	STL.	0.04
3	2	R–13467	PREFORMED GUY GRIP	STL	2.3
4	1	R–16624*	MR ANCHOR ASSEMBLY	STL	18.5
5	–	7045/L	GUYWIRE 9/16 X 19 EHS	19	



USED ON NUMBERS	NO.	DATE	BY	APP.	DESCRIPTION
					REVISIONS

–STRENGTH– LBS. | REQ–

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969–3471

TITLE: GUY WIRE ASSEMBLY USING HYDRAULICALLY INSTALLED ANCHORS

TOLERANCES UNLESS OTHERWISE NOTED	FRACTIONS	DECIMALS
CAST		
FORGE		
MACHINE		
FABRICATION		

WEIGHT: ASMB– | RAW | FIN.

MATERIAL: SEE TABLE | FINISH: SEE TABLE

NOTE! DO–NOT SCALE DRAWING; BREAK ALL SHARP EDGES

APP. | CHK. | DRG. S.C. 02/21/06

SCALE: NONE

NUMBER:

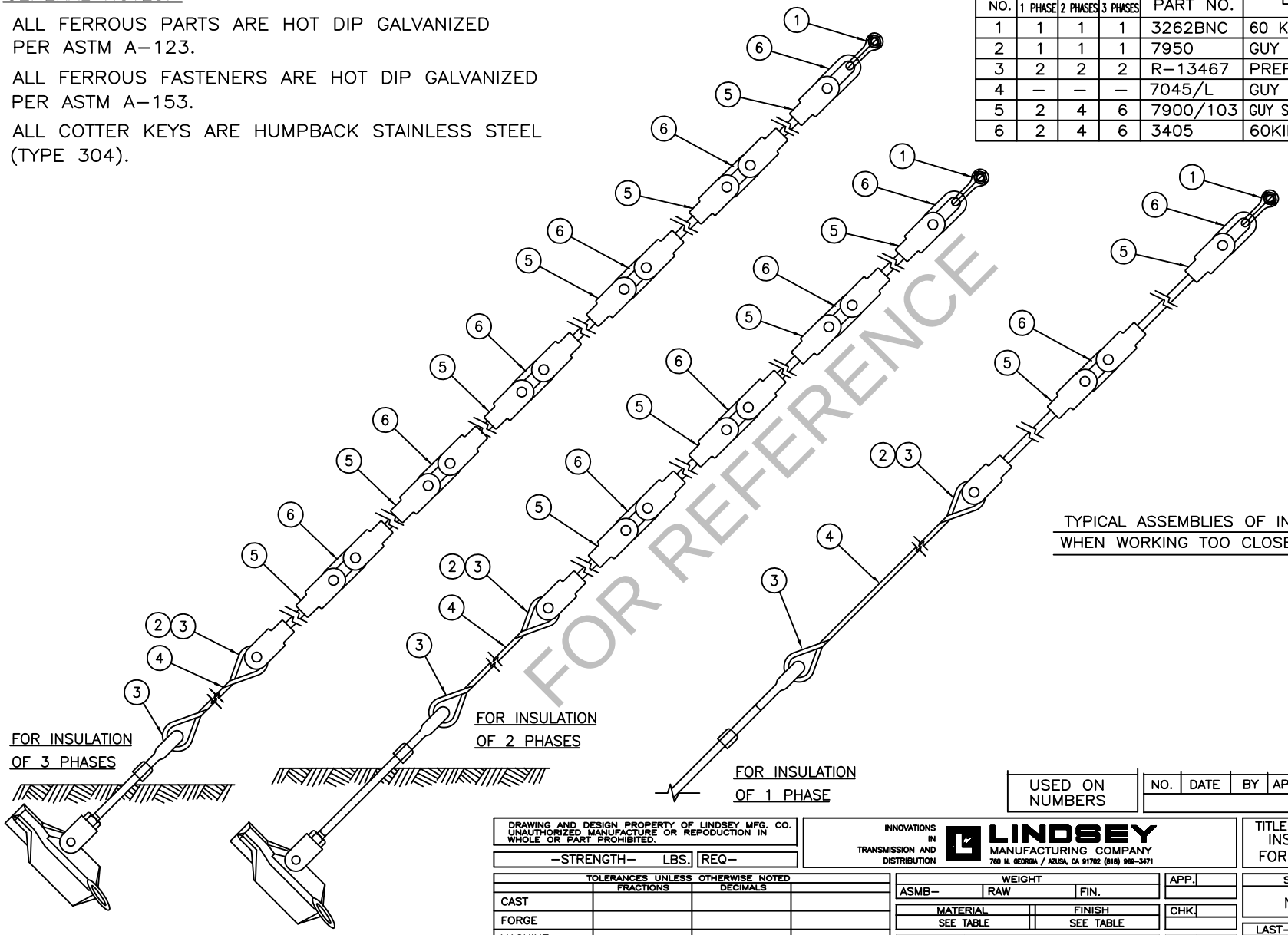
LAST–REVISION: NO. 1 | DATE 08/31/06

DRAWING–NUMBER: R–19588–3

GENERAL NOTES:

1. ALL FERROUS PARTS ARE HOT DIP GALVANIZED PER ASTM A–123.
2. ALL FERROUS FASTENERS ARE HOT DIP GALVANIZED PER ASTM A–153.
3. ALL COTTER KEYS ARE HUMPBACK STAINLESS STEEL (TYPE 304).

ITEM NO.	QUANTITY 1 PHASE	2 PHASES	3 PHASES	LINDSEY PART NO.	DESCRIPTION	MAT'L	WT.EA. KGS.
1	1	1	1	3262BNC	60 KIP ANCHOR SHACKLE	F.S.	1.2
2	1	1	1	7950	GUY WIRE THIMBLE	D.I.	0.4
3	2	2	2	R–13467	PREFORMED GUY GRIP	STL	2.3
4	–	–	–	7045/L	GUY WIRE 9/16 x 19 EHS	STL	–
5	2	4	6	7900/103	GUY STRAIN INSUL., 103" LONG	F.G.	4.5
6	2	4	6	3405	60KIP CHAIN LINK	F.S.	0.7



TYPICAL ASSEMBLIES OF INSULATED GUY WIRES WHEN WORKING TOO CLOSE TO ENERGIZED LINES.

USED ON NUMBERS

NO.	DATE	BY	APP.	DESCRIPTION
REVISIONS				

–STRENGTH– LBS. | REQ–

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969–3471

TITLE: INSULATED GUY WIRE ASSEMBLIES FOR EMERGENCY REST. STRUCTURES

TOLERANCES UNLESS OTHERWISE NOTED	FRACTIONS	DECIMALS	
CAST			
FORGE			
MACHINE			
FABRICATION			

WEIGHT: ASMB– | RAW | FIN.

MATERIAL: SEE TABLE | FINISH: SEE TABLE

NOTE! DO–NOT SCALE DRAWING; BREAK ALL SHARP EDGES

APP. | CHK. | DRG. P.L. 05/8/2019

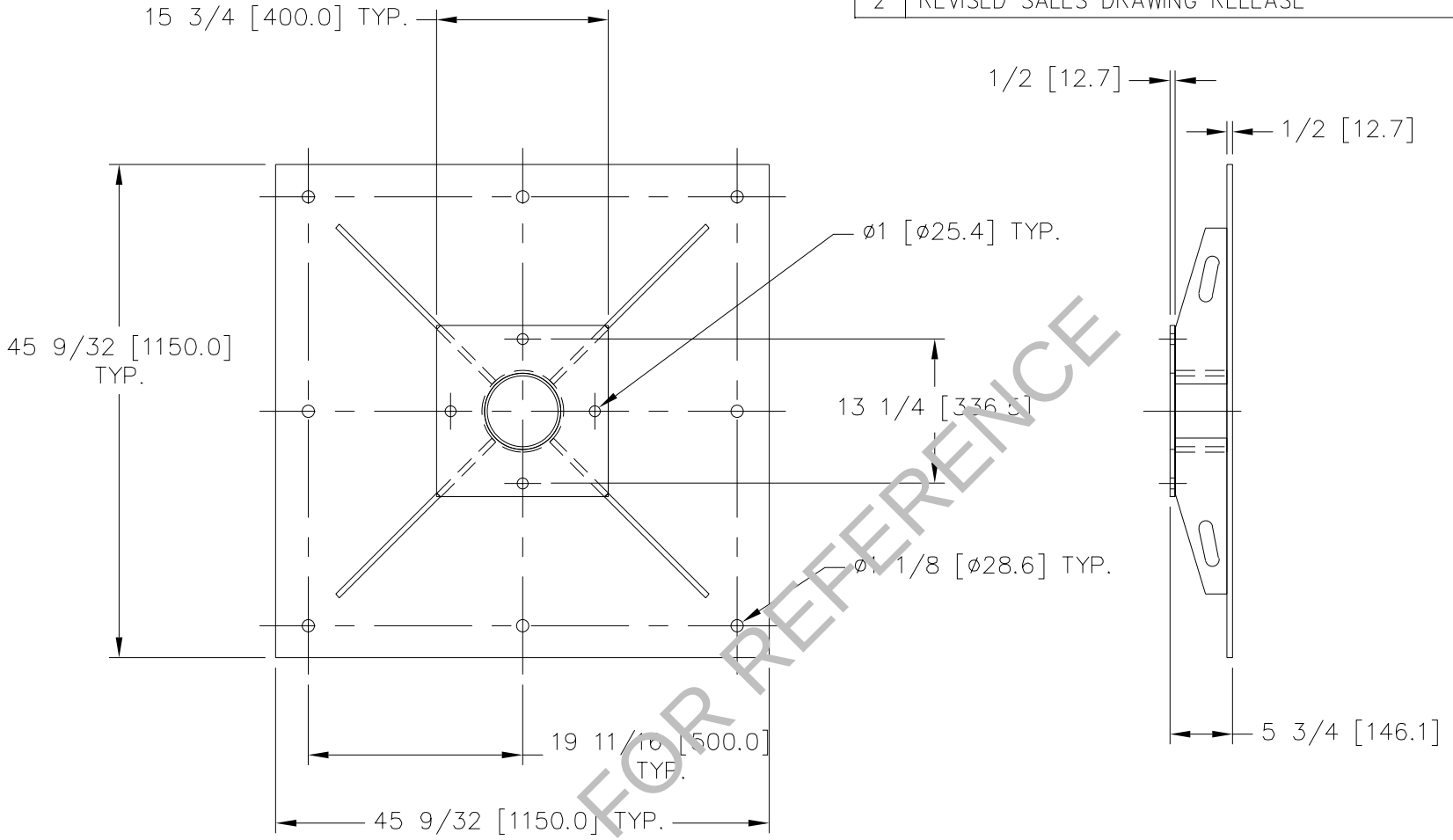
SCALE: NONE

MAHARASHTRA SEB – INDIA NUMBER

LAST–REVISION NO. | DATE

DRAWING–NUMBER: R–19588–4

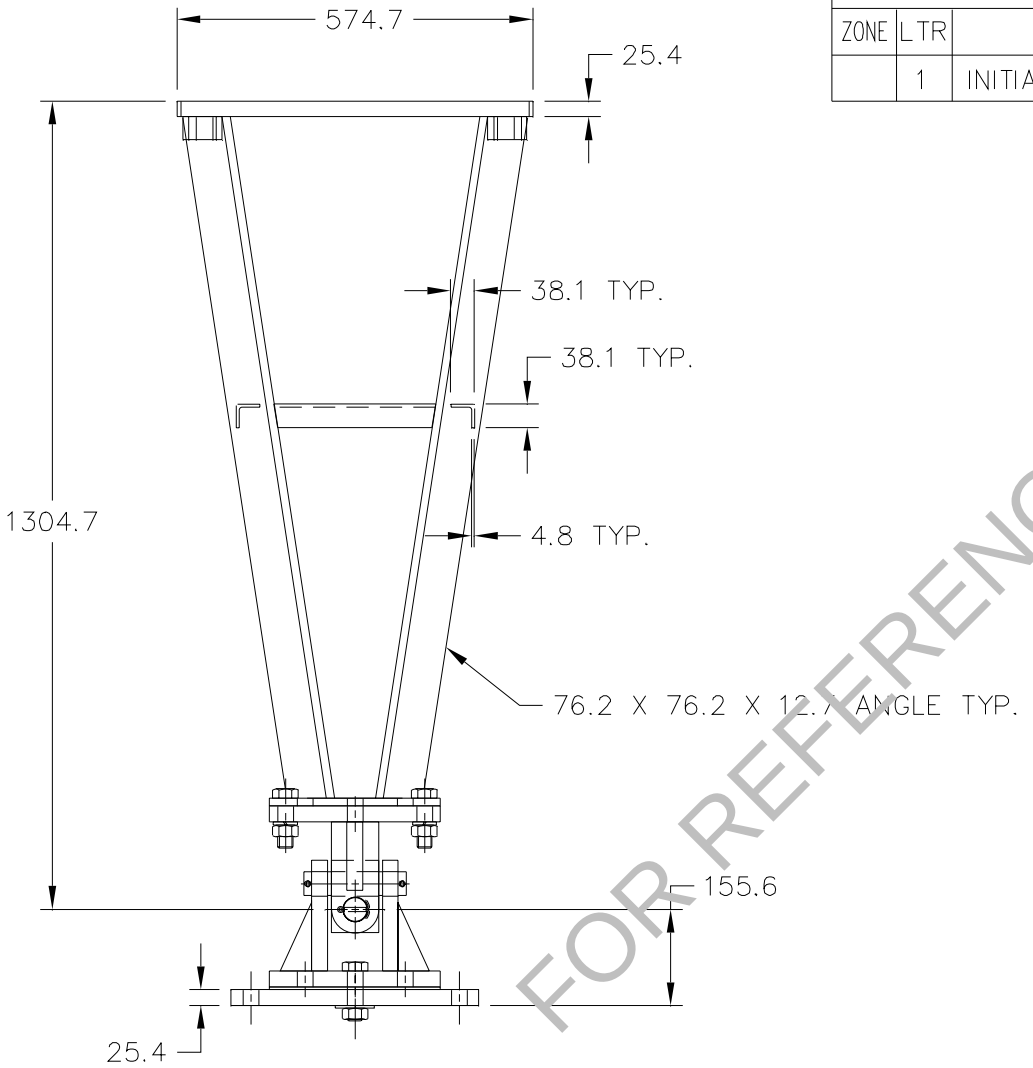
REVISIONS		869
LTR	DESCRIPTION	ENG/DATE
2	REVISED SALES DRAWING RELEASE	P.L. 4/12/07



2. WEIGHT: 132 lbs. [60 Kg]
1. MATERIAL: 6061-T6 ALUMINUM ALLOY
NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	FOUNDATION			
DRAWN PAUL LARA	4/11/07				
CHECKED WILL LEWIS	4/12/07	SIZE A	SCALE 1:15	DWG 7254	REV 2
ENGINEER					

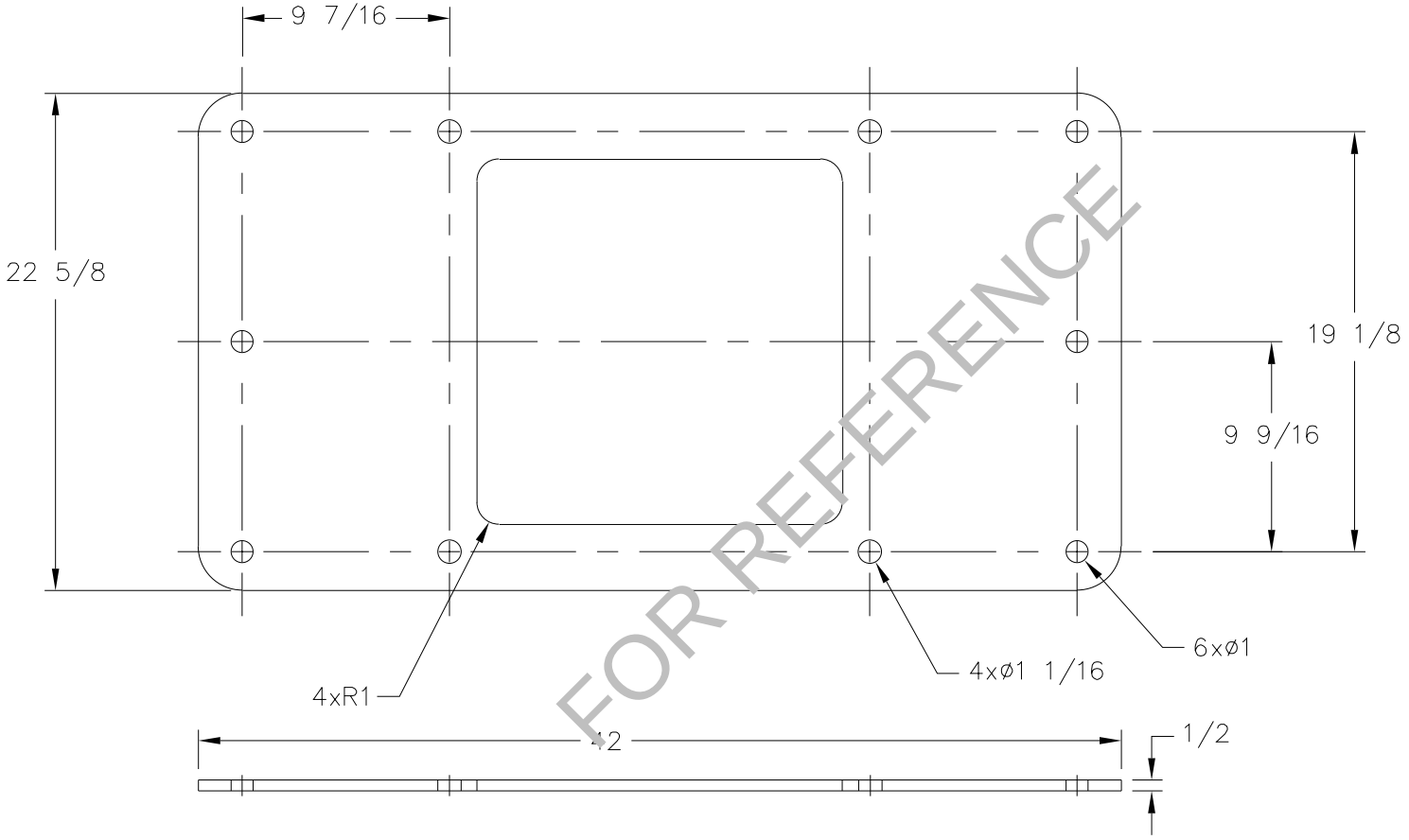
REVISIONS					870
ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	1	INITIAL SALES DRAWING RELEASE	P.L. 11/2/05		



WEIGHT: 77 kg
ALL DIMENSION ARE IN METRIC
NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	GIMBAL TOWER			
DRAWN PAUL LARA	11/2/05				
CHECKED PAT ROWAN	XXXX	SIZE A	SCALE 1:300	DWG 7224	REV 1
ENGINEER PAT ROWAN	XXXX				

REVISIONS					
ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	2	REVISED SALES RELEASE	HB 5/4/07		



2. APPROX. WEIGHT= 14 Kgs. (30 Lbs.)

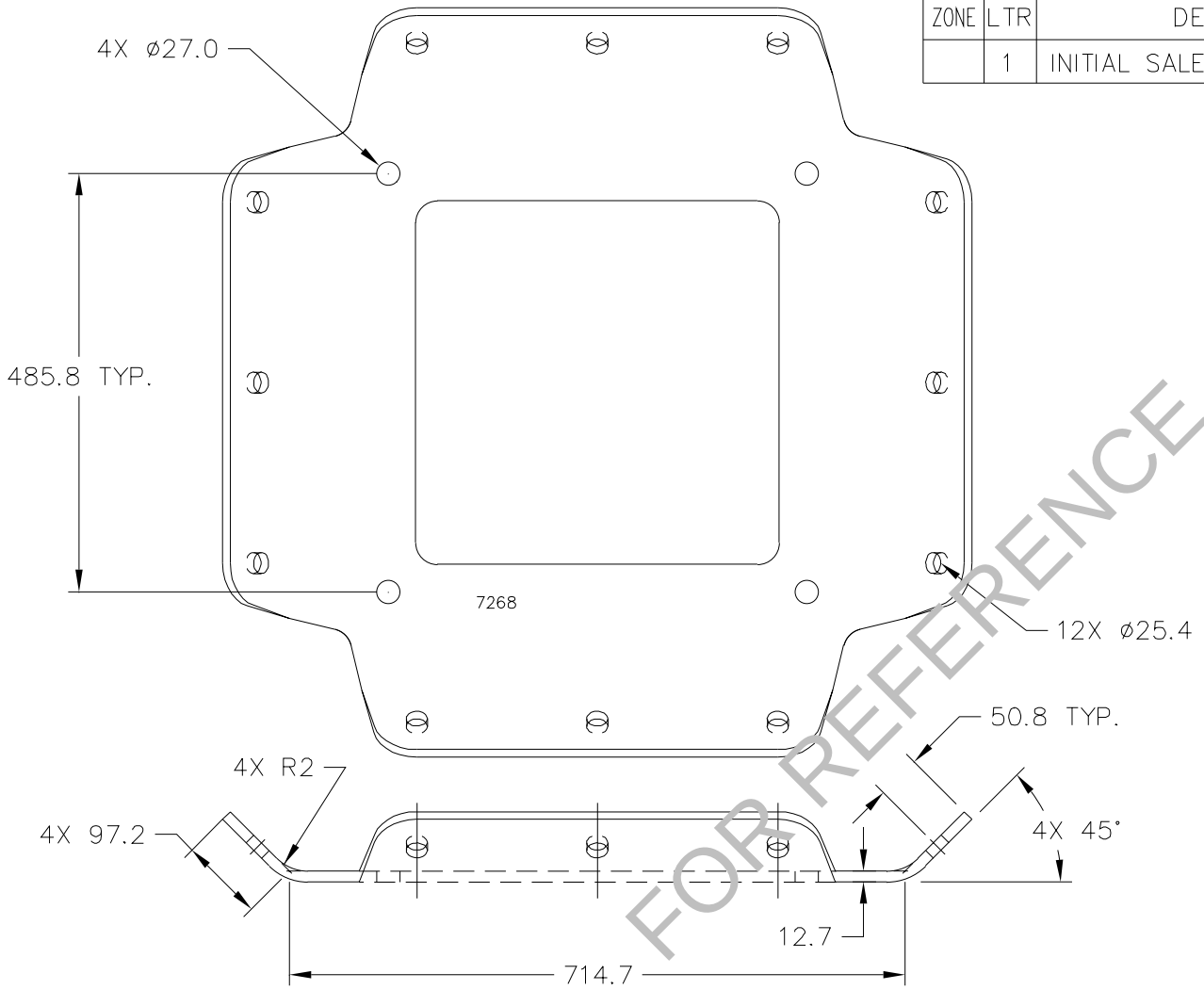
1. MATL.: 1/2THK. PLATE, AL. ALY. 6061-T6

NOTES: UNLESS OTHERWISE SPECIFIED

FAB		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	GUY PLATE 0-0 EXTENDED			
DRAWN HASKELL BARNETT	5/4/07				
CHECKED		SIZE A	SCALE 1:8	DWG 7269	REV 2
ENGINEER					

872

REVISIONS					
ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	1	INITIAL SALES DRAWING RELEASE	P.L. 11/2/05		



2. WEIGHT: 24 kg.
1. ALL DIMENSIONS ARE IN METRIC.
NOTES: UNLESS OTHERWISE SPECIFIED

SALES

APPROVALS		DATE
DRAWN	PAT ROWAN	11/2/05
CHECKED	AJAY BHAKTA	XXXX
ENGINEER	PAT ROWAN	XXXX

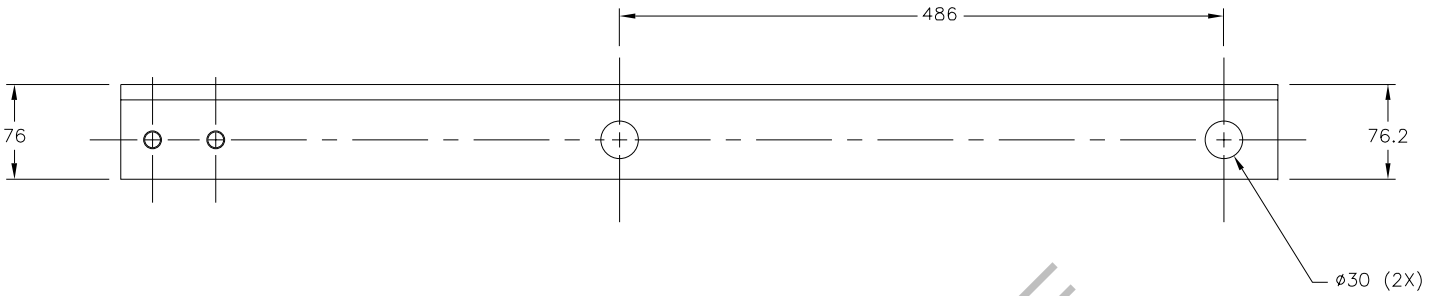
INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

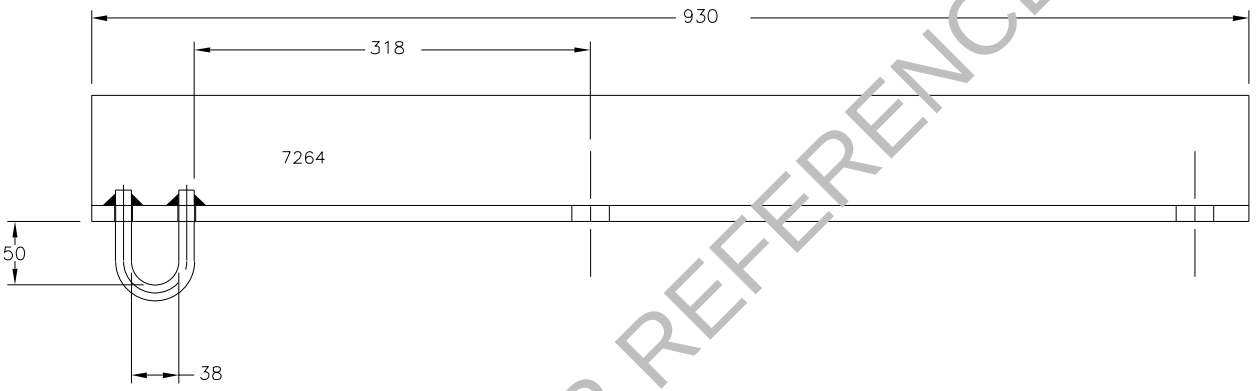
LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

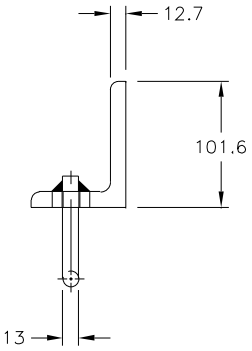
GUY PLATE 45-45 600 SERIES

SIZE	SCALE	DWG	REV
A	1:8	7268	1

REVISIONS 873					
ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	1	SALES RELEASE	1/16/04		



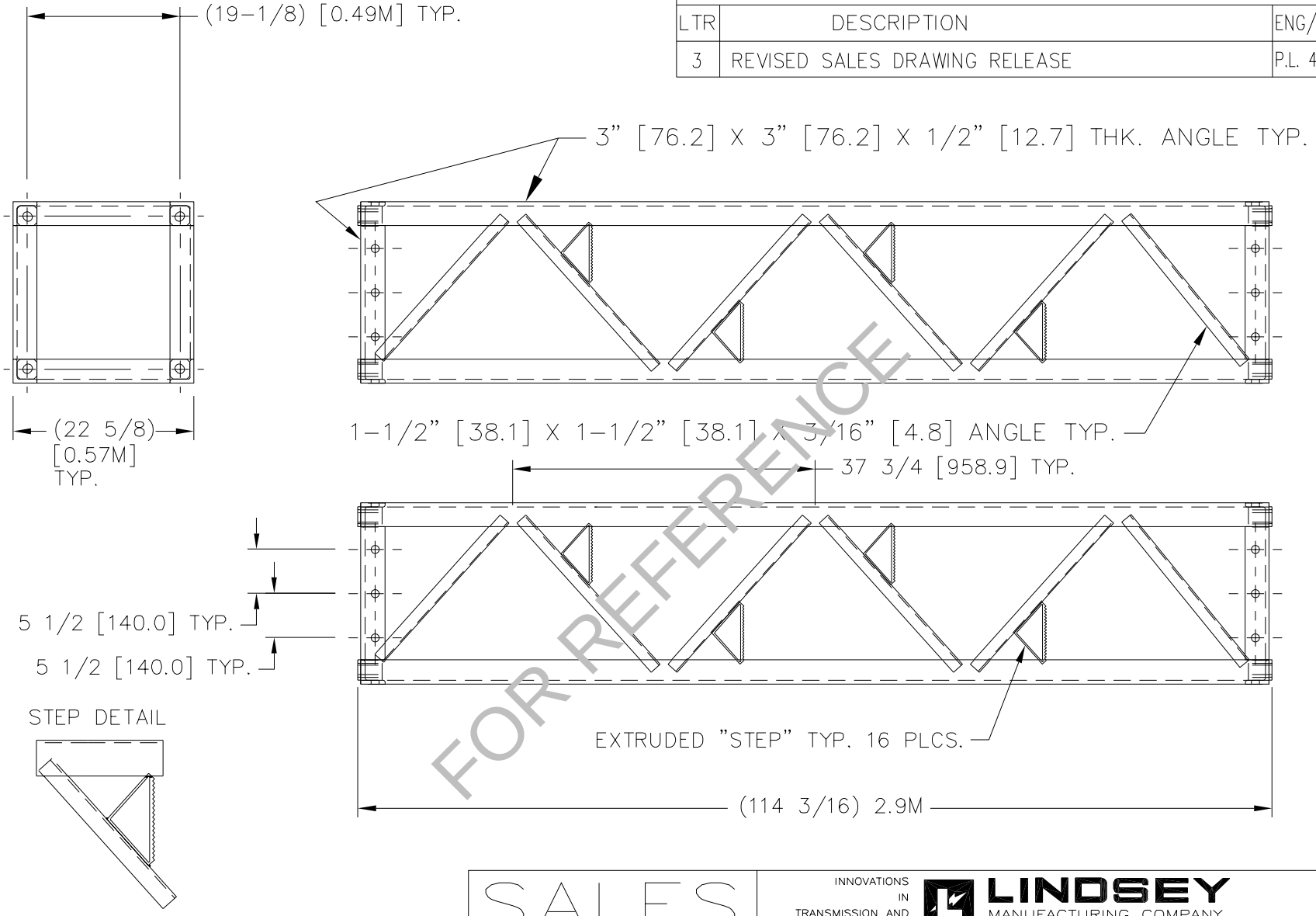




2. WEIGHT: 15.9 kg.
1. ALL DIMESNIONS ARE IN METRIC.
NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	OHGW BRACKET			
DRAWN PAT ROWAN	1/16/04				
CHECKED AJAY BHAKTA	1/16/04	SIZE B	SCALE 1:4	DWG 7264	REV 1
ENGINEER PAT ROWAN	1/16/04				

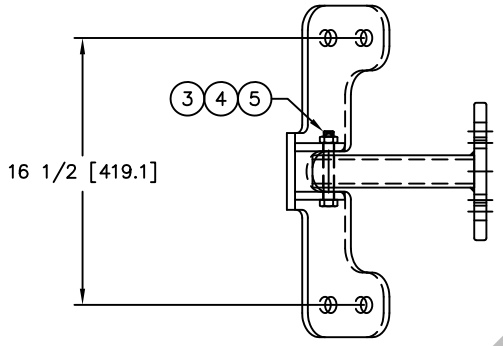
REVISIONS		874
LTR	DESCRIPTION	ENG/DATE
3	REVISED SALES DRAWING RELEASE	P.L. 4/12/07

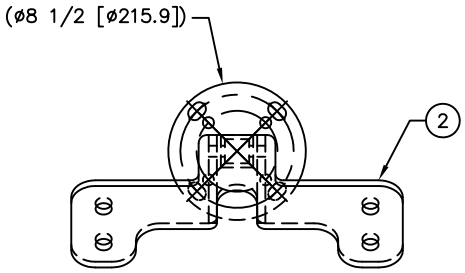


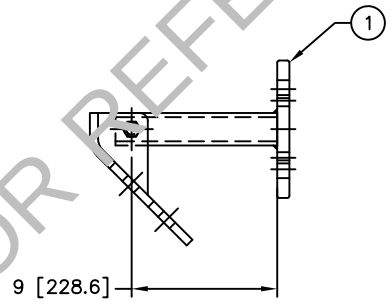
2. WEIGHT: 209.4 lbs. [95KG].
1. MATERIAL: 6061-T6 ALUMINUM ALLOY.
NOTES: UNLESS OTHERWISE SPECIFIED

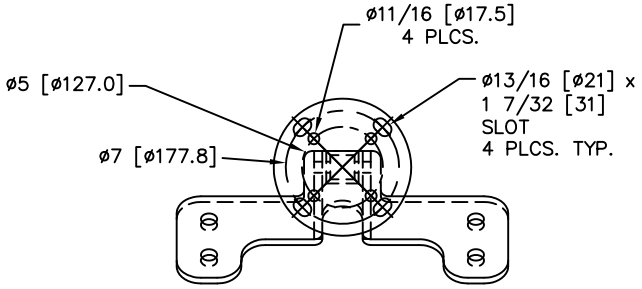
SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	2.9 TOWER SECTION			
DRAWN PAUL LARA	8/18/06				
CHECKED STEVE SCHOLFIELD	6/12/06	SIZE A	SCALE 1:18	DWG 7262	REV 3
ENGINEER WILL LEWIS	4/12/07				

REVISIONS			
LTR	DESCRIPTION	ENG/DATE	BY/DATE
1	INITIAL SALES DRAWING RELEASE	P.L. 6/19/17	P.L. 7/24/17







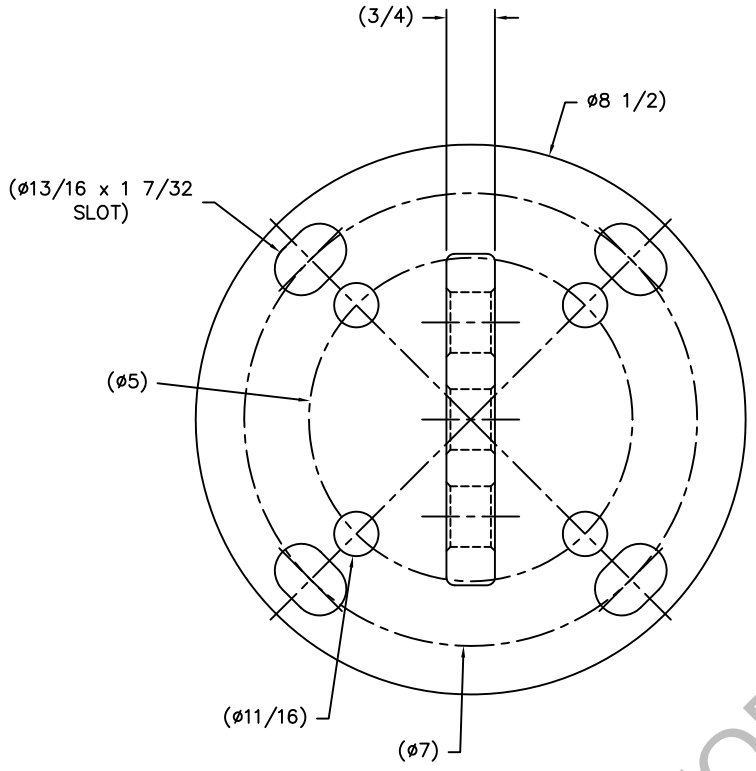


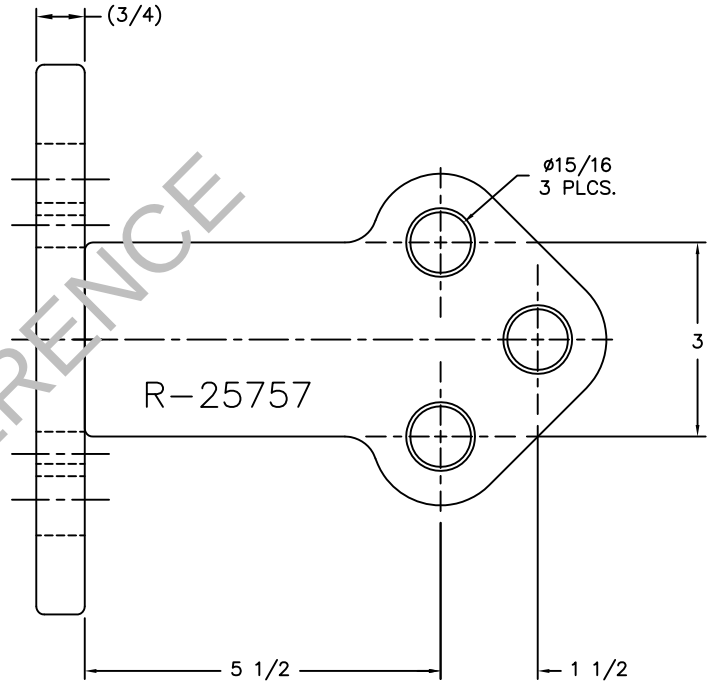
3. WEIGHT: 37 LBS.
2. FINISH: HOT DIP GALVANIZE PER ASTM STD. A-123.
1. MATERIAL: SEE B.O.M.

NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	POST INSULATOR MOUNT			
DRAWN PAUL LARA	6/19/17				
CHECKED MARWA ELSHRAGTY	6/19/17	SIZE B	SCALE 1:8	DWG R-25756	REV 1
ENGINEER SERGIO CORTEZ	6/19/17				

REVISIONS			
LTR	DESCRIPTION	ENG/DATE	BY/DATE
1	INITIAL SALES DRAWING RELEASE	P.L. 7/12/17	P.L. 7/24/17





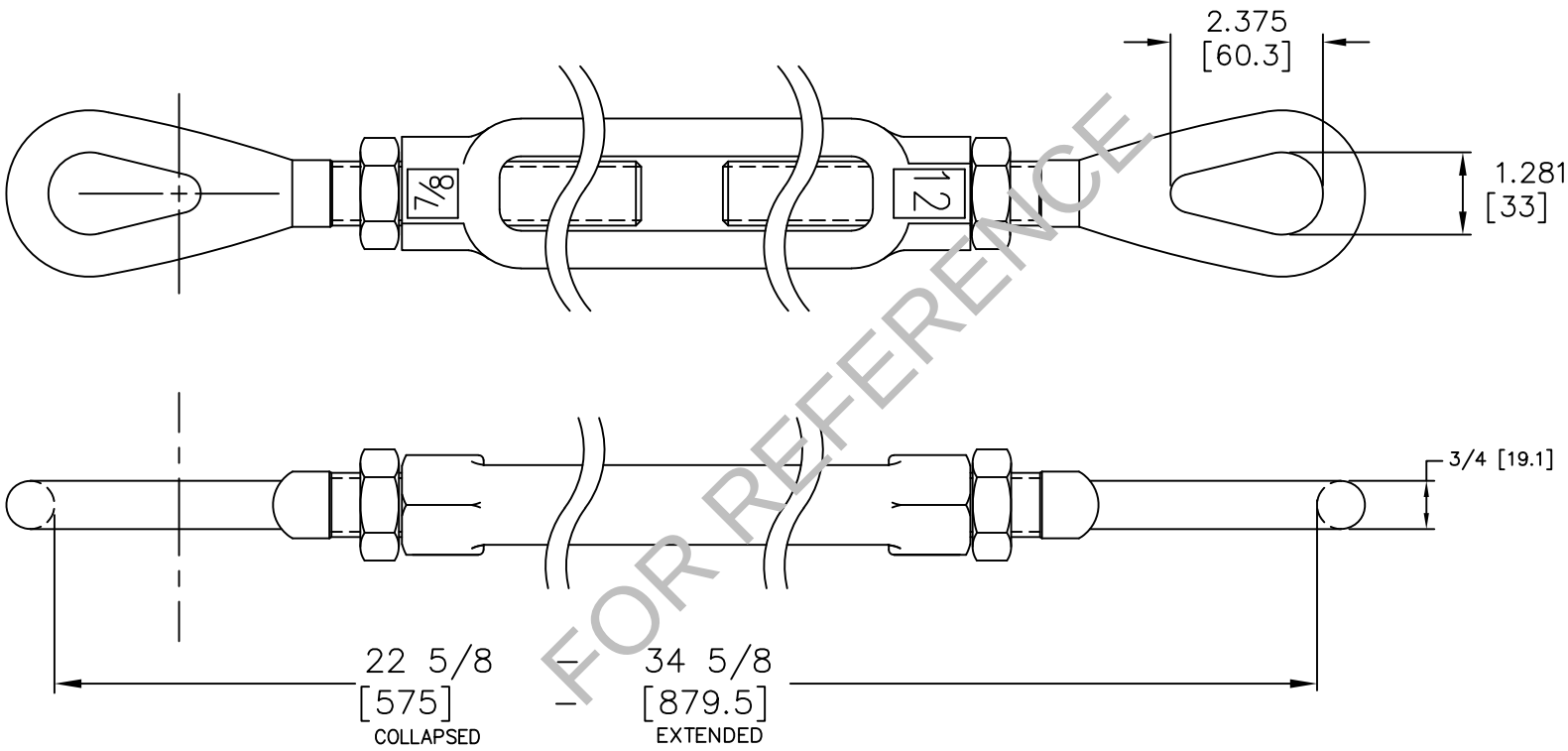
3. WEIGHT: 18 LBS.
2. FINIHSH: HOT DIP GALVANIZER PER ASTM A-123.
1. MATERIAL: STEEL

NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	POST END CAP ASSY.			
DRAWN PAUL LARA	6/19/17				
CHECKED MARWA ELSAHRGATY	7/24/17	SIZE B	SCALE 1:1	DWG R-25757	REV 1
ENGINEER SERGIO CORTEZ	7/24/17				

REVISIONS			
LTR	DESCRIPTION	ENG/DATE	BY/DATE
1	SALES RELEASE	P.L. 10/7/05	W.L. 7/21/08
2	UPDATE WEIGHT	H.A. 5/01/24	

877

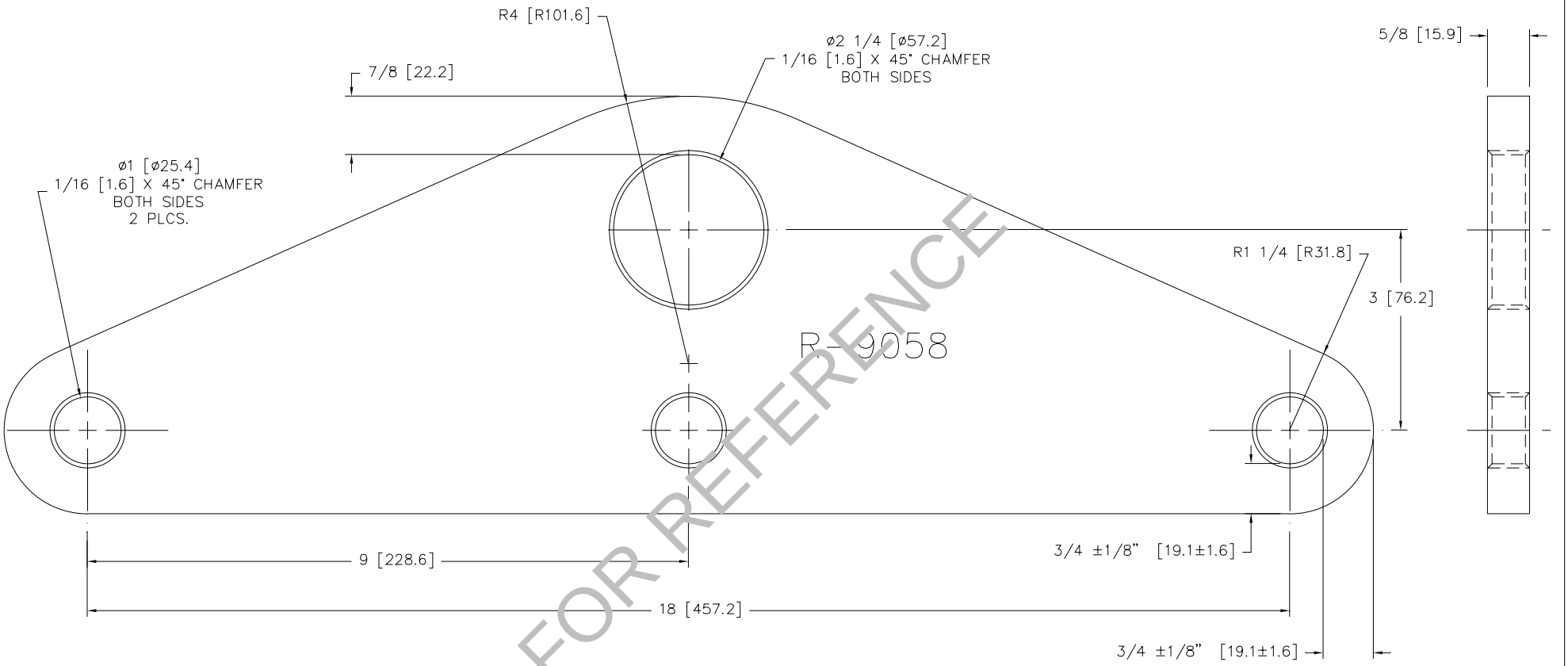


6. ALL DIMENSIONS IN [x] ARE METRIC.
5. ULTIMATE STRENGTH: 35 KIP [156kN].
4. WEIGHT: 7.6 LBS. [3.5kG]
3. ALL FERROUS FASTENERS ARE HOT DIP GALVANIZED PER ASTM STD. A-153.
2. ALL FERROUS PARTS ARE HOT DIP GALVANIZED PER ASTM STD. A-123.
1. MAT'L: FORGED STEEL PER REQUIRED ASTM STANDARDS.

NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	35KIP TURNBUCKLE EYE-EYE (7/8")			
DRAWN PAUL LARA	2/11/03				
CHECKED PAT ROWAN	2/17/03	SIZE B	SCALE 1:2	DWG 3790EE	REV 1
ENGINEER AJAY BHAKTA	2/17/03				

REVISIONS 878					
ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	1	INITIAL SALES DRAWING RELEASE	P.L. 3/7/06		



4. WEIGHT: 14.2 LBS. [16.4Kg.]
3. STAMP PART NO "R-9058" WITH 3/8" [9.5] STL DIES
2. FINISH: HOT DIP GALV. PER ASTM STD. A-123.
1. MAT'L: 5/8" [15.9] THK PLT. A-572 H.R.S.

NOTES: UNLESS OTHERWISE SPECIFIED

SALES

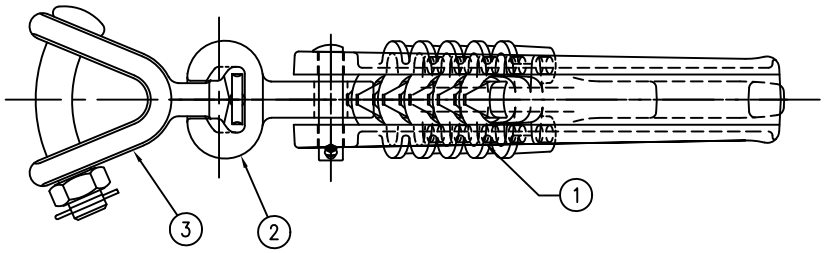
INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

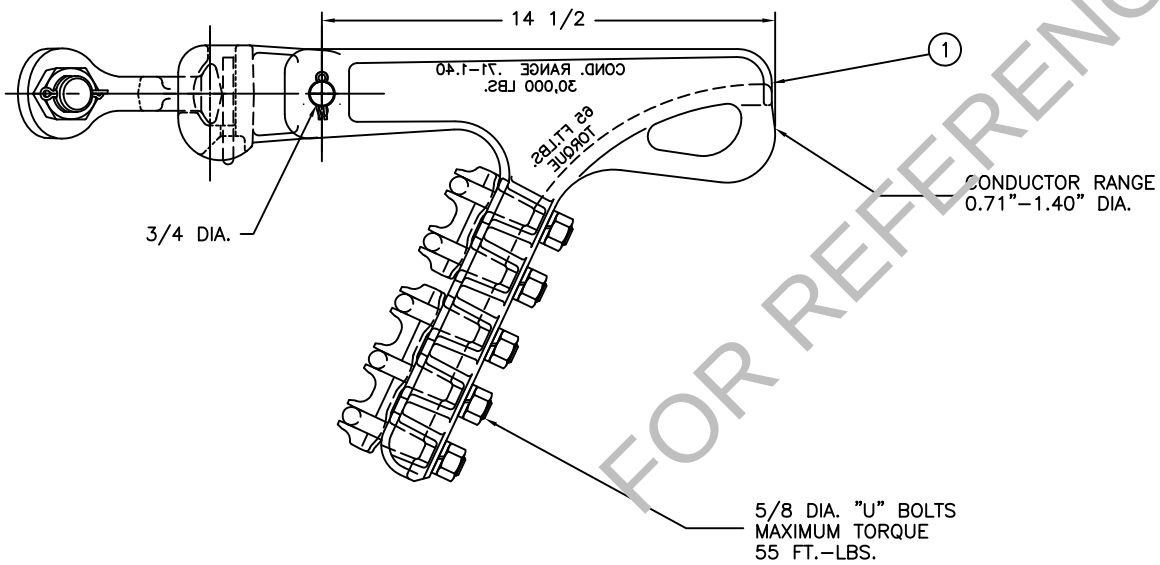
APPROVALS	DATE
DRAWN PAUL LARA	6/28/02
CHECKED PAT ROWAN	7/1/02
ENGINEER PAT ROWAN	7/1/02

30 KIP [133.4 kN] TRIANGULAR YOKE PLATE

SIZE	SCALE	DWG	REV
B	1:1.5	R-9058	1



ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION	MAT'L
1	1	1710	35 KIP STRAIN CLAMP ASSEMBLY	AL.
2	1	R-10024	30 KIP SOCKET EYE ASSEMBLY	D.I.
3	1	3089	30 KIP "Y" CLEVIS-BALL ASSEMBLY	F.S.



GENERAL NOTES

1. MATERIAL: CLAMP, ALUMINUM A356-T6.
   SOCKET EYE, 60-40-18 DUCTILE IRON PER ASTM STD. A-536
   Y-CLEVIS BALL, FORGED STL. PER ASTM STD. A-576
2. ALL FERROUS PARTS ARE HOT DIP GALVANIZED PER ASTM STD. A-123
3. ALL FERROUS FASTENERS ARE HOT DIP GALVANIZED PER ASTM STD. A-153
4. ALL COTTER KEYS ARE HUMPBACK STAINLESS STEEL (TYPE 304)
5. WEIGHT : 16.0 LBS. (7.0 KGS.)
6. ULTIMATE STRENGTH: 30,000 lbs. [134 Kn].

USED ON NUMBERS

NO.	DATE	BY	APP.	DESCRIPTION
REVISIONS				

-STRENGTH- LBS. | REQ-

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

TITLE: 30KIP QUADRANT STRAIN CLAMP ASSEMBLY

TOLERANCES UNLESS OTHERWISE NOTED	FRACTIONS	DECIMALS	
CAST			
FORGE			
MACHINE			
FABRICATION			

WEIGHT		
ASMB-	RAW	FIN.
MATERIAL	FINISH	
SEE NOTES	SEE NOTES	

NOTE! DO-NOT SCALE DRAWING
BREAK ALL SHARP EDGES

APP.
CHK.
DRG. S.C. 05/02/95

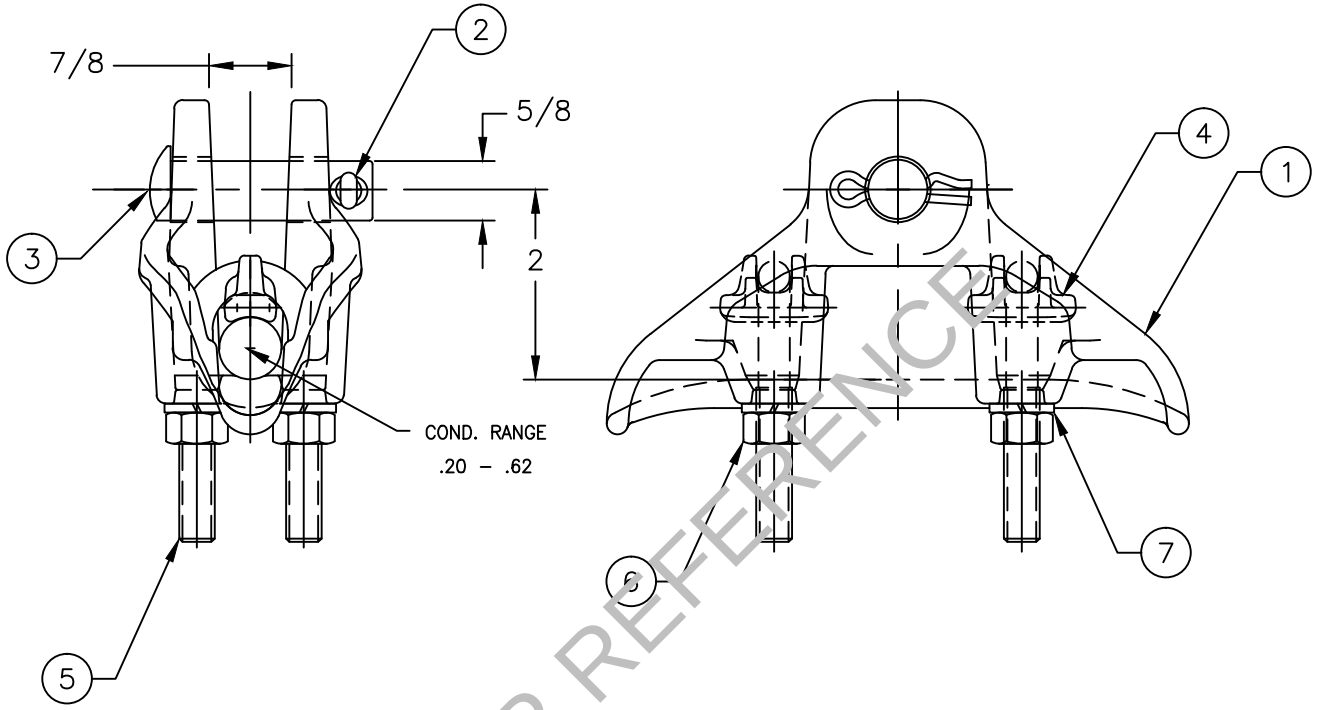
SCALE: NONE

NUMBER:

LAST-REVISION NO. | DATE

DRAWING-NUMBER: 1710SY

REVISIONS					
ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	B	BOLT REPLACED WITH CLEVIS PIN	HB 9/12/06		



1. MAT'L: 60–40–18 DUCTILE IRON PER ASTM A536
2. FINISH: ALL FERROUS PARTS ARE HOT DIPPED GALV. PER ASTM STD. A–123.
   ALL FERROUS FASTENERS ARE HOT DIPPED GALV. PER ASTM STD. A–153.
3. ALL COTTER KEYS ARE HUMPBACK STAINLESS STEEL (TYPE 304).
4. CALL OUTS ARE FOR INTERNAL BOM REFERENCE ONLY

DIMS IN INCHES BREAK EDGES 0.015
TOLERANCES – UNLESS OTHERWISE SPECIFIED
X/X ±1/32
X.X ±0.06
X.XX ±0.02
X.XXX ±0.005
ANGLES ±1°

ASSY

APPROVALS	DATE
DRAWN HASKELL BARNETT	9/12/06
CHECKED STEVE SCHOLFIELD	9/12/06
ENGINEER HASKELL BARNETT	9/12/06

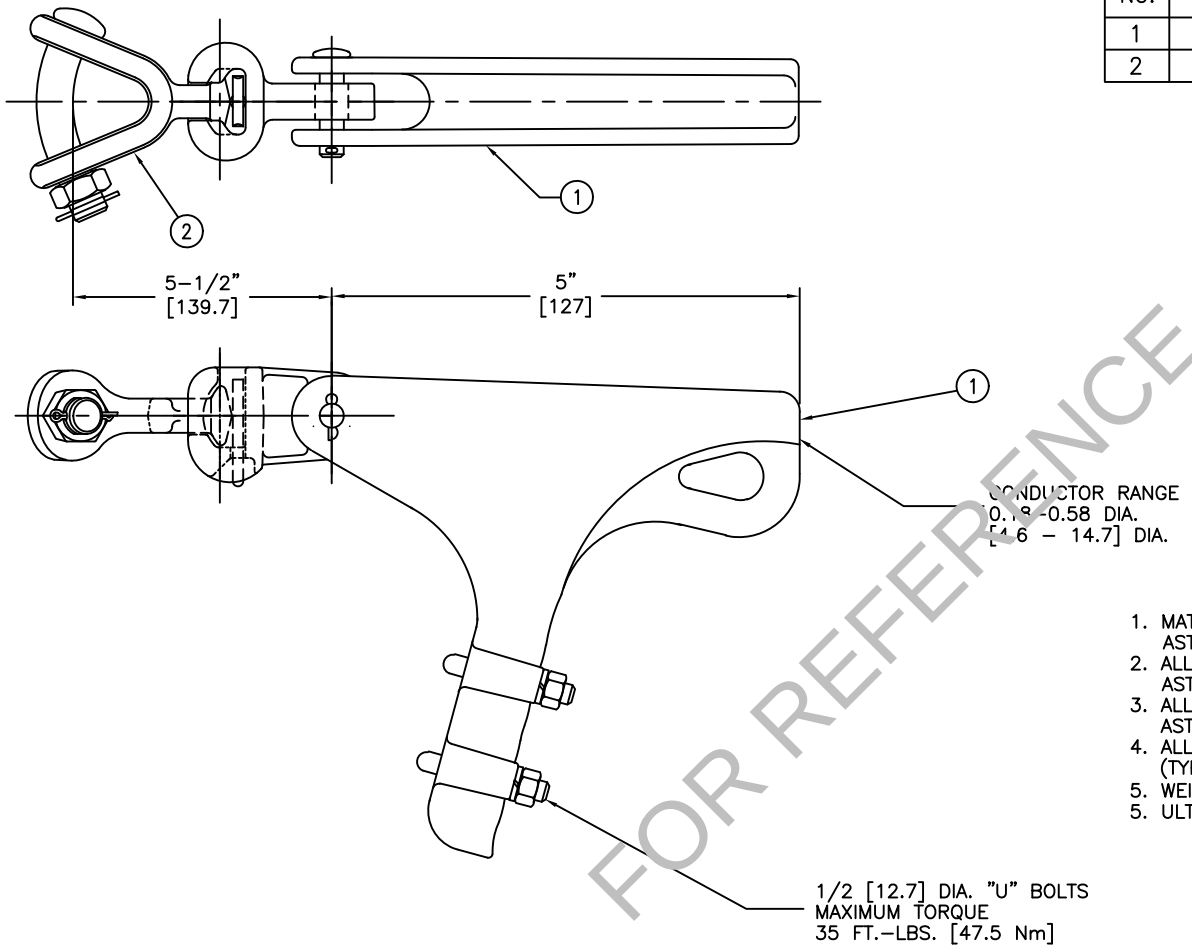
INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (626) 969-3471

17KIP SUSPENSION CLAMP

MATERIAL	FINISH	SIZE	SCALE	DWG	REV
SEE NOTES	SEE NOTES	B	1 : 2	1329	B

ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION	MAT'L
1	1	1701S	20KIP STRAIN CLAMP ASSY. W/S-E	D.I.
2	1	3089	30 KIP "Y" CLEVIS-BALL ASSEMBLY	F.S.



GENERAL NOTES

1. MATERIAL: CLAMP AND SOCKET EYE 60-40-18 DUCTILE IRON PER ASTM STD.A-536, Y-CLEVIS BALL FORGED STL. PER ASTM STD.A-576
2. ALL FERROUS PARTS ARE HOT DIP GALVANIZED PER ASTM STD. A-123
3. ALL FERROUS FASTENERS ARE HOT DIP GALVANIZED PER ASTM STD. A-153
4. ALL COTTER KEYS ARE HUMPBACK STAINLESS STEEL (TYPE 304)
5. WEIGHT : 3.5 LBS.
5. ULTIMATE STRENGTH: 20,000 LBS. [89 Kn]

USED ON NUMBERS	NO.	DATE	BY	APP.	DESCRIPTION
					REVISIONS

-STRENGTH- LBS. | REQ-

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

TITLE: 20 KIP QUADRANT STRAIN CLAMP ASSEMBLY

TOLERANCES UNLESS OTHERWISE NOTED	FRACTIONS	DECIMALS	ANGLES
CAST			
FORGE			
MACHINE			
FABRICATION			

WEIGHT		
ASMB-	RAW	FIN.

MATERIAL	FINISH
SEE NOTES	SEE NOTES

NOTE! DO-NOT SCALE DRAWING
BREAK ALL SHARP EDGES

APP.
CHK.
DRG. 09/21/93

SCALE: NONE

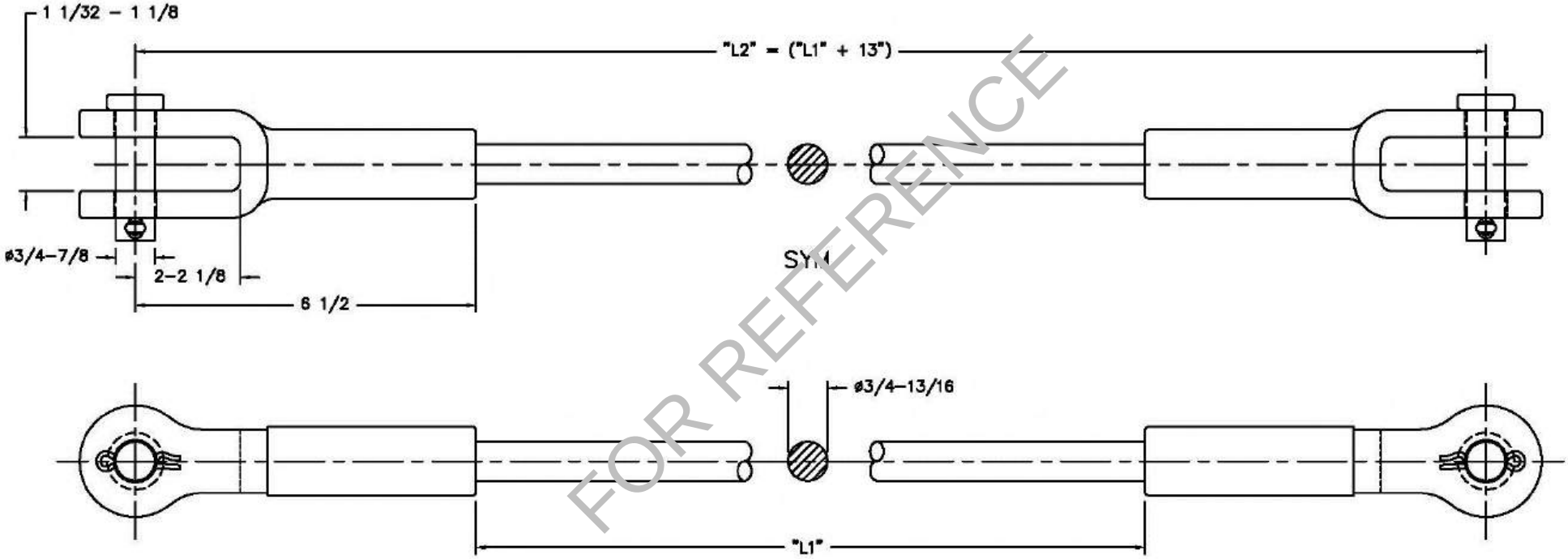
LAST-REVISION NO. | DATE

NUMBE

DRAWING-NUMBER: 1701SY

LINDSEY PART NO.	LENGTH "L1"	LENGTH "L2"	MACLEAN POWER SYSTEMS PT.NO.
7900/103	90"	103"	GCC36-90
7900/109	96"	109"	GCC36-96
7900/132	120"	132"	GCC36-120
7900/158	144"	158"	GCC36-144

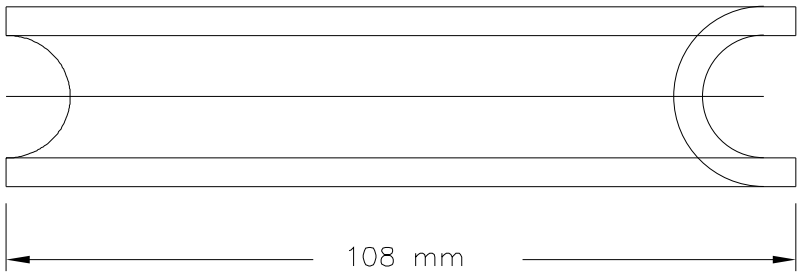
REVISIONS			
LTR	DESCRIPTION	BY /DATE	APPD BY /DATE
C	REVISED DRAWING TO MATCH A RANGE OF SUPPLIERS	P.L. 5/31/16	M.K. 5/31/16

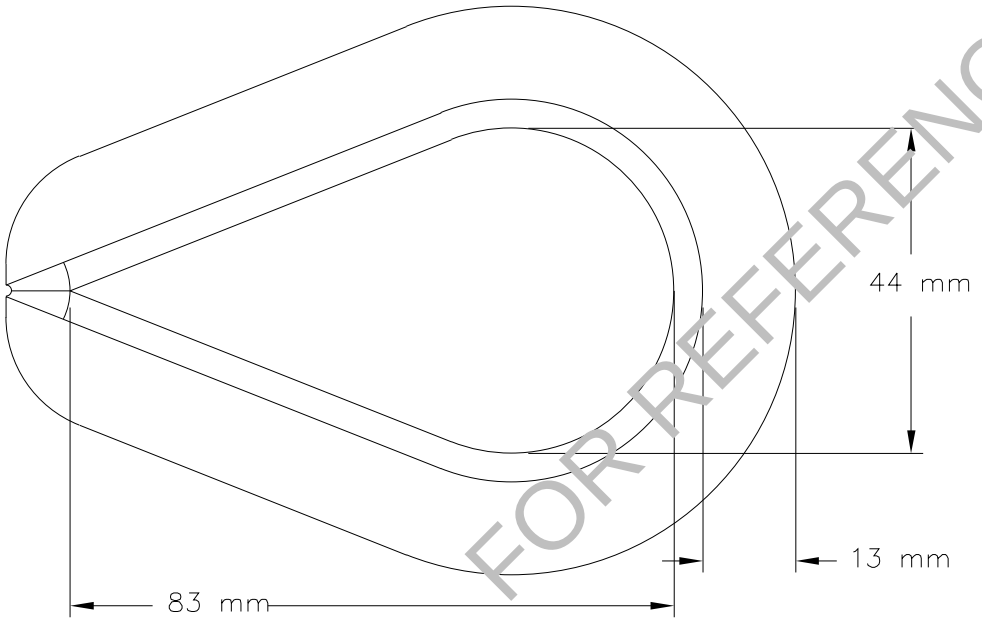


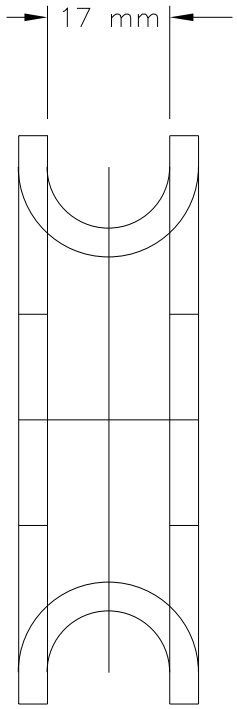
2. FINISH: FIBERGLASS: NEMA BLUE–GREY WITH ULTRA–VIOLET PROT
ALL FERROUS PARTS: HOT DIP GALV. PER ASTM STD. A–153.
1. MAT'L: SHAFT: 13/16 SOLID FIBERGLASS ROD
ENDS: 60–40–18 DUCTILE IRON.
NOTES: UNLESS OTHERWISE SPECIFIED

SALES		LINDSEY MANUFACTURING COMPANY				
APPROVALS	DATE	36KIP [156kN] STRAIN INSULATOR				
DRAWN PAUL LARA	8/19/14					
CHECKED RICK ZONNEVILLE	8/19/14	SIZE B	SCALE 1:2	DWG 7900/L	REV C	
ENGINEER SERGIO CORTEZ	8/19/14					

REVISIONS					
ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	A	REDRAWN IN CAD, NO CHANGE	P.L. 10/26/05		







3. WEIGHT: 0.34 Kgs.
2. FINISH: HOT DIP GALV. PER ASTM A-153.
1. MAT'L: FORGING QUALITY STEEL PER ASTM STD. A-576.

NOTES: UNLESS OTHERWISE SPECIFIED

DIMS IN INCHES BREAK EDGES 0.015
TOLERANCES - UNLESS OTHERWISE SPECIFIED
X/X ±1/32
X.X ±0.06
X.XX ±0.02
X.XXX ±0.005
ANGLES ±1°

FAB

APPROVALS		DATE
DRAWN	PAUL LARA	10/26/05
CHECKED	PAT ROWAN	10/26/05
ENGINEER	PAT ROWAN	10/26/05

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

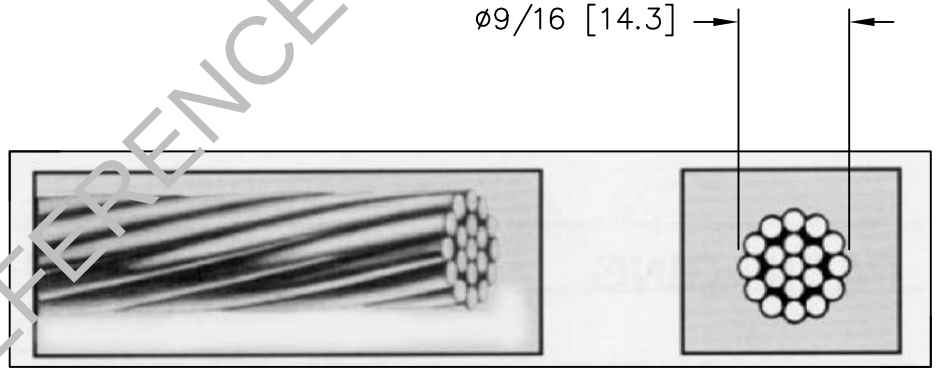
GUY WIRE THIMBLE

MATERIAL	FINISH	SIZE	SCALE	DWG	REV
SEE NOTE 1	SEE NOTE 2	A	1:1	7950	A

PART NO.	LENGTH (FT.) "L"	LENGTH (METERS) "L"
7045/180	180 FT.	55 M
7045/246	246 FT.	75 M
7045/328	328 FT.	100 M

REVISIONS		
LTR	DESCRIPTION	BY/DATE
2	UPDATED DRAWING	P.L. 4/5/06

884



3. NET WEIGHT: .637 LBS./FT. (.947 Kgs./M).
2. BREAKING STRENGTH: 33,700 LBS. (150 kN).
1. MAT'L: ø9/16" [14.3] 1x19 STRAND
GALVANIZED STEEL
EXTRA HIGH STRENGTH GUY WIRE.

NOTES: UNLESS OTHERWISE SPECIFIED

SALES

APPROVALS		DATE
DRAWN	PAUL LARA	10/19/04
CHECKED	PAT ROWAN	11/3/04
ENGINEER	PAT ROWAN	11/3/04

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

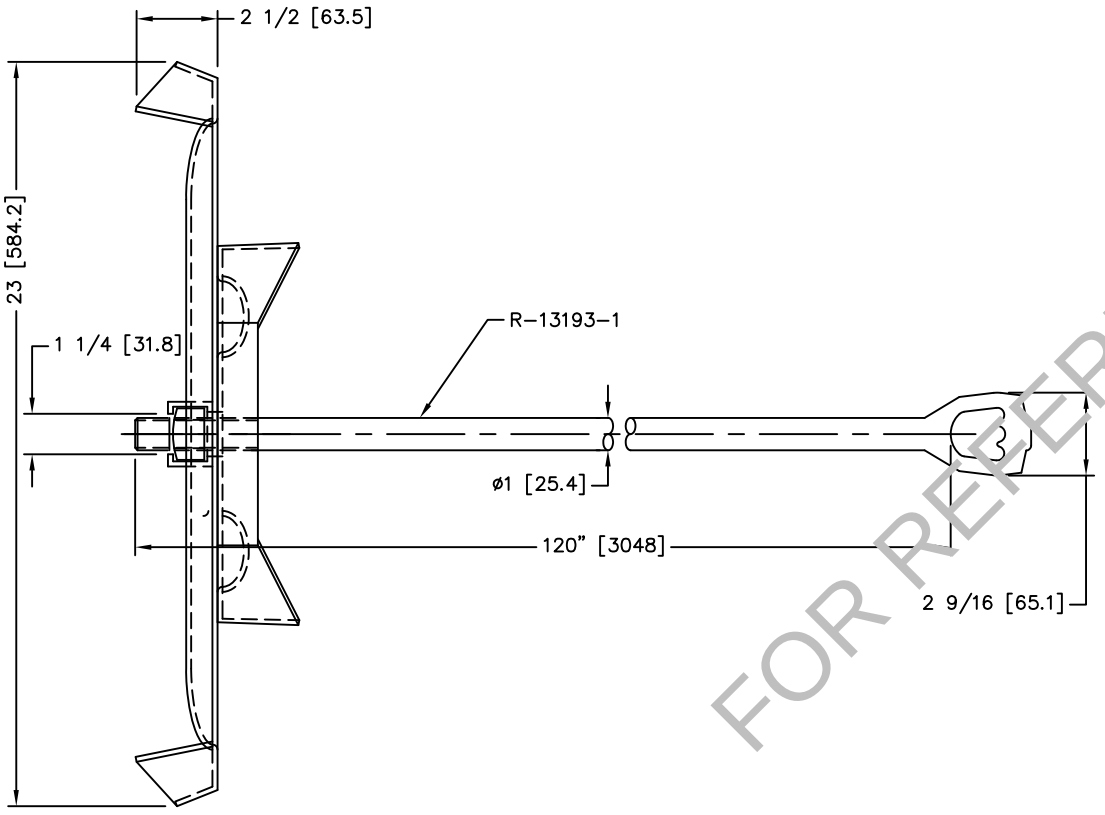
LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

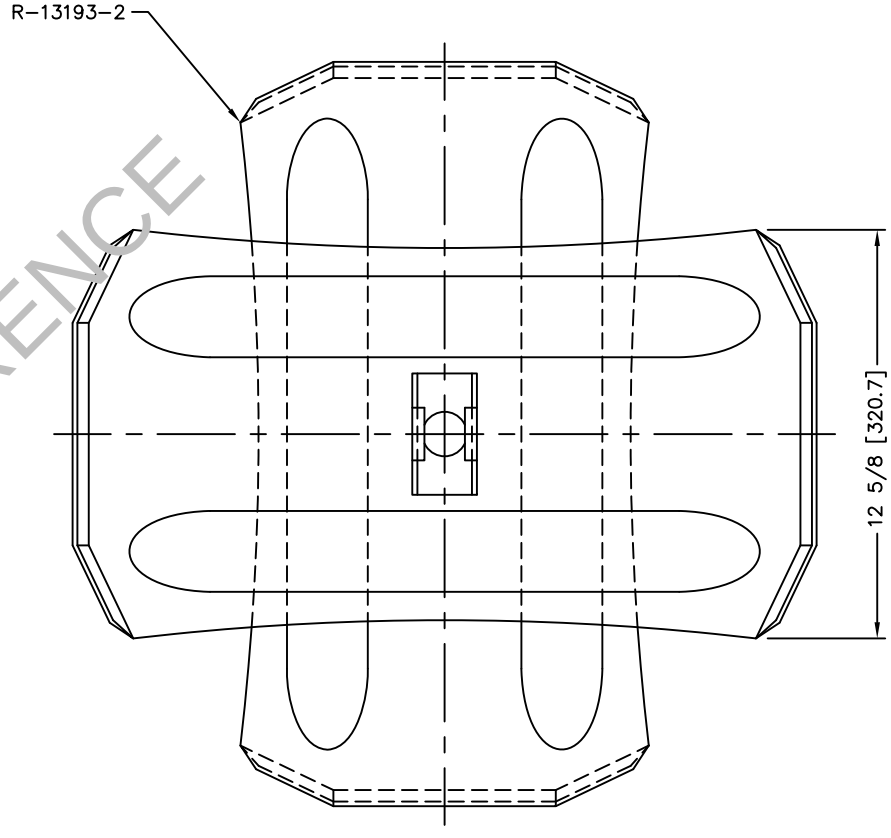
ø9/16" [14.3] EHS GUY WIRE

SIZE	SCALE	DWG	REV
A	1 : 1	7045/L	2

REVISIONS			
LTR	DESCRIPTION	ENG/DATE	BY/DATE
1	INITIAL SALES DRAWING RELEASE	P.L. 11/30/12	

885

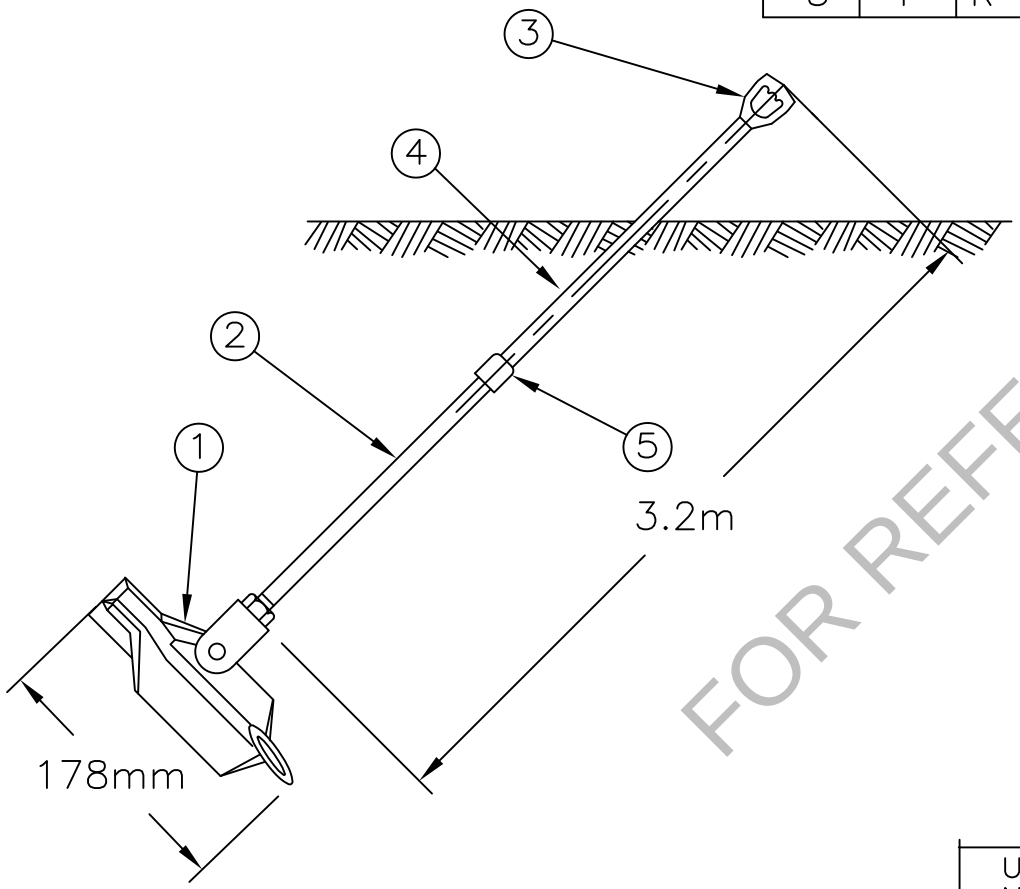




2. FINISH: HOT DIP GALV. PER ASTM STD. A-123
1. MAT'L:FORGED STEEL
NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	CROSS PLATE ANCHOR			
DRAWN PAUL LARA	11/30/12				
CHECKED SERGIO CORTEZ	11/30/12	SIZE B	SCALE 1:4	DWG R-13193	REV 1
ENGINEER SERGIO CORTEZ	11/30/12				

ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION	MAT'L	WT.EA. KGS.
1	1	R-16624-1	ANCHOR MR-1 GALV.	D.I.	6.0
2	1	R-16624-2	ANCHOR ROD 1"(25) x 7'-0"(2133) GALV.	STL.	7.5
3	1	R-16624-3	TRIPLE THIMBLE EYE NUT GALV.	STL	1.0
4	1	R-16624-4	ANCHOR ROD 1"(25) x 3'-6"(1067) GALV.	STL.	4.0
5	1	R-16624-5	ROUND STYLE COUPLING NUT 1"(25) UNC GALV.	STL	0.2



ULITMATE STRENGTH: 40 KIP (178 kN).
MATERIAL: ANCHOR PLATE CAST IRON
EXTENSION BARS C. R. STEEL.
FINISH: HOT DIP GALVANIZED PER ASTM STD. A-123.

USED ON NUMBERS

NO.	DATE	BY	APP.	DESCRIPTION
REVISIONS				

-STRENGTH- LBS. | REQ-

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (626) 969-3471 FAX. (626) 969-3177

TITLE:
M.R.-NORMAL SOIL ANCHOR ASSY.

TOLERANCES UNLESS OTHERWISE NOTED			
	FRACTIONS	DECIMALS	ANGLES
CAST			
FORGE			
MACHINE			
FABRICATION			

WEIGHT		
ASMB-	RAW	FIN.

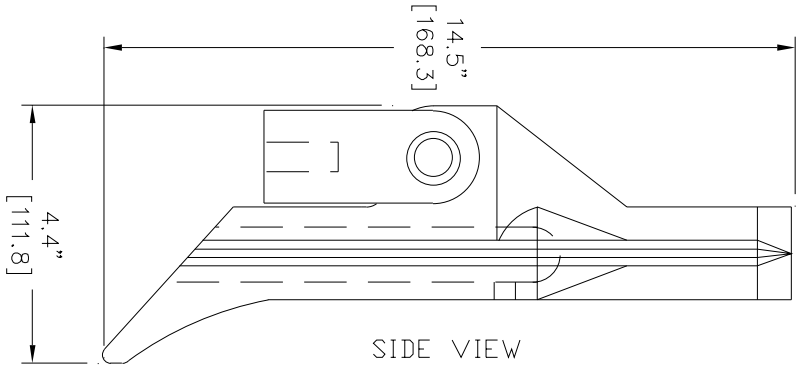
MATERIAL	FINISH
SEE NOTES	SEE NOTES

NOTE!	DO-NOT SCALE DRAWING
	BREAK ALL SHARP EDGES

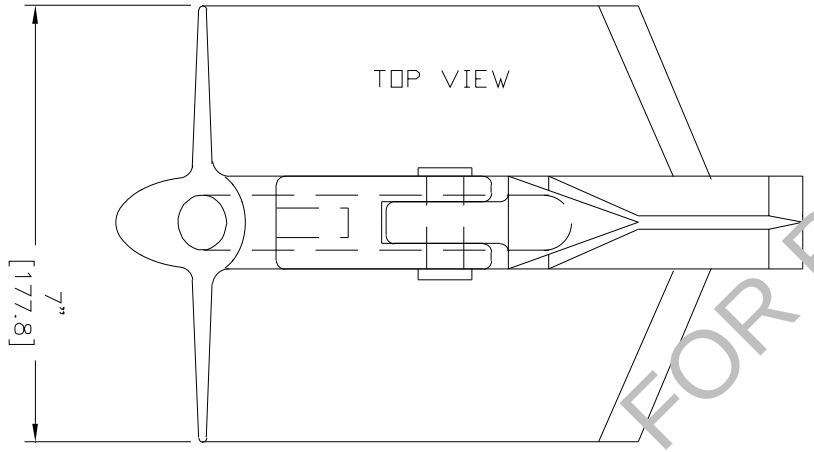
APP.	
CHK.	
DRG.	10/24/17

SCALE	NUMBER
NONE	

LAST-REVISION NO.	LAST-REVISION DATE	DRAWING-NUMBER
		R-16624



SIDE VIEW



TOP VIEW

GENERAL NOTES
DESCRIPTION: IMPACT, TRACK DRILL, OR VIBRATION DRIVEN SOIL ANCHOR.
ANCHOR WIDTH: 7" (17.8 Cms.)
ANCHOR LENGTH: 14.5" (36.8 Cms.)
BEARING AREA: 71 SQ. INCHES (180 SQ. Cms.)
ANCHOR WEIGHT: 12 Lbs. (5.4 Kgs.)
INSTALLATION DEPTH: 7-30 FT. (2.1-9 Mts.)
YIELD STRENGTH: 30 KIPS (134 kN)
ULTIMATE STRENGTH: 40 KIPS (178 kN)
WORKING LOAD: UP TO 27 KIPS
HOLDING CAPACITY: 15-20 KIPS (66-89 kN)
AT 2.1 Mts. (7 FT.) DEPTH IN MEDIUM DENSE COARSE SAND AND SANDY GRAVEL OR STIFF CLAYS
WITH BLOW COUNT (N) = 14-25
MATERIAL: DUCTILE IRON CAST
FINISH: HOT DIP GALVANIZED

USED ON NUMBERS

NO.	DATE	BY	APP.	DESCRIPTION
REVISIONS				

-STRENGTH- LBS. | REQ-

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (626) 969-3471 FAX. (626) 969-3177

TITLE: ANCHOR PLATE

TOLERANCES UNLESS OTHERWISE NOTED	FRACTIONS	DECIMALS	ANGLES
CAST			
FORGE			
MACHINE			
FABRICATION			

WEIGHT		
ASMB-	RAW	FIN.

MATERIAL	FINISH
SEE NOTES	

NOTE!	DO-NOT SCALE DRAWING
	BREAK ALL SHARP EDGES

APP.	
CHK.	
DRG.	S.C.
03/12/01	

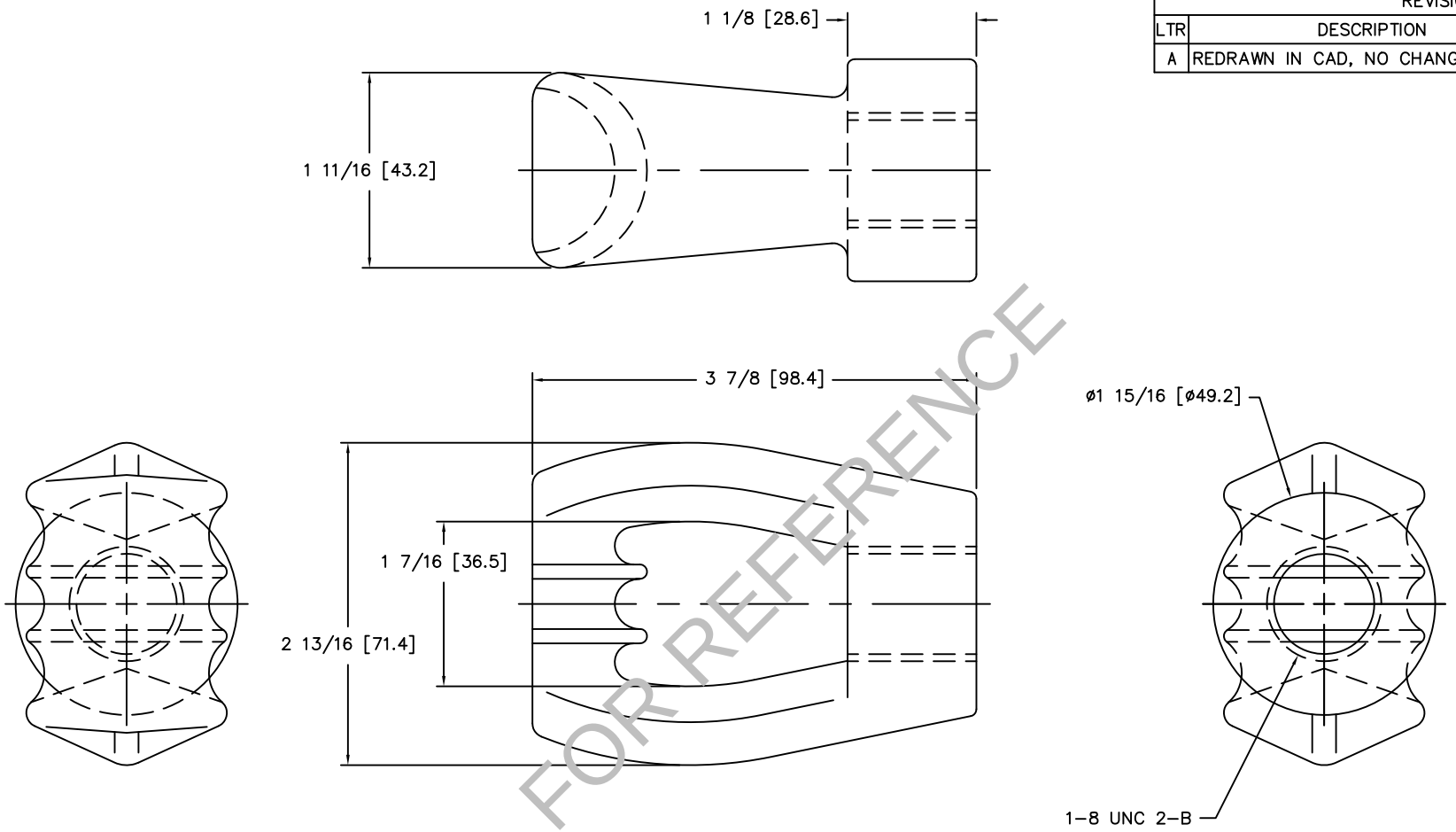
SCALE
NONE

LAST-REVISION NO.	DATE

NUMBER

DRAWING-NUMBER
R-16624-1

REVISIONS		
LTR	DESCRIPTION	BY/DATE
A	REDRAWN IN CAD, NO CHANGE	P.L. 8/28/06



3. WEIGHT: 2.2 lbs. (1.0 kgs.)
2. FINISH: HOT DIP GALV. PER ASTM STD. A-123
1. MAT'L: DUCTILE IRON CASTING PER ASTM STD. A-536
NOTES: UNLESS OTHERWISE SPECIFIED

DIMS IN INCHES BREAK EDGES 0.015
TOLERANCES - UNLESS OTHERWISE SPECIFIED
X/X ±1/32
X.X ±0.06
X.XX ±0.02
X.XXX ±0.005
ANGLES ±1°

MATERIAL: SEE NOTE 1
FINISH: SEE NOTE 2

FAB

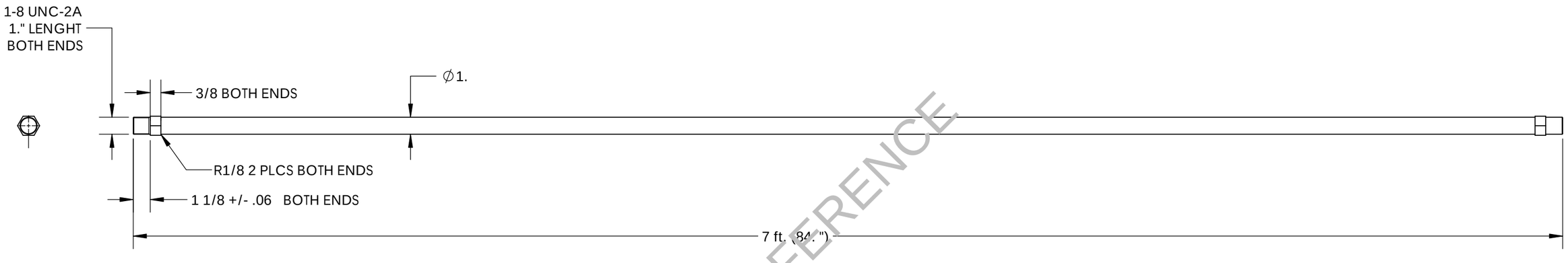
APPROVALS		DATE
DRAWN	PAUL LARA	8/28/06
CHECKED	HASKELL BARNETT	8/29/06
ENGINEER	HASKELL BARNETT	8/29/06

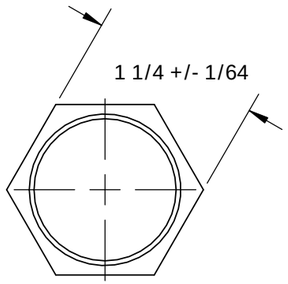
INNOVATIONS IN TRANSMISSION AND DISTRIBUTION
LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

36 KIP TRIPLE THIMBLE EYE

SIZE	SCALE	DWG	REV
B	1 : 1	R-16624-3	A

REVISIONS			
LTR	DESCRIPTION	ENG/DATE	BY/DATE
1	REDDRAWEN IN CAD. NO CHANGES	A.K. 10/14/21	E.A. 10/14/21





1: 1 SCALED LEFT VIEW

NOTES: UNLESS OTHERWISE SPECIFIED
1. MATERIAL: FORGED STEEL PER ASTM STD. A-576
2. FINISH: HOT DIP GALVANIZE PER ASTM A-153
3. WEIGHT: 16.5 LBS. (7.5 KG.)

DIMS IN INCHES BREAK EDGES 0.015
TOLERANCES - UNLESS OTHERWISE SPECIFIED

X/X ±0.06
X.X ±0.06
X.XX ±0.03
X.XXX ±0.010
ANGLES ±1°

MATERIAL	FINISH
SEE NOTE 1	SEE NOTE 2

SALES

APPROVALS	DATE
DRAWN ARA K.	10/14/21
CHECKED EMIGDIO A.	10/14/21
ENGINEER SERGIO C.	10/14/21

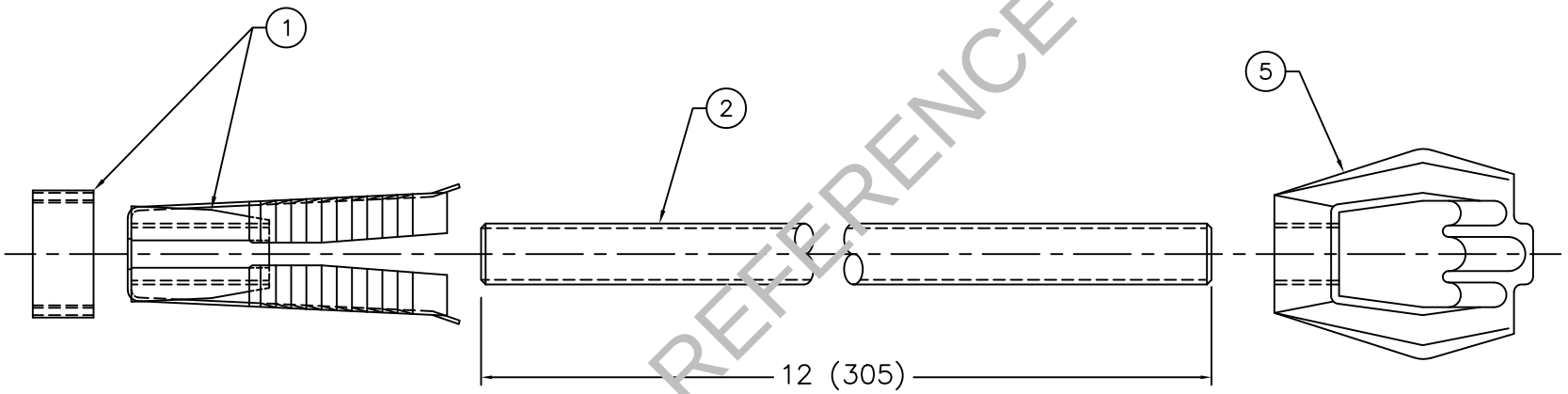
INNOVATIONS IN TRANSMISSION AND DISTRIBUTION
LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3071

STRAP10A 1INX7FT ROD
1-8 UMC ENDS

SIZE	SCALE	DWG	REV
B	1:6	R-16624-2	1

ITEM	P/N	DESCRIPTION	QTY.	WEIGHT (Kgs.)
1	R-16978-1	ROCK ANCHOR HEAD	1	0.75
2	R-16978-2	1"(25) x 12" (305) THREADED ROD	1	1.0
5	R-16624-3	TRIPLE THIMBLE EYE	1	1.0

REVISIONS		
LTR	DESCRIPTION	ENG/DATE
1	REDRAWN IN CAD, NO CHANGE	P.L. 12/9/05
2	DELETE 3.5 AND 7.0 FT. EXTENTIONS AND C-NUT	S. C. 04/01/10



ULTIMATE STRENGTH: 35 KIP [155.7 kN]

1. FINISH: ALL FERROUS PARTS ARE HOT DIP GALVANIZE PER ASTM STD. A-123.
ALL FERROUS FASTENERS ARE HOT DIP GALVANIZE PER ASTM STD. A-153.

NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471				
APPROVALS	DATE	ROCK ANCHOR ASSY.				
DRAWN PAUL LARA	12/9/05					
CHECKED PAT ROWAN	XXXX	SIZE B	SCALE 1:2	DWG R-16978	REV 2	
ENGINEER PAT ROWAN	XXXX					

REVISIONS		
LTR	DESCRIPTION	BY/DATE
1	SALES RELEASE	P.L. 10/22/04

891

SPECIFICATIONS

ITEM	U.S.A.	METRIC
CAPACITY (SK58130)	7/8 in. Hex x 4-1/4 in. Shank	
CAPACITY	1 in. Hex x 4-1/4 in. Shank	
PERFORMANCE	3 in. x 20 ft. Deep Hole	
FLOW RANGE	7 - 9 gpm	26 - 34 lpm
PRESSURE	1500 - 2000 psi	105 - 140 bar
PORTS*	-8 SAE O-Ring (H), 1/2 in. NPT (A)	
WEIGHT	67 lbs	30 kg
LENGTH	26 in.	66 cm
WIDTH	18 in.	46 cm
CONNECTION	3/8 in. Male NPT Hose End	
HOSE WHIPS	Yes	
MOTOR	Integral	

* (H) = Hydraulic
(A) = Air

1. MAT'L: REF. STANLEY P/N SK58120

NOTES: UNLESS OTHERWISE SPECIFIED

DIMS IN INCHES BREAK EDGES 0.015
TOLERANCES – UNLESS OTHERWISE SPECIFIED
X/X ±1/32
X.X ±0.06
X.XX ±0.02
X.XXX ±0.005
ANGLES ±1°

MATERIAL	FINISH
SEE NOTE 1	NONE

SALES

APPROVALS	DATE
DRAWN PAUL LARA	10/22/04
CHECKED PAT ROWAN	11/3/04
ENGINEER PAT ROWAN	11/3/04

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION
LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

ROCKDRILL TOOL SET

SIZE	SCALE	DWG	REV
A	1 : 1	R-16979	1

REVISIONS			
LTR	DESCRIPTION	BY/DATE	APPD.BY/DATE
1	INITIAL SALES DRAWING RELEASE	09/09/10	09/09/10

892

WEIGHT : 30 LBS. (13.6 KGS)

SALES			
APPROVAL	DATE	INNOVATIONS DANS LA TRANSMISSION ET DISTRIBUTION	LINDSEY MANUFACTURING COMPANY
DRAWN PAUL LARA	09/09/10	STANLEY ROCK DRILL HD45	
CHECKED STEVE SCHOLFIELD	09/09/10		
ENGINEER STEVE SCHOLFIELD	09/09/10		

TAILLE	SCALE	DESSIN	RÉV
A	NONE	R-16979-1	1

REVISIONS			
LTR	DESCRIPTION	BY/DATE	APPD.BY/DATE
1	INITIAL SALES DRAWING RELEASE	09/09/10	09/09/10

WEIGHT: 5 LBS. (2.27 KGS)

SALES

INNOVATIONS DANS LA TRANSMISSION ET DISTRIBUTION

LINDSEY MANUFACTURING COMPANY

	APPROVAL	DATE
DRAWN	PAUL LARA	09/09/10
CHECKED	STEVE SCHOLFIELD	09/09/10
ENGINEER	STEVE SCHOLFIELD	09/09/10

7/8" [22.2mm] X 2' [1219.2mm] ROD

TAILLE	SCALE	DESSIN	RÉV
A	NONE	R-16979-2	1

REVISIONS			
LTR	DESCRIPTION	BY/DATE	APPD.BY/DATE
1	INITIAL SALES DRAWING RELEASE	09/09/10	09/09/10

WEIGHT : 8 LBS. (3.63 KGS)

SALES		INNOVATIONS DANS LA TRANSMISSION ET DISTRIBUTION — LINDSEY MANUFACTURING COMPANY
APPROVAL	DATE	7/8" [22.2mm] X 4' [2438.4mm] ROD
DRAWN PAUL LARA	09/09/10	
CHECKED STEVE SCHOLFIELD	09/09/10	TAILLE A / SCALE NONE / DESSIN R-16979-3 / RÉV 1
ENGINEER STEVE SCHOLFIELD	09/09/10	

REVISIONS			
LTR	DESCRIPTION	BY/DATE	APPD.BY/DATE
1	INITIAL SALES DRAWING RELEASE	09/09/10	09/09/10

WEIGHT : 1 LB. (0.454 KGS)

SALES		INNOVATIONS DANS LA TRANSMISSION ET DISTRIBUTION — LINDSEY MANUFACTURING COMPANY
APPROVAL	DATE	COUPLEAURS
DRAWN PAUL LARA	09/09/10	
CHECKED STEVE SCHOLFIELD	09/09/10	
ENGINEER STEVE SCHOLFIELD	09/09/10	

TAILLE	SCALE	DESSIN	RÉV
A	NONE	R-16979-4	1

REVISIONS			
LTR	DESCRIPTION	BY/DATE	APPD.BY/DATE
1	INITAL SALES DRAWING RELEASE	09/09/10	09/09/10

WEIGHT : 1.0 LB. (0.455 KGS)

SALES

INNOVATIONS DANS LA TRANSMISSION ET DISTRIBUTION

LINDSEY MANUFACTURING COMPANY

APPROVAL		DATE
DRAWN	PAUL LARA	09/09/10
CHECKED	STEVE SCHOLFIELD	09/09/10
ENGINEER	STEVE SCHOLFIELD	09/09/10

1" [25.4mm] SHANK

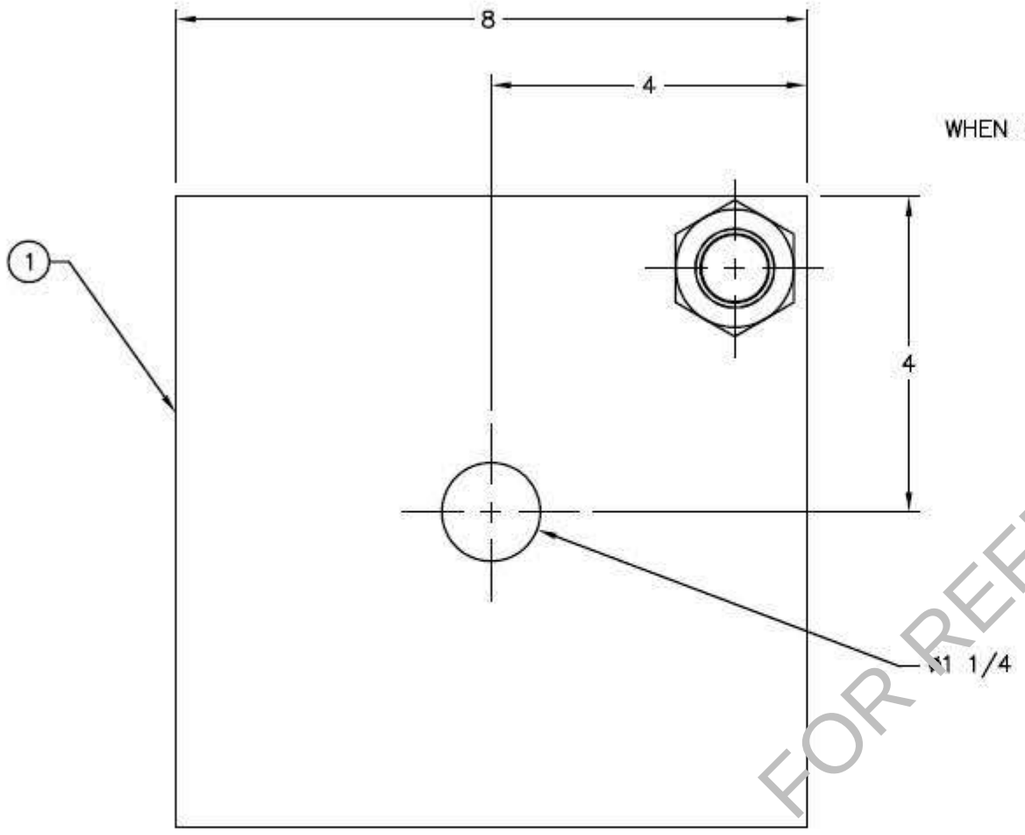
TAILLE	SCALE	DESSIN	RÉV
A	NONE	R-16979-5	1

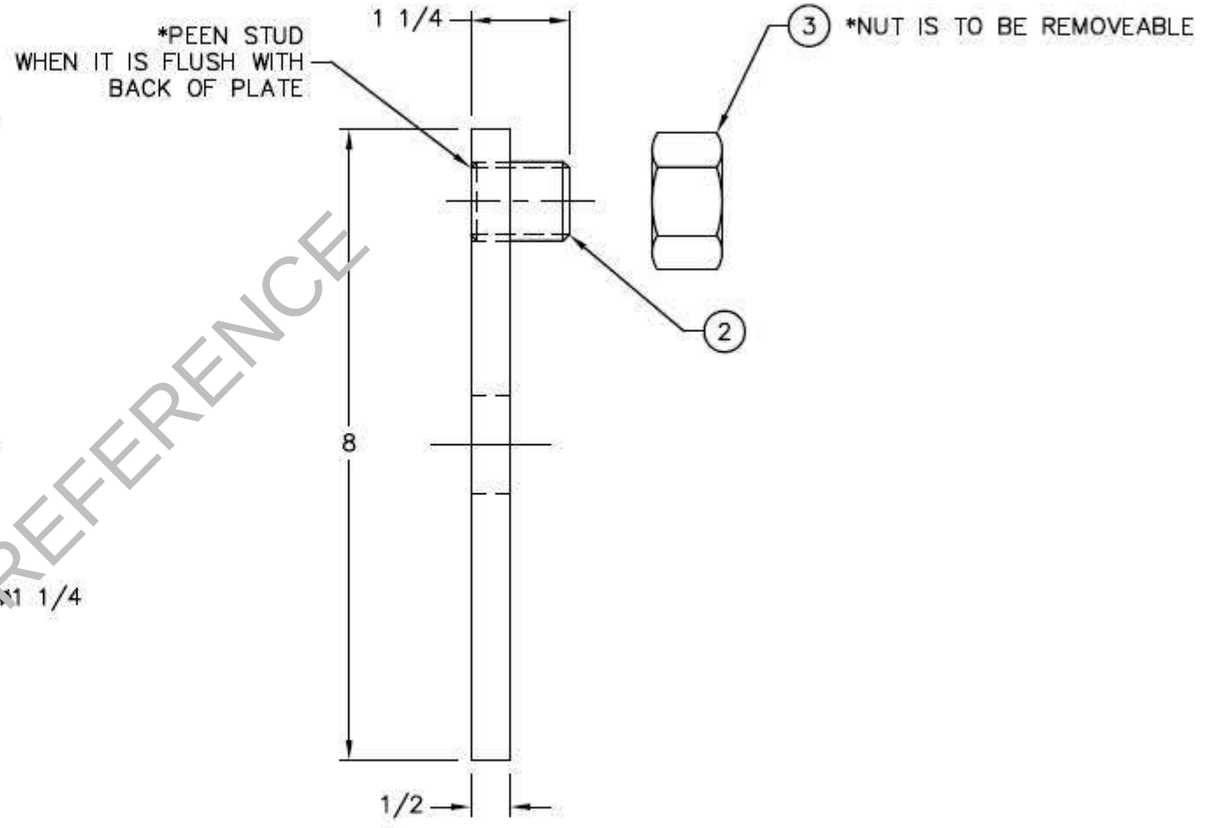
REVISIONS			
LTR	DESCRIPTION	BY/DATE	APPD BY/DATE
1	INITIAL SALES DRAWING RELEASE	09/09/10	09/09/10

WEIGHT : 1.0 LB. (0.455 KGS) EACH.

SALES		LINDSEY MANUFACTURING COMPANY
APPROVAL	DATE	1-3/4" [44.5mm] CARBIDE BITS
DRAWN PAUL LARA	09/09/10	
CHECKED STEVE SCHOLFIELD	09/09/10	
ENGINEER STEVE SCHOLFIELD	09/09/10	TAILLE A · SCALE NONE · DESSIN R-16979-6 · RÉV 1

REVISIONS			
LTR	DESCRIPTION	ENG/DATE	APPD. BY/ DATE
B	ADDED STUD AND HEXNUT TO DRAWING	P.L. 5/21/08	S.D.S. 5/22/08





3. WEIGHT : 1.2 LBS. (0.55 KGS)
2. BREAK ALL SHARP EDGES.
1. SEE B.O.M.

NOTES: UNLESS OTHERWISE SPECIFIED

DIMS IN INCHES BREAK EDGES 0.015
TOLERANCES – UNLESS OTHERWISE SPECIFIED
X/X ±1/32
X.X ±0.06
X.XX ±0.02
X.XXX ±0.005
ANGLES ±1°

MATERIAL: NOTE 1
FINISH: NOTE 2

ASSY

APPROVALS		DATE
DRAWN	HASKELL BARNETT	8/8/07
CHECKED	STEVE SCHOLFIELD	8/9/07
ENGINEER	HASKELL BARNETT	8/8/07

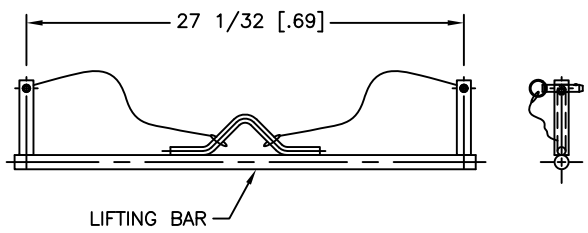
INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

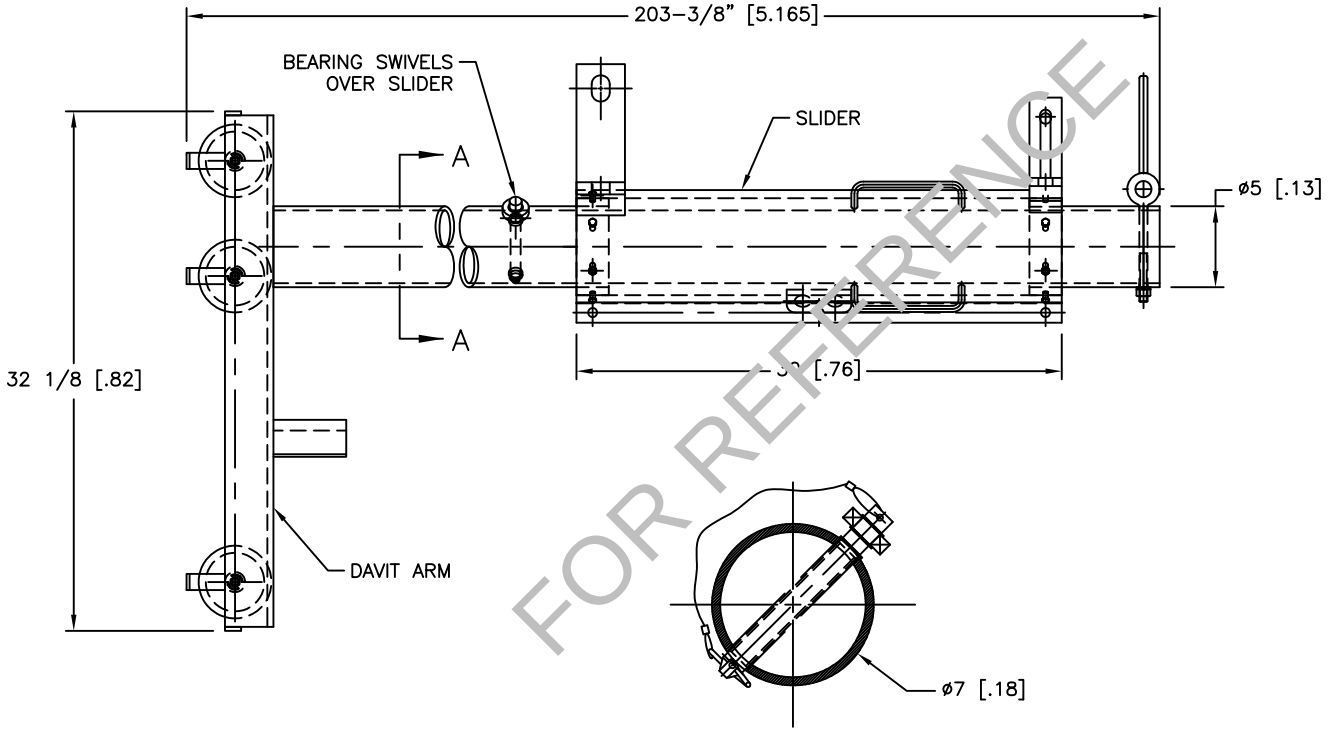
LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

BEARING PLATE ASSY.

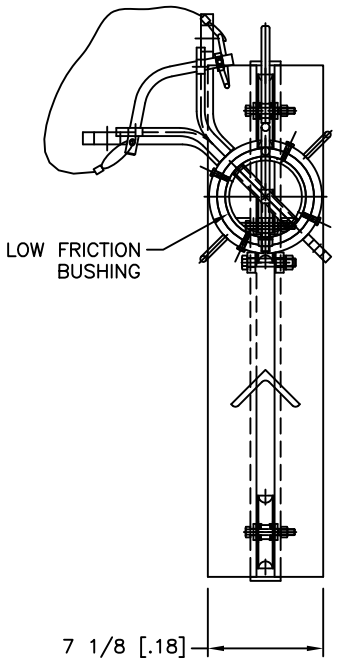
SIZE	SCALE	DWG	REV
B	1 : 2	R-16979-7	B

REVISIONS			
LTR	DESCRIPTION	ENG/DATE	APPD. BY/DATE
1	INITIAL SALES DRAWING RELEASE	P.L. 1/27/14	P.L. 1/27/14





SECTION A–A



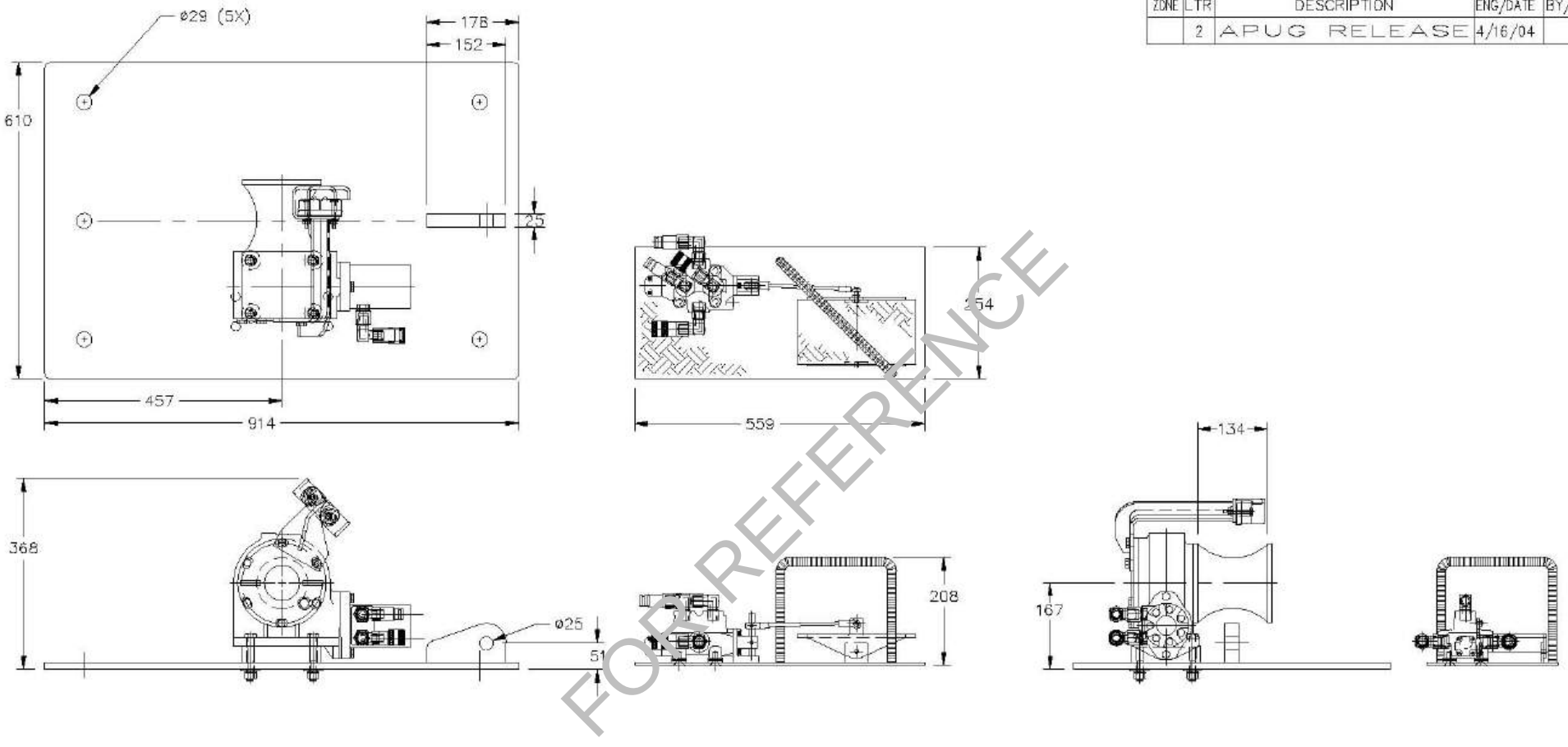
4. DIMESNIONS IN [.] ARE IN METERS.
3. WORKING LOAD LIMITS: 660 Lbs. [300 Kgs.]
2. WEIGHT: 120 Lbs. [54.4 Kgs.]
1. MATERIAL: ALUMINUM

NOTES: UNLESS OTHERWISE SPECIFIED

SALES						
APPROVALS		DATE	INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
DRAWN	PAT ROWAN	1/21/04	GIN POLE			
CHECKED	AJAY BHAKTA	1/21/04	SIZE B	SCALE 1:8	DWG 7271	REV 1
ENGINEER	PAT ROWAN	1/21/04				

REVISIONS 900

ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	2	APUG RELEASE	4/16/04		



4. WEIGHT: 50.7 Lbs. (22 Kgs)

3. CAPACITY 1,000 lbs. (450 Kg).
2. SOME FITTINGS REMOVED TO REDUCE DRAWING COMPLEXITY
1. VIEWS REORGANIZED TO FIT PAGE
NOTES: UNLESS OTHERWISE SPECIFIED

SALES		
APPROVALS		DATE
DRAWN	AJAY BHAKTA	4/16/04
CHECKED	PAT ROWAN	4/16/04
ENGINEER	AJAY BHAKTA	4/16/04

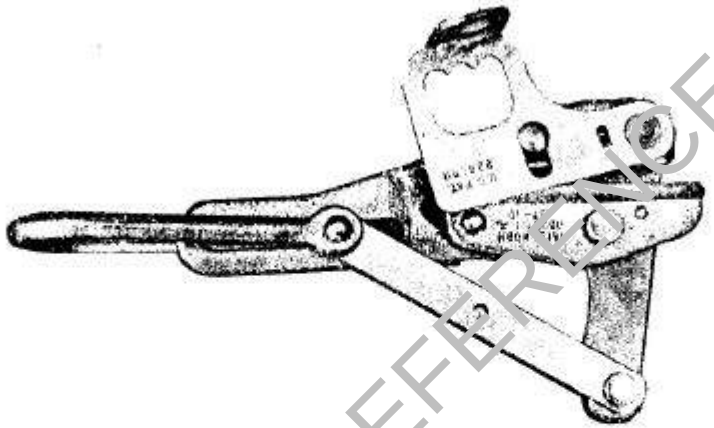
INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY

760 N. GRIFFIN / AZUSA, CA 91702 (626) 969-3491

CAPSTAN AND FOOTPEDAL ASSY.

SIZE	SCALE	DWG	REV
B	1: 200	7004H	2



1. MATL: STEEL
2. WEIGHT: 15-1/2 LBS [7.03 kg]
3. GUY WIRE RANGE: 0.31-0.62 (8-16)

MAXIMUM SAFE LOAD: 15 KIP [67 kN]

USED ON NUMBERS	NO.	DATE	BY	APP.	DESCRIPTION
					REVISIONS

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818)969-2471

TITLE: AUTOMATIC WIRE GRIP

-STRENGTH- LBS. REQ-

TOLERANCES UNLESS OTHERWISE NOTED

	FRACTIONS	DECIMALS
CAST		
FORGE		
MACHINE		
FABRICATION		

WEIGHT: ASME- RAW FIN.

MATERIAL: STEEL

FINISH: ZINC PLATED

NOTE: DO-NOT SCALE DRAWING; BREAK ALL SHARP EDGES

APP.

CHK.

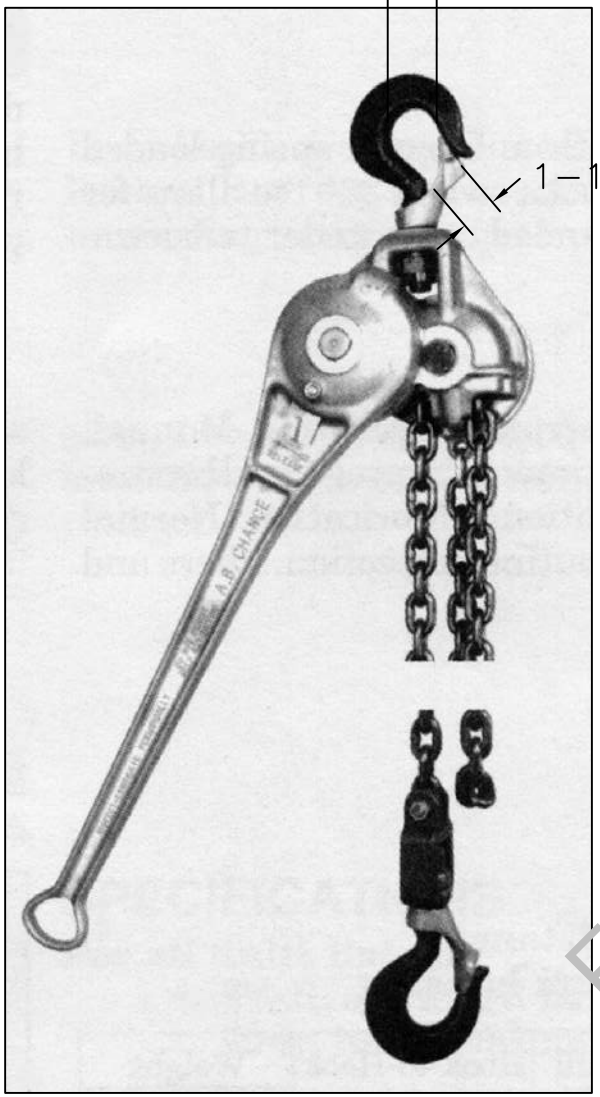
DWG. S.C. 05/01/95

SCALE: NONE

NUMBER

LAST-REVISION NO. DATE

DRAWING-NUMBER: R-14301



MIN. 10 FT [3.1m] CHAIN WITH (STANDARD LIFT 3m)
FORGED PULLING HOOKS & SAFETY LATCH
WEIGHT: 53 LBS. (24Kgs)
WORKING CAPACITY: 26.7kN [3000Kg]

USED ON NUMBERS

NO.	DATE	BY	APP.	DESCRIPTION
				REVISIONS

-STRENGTH- LBS. | REQ-

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

TITLE: 3 TON. CHAIN HOIST WITH 10 FT. TAKE-UP

TOLERANCES UNLESS OTHERWISE NOTED			
	FRACTIONS	DECIMALS	ANGLES
CAST			
FORGE			
MACHINE			
FABRICATION	±1/16	-	±1°

WEIGHT		
ASMB-	RAW	FIN.

MATERIAL	FINISH
SEE NOTES	SEE NOTES

NOTE!	DO-NOT SCALE DRAWING
	BREAK ALL SHARP EDGES

APP.	
CHK.	
DRG.	P.L.
9/8/2017	

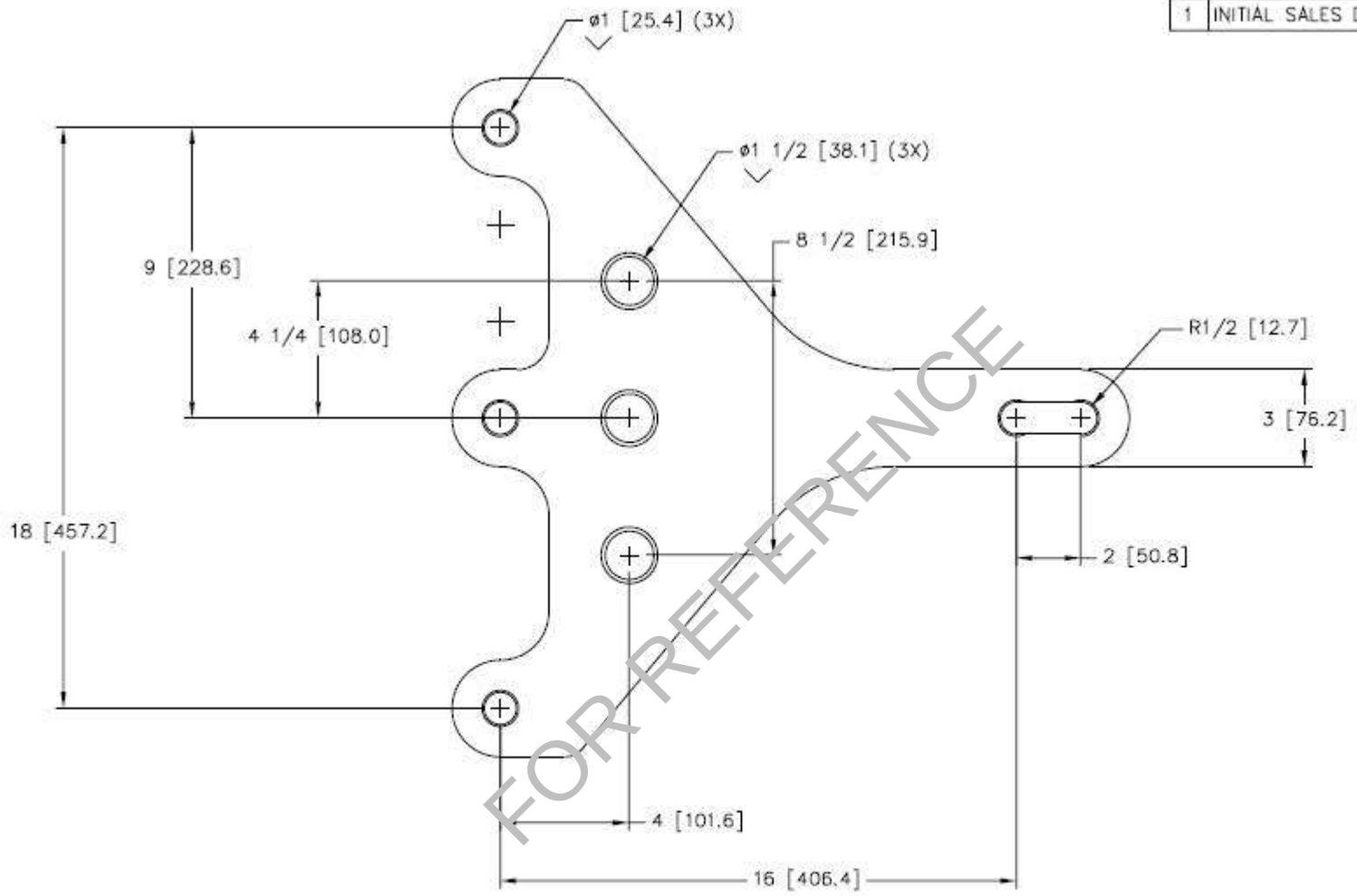
SCALE
NONE

LAST-REVISION	
NO.	DATE
1	9/8/2017

NUMBER

DRAWING-NUMBER
R-15107

REVISIONS		
LTR	DESCRIPTION	ENG/DATE
1	INITIAL SALES DRAWING RELEASE	P.L 11/11/05



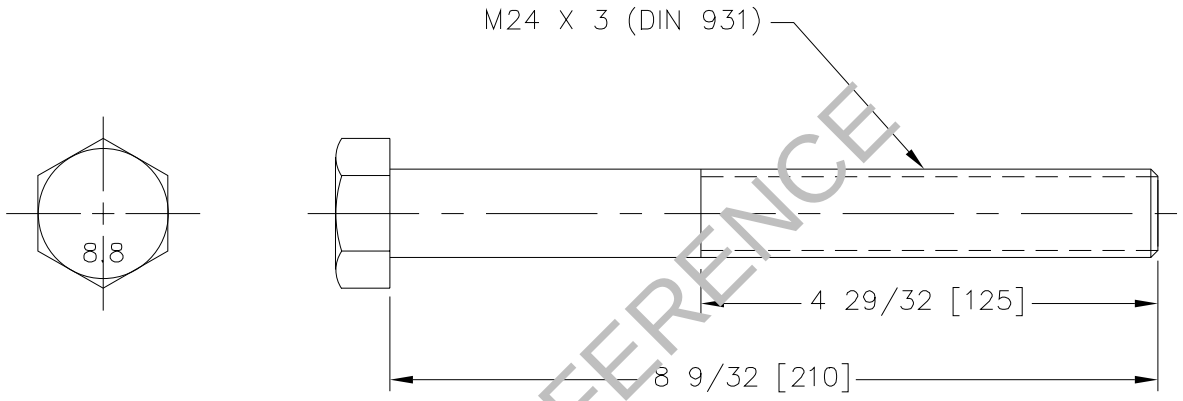
ULTIMATE STRENGTH: 20 KIP [89 kN]

2. TOTAL WEIGHT = 3 Kgs. (7 Lbs.)

1. MAT'L: 1/2" 6061-T6 ALUMINUM PLATE
NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-2471			
APPROVALS	DATE	CONSTRUCTION YOKE			
DRAWN AJAY BHAKTA	2/4/04				
CHECKED PAT ROWAN	2/4/04	SIZE B	SCALE 1:4	DWG 7272	REV 1
ENGINEER AJAY BHAKTA	2/4/04				

REVISIONS					
ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	1	INITIAL SALES DRAWING RELEASE	P.L. 10/20/05		



4. THREAD LENGTH PROVIDED IS A MINIMUM, MAY BE FULL THREAD
3. MARK VENDOR AND CLASS MARKING ON HEAD
2. FINISH: HOT DIP GALV. PER ASTM STD. A 153
1. MAT'L: EQ TO METRIC CLASS 8.8 MEDUIM STRENGTH, DIN 931

NOTES: UNLESS OTHERWISE SPECIFIED

SALES

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

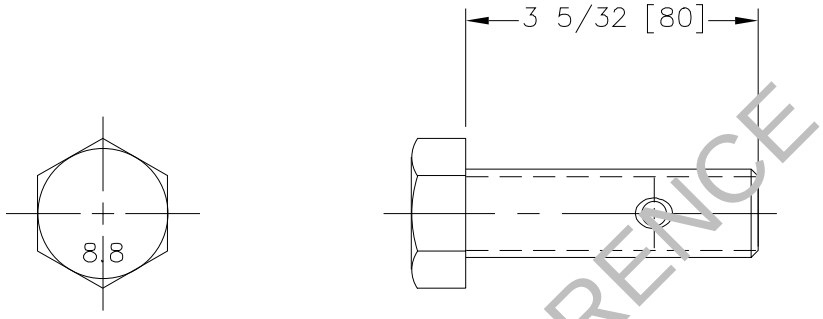
LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

APPROVALS	DATE
DRAWN AJAY BHAKTA	10/7/03
CHECKED PAT ROWAN	10/7/03
ENGINEER AJAY BHAKTA	10/7/03

24 X 3 X 210 METRIC BOLT

SIZE	SCALE	DWG	REV
A	1 : 2	7250/210	1

REVISIONS					905
ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	1	SALES RELEASE	1/23/04		



3. WEIGHT: 0.37 kg.
2. FINISH: HOT DIP GALV. PER ASTM STD. A-153
1. MAT'L: METRIC CLASS 8.8 MEDUIM STRENGTH, DIN 931 (M24-3)

NOTES: UNLESS OTHERWISE SPECIFIED

DIMS IN INCHES BREAK EDGES 0.015
TOLERANCES - UNLESS OTHERWISE SPECIFIED
X/X ±1/32
X.X ±0.06
X.XX ±0.02
X.XXX ±0.005
ANGLES ±1°

SALES

APPROVALS	DATE
DRAWN AJAY BHAKTA	1/23/04
CHECKED PAT ROWAN	1/23/04
ENGINEER AJAY BHAKTA	1/23/04

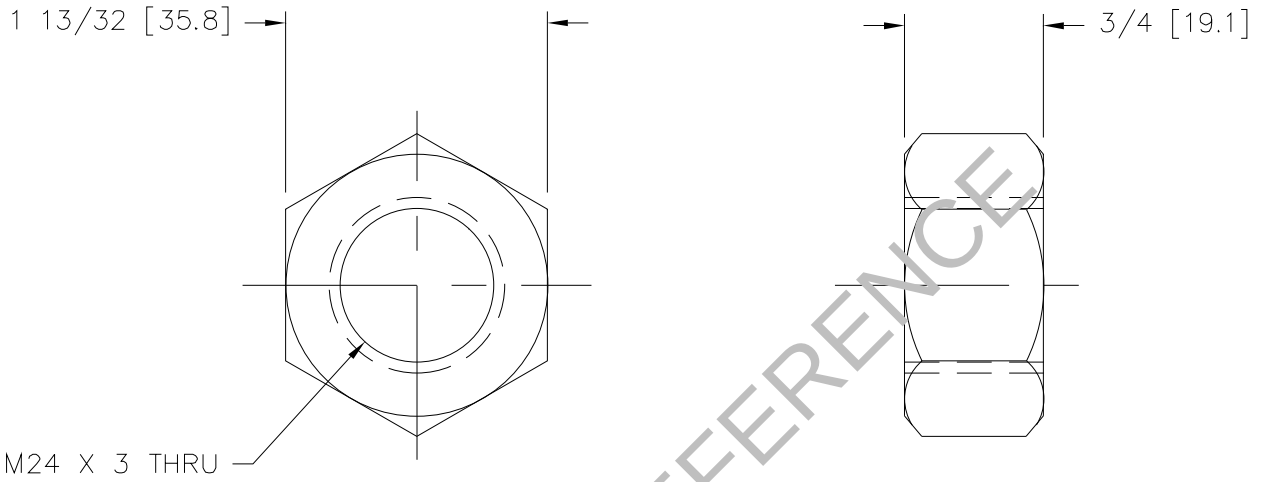
INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

24 X 3 X 80 METRIC BOLT

MATERIAL	FINISH	SIZE	SCALE	DWG	REV
SEE NOTE 1	SEE NOTE 2	A	1:2	7249/24/80	1

REVISIONS		906
LTR	DESCRIPTION	BY/DATE
1	INITIAL SALES DRAWING RELEASE	P.L. 4/5/06

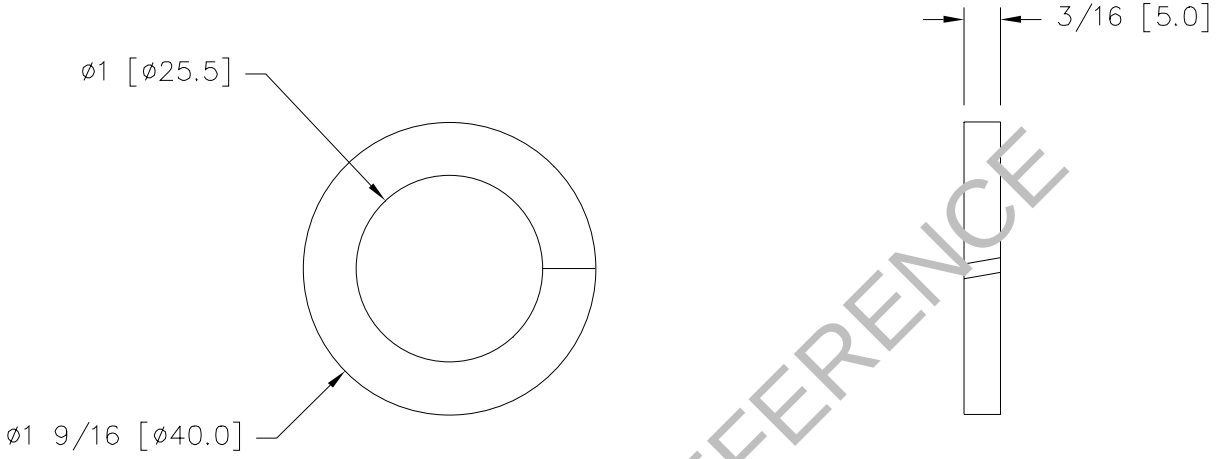


3. BREAK ALL SHARP EDGES AND DEBURR ALL DRILLED HOLES.
2. FINISH: HOT DIP GALV. PER ASTM A-153.
1. MAT'L: MAKE FROM P/N 7249-1X.

NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	M24 X 3 HEX NUT			
DRAWN PAUL LARA	4/5/06				
CHECKED PAT ROWAN	XXXX	SIZE A	SCALE 1:1	DWG 7249-1	REV 1
ENGINEER PAT ROWAN	XXXX				

REVISIONS		907
LTR	DESCRIPTION	BY/DATE
1	INITIAL SALES DRAWING RELEASE	P.L. 4/5/06



3. BREAK ALL SHARP EDGES AND DEBURR ALL DRILLED HOLES.
2. FINISH: HOT DIP GALV. PER ASTM A-123.
1. MAT'L: MAKE FROM 7249-2X.

NOTES: UNLESS OTHERWISE SPECIFIED

SALES

APPROVALS		DATE
DRAWN	PAUL LARA	4/5/06
CHECKED	PAT ROWAN	XXXX
ENGINEER	PAT ROWAN	XXXX

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

M24 LOCKWASHER

SIZE	SCALE	DWG	REV
A	1 : 1	7249-2	1

REVISIONS		
LTR	DESCRIPTION	BY/DATE
1	SALES RELEASE	MK 08/22/16

908

R-21645-3

R-21645-2

R-21645-1

SALES					
APPROVALS	DATE				
DRAWN PAUL LARA	10/18/04				
CHECKED PAT ROWAN	11/3/04				
ENGINEER PAT ROWAN	11/3/04				

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

FALL ARREST LIFELINE KIT

SIZE	SCALE	DWG	REV
A	NTS	R-21645	1

NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS			
LTR	DESCRIPTION	BY/DATE	APPR/DATE
1	REDRAWN IN CAD, NO CHANGE	11/11/10	11/11/10

1. MATERIAL : SHEET METAL PAINTED
2. WEIGHT : 11 Lbs. (5.0 Kgs)

SALES

APPROVALS		DATE
DRWN	PAUL LARA	11/11/10
CHECKED	STEVE SCHOLFIELD	11/11/10
DSNED	STEVE SCHOLFIELD	11/11/10

LINDSEY MANUFACTURING COMPANY

RED TOOL BOX -E.R.S.

SIZE	SCALE	DWG	REV
A	NTS	R-17798	1

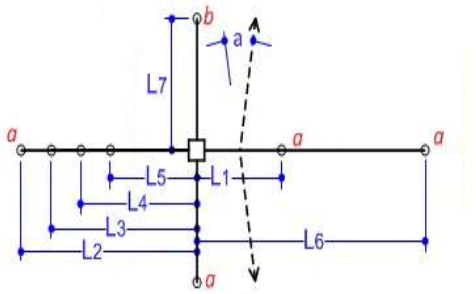
11 ERS PROSPOT® ANALYSIS

LINDSEY

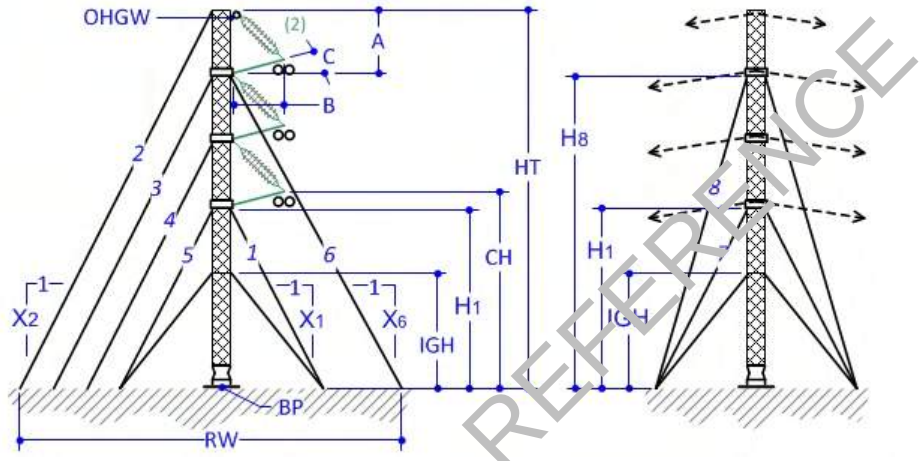
Emergency Restoration System - ProSpot 5.0.85
Series 600H - ERS Series 600H (2.9m column height interval)

Printed: 9/6/2023
Registered To: HARUT AVETISYAN
Version 5.0.85

Horizontal Vee - 400KV



Plan View



Conductors Per Phase: 2

Elevation View

Insulators Per Phase: 2

a =	20.0 degrees
A =	8.7 m
B =	3.8 m
BP =	194.06 kPa
C =	0.0 degrees
CH =	21.9 m
H1 =	21.9 m
H8 =	39.3 m
HT =	48.0 m
IGH =	13.20 m
L1 =	22.5 m
L2 =	48.6 m
L3 =	40 m
L4 =	31 m
L5 =	23 m
L6 =	39.9 m
L7 =	21 m
RW =	88.5 m
X1 =	1.0
X2 =	1.0
X6 =	1.0

Conductor / OHGW Data - RUBUS

Cond. Diameter = 3.15 cm | Cond. Unit Weight = 1.62 kg/m | Cond. Tension (Tension 1) = 34.0 kN
OHGW Diameter = 1.02 cm | OHGW Unit Weight = 0.45 kg/m | OHGW Tension (Tension 1) = 13.3 kN

Geometry Data - 400KV

Post Buckling = 75 kN

Loading Data - LOAD 1

Conductor Wind = 1200.0 Pa | Column Wind = 1200.0 Pa | Radial Ice = 0.00 cm | Addl. Ecc. = 10.0 cm
Shape Factor = 2.10 | OLF Vertical = 1.10 | OLF Horizontal = 1.10 | OLF Line Tension = 1.10

Wind and Weight Span Data - PRO 1

Allowable Wind Span = 400.0 m | Allowable Weight Span = 400.0 m

Insulator Loads

Max Post Insulator Load = -13 kN, 53 kN | Max Suspension Insulator Tensile Load = 8 kN

Guy Loads (kN)/Lead

T1 = 37 kN | T2 = 27 kN | T3 = 92 kN
T4 = 92 kN | T5 = 83 kN | T6 = 28 kN
Int. Front (IF) = 8 kN | Int. Back (IB) = 8 kN | T7, T8 Anchor Load = 60 kN

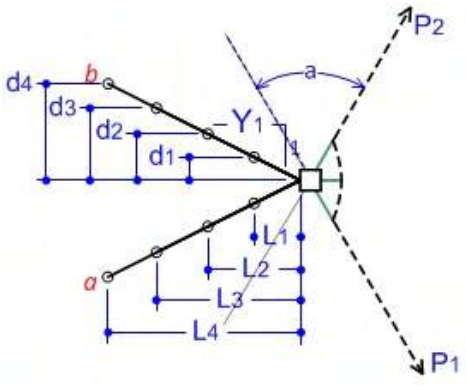
Guy Wire Lengths	
	a
Int Guy 1	26.1 m
Int Guy 5	26.1 m
Front Guy 1	31.4 m
Back Guy 2	68.3 m
Back Guy 3	56.0 m
Back Guy 4	43.7 m
Back Guy 5	31.4 m
Midphase Guy 6	56.0 m
Int. Longitudinal Guy 7	25.6 m
Longitudinal Guy 7	31.0 m
Longitudinal Guy 8	45.0 m

LINDSEY

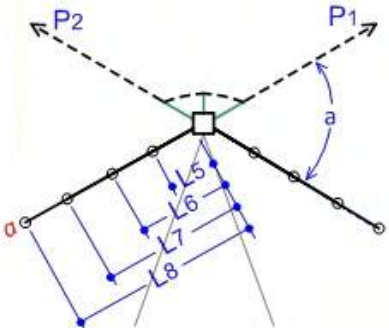
Emergency Restoration System - ProSpot 5.0.85
Series 600H - ERS Series 600H (2.9m column height interval)

Printed: 9/6/2023
Registered To: HARUT AVETISYAN
Version 5.0.85

Dead End - 400KN DEAD END



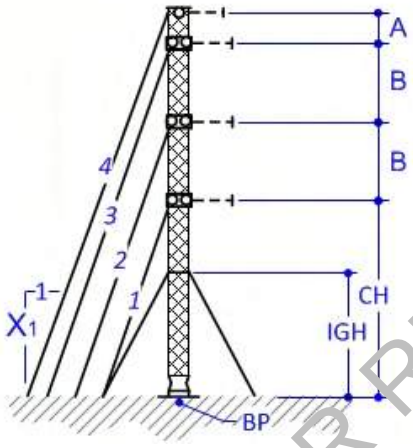
Side 1 Back Guys
Total Back Anchors - 8 req'd



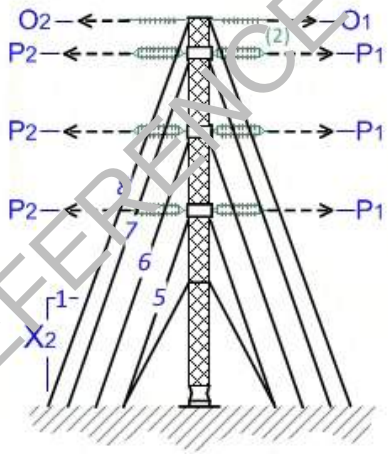
Plan View

Side 2 Guys
Total Side Anchors - 8 req'd

a =	60.0 degrees
A =	8.7 m
B =	8.7 m
BP =	344.79 kPa
CH =	21.9 m
d1 =	11.0 m
d2 =	15.3 m
d3 =	19.7 m
d4 =	24.0 m
IGH =	13.20 m
L1 =	21.9 m
L2 =	30.6 m
L3 =	39.3 m
L4 =	48.0 m
L5 =	21.9 m
L6 =	30.6 m
L7 =	39.3 m
L8 =	48.0 m
O1 =	OHGW In
O2 =	OHGW Out
P1 =	Phase In
P2 =	Phase Out
X1 =	1.0
X2 =	1.0
Y1 =	2.00



Back Guys
Conductors Per Phase: 2
Insulators Per Phase: 2



Elevation View

Side Guys

Conductor / OHGW Data - RUBUS

Cond. Diameter = 3.15 cm	Cond. Unit Weight = 1.62 kg/m	Cond. Tension = 38.0 kN
OHGW Diameter = 1.02 cm	OHGW Unit Weight = 0.45 kg/m	OHGW Tension = 13.3 kN

Loading Data - WIND ZONE 4

Conductor Wind = 1220.0 Pa	Column Wind = 1220.0 Pa	Radial Ice = 0.00 cm	Addl. Ecc. = 10.0 cm
Shape Factor = 2.10	OLF Vertical = 1.10	OLF Horizontal = 1.10	OLF Line Tension = 1.10

Wind and Weight Span Data - PROF 1

Allowable Wind Span = 400.0 m
Allowable Weight Span = 400.0 m

Guy Loads (kN)/Lead

Back	T1 = 94 kN	T2 = 94 kN	T3 = 94 kN	T4 = 18 kN	Int = 4 kN
Side	T5 = 32 kN	T6 = 32 kN	T7 = 32 kN	T8 = 8 kN	Int = 8 kN
Front	F-Int = 7 kN				

Guy Wire Lengths		
	a	*b*
Int Guy 1	27.8 m	27.8 m
Int Guy 5	25.6 m	
Back Guy 1	32.9 m	32.9 m
Back Guy 2	45.9 m	45.9 m
Back Guy 3	59.0 m	59.0 m
Back Guy 4	72.0 m	72.0 m
Side Guy 5	31.0 m	
Side Guy 6	43.3 m	
Side Guy 7	55.6 m	
Side Guy 8	67.9 m	

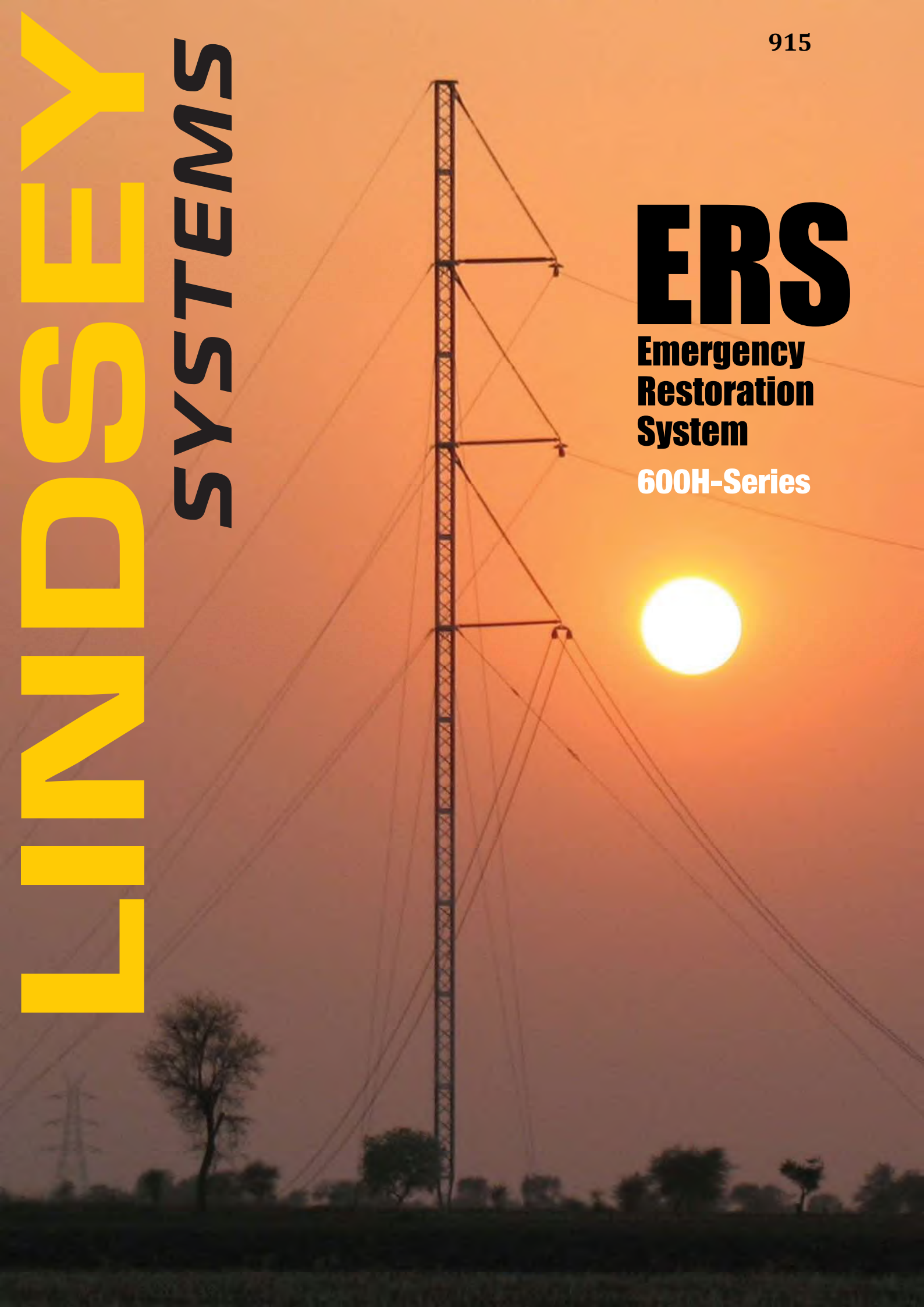
LINDSEY SYSTEMS

915

ERS

Emergency Restoration System

600H-Series



PERRY JOHNSON REGISTRARS, INC.

Certificate of Registration

Perry Johnson Registrars, Inc., has audited the Quality Management System of:

Lindsey Manufacturing Co. dba Lindsey Systems

760 North Georgia Avenue, Azusa, CA 91702 United States

(This single site has more than one location. See appendix for details.)

(Hereinafter called the Organization) and hereby declares that Organization is in conformance with:

ISO 9001:2015

This Registration is in respect to the following scope:

Design and Manufacture of Transmission and Distribution Products, Monitoring Devices and Systems Primarily for the Electric Utility Industry

This Registration is granted subject to the system rules governing the Registration referred to above, and the Organization hereby covenants with the Assessment body duty to observe and comply with the said rules.

PERRY JOHNSON REGISTRARS, INC.

ANAB
ANSI National Accreditation Board
ACCREDITED
ISO/IEC 17021-1
MANAGEMENT SYSTEMS CERTIFICATION BODY

Terry Boboige, President

Perry Johnson Registrars, Inc. (PJR)
755 West Big Beaver Road, Suite 1340
Troy, Michigan 48084
(248) 358-3388

The validity of this certificate is dependent upon ongoing surveillance.

Effective Date: August 14, 2024
Expiration Date: August 13, 2027

Certificate No.: C2024-03331

Proposal for Lindsey Emergency Restoration System 600H Structures

Prepared for:
JAIGAD POWER TRANSCO LIMITED

INDIA

October 08, 2024

Lindsey Systems
760 N. Georgia Ave. P.O. Box 877 Azusa, CA 91702 U.S.A Phone:
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1 CONTENTS

PROPOSAL

Lindsey Systems is pleased to provide a proposal for our 600H-series Emergency Restoration System (ERS) structures.

2 ABOUT LINDSEY ERS STRUCTURES

Since 1982 Lindsey ERS structures have been the leading choice of utilities, contractors, and EPC firms around the world both to provide for rapid restoration of unscheduled transmission tower outages, and for use during scheduled construction and maintenance projects. In fact, Lindsey developed the original 1070-Series ERS in conjunction with five utilities. Lindsey's motto, "Touching High Voltage Every Day," is also a reflection of this.

In addition to ERS structures, Lindsey produces HV and EHV hardware, transmission line monitoring systems, transmission line security systems, and high accuracy medium-voltage current and voltage sensors for both overhead and underground applications. Lindsey products do touch high voltage every day. And they have done so for over 70 years.

It is this deep experience with utilities that Lindsey has brought to the Series-600H ERS structures. Key features resulting from direct utility field personnel input, include:

- Lightweight, open lattice design.
    - The open lattice design of the Series-600H provides a comfortable climbing environment for linemen. This eliminates the need to carry portable footrests needed with designs present linemen with narrow edged, curved footholds.
    - Open lattice design ensures even the heaviest system components weight less than 100 kg, ensuring easy manual portability in even the most inhospitable environments.
    - Compatibility with all commercially available fall arrest systems. Open lattice construction allows line crews to use the fall arrest system they have trained with and are familiar with. No proprietary fall arrest system is required.

- Wide cross sections.
    - Wide cross sections mean superior buckling resistance. The Lindsey Series-600H offers more than twice the strength-to-weight ratio of towers with narrower cross sections. Superior buckling strength provides better performance of tall structures under high loads.
    - The wide cross section of the Series-600H provides the ability of up to 4 linemen to work at the same level. This is a critical safety and work practice issue when dealing with complicated installations.
- All welded aluminum construction.
    - Aluminum has been the standard for ERS. Aluminum ensures light weight; a critical feature to ensure ease of handling and fast installation when deploying in the field. Aluminum is also corrosion resistant. ERS structures are designed for both long term storage, deployment in sometimes brutal and primitive environments, and are intended to be un-installed and stored for reuse. Aluminum ensures that the nicks and dings which will invariable occur from such use will not result in corrosion as would occur with steel structures.

Lindsey ERS structures are intended for temporary use. However, their robust design is the reason many utilities have left them in continuous service; some structures have been in continuous service for over twenty years.

3 SUMMARY OF PROPOSAL

In accordance with your request, Lindsey Systems is pleased to submit the following **budgetary quotation** for one (1) complete set of 400kV Emergency Restoration Structures (ERS), and three set of hardware assembly for 600H Lindsey ERS. With these materials you should be able to build the following structures:

Five (5) 400kV Single Circuit 0°- 20° Suspension Towers with-OHGW.

See drawing ER-ASY-13642-HVT-400 Conductor Height =22m. (2 conductors / phase)

Total height of Tower = 40m.

OR

Five (5) 400kV Single Circuit 0°- 60° Tension Towers with-OHGW.

See drawing ER-ASY-13652-DET-400 Conductor Height = 22m. (2 conductors / phase)

Total height of Tower = 40m

4 STRUCTURE TYPES

Material supplied with Lindsey ERS sets can be configured to build a wide variety of structure types. Following is a brief description of the most common versions of these structures.

4.1 HORIZONTAL-VEE

Horizontal Vee structures are among the most commonly built ERS structure. They can be built to hold one, two or three phases and are commonly used to bypass a single circuit, or a double circuit, one structure on either side. They use a “vee” shaped combination of a post insulator and a suspension insulator to support the conductor. They are used for pure suspension to moderate angle running-angle applications.

4.2 RUNNING ANGLE

Running angles are very much like horizontal-vee structures except the line angle is more pronounced, eliminating the need for the post insulator.

4.3 DELTA

This is essentially the same as a horizontal vee except one phase is on the opposite side of the other two. One advantage if this structure is its shorter overall height and smaller right-of-way requirement. This structure is mainly used for suspension only applications.

4.4 DEAD END (TENSION) TOWERS

On the left, three shorter single-phase structures are used to provide dead-end terminations to phase conductors. Both three-phase and single-phase dead-ends can be built. Single-phase structures are shorter and easier to guy. The use of single-phase dead-ends also provides much greater flexibly in placement and less complex conductor routings than three-phase dead-ends.

A three-phase full tension tower is shown on the right. Note the four-bundle conductor load on one side, transitioning to a two-bundle on the other side. This is a useful practice during bypasses as a way of reducing conductor load.

4.5 CHAINETTE STRUCTURES

Two ERS columns can be used using suspension insulators only to construct two-phase (i.e. HVDC) or three-phase chainette structures. Chainettes are used for suspension applications particularly where the transmission line is built with horizontal phase construction (side-by-side phases).

Other advantages of chainette structures include:

- The ERS columns themselves can provide the leverage to lift the phase conductors into place.
- Very strong compared to horizontal vee structures and therefore are ideal for long spans or heavy conductor loads.

4.6 FOUR-COLUMN STRUCTURES

Four ERS columns can be used with suspension insulators to construct three-phase suspension structures especially for lines using horizontal phase construction (side-by-side phases). This is an exceptionally strong configuration, is ideal for very tall applications, and can support very heavy conductor loads and long spans. They may be applied at fairly large line angles. This type of structure also allows the ERS columns themselves to provide the leverage to lift the phase conductors into place.

4.7 HERRINGBONE STRUCTURES

Two ERS columns can be used using suspension insulators only to construct one-, two- or three-phase V-string structures. The concept is similar to the Chainette structure but ideal for lines with vertical phase construction. Advantages are the same as for Chainettes:

- The ERS columns themselves can provide the leverage to lift the phase conductors into place.
- Very strong compared to horizontal vee structures and therefore are ideal for long spans or heavy conductor loads.
- Can be applied at greater line angles than horizontal vee structures.

5 MATERIAL DESCRIPTION

ERS systems are typically packaged and sold in “sets.” There is no industry standard or definition as to the meaning of a set. A set typically includes all the parts necessary to build a specified number of ERS structures at one or more voltages, and of one or more types of structure configurations. Typical parts included in a set may include:

- ERS structure foundations and support gimbals
- ERS structure column sections
- Guy plates
- Insulators
- Conductor hardware
- Anchors, guy wires, and associated hardware

IN addition, the following Installation tool kits may be included the Proposal. These may include:

- Gin poles and/or erection jibs for hand erection of the structures
- Working platforms
- Anchor installation tools
- Miscellaneous hand tools

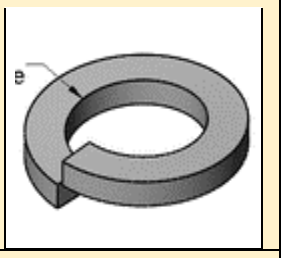
Lindsey’s ProSpot ERS structure analysis software and field training are also usually quoted as a separate line items.

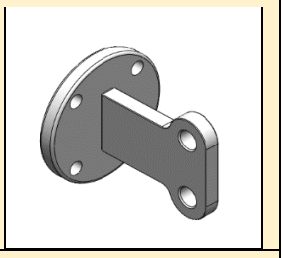
5.1 SERIES-600H ERS STRUCTURE COMPONENTS

Following is a description of all the items that may be included with the Series-600H ERS. Consult the BOQ Section of this proposal for a list of all items included in this Proposal.

Item/Description	P/N	Image
FOUNDATION *The Foundation is made from 1.2m by 1.2m aluminum plate and is designed to be placed directly on the ground to provide bearing support. The design of the Lindsey Foundation allows for several rigging attachment points used for erection of the columns or for raising the conductors.*	**7254**	
GIMBAL TOWER *The Gimbal or articulating joint acts as a universal joint eliminating torsion loading of the final structure and allowing the assembled column to be rotated from the horizontal plane to the vertical position from any position.*	**7224**	

ERS TOWER SECTIONS 600L *All column sections are fabricated from lightweight, high strength structural aluminum alloy. The all-welded construction insures easy handling and eliminates the loss of small bolted pieces.*	**7262 (2.9m)** **7263 (1.45m)**	
OHGW BRACKET ERS TOWER *This bracket mounts to the top of the completed tower to support overhead ground wires.*	**7264**	
4WAY 45DEG GUY PLATE 600ERS *High Strength Guy Plates are made from structural aluminum plate and directly transfer the insulator loads across the structure and into guy wire loads. Each attachment hole is designed to hold a 134kN load. The Guy Plates are attached to the four (4) holes between or on the top of each column section using high strength M24x3x210 galvanized bolts. The edges of this guy plate is bent at a 45 degree angle for better alignment with ground connected guys.*	**7268**	
0 0 GUY PLATE 600 ERS *This is the same as the 4WAY 45 DEG GUY PLATE except the plate is flat. This is commonly used for multiple column structures such as herringbone and chainette designs were structural guy wires are used to connect the columns. This can also be used on top of 45 degree guy plates to provide additional guy attachment points at the same level.*	**7269**	
POST INSULATOR SUPPORT *This attaches to the top or bottom of any tower section and provides an attachment point for post insulators, most commonly used on horizontal vee structures. The design of the post insulator support provides a universal pivot point for the post insulator, eliminating bending moments on the post insulator and thus increasing the insulator's buckling strength.*	**7267**	
M24X3X210 BOLT HH MTRC 8.8 GALV *Lindsey Series-600H ERS use only one size bolt, provided in two lengths. This is the longer bolt (210mm) as is used for all connections except from the foundation to the gimbal or a guy plate mounted to the very top of a structure.*	**7250/210**	

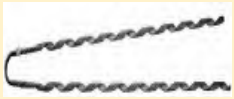
M24X3X80 BOLT HH MTRC TAP 8.8 GALV *Lindsey Series-600H ERS use only one size bolt, provided in two lengths. This is the shorter bolt (80mm) as is used for to connect the foundation to the gimbal or a guy plate mounted to the very top of a structure.*	**7249**	
M24X3 NUT HEX MTRC GALV *This nut is used with all bolts.*	**7249-1**	
M24 WASHER LOCK MTRC GALV *This lock washer is used with all bolts.*	**7249-2**	
60KIP ANCHOR SHACKLE GALV *The anchor shackles are used in various locations associated with anchoring and line hardware connections.*	**3262BNC**	
60KIP CHAIN LINK GALV 080-63505 *The chain links are used in various locations associated with anchoring and line hardware connections.*	**3405**	
35KIP 7/8X12 TURNBUCKLE EYE EYE Turnbuckles are used to permanently remove slack from anchor wires.	**3790EE**	

END CAP ADAPTER GALV *This connects to the end of a post insulator and provides connection points for conductor hardware (conductor clamps, yoke plates, etc.)*	**R-10850**	
EXTENSION STRAP SET INSULATOR *These hold the suspension insulator in a horizontal-vee assembly and provide a restoring moment for the assembly under longitudinal loads.*	**7273/600**	
25KIP CLAMP SUSPENSION W SY This is a wye clevis socket eye conductor clamp. Designed for ACSR conductors ranging from 19 – 30mm (0.75 – 1.19 inches) in diameter. The clamps bodies and keepers are manufactured from light weight, high strength A 356-T6 aluminum alloy. U-bolts, nuts, lock washers and clevis pins are hot dip galvanized steel.	**1336SY**	
30KIP CLAMP QUAD STRAIN W SE YCE *Lindsey's 17008SY Series Quadrant Strain Clamps is recommended for ACSR or all aluminum conductor from 12.7 – 30 mm (0.50 – 1.20 inches). The clamp bodies and keepers are manufactured from lightweight, high strength A356-T6 aluminum alloy. U-Bolts, nuts, lock washers and clevis pins are hot dip galvanized steel. Humpback cotter keys are stainless steel.*	**1708SY**	
18KIP CLAMP SUSPENSION *This is a ductile iron suspension clamp for use with steel overhead ground/static wires.*	**1329**	
15KIP QUAD CLAMP W SE YCB GALV *This is a ductile iron strain clamp for use with steel overhead ground/static wires.*	**1701SY**	

INSULATOR SUSPENSION *Suitably rated, light weight, non-ceramic suspension insulators are supplied with Lindsey ERS structures. These insulators conform to all applicable electrical and mechanical tests as required by both ANSI and IEC standards.*	**7003-104CH**	
INSULATOR POST *Suitably rated, light weight, non-ceramic post insulators are supplied with Lindsey ERS structures. These insulators conform to all applicable electrical and mechanical tests as required by both ANSI and IEC standards.*	**7003-212CH**	
KIT OF BOLTS FOR POST INSULATORS *Appropriate bolt kits are supplied for connecting and mounting suspension and post insulators.*	**7003-196**	
TBAR FOUNDATION STAKE GALVANIZED *These are stakes used to hold the ERS foundation plate from slipping during assembly.*	**R-14304**	
30KIP GUY STRAIN INSULATOR 103IN *Guy strain insulators are connected in series with guy wires to ensure that the electrically grounded guy wires do not interfere electrically with the phase conductors as they make connection to the ERS tower guy plates.*	**7900/103**	
20FT ERS STORAGE CONTAINER *One or more of these 20' ocean going containers will be supplied to hold all of the material supplied with the ERS kit.*	**R-16431**	

5.2 SERIES-600H GUYING HARDWARE

Following is a description of all guying hardware items that <<may be or are ??>> included with the Series-600H ERS:

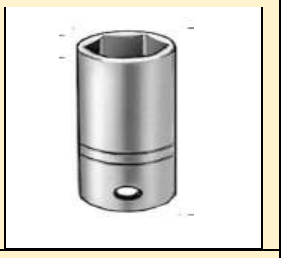
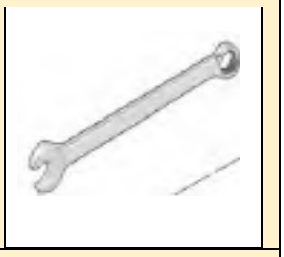
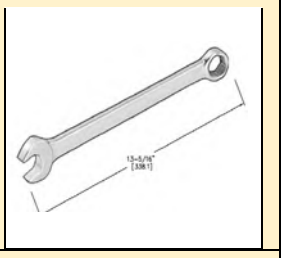
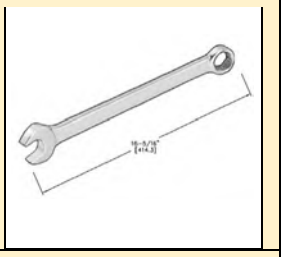
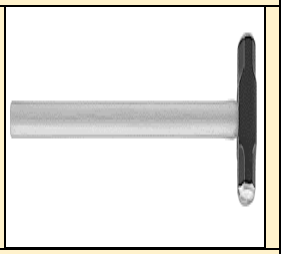
9/16DIAXxx EHS GUYWIRE STL GA *Only flexible multi-strand guy wire is provided with Lindsey ERS structures for easy handling in the field. Guy wire may be supplied in reels or pre-cut lengths.*	**7045**	
5/8 THIMBLE WIRE ROPE *These thimbles protect guy wires (wire ropes) from damage as they pass through anchor connectors.*	**7950**	
TE-1T TRIPLE THIMBLE EYE *This eye attaches to the end of anchor extension rods and provides the ability to support three anchor wire fitted with thimbles.*	**R-16624-3**	
BIG GRIP DEADEND *These are preformed grips to designee to attached to the stranded guy wire provided with Lindsey ERS structures.*	**R-13467**	
20KIP MANTA RAY STYLE ANCHOR *These hydraulically installed self-locking type anchors can be installed in 15-20 minutes. The advantage of these type anchors, besides their speed of installation in normal soils, is that they are proof tested during installation. Anchor installation kits are commonly supplied with these types of anchors as part of the optional ERS Tool Kit.*	**R-16624 or R-16624-1**	
CROSS PLATE ANCHOR ASSEMBLEY *Cross plate anchors are a very common and universal anchoring method, requiring minimal installation equipment.*	**R-13193**	

TRIPLE HELIX ANCHOR *For normal or low-density soil conditions, i.e. swamp or peat, high strength triple helix screw anchors can be provided*.	**R-14384**	
ROCK ANCHOR ASSEMBLY *For use in anchoring guy wires into rock.*	**R-16978**	
ANCHOR EXTENSION RODS SAR10A 1INX7FT ROD 1-8UNC ENDS *These are 2.1m (7 foot) extension rods supplied to provide connection between anchors and the attachment point for the connected ground wire. They may be connected end to end as required.*	**R-16624-2**	
ANCHOR EXTENSION RODS 1X3 1/2FT ROD SAR 10C *These are 1 m (3.5 foot) extension rods supplied to provide connection between anchors and the attachment point for the connected ground wire. They may be connected end to end as required.*	**R-16624-4**	
ANCHOR EXTENSION ROD COUPLING NUTS 1-8 *These coupling nuts are used to connect anchor extension rods as required.*	**R-16624-5**	

5.3 SERIES-600H ERS TYPICAL TOOL SET COMPONENTS

Following is a description of all the items that <<may be or are ??>> included the Series-600H ERS tool sets:

GIN POLE 600 SERIES *The Gin Pole is designed to support manual installation of ERS. Made from aluminum alloy, the gin pole is supported on one corner of a column section and allows for the lifting of column sections to the top of the structure. All necessary snatch blocks and rigging ropes are included. The gin pole davit arm keeps loads clear of the structure while being raised by manpower, or a capstan with hydraulic power unit.*	**7271**	
T516 GRIPHOIST W 150FT CABLE *Griphoists are portable manual hoists with traversing wire rope. These lever operated wire rope hoists are the ideal solution for tightening temporary guys for ERS structures. These hoists are portable, strong and can be used in any orientation. The design of these hoists allow for a virtual unlimited lift or pull, the limit of which is determined only by the length of wire rope inserted into it and they have built in overload protection.*	**R-16513**	
CAPSTAN AND FOOTPEDAL *The 1-ton hydraulic capstan winch with foot pedals is used to lift column sections, insulators, etc., in conjunction with use of the gin pole and all manual installation methods. The capstan is capable of being powered by the same hydraulic power unit which is used to install manta-ray style anchors.*	**7004H**	
5/8X600FT SPL 3 STRD POLYESTER ROPE *This rope is used with the capstan and gin pole to lift material (column sections, insulators) up the ERS column as it is being constructed using manual methods.*	**R-15738**	
HANDLING BLOCK *The handling block, or snatch-block, is used with the capstan and gin pole to help guide the lifting rope as it routes from the foundation to the top of the structure.*	**R-16884**	
15IN RATCHET 1/2 DRIVE *This ratcheting socket drive is used to tighten bolts used with the ERS structure.*	**T-1006**	

1/2" SQ. Dr 75mm Deep Socket, 36mm *This socket is used with the above wrench to tighten bolts used with the ERS structure.*	**T-1007**	
36MM COMBINATION WRENCH *Used for tightening*	**T-1008**	
24MM COMBINATION WRENCH *Used for tightening*	**T-1009**	
30MM COMBINATION WRENCH *Used for tightening*	**T-1017**	
12IN CRESCENT WRENCH *Used for tightening*	**T-1005**	
SLEDGE HAMMER 10LB *Used to drive foundation stakes into the ground.*	**R-15037**	
3TON CHAIN HOIST *Used when adjusting the guys or when side guying a column during erection. Eliminates the need for block and tackle that do not have a positive stop.*	**R-15107**	

ANCHOR PULLING EYE ALUMINUM *This is used to connect the construction yoke to an anchor rod. The offset eye allows for connection to the three-ton chain hoist for tightening and connection of the guy grip. The pulling eye can be disassembled after use.*	**R-17103-10**	
AUTOMATIC WIRE GRIP *Use the automatic wire grip to hold the guy wire and is used with the chain hoist to properly tension the guy wire before permanently attaching with preformed grips and guy thimbles.*	**R-14301**	
10FT NYLON SLING *Slings are used for a variety of lifting tasks. This sling has a 85kN maximum capacity.*	**R-14303**	
6FT GREEN SLING ENDLESS ROUND *Slings are used for a variety of lifting tasks. This sling has a 47kN maximum capacity.*	**R-17105**	
CONDUCTOR LIFTING HOOK *This is used to assist lifting conductors out of single or bundled stringing travelers.*	**R-14305**	
ERS CONSTRUCTION YOKE PLATE *The construction yoke plate is used to provide spacing between temporary guys and permanent guys during the connection of permanent guys to an anchor rod. This simplifies the guying process.*	**7272**	

PIN EXTRACTOR *This is for use in removing foundation stakes after dismantling an ERS structure.*	**R-19431**	
6TON HYDRAULIC WIRE CUTTER *For use in gutting guy wire to length.*	**R-15258**	
TOOL BOX ERS *Used to conveniently store and hold miscellaneous tools.*	**R-17798**	

5.4 SERIES-600H ERS MANTA-RAY TYPE ANCHOR INSTALLATION TOOL SET COMPONENTS

Following is a description of all the items that <<may be or are ??>> included with the optional Manta-Ray type Anchor Installation Tool Set:

MANTA RAY INSTALLATION TOOL SET with HPU This is a complete tool set for installing and locking manta-ray type anchors.	**R-16625**	SEE COMPONENTS PHOTOS BELOW
STL HP8BA HYDRAULIC POWER UNIT (HPU) *18HP gasoline power hydraulic power unit with an output capacity of 5 or 8 GPM (20 or 30 LPM).*	**R-16625-1**	
BR87130 HYDRAULIC BREAKER DRIVE HAMMER *This is used to drive the manta-ray type anchor heads into the soil. The driving steel (below) is attached to the hammer and the anchor head is attached to the driving steel.*	**R-16625-2**	
HOSE SETS HC-16-25 For use in connecting the hydraulic output from the HPU to the drive hammer or capstan with foot pedal.	R-16625-3	
LL 1 ANCHOR LOCKER *This device is used to load lock manta-ray type anchor heads and proof test the anchor.*	**R-16625-4**	
SGC 14 DRIVING STEEL SET *This is a complete set of driving steel used to drive manta-ray type anchor heads into normal soil and will drive an anchor to a depth of 2.4m (8 feet).*	**R-16625-5**	

SG 2 EXTENSION *This is a 0.8m (33 inch) extension to the driving steel set above.*	**R-16625-6**	
SG 3 RADIUS TIP *This is a spare tip that fits into the manta-ray style anchor head. One of these is included in the Driving Steel Kit.*	**R-16625-8**	
SG 14 SHANK *This is a spare shank that fits into the hydraulic driving hammer. One of these is included in the Driving Steel Kit.*	**R-16625-9**	
SG 4 COUPLER *This is used to connect driving steel extension rods to the existing driving steel, radius tips and shanks.*	**R-16625-7**	

5.5 SERIES-600H ERS STORAGE CONTAINERS

ERS systems are intended for rapid deployment in times of emergency. Lindsey 600H-Series ERS systems are shipped in standard 20-foot ocean cargo storage containers, ensuring all ERS system components are kept together and readily transportable to site. These containers are part of the ERS system and designed to hold all ERS material until such time that they must be deployed to a work site

20FT ERS TOOLING CONTAINER *These specially fitted tool containers are provided when optional construction tools are ordered.*	**R-16001**	

20FT ERS STORAGE CONTAINER *These standard containers contain ERS tower components, associated insulators and hardware, anchors and guy wire.*	**R-16431**	

6 PROSPOT® ERS DESIGN SOFTWARE

ProSpot® ERS design software is specifically for ERS systems and allows for rapid configuration and design of ERS towers in the field or in the office. ProSpot works with all series of Lindsey ERS structures. Lindsey ProSpot advantages include:

- FAIL SAFE output – A Lindsey exclusive: If the design parameters selected will not result in a stable structure, no results are generated. No need for interpretation of pages of data. Only with ProSpot do you know that if you see it, you can build it.
- Fast selection of tower types; no complex set up. Design any tower, whether or not originally envisioned at the time of the original ERS system purchase.
- Limited input data requirements for fast design.
- One page output containing plan and elevation views and all critical loading parameters.
- No annual licensing fee, eliminating on-going software costs.
- May be freely copied within your organization, eliminating the need to purchase expensive software for casual users.

7 TRAINING

Lindsey offers a comprehensive one (1) Week (4-5 working days) Emergency Restoration System training session. This includes one day of training for engineers on the use Lindsey's ProSpot® ERS design software, and four days field training for linemen and supervisors on mutually agreed training dates.

Training is conducted at the purchaser's facilities for the time period as specified. Training includes field training imparting first-hand knowledge about the assembly of modular structures, erecting of structures, guying and anchoring. Specific instructions will be given for installation of ERS using cranes, gin pole and hydraulic hoisting equipment. Before the training is scheduled, Lindsey and the Purchaser will mutually agree on the structure types and methods which will be used during the hands-on instruction.

The training will also include training on Lindsey's ProSpot ERS design software to ensure engineers can determine the capabilities of the structures. Input of data will be demonstrated, and ProSpot will provide analysis of restoration structures, including foundation and anchoring forces.

Due to the interactive nature of the services to be provided, assistance from the Purchaser is required to achieve a successful training session. Purchaser will need to coordinate with Lindsey's trainers ahead of the training date to ensure that the proper facilities, equipment, tools and materials, are available. Ideally anchors should be pre-installed and tested. These preparations will allow the planned training activities to occur within the allotted training time.

COMPLETE DESCRIPTION OF THE PROPOSED MATERIALS AND SERVICES

DETAILED LISTING OF ALL PROPOSED MATERIALS AND SERVICES FOR FIVE (5) SUSPENSION OR FIVE (5) TENSION 600H ERS TOWERS

10/21/2024

Item No.	Lindsey Part No.	Description	Qty.
	E.R.S. Structure Components		
1	7254	FOUNDATION PLATE	5
2	7224	RIGID GIMBAL	5
3	7262	2.90m COLUMN	65
4	7264	OVERHEAD GROUND WIRE BRACKET	5
5	7268	45/45 DEG 4-WAY GUY PLATE	20
6	7269	0/0 DEG GUY PLATE	20
7	R-25756	POST INSULATOR SUPPORT	15
8	7250-210	ERS BOLT M24 x 3 x 210 (INC.20% EXTRA)	364
9	7249	ERS BOLT M24 x 3 x 80 (INC.20% EXTRA)	104
10	7249-1	M24 x 3 HEX NUT GALV. (INC.20% EXTRA)	468
11	7249-2	M24 LOCKWASHER GALV. (INC.20% EXTRA)	468
	E.R.S. Training & Computer Programs		
12	7001	ERS Computer Analysis Programs	1
13	7002	ERS On-Site Training (weeks)	1
	Conductor and Guying Hardware		
14	3262BNC	ANCHOR SHACKLE	319
15	3405	CHAIN LINK	149
16	3790EE	7/8 x 12" EYE-EYE TURNBUCKLE	66
16	R-9058	30 KIP TRIANGULAR YOKE PLATE	17
17	7273/785	HANGER STRAMPS ASSY 78-1/2	15
18	R-25757	INSULATOR BLADE ADAPTER	17
19	R-11271/230	30 KIP STRAP LINK23"	17
20	1420/143SY	EHV Suspension Clamp 30.5-36.3mm	33
21	1710SY	CONDUCTOR STRAIN CLAMP 18.0-35.6mm	66
22	1329	OHGW SUSP. CLAMP	3
23	1701SY	OHGW STRAIN CLMP	11
	Insulators		
24	7003-143CH	SUSPENSION INSULATOR	79
25	7003-144CH	POST INSULATOR	16
26	7003-202	KIT OF BOLTS FOR POST INSULATOR	18

Item No.	Lindsey Part No.	Description	Qty.
	Guy Wire Components		
27	7950	THIMBLE CLEVIS	117
28	R-13467	PLP DEAD-END GUY GRIP	234
29	7045/L	9/16" DIA. EHS GUY WIRE (M)	8000
30	7900/103	GUY STRAIN INSULATOR	55

	Anchor Assemblies		
31	R-13193	CROSS PLATE ANCHOR ASSEMBLY	85
	Each Set Consists of the Following Items		Qty/Set
	R-13193-1	TRIPLE EYE ANCHORE ROD	1
	R-13193-2	CROSS PLATE ANCHOR HEAD	1
32	R-16624	MANTA RAY ANCHOR ASSEMBLY	85
	Each Set Consists of the Following Items		Qty/Set
	R-16624-1	MANTA RAY-1 ANCHOR	1
	R-16624-2	SAR10A 1"X 7FT ROD	1
	R-16624-3	TE-1T TRIPLE THIMBLE EYE	1
	R-16624-4	SAR10C 1" X 3.5 FT ROD	1
	R-16624-5	C-1 NUT	1
33	R-16978	ROCK ANCHOR ASSEMBLY	39
	Each Set Consists of the Following Items		Qty/Set
	R-16978-1	ROCK ANCHOR HEAD	1
	R-16978-2	1"(25) X 12" (305)THREADED ROD	1
	R-16978-3	TRIPLE THIMBLE EYE	1

Item No.	Lindsey Part No.	Description	Qty.
	Accessories		
34	R-20079	ASSEMBLY & ERECTION TOOL SET 600 Series	1
	Each Set Consists of the Following Items		Qty/Set
34.01	7271	600H Gin Pole	1
34.02	R-16513	2 ton Tirfor Griphoist	8
34.03	7004H	Capstan with Foot Pedal	1
34.04	R-15738	5/8" Polyester Rope, 600' Spool	6
34.05	R-16884	Snatch Block for 5/8" rope	5
34.06	T-1006	1/2" Square Drive Ratchet	6
34.07	T-1007	1/2" SQ. Drive Deep Socket, 36mm	6
34.08	T-1008	15"-12 Point Box Wrench, 36mm	6
34.09	T-1009	24mm Combination Wrench	6
34.1	T-1017	30mm Combination Wrench	6
34.11	T-1005	12" Adjustable Spanner Wrench	3
34.12	R-15037	10-12 LB. Sledge Hammer	2
34.13	R-15107	3 Ton Chain Hoist	6
34.14	R-17103-10	Pulling Eye	12
34.15	R-14301	Automatic Wire Grip	8
34.16	R-14302	10 ft. Metal Sling	2
34.17	R-14303	10 ft. Nylon Sling	2
34.18	R-17105	6' (1.8m) Endless Rd. Sling (Green)	8
34.19	R-14305	Conductor Lifting Hook	3
34.2	7272	Anchor Construction Yoke Plate	6
34.21	7274/350	Workman's Platform	1
34.22	R-15258	6 Ton Hydraulic Wire Cutter	1
34.23	R-21645	Fall Arrest Life Line System Kit with Safety Belt	3
34.24	R-17798	Tools Box	1
35	R-16625	MANTA RAY INST. TOOLS SET & HPU	1
	Each Set Consists of the Following Items		Qty/Set
	R-16625-1	HPU-18-8 Hydraulic Power Unit, 18hp	1
	R-16625-2	HB90-14 Hammer	1
	7004-5	Hose Sets HC-16-25	2
	R-16625-4	LL-1 Load Locker	1
	R-16625-5	SGC-14 Drive Steel Set	1
	R-16625-6	SG2 Extension (3ft)	3
	R-16625-7	SG4 Couplers	4
	R-16625-8	SG3 Radius Tip	1
	R-16625-9	SG-14 1 1/4" Shank	1

36	R-16979	ROCK DRILL TOOL SET	1
	Each Set Consists of the Following Items		Qty/Set
	R-16979-1	Rock Drill Stainley HD45(Uses R-16625-1)	
	R-16979-2	7/8" x 2'	1
	R-16979-3	7/8 "x 4'	1
	R-16979-4	Couplers	2
	R-16979-5	1" Shank	1
	R-16979-6	1 3/4" Carbide Bits	5
	R-16979-7	Bearing Plate	1

Accessories (CONTINUED)

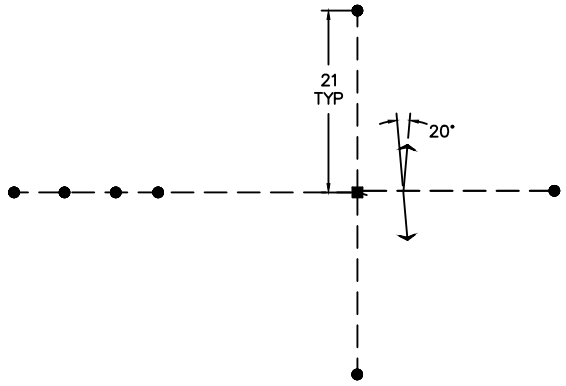
37	R-14304	FOUNDATIONS STAKES 1.2 Mts.	26
38	R-16001	20 ft. INSULATOR / HARDWARE STORAGE CONTAINER	1
39	R-16431	20 ft. STORAGE CONTAINER FOR TOWER SECTIONS.	4

Table
Recommended Spare Parts

ERS Structure Components		0%
ERS Nuts, Bolts and Lockwashers		30%
Conductor and Insulator Hardware		10%
Insulators and Corona Rings		5%
Guy Wire Components:		
	Thimbles and PLP Grips	30%
	Guy Wire	30%
	Guy Strain Insulators	10%
Anchors:		
	Normal Soil Anchors	30%
	Swamp Anchors	30%
	Rock Anchors	30%

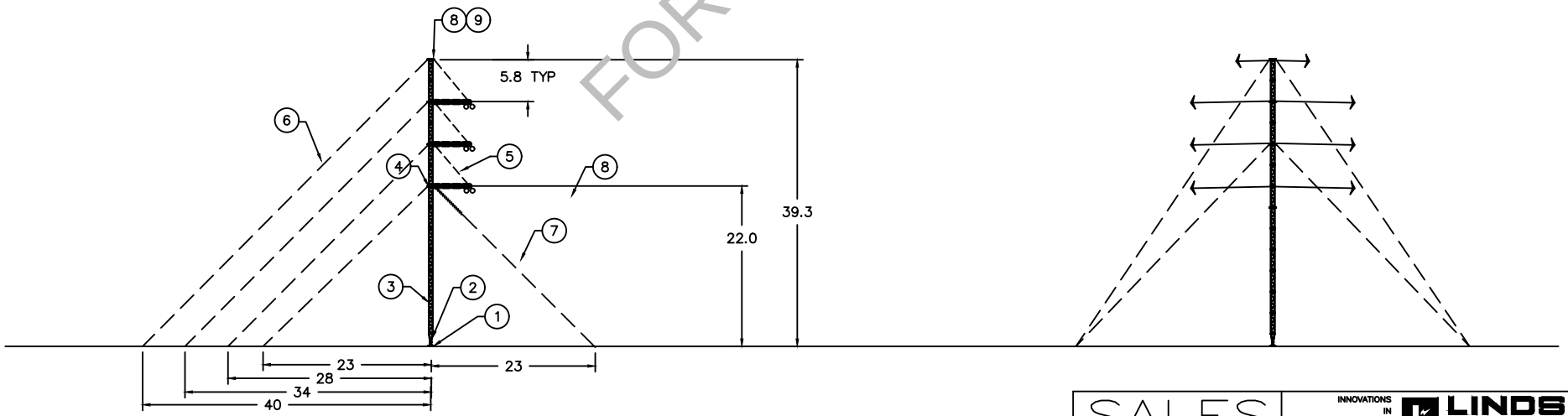
10 DRAWINGS

REVISIONS		
LTR	DESCRIPTION	ENG/DATE
1	INITIAL SALES DRAWING SUBMITTAL	P.L. 3/5/19



ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION	MAT'L	WT.EA. KGS.
1	1	7254	FOUNDATION PLATE	AL	60
2	1	7224	RIGID GIMBAL	AL	77
3	13	7262	2.9m COLUMN SECTION	AL	95
4	4	7268	45°/ 45° 4-WAY GUY PLATE	AL	24
5	3	ER-ASY-13642-HVH-400	HORIZONTAL VEE HRDWR ASSY.	–	–
6	8	R-19588-3	GUY WIRE ASSY.	–	–
7	1	R-19588-4	INSULATED GUY WIRE ASSY.	–	–
8	1	R-19588-2	OHGW HW ASSEMBLY.	–	–
9	1	7264	OHGW BRACKET	–	–

TOTAL GUYS	9
TOTAL ANCHORS	7
TOTAL GUY WIRE REQD.	800M

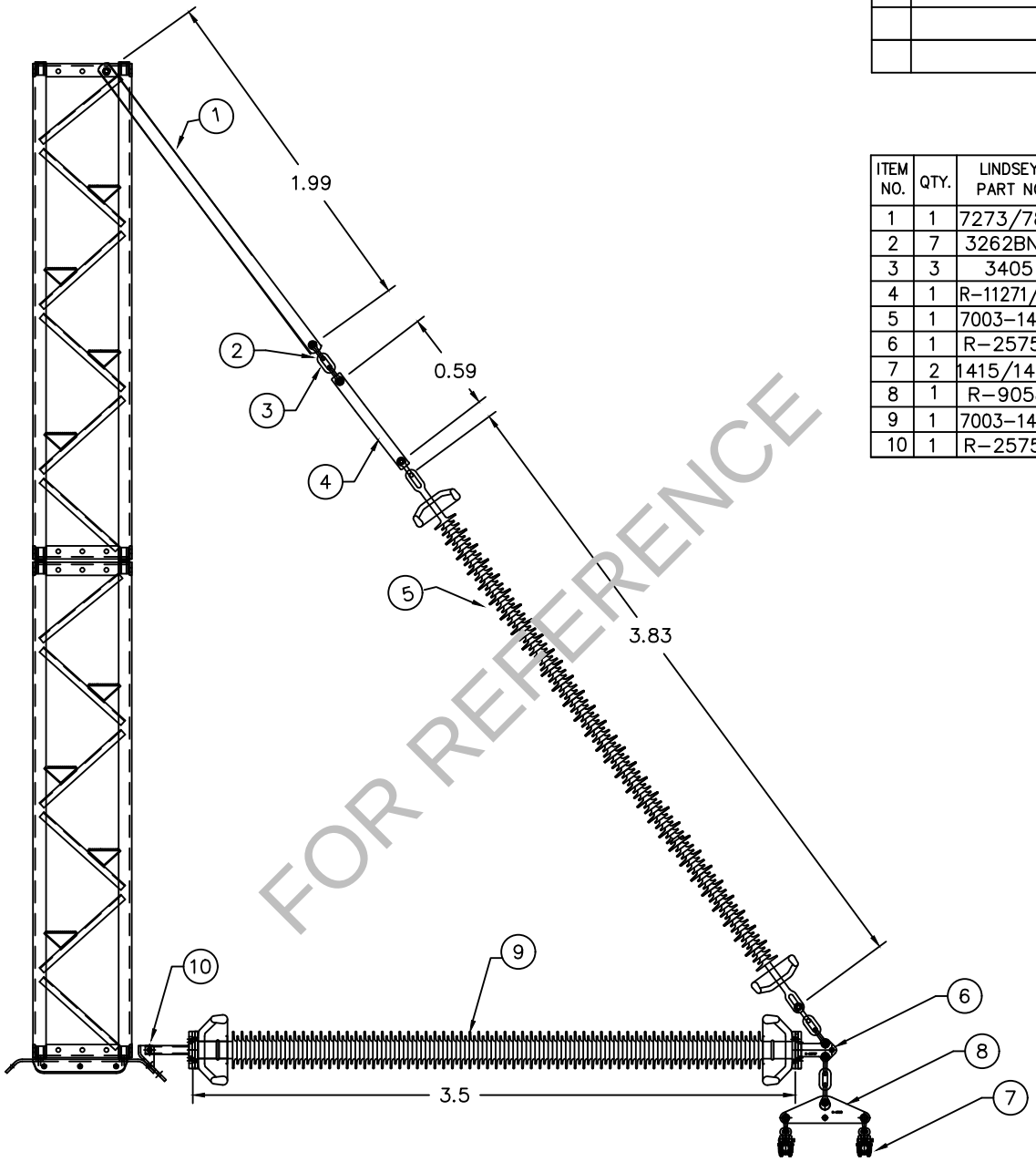


* MAXIMUM CONDUCTOR HEIGHT SHOWN.
1. ALL DIMENSIONS ARE IN METERS
NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY 760 N. GEORGIA / AZUSA, CA 91702 (626) 969-3471			
APPROVALS	DATE	400kV 20° HORIZONTAL-VEE			
DRAWN PAUL LARA	3/5/19				
ENGINEER EMIDGIO AGUILERA	XXXX	SIZE B	SCALE 1:600	DWG ER-ASY-13642-HVT-400	REV 2
REF. jAIGAD Power Transco India					

945

REVISIONS		
LTR	DESCRIPTION	BY/DATE



ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION
1	1	7273/785	78–1/2 [1993.9]
2	7	3262BNC	ANCHOR SHACKLE
3	3	3405	CHAIN LINK
4	1	R–11271/230	EXTENSION LINK 23"
5	1	7003–143CH	SUSPENSION INSULATOR
6	1	R–25757	INSULATOR BLADE ADAPTOR
7	2	1415/143SY	SUSPENSION CLAMP ASSY.
8	1	R–9058	30 KIP TRI YOKE PLATE
9	1	7003–144CH	POST INSULATOR w/CORONA RING
10	1	R–25756	POST INSULATOR SUPPORT

SALES

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

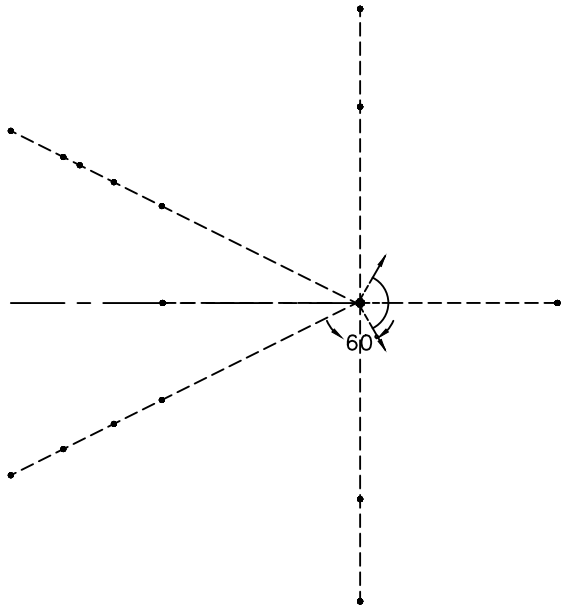
LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

APPROVALS	DATE
DRAWN HARUT AVETISYAN	8/23/2022
ENGINEER	XXXX
REF.Jaigad Power Transco India	

400kV HORIZONTAL VEE HARDWARE ASSY.

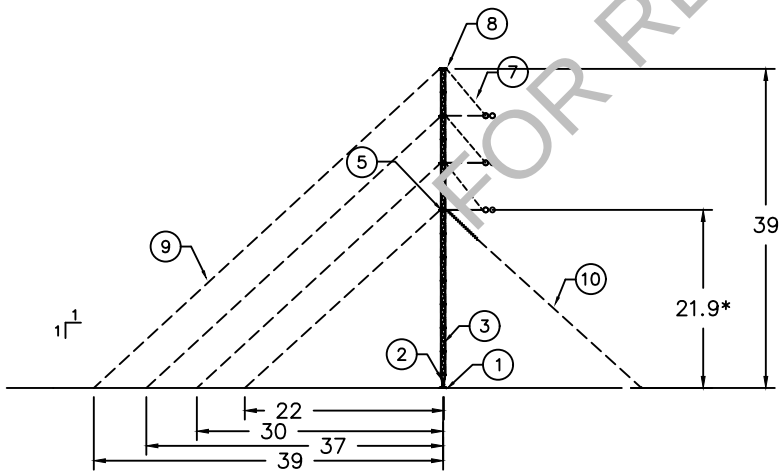
SIZE	SCALE	DWG	REV
B	1: 30	ER-ASY-13642-HVH-400	2

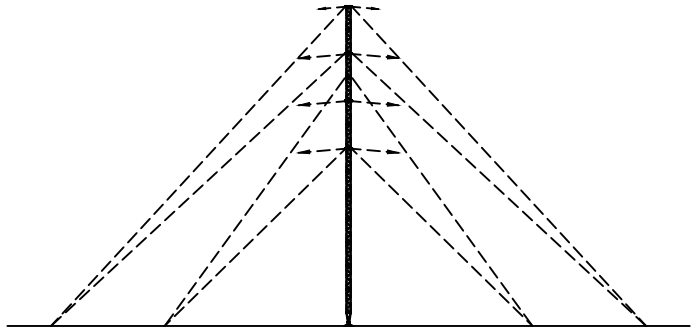
REVISIONS 946		
LTR	DESCRIPTION	ENG/DATE
1	INITIAL SALES DRAWING RELEASE	P.L. 7/11/11



ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION	MAT'L	WT.EA. KGS.
1	1	7254	FOUNDATION PLATE	AL	60
2	1	7224	RIGID GIMBAL	AL	77
3	13	7262	2.9m COLUMN SECTION	AL	95
4	4	7269	0°/ 0° GUY PLATE	AL	24
5	4	7268	45°/ 45° GUY PLATE	AL	24
6	0	7225	BOX SECTION	AL	44
7	3	ER-ASY-13652-DEH-400	DEAD-END HARDWARE ASSY.	–	–
8	2	R-19589-2	OHGW STRAIN	–	–
9	17	R-19588-3	ANCHOR GUY WIRE ASSY.	–	–
10	1	R-19588-4	INSULATED GUY WIRE ASSY.		

TOTAL GUYS	18
TOTAL ANCHORS	13
TOTAL GUY WIRE REQD.	1200M





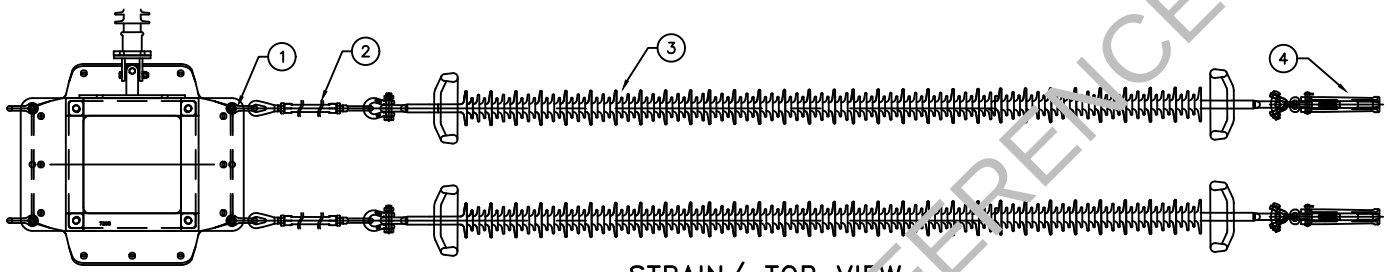
* MAXIMUM CONDUCTOR HEIGHT SHOWN.
1. ALL DIMENSIONS ARE IN METERS
NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	400kV 60° SINGLE CIRCUIT DEAD-END W/ OHGW			
DRAWN PAUL LARA	7/11/11				
ENGINEER SERGIO CORTEZ	7/11/11	SIZE B	SCALE 1:700	DWG ER-ASY-13652-DET-400	REV 2
REF. Jaigad Power Transco India					

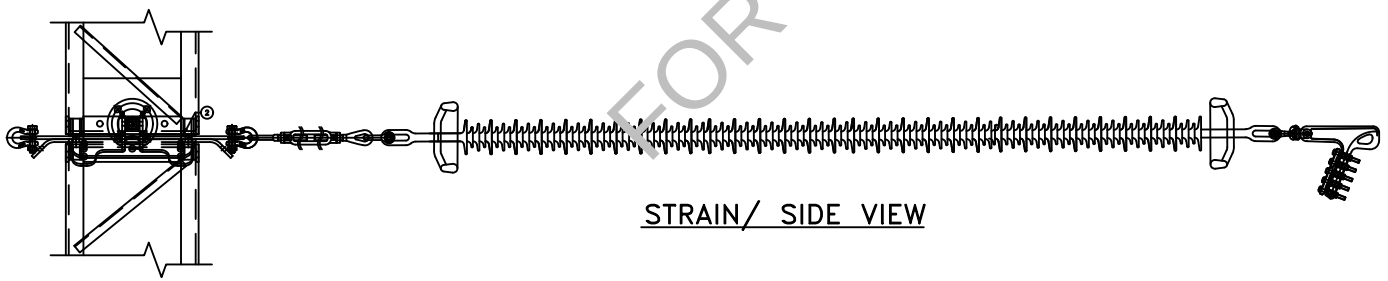
REVISIONS		
LTR	DESCRIPTION	BY/DATE
	947	

ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION
1	4	3262BNC	ANCHOR SHACKLE
2	2	3790EE	36KIP EYE-EYE TURNBACKLE
3	2	7003-143CH	SUSPENSION INSULATOR WITH COR. RING
4	2	1710SY	STRAIN DEAD END CLUMP

NOTE:
FOR JUMPER ASSY. SEE DRAWING # ER-ASY-12912-DEJ-400



STRAIN/ TOP VIEW

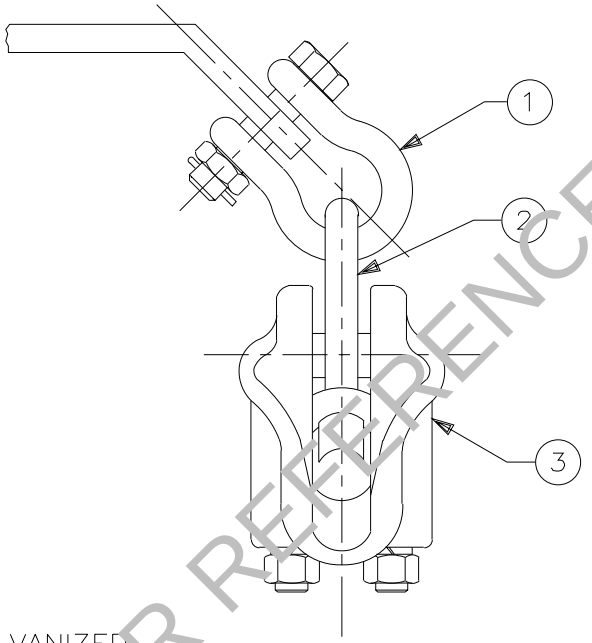


STRAIN/ SIDE VIEW

NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	400kV DEAD - END HARDWARE ASSY.			
DRAWN HARUT AVETISYAN	8/23/2022				
ENGINEER	XXXX	SIZE B	SCALE 1:30	DWG ER-ASY-13652-DEH-400	REV

ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION	MAT'L	WT.EA. KGS.
1	1	3262 BNC	60 KIP ANCHOR SHACKLE	FS	1.2
2	1	3405	60 KIP CHAIN LINK	FS	0.7
3	1	1329	18 KIP SUSP. CLAMP .20" –.63"	FS	1.4



GENERAL NOTES:

1. ALL FERROUS PARTS ARE HOT DIP GALVANIZED PER ASTM A–123.
2. ALL FERROUS FASTENERS ARE HOT DIP GALVANIZED PER ASTM A–153.
3. ALL COTTER KEYS ARE HUMPBACK STAINLESS STEEL (TYPE 304).

USED ON NUMBERS

NO.	DATE	BY	APP.	DESCRIPTION
				REVISIONS

–STRENGTH– LBS. | REQ–

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

TITLE: OVER HEAD GROUND WIRE ASSEMBLY

TOLERANCES UNLESS OTHERWISE NOTED	FRACTIONS	DECIMALS	
CAST			
FORGE			
MACHINE			
FABRICATION			

WEIGHT		
ASMB–	RAW	FIN.

MATERIAL	FINISH
SEE TABLE	SEE TABLE

NOTE!	DO–NOT SCALE DRAWING
	BREAK ALL SHARP EDGES

APP.	
CHK.	
DRG.	S.C.
	02/21/06

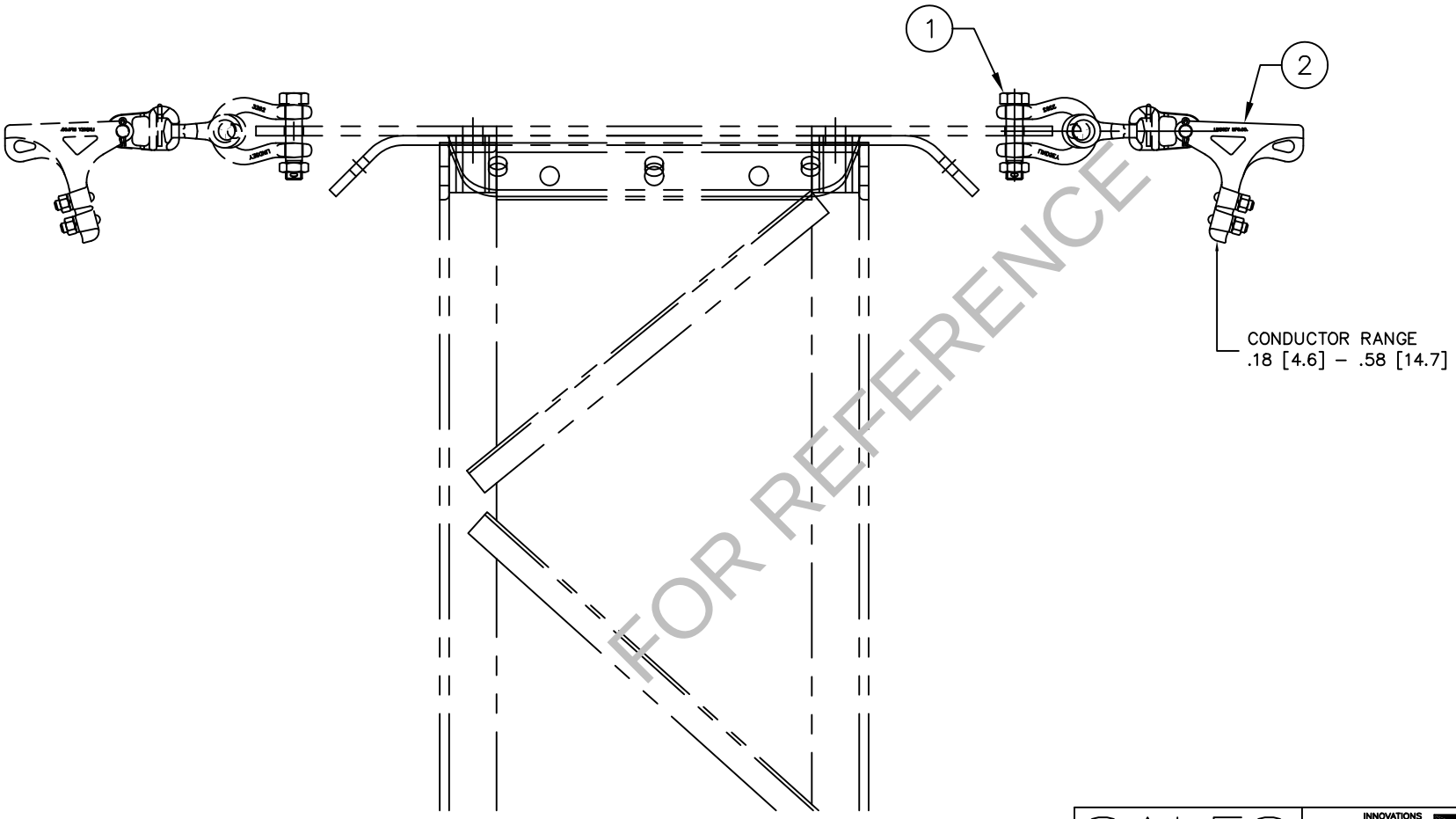
SCALE	NUMBER
NONE	

LAST–REVISION NO.	DATE
1	08/01/06

DRAWING–NUMBER
R–19588–2

ITEM	P/N	DESCRIPTION	QTY.
1	3262BNC	60 KIP ANCHOR SHACKLE	1
2	1701SY	15 KIP QUAD. CLAMP W/SE/YC	1

REVISIONS		
LTR	DESCRIPTION	BY/DATE
1	INITIAL SALES DRAWING RELEASE	P.L. 8/31/06



3. ALL COTTER KEYS ARE HUMPBACK STAINLESS STEEL (TYPE 304).
2. ALL FERROUS FASTENERES ARE HOT DIP GALVANIZED PER ASTM STD. A–153.
1. AL LFERROUS PARTS ARE HOT DIP GALVANIZED PER AST STD. A–123.

NOTES: UNLESS OTHERWISE SPECIFIED

SALES

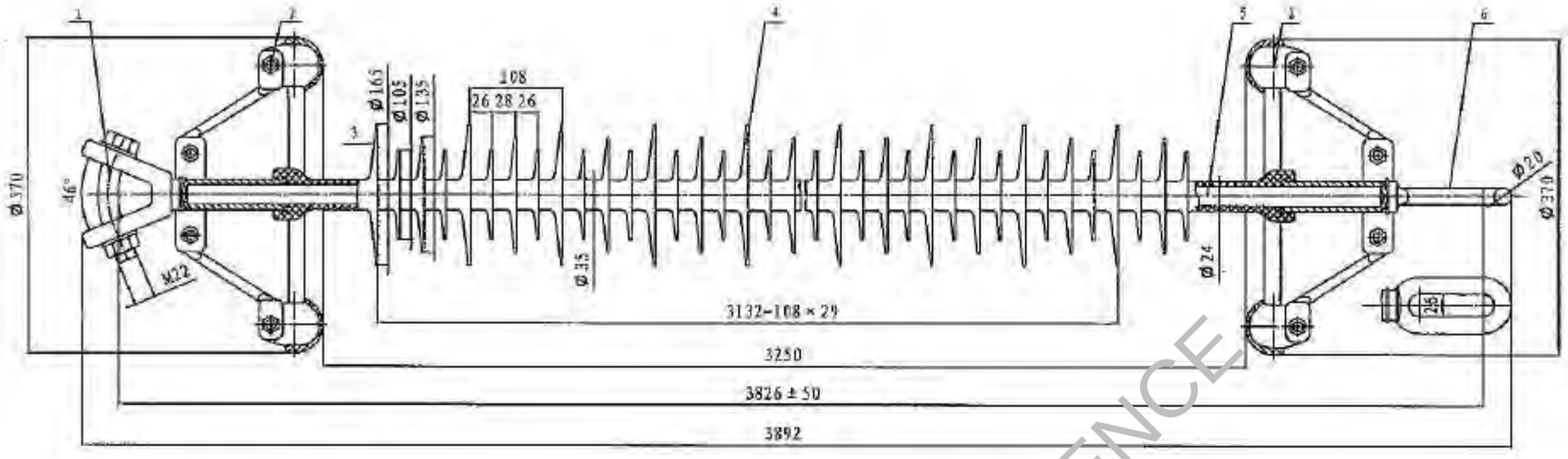
APPROVALS	DATE
DRAWN PAUL LARA	8/31/06
CHECKED SERGIO CORTEZ	8/31/06
ENGINEER SERGIO CORTEZ	8/31/06

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

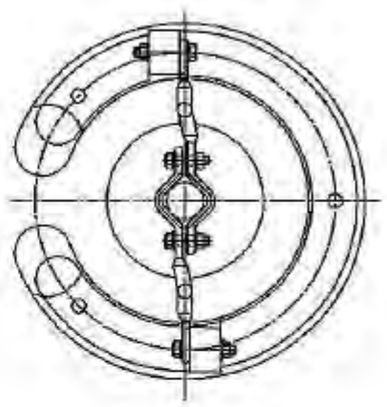
LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

OVERHEAD GROUND WIRE STRAIN HARDWARE ASSY.

SIZE	SCALE	DWG	REV
B	1:6	R-19589-2	1



Right view



Technical Specifications

Electrical data

(1)Rated Voltage :	400 kV
(2)Maximum Voltage :	420 kV
(3)Power Frequency Withstand Voltage (Dry/Wet) :	820/680 kV
(4)Power Frequency Flashover Voltage (Dry/Wet) :	880/780 kV
(5)Switching surge Withstand Voltage (Wet) :	1050 kV
(6)Impulse Withstand Voltage (Dry)(Pos./Neg.):	1550/1650 kV (Peak)
(7)Impulse Flashover Voltage (Pos./Neg.):	1750/1850 kV (Peak)
(8)Minimum Corona Extinction Voltage (rms) Under Dry condition:	320kV
(9)RIV at 1 MHz for phase to earth voltage under 305kV dry condition:	Max. 1000 Micro volt

Mark:

CHANG JIANG ®
长号
400kV/160kN

JIANGSU XIANGYUAN ELECTRIC EQUIPMENT CO., LTD.

Mechanical data

(1)Specified Mechanical Tensile Load	160kN
(2)Routine Test Load	80 kN

Dimensions

(1)Section Length	3826mm
(2)Arcing Distance	3250mm
(3)Min Creepage Distance	13020mm
(4)Shed Spacing(between major sheds)	108mm
(5)Core Rod Diameter	24mm

Color: Light Grey

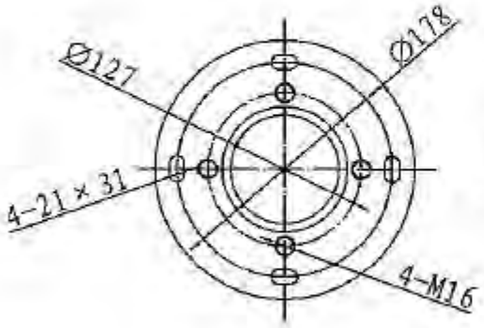
Standards: IEC 61109.

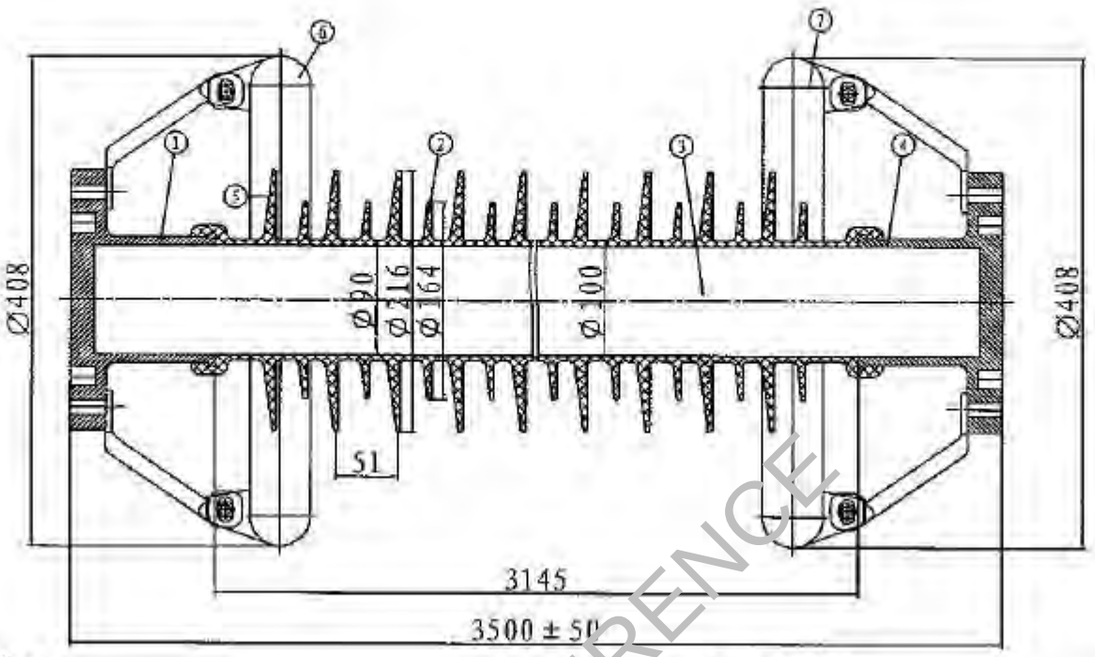
7003-143

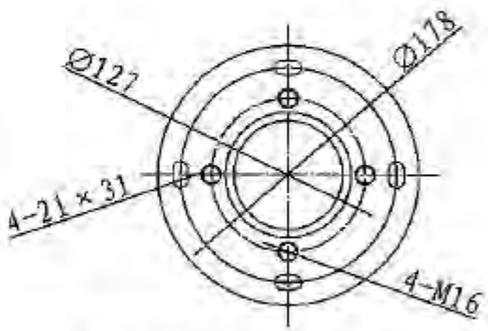
Item	Description	Material	Qty	Weight	Model/Remark
6	Eye	Forged Steel	1	2.35kg	Hot-dip galvanized
5	Core Rod	Glass-fiber Reinforced Epoxy Resin		3.58kg	ECR Rod Ø24
4	Housing	Silicone Rubber	1	13.51kg	Color:Light grey
3	Mark		1		
2	Grading ring	Aluminum Alloy	2	2.72kg/set	Connectors, nuts bolts and washers etc. included
1	Y-clevis	Forged Steel	1	2.55kg	Hot-dip galvanized

NOTES	REV	DESCRIPTION OF REVISION	INITIALS	DATE

JIANGSU XIANGYUAN ELECTRIC EQUIPMENT CO., LTD			DATE OF ISSUE: Aug 07th,2012	
400kV Composite Suspension/Tension Insulator				
DRN. BY			Drawing NO: 400kV-201120807-2	Sheet 1 of 1
CHE. BY			Model: FXBW-400/160-3826	In millimeter
APP. BY			APPROX NET WEIGHT: 27kg	SCALE-NTS







7003-144

Technical Specifications

Electrical data

(1)Rated Voltage :	400 kV
(2)Maximum Voltage :	420 kV
(3)Power Frequency Withstand Voltage (Dry/Wet) :	820/680 kV
(4)Power Frequency Flashover Voltage (Dry/Wet) :	880/780 kV
(5)Switching surge Withstand Voltage (Wet) :	1050 kV
(6)Impulse Withstand Voltage (Dry) (Pos./Neg.):	1550/1650 kV (Peak)
(7)Impulse Flashover Voltage (Pos./Neg.):	1750/1850 kV (Peak)
(8)Minimum Corona Extinction Voltage (rms) Under Dry condition:	320kV
(9)RIV at 1 MHz for phase to earth voltage under 305kV dry condition:	Max.1000 Micro volt
(10)Dimensions of the metal fitting accord with client's request	

Mechanical data

(1)Specified Mechanical Bending Load	5 kN
(2)Max. Design Cantilever Load	2.5kN
(3)Specified Mechanical Tensile Load	120kN
(4)Specified Mechanical Compression Load	90kN

Dimensions

(1)Section Length	3500mm
(2)Arcing Distance	3145mm
(3)Min Creepage Distance	13020mm
(4)Shed Spacing(between major sheds)	51mm
(5)Core Rod Diameter	90mm

Color: Light Grey

Standards: IEC 61109

Mark:

CHANG JONG ®

400kV/5kN

JIANGSU XIANGYUAN ELECTRIC EQUIPMENT CO., LTD.

Item	Description	Material	Qty	Weight	Remark
7	Grading ring	Aluminum Alloy	1	3.5kg	
6	Grading ring	Aluminum Alloy	1	3.5kg	
5	Mark		1		
4	Bottom Fitting	Cast Steel	1	5.80kg	Hot-dip galvanized
3	Core Rod	Glass fiber reinforced Epoxy Resin	1	48.68kg	Rod Ø90
2	Weathersheds	Silicone Rubber	1	28.98kg	Color: Light Grey
1	Top Fitting	Cast Steel	1	5.80kg	Hot-dip galvanized

NOTES	REV	DESCRIPTION OF REVISION	INITIALS	DATE

JIANGSU XIANGYUAN ELECTRIC EQUIPMENT CO., LTD. | DATE OF ISSUE: Aug 07th,2012

400kV Composite Station Post Insulator

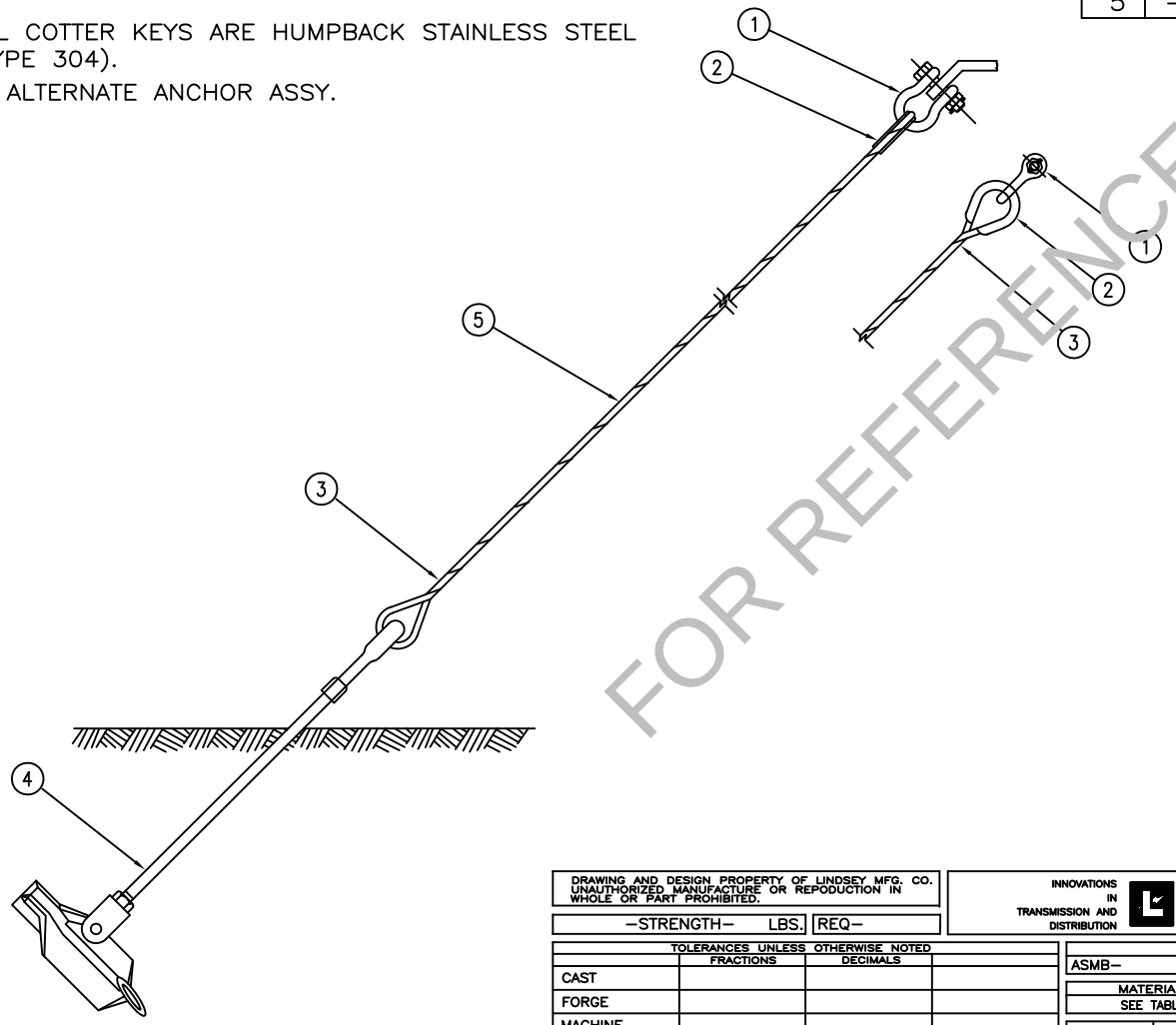
DRN. BY			Drowing NO: 400kV-20120807-1	
CHE. BY			Model: FZSW-400/5	In millimeter
APP. BY			APPROX NET WEIGHT: 96.4kg	SCALE: NTS

GENERAL NOTES:

1. ALL FERROUS PARTS ARE HOT DIP GALVANIZED PER ASTM A–123.
2. ALL FERROUS FASTENERS ARE HOT DIP GALVANIZED PER ASTM A–153.
3. ALL COTTER KEYS ARE HUMPBACK STAINLESS STEEL (TYPE 304).

* OR ALTERNATE ANCHOR ASSY.

ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION	MAT'L	WT.EA. KGS.
1	1	3262 BNC	60 KIP ANCHOR SHACKLE	FS	1.2
2	1	7950	WIRE ROPE THIMBLE	STL.	0.04
3	2	R–13467	PREFORMED GUY GRIP	STL	2.3
4	1	R–16624*	MR ANCHOR ASSEMBLY	STL	18.5
5	–	7045/L	GUYWIRE 9/16 X 19 EHS	19	



USED ON NUMBERS

NO.	DATE	BY	APP.	DESCRIPTION
				REVISIONS

–STRENGTH– LBS. | REQ–

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969–3471

TITLE: GUY WIRE ASSEMBLY USING HYDRAULICALLY INSTALLED ANCHORS

TOLERANCES UNLESS OTHERWISE NOTED	FRACTIONS	DECIMALS	
CAST			
FORGE			
MACHINE			
FABRICATION			

WEIGHT		
ASMB–	RAW	FIN.

MATERIAL	FINISH
SEE TABLE	SEE TABLE

NOTE! DO–NOT SCALE DRAWING
BREAK ALL SHARP EDGES

APP.
CHK.
DRG. S.C. 02/21/06

SCALE: NONE

NUMBER:

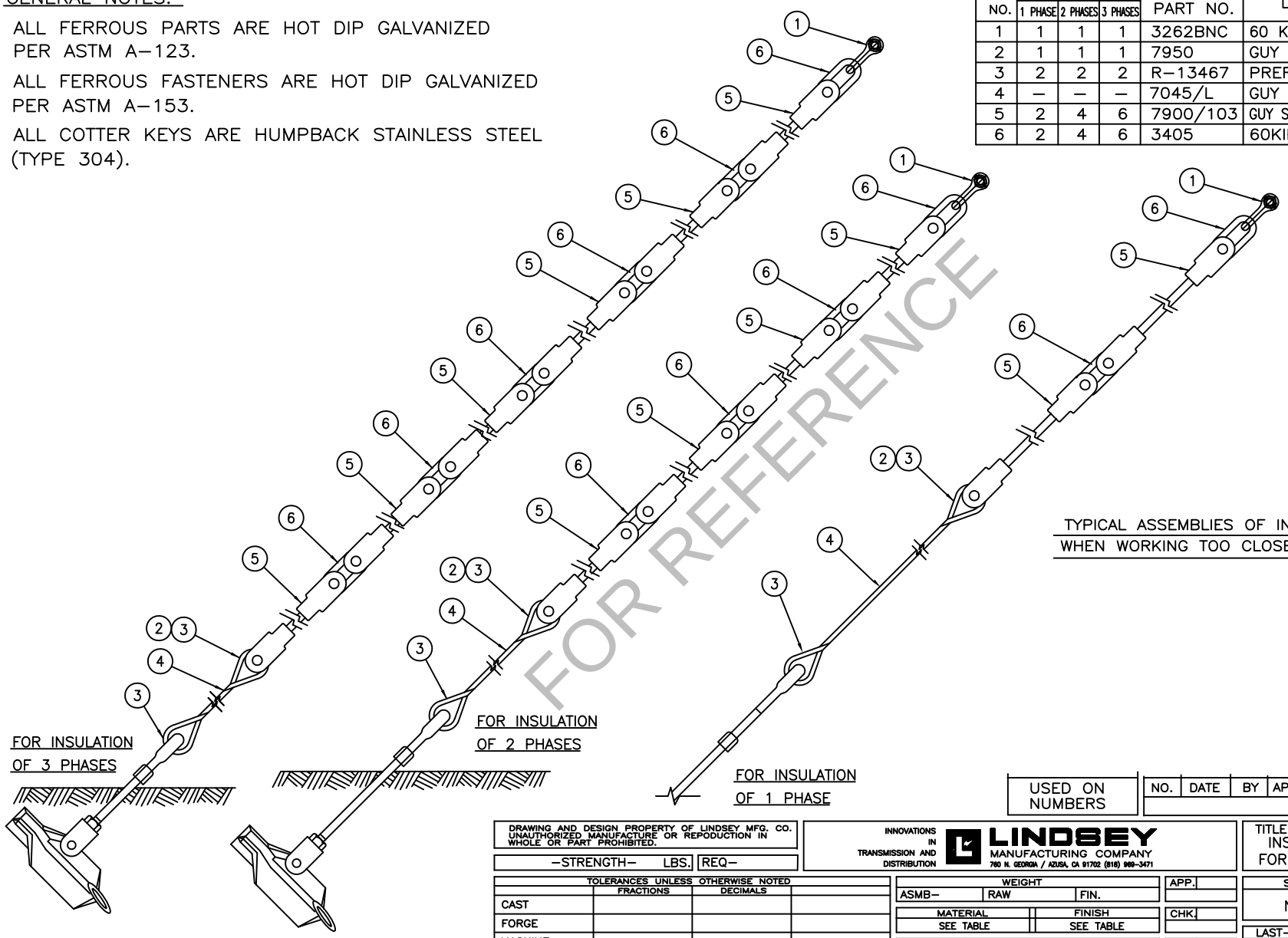
LAST–REVISION NO.	DATE
1	08/31/06

DRAWING–NUMBER: R–19588–3

GENERAL NOTES:

1. ALL FERROUS PARTS ARE HOT DIP GALVANIZED PER ASTM A–123.
2. ALL FERROUS FASTENERS ARE HOT DIP GALVANIZED PER ASTM A–153.
3. ALL COTTER KEYS ARE HUMPBACK STAINLESS STEEL (TYPE 304).

ITEM NO.	QUANTITY 1 PHASE	2 PHASES	3 PHASES	LINDSEY PART NO.	DESCRIPTION	MAT'L	WT.EA. KGS.
1	1	1	1	3262BNC	60 KIP ANCHOR SHACKLE	F.S.	1.2
2	1	1	1	7950	GUY WIRE THIMBLE	D.I.	0.4
3	2	2	2	R–13467	PREFORMED GUY GRIP	STL	2.3
4	–	–	–	7045/L	GUY WIRE 9/16 x 19 EHS	STL	–
5	2	4	6	7900/103	GUY STRAIN INSUL., 103" LONG	F.G.	4.5
6	2	4	6	3405	60KIP CHAIN LINK	F.S.	0.7



TYPICAL ASSEMBLIES OF INSULATED GUY WIRES WHEN WORKING TOO CLOSE TO ENERGIZED LINES.

USED ON NUMBERS

NO.	DATE	BY	APP.	DESCRIPTION
REVISIONS				

–STRENGTH– LBS. | REQ–

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969–3471

TITLE: INSULATED GUY WIRE ASSEMBLIES FOR EMERGENCY REST. STRUCTURES

TOLERANCES UNLESS OTHERWISE NOTED	FRACTIONS	DECIMALS	
CAST			
FORGE			
MACHINE			
FABRICATION			

WEIGHT: ASMB– | RAW | FIN.

MATERIAL: SEE TABLE | FINISH: SEE TABLE

NOTE! DO–NOT SCALE DRAWING; BREAK ALL SHARP EDGES

APP. | CHK. | DRG. P.L. 05/8/2019

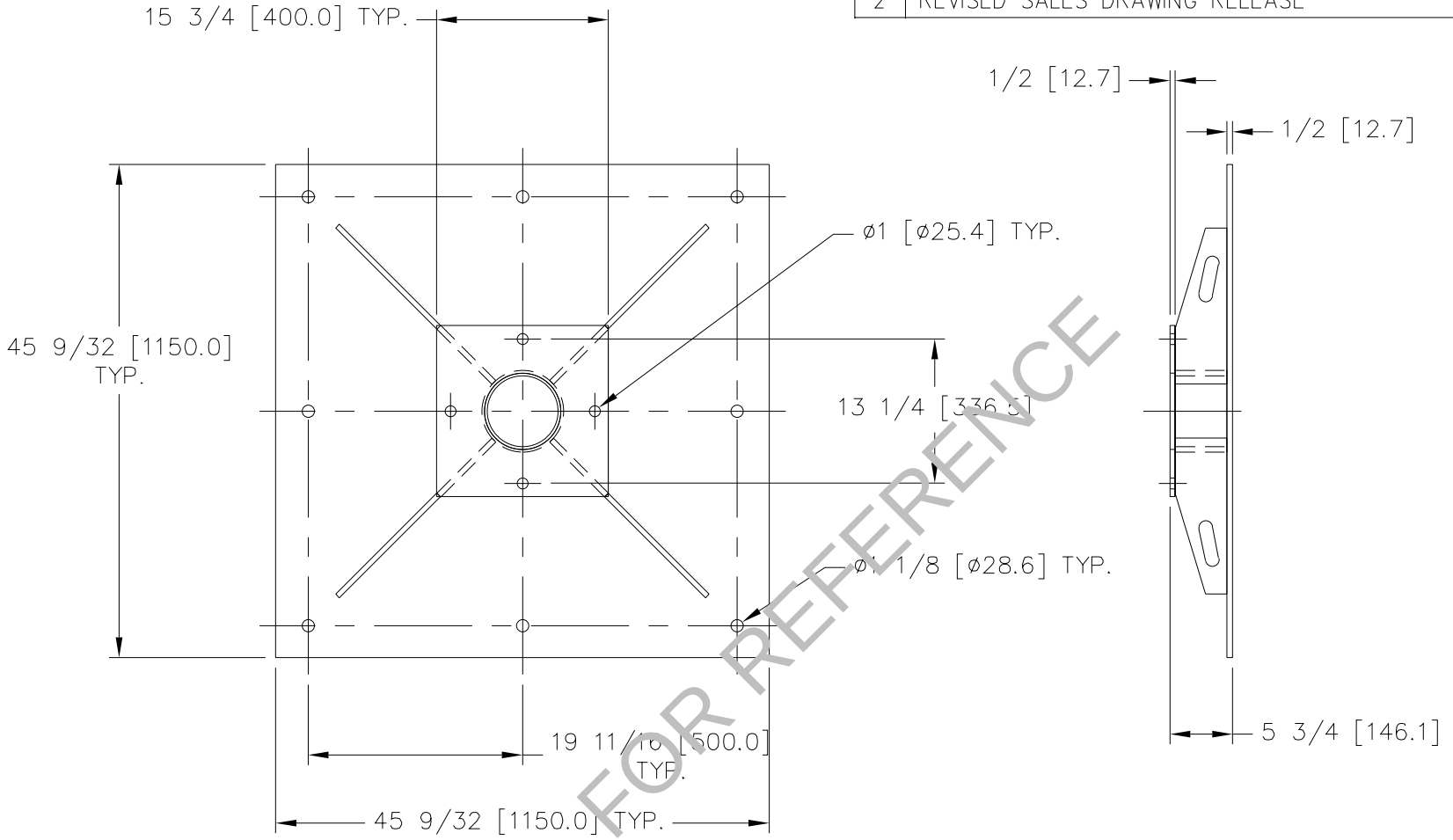
SCALE: NONE

MAHARASHTRA SEB – INDIA NUMBER

LAST–REVISION NO. | DATE

DRAWING–NUMBER: R–19588–4

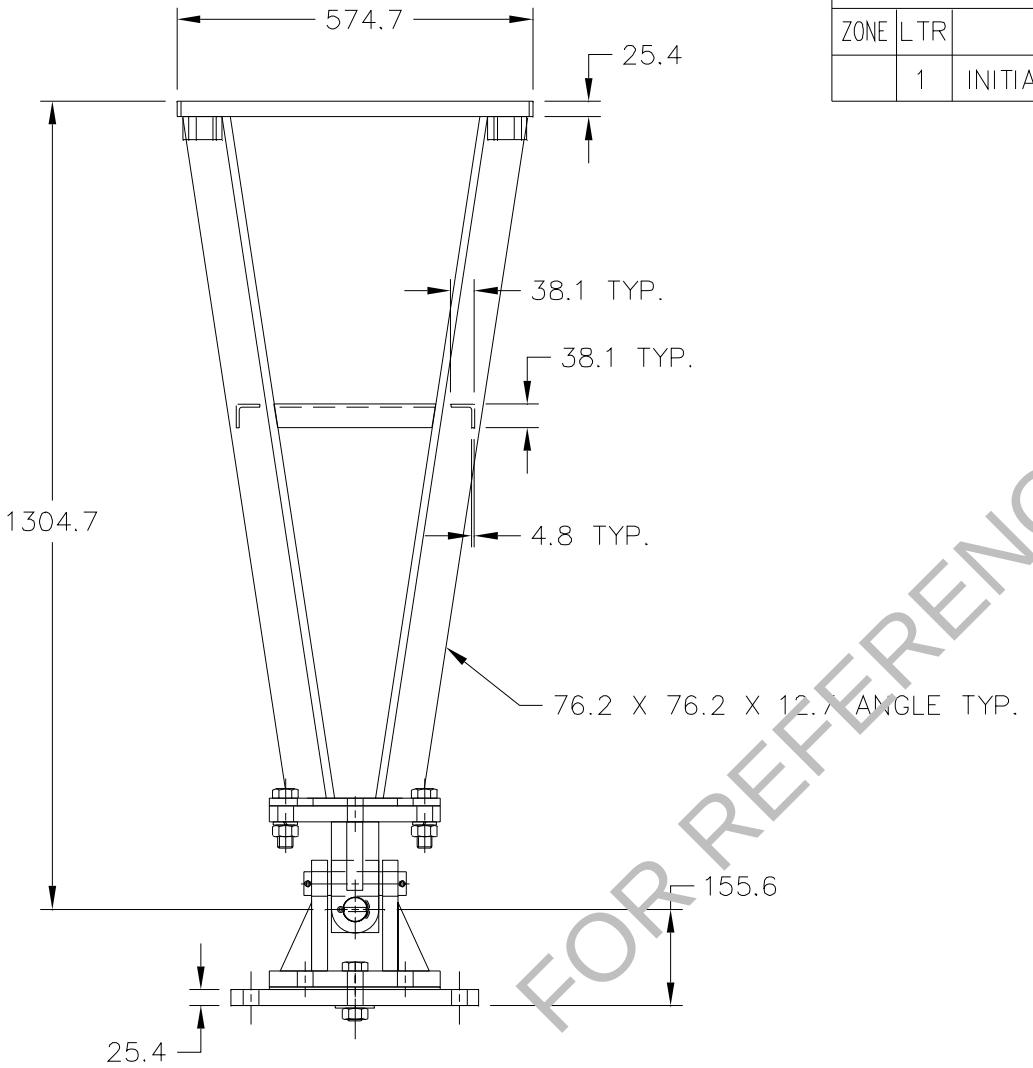
REVISIONS		954
LTR	DESCRIPTION	ENG/DATE
2	REVISED SALES DRAWING RELEASE	P.L. 4/12/07



2. WEIGHT: 132 lbs. [60 Kg]
1. MATERIAL: 6061-T6 ALUMINUM ALLOY
NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	FOUNDATION			
DRAWN PAUL LARA	4/11/07				
CHECKED WILL LEWIS	4/12/07	SIZE A	SCALE 1:15	DWG 7254	REV 2
ENGINEER					

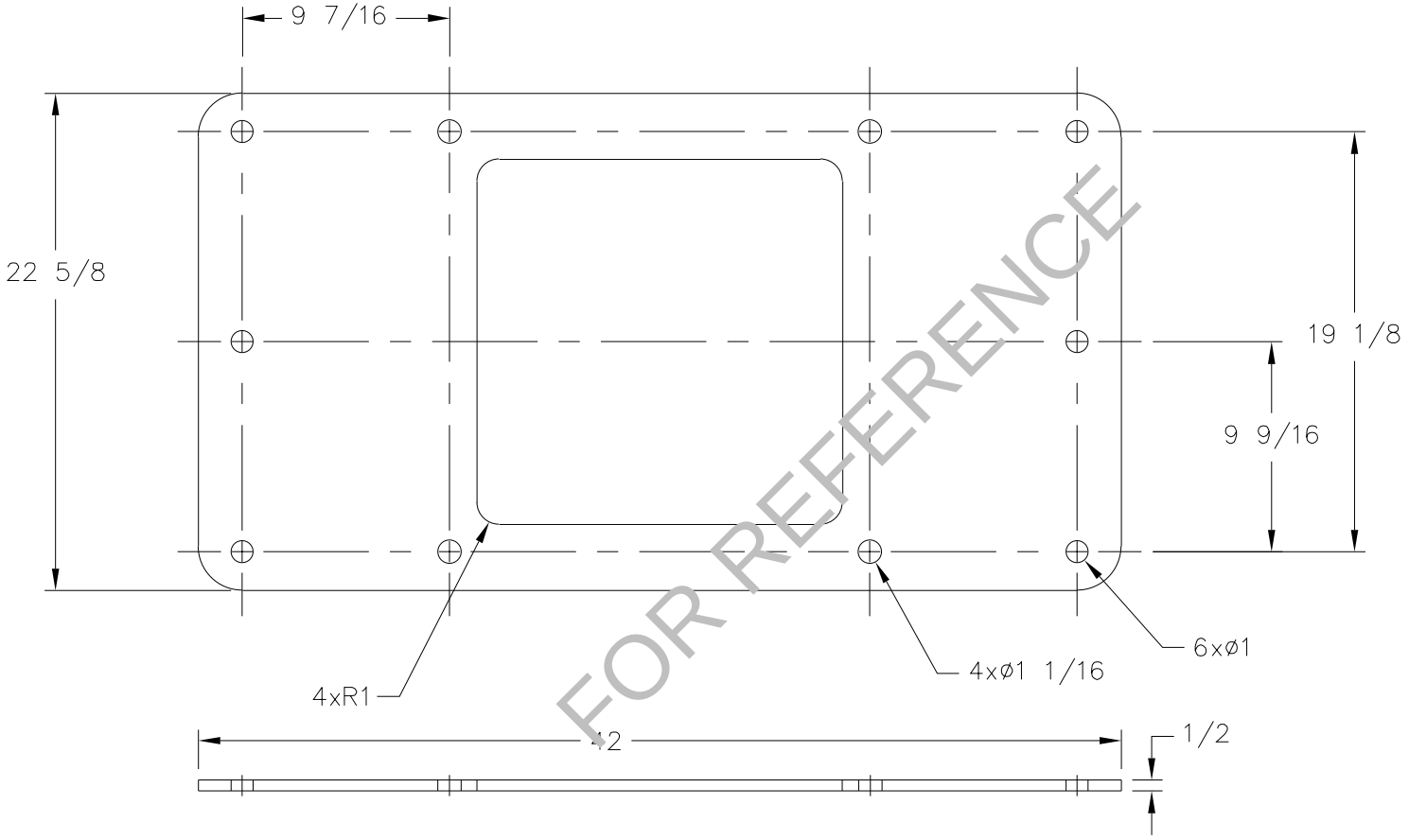
REVISIONS					955
ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	1	INITIAL SALES DRAWING RELEASE	P.L. 11/2/05		



WEIGHT: 77 kg
ALL DIMENSION ARE IN METRIC
NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	GIMBAL TOWER			
DRAWN PAUL LARA	11/2/05				
CHECKED PAT ROWAN	XXXX	SIZE A	SCALE 1:300	DWG 7224	REV 1
ENGINEER PAT ROWAN	XXXX				

REVISIONS					
ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	2	REVISED SALES RELEASE	HB 5/4/07		



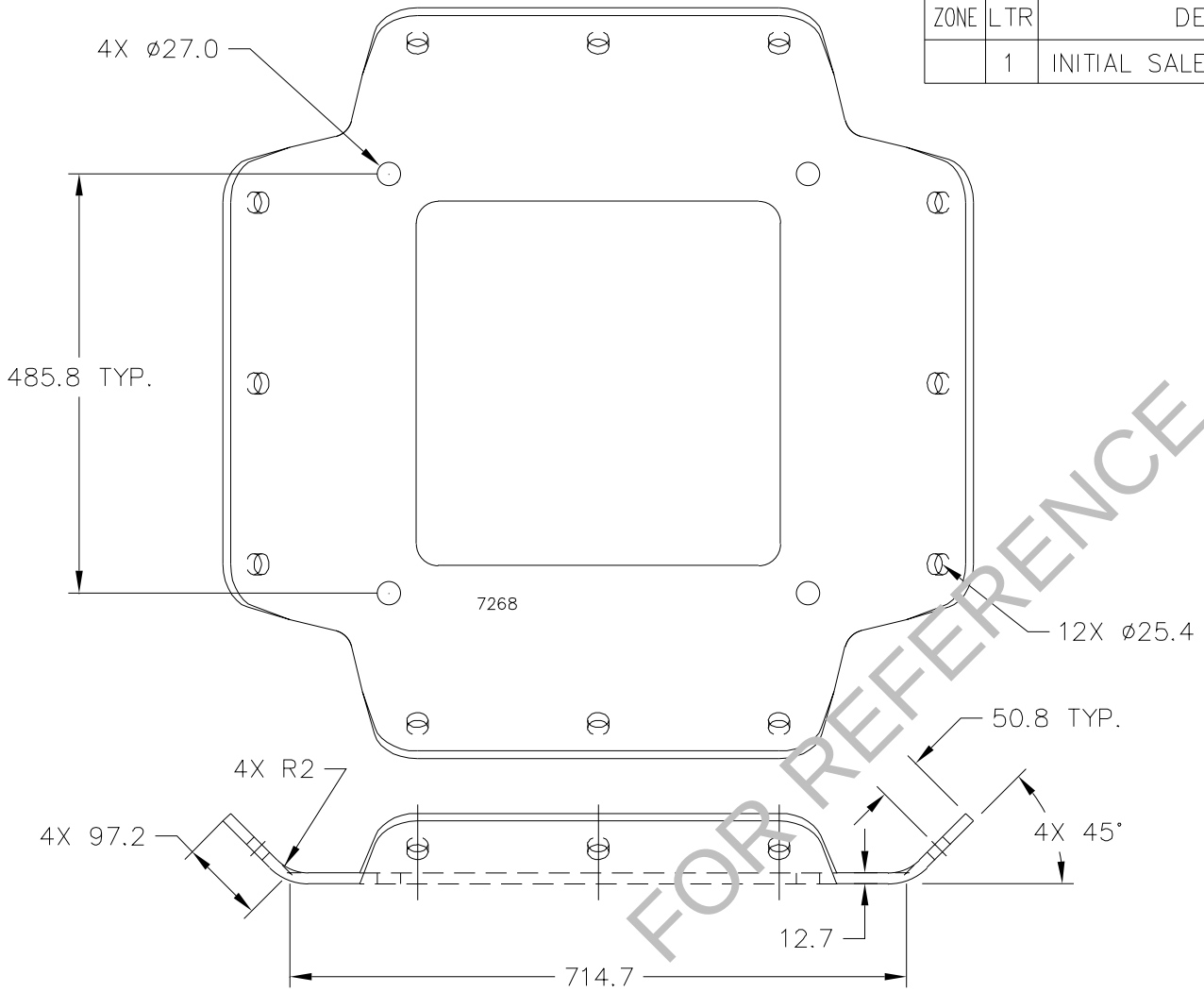
2. APPROX. WEIGHT= 14 Kgs. (30 Lbs.)

1. MATL.: 1/2THK. PLATE, AL. ALY. 6061-T6

NOTES: UNLESS OTHERWISE SPECIFIED

FAB		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	GUY PLATE 0-0 EXTENDED			
DRAWN HASKELL BARNETT	5/4/07				
CHECKED		SIZE A	SCALE 1:8	DWG 7269	REV 2
ENGINEER					

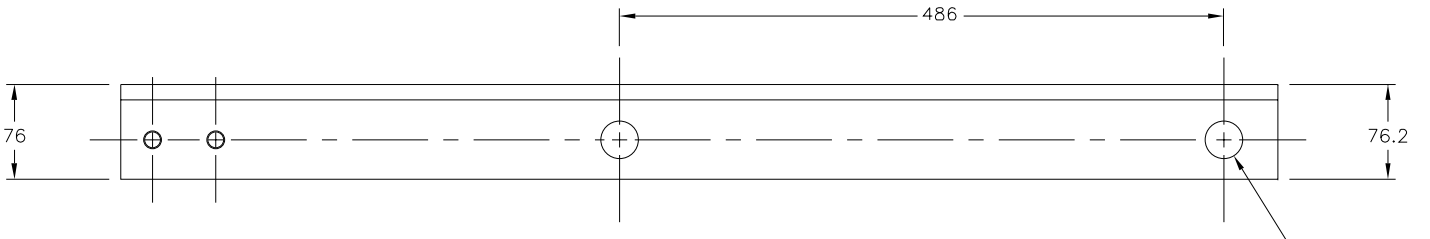
REVISIONS					
ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	1	INITIAL SALES DRAWING RELEASE	P.L. 11/2/05		

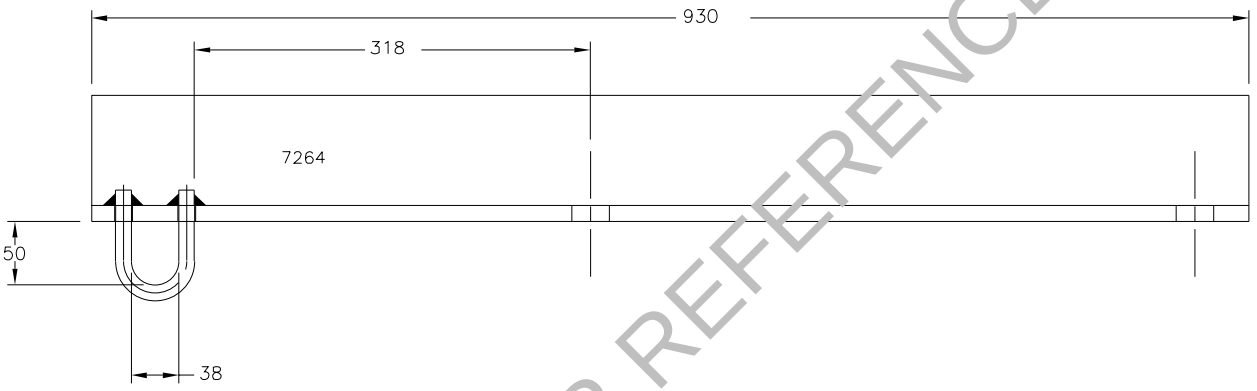


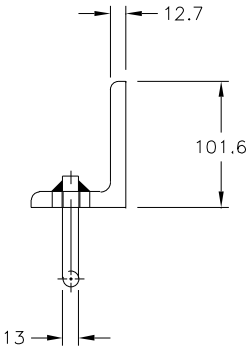
NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL DIMENSIONS ARE IN METRIC.
2. WEIGHT: 24 kg.

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	GUY PLATE 45-45 600 SERIES			
DRAWN PAT ROWAN	11/2/05				
CHECKED AJAY BHAKTA	XXXX	SIZE A	SCALE 1:8	DWG 7268	REV 1
ENGINEER PAT ROWAN	XXXX				

REVISIONS 958					
ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	1	SALES RELEASE	1/16/04		





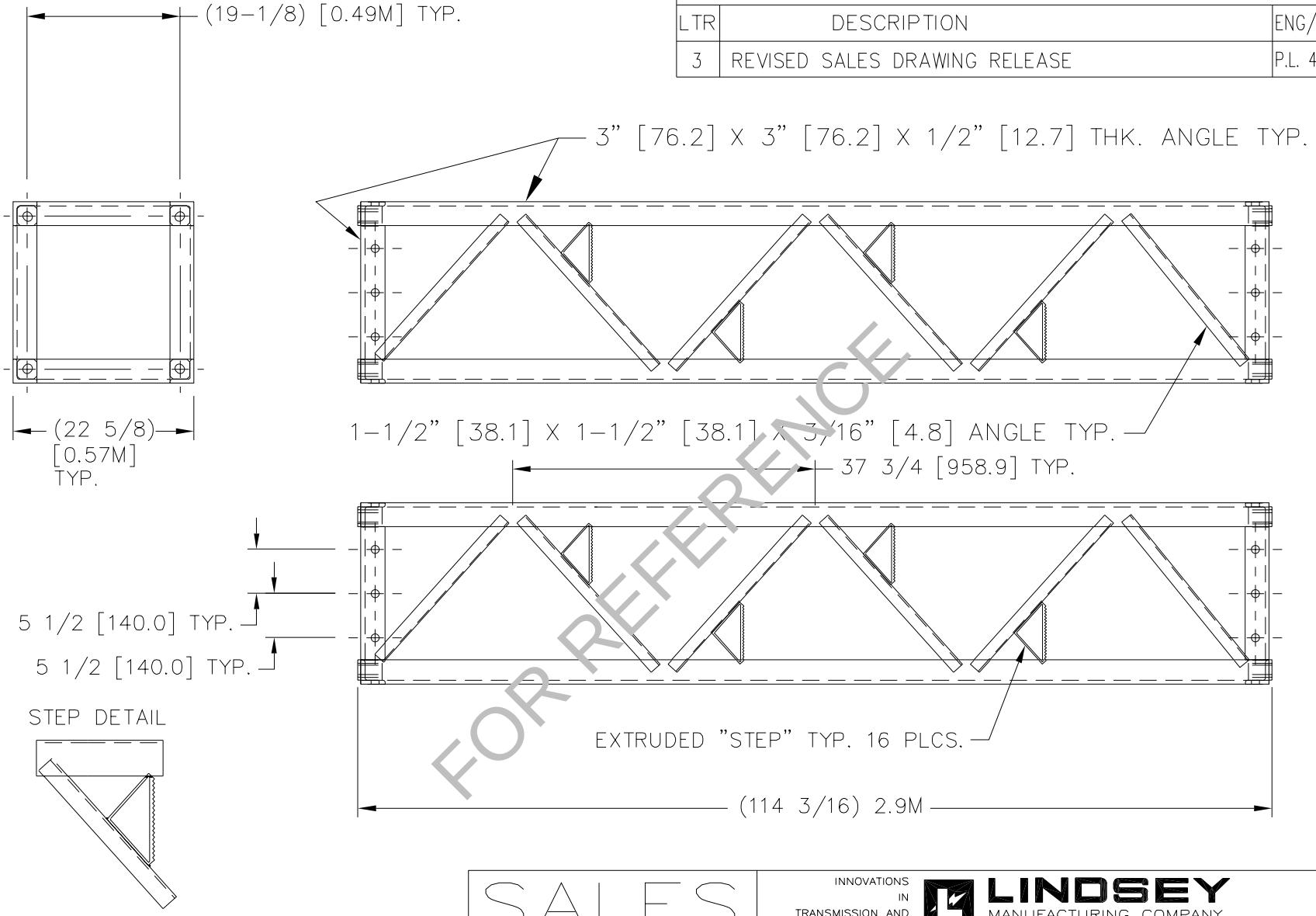


2. WEIGHT: 15.9 kg.
1. ALL DIMESNIONS ARE IN METRIC.
NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	OHGW BRACKET			
DRAWN PAT ROWAN	1/16/04				
CHECKED AJAY BHAKTA	1/16/04	SIZE B	SCALE 1:4	DWG 7264	REV 1
ENGINEER PAT ROWAN	1/16/04				

959

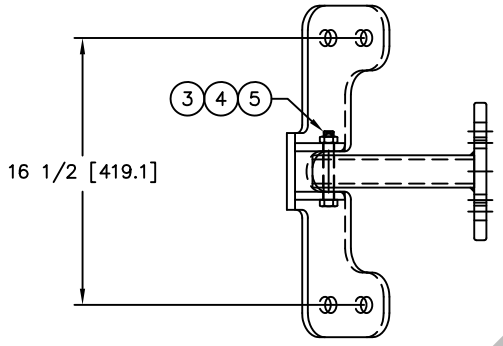
REVISIONS		
LTR	DESCRIPTION	ENG/DATE
3	REVISED SALES DRAWING RELEASE	P.L. 4/12/07

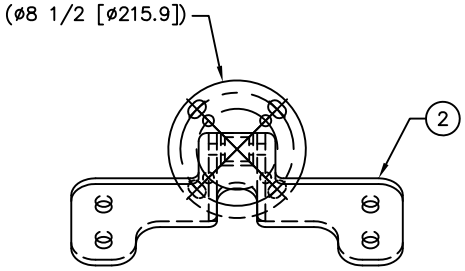


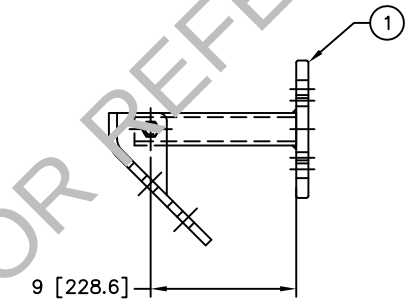
2. WEIGHT: 209.4 lbs. [95KG].
1. MATERIAL: 6061-T6 ALUMINUM ALLOY.
NOTES: UNLESS OTHERWISE SPECIFIED

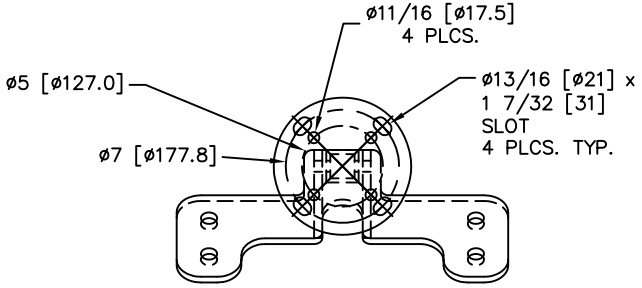
SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	2.9 TOWER SECTION			
DRAWN PAUL LARA	8/18/06				
CHECKED STEVE SCHOLFIELD	6/12/06	SIZE A	SCALE 1:18	DWG 7262	REV 3
ENGINEER WILL LEWIS	4/12/07				

REVISIONS			
LTR	DESCRIPTION	ENG/DATE	BY/DATE
1	INITIAL SALES DRAWING RELEASE	P.L. 6/19/17	P.L. 7/24/17







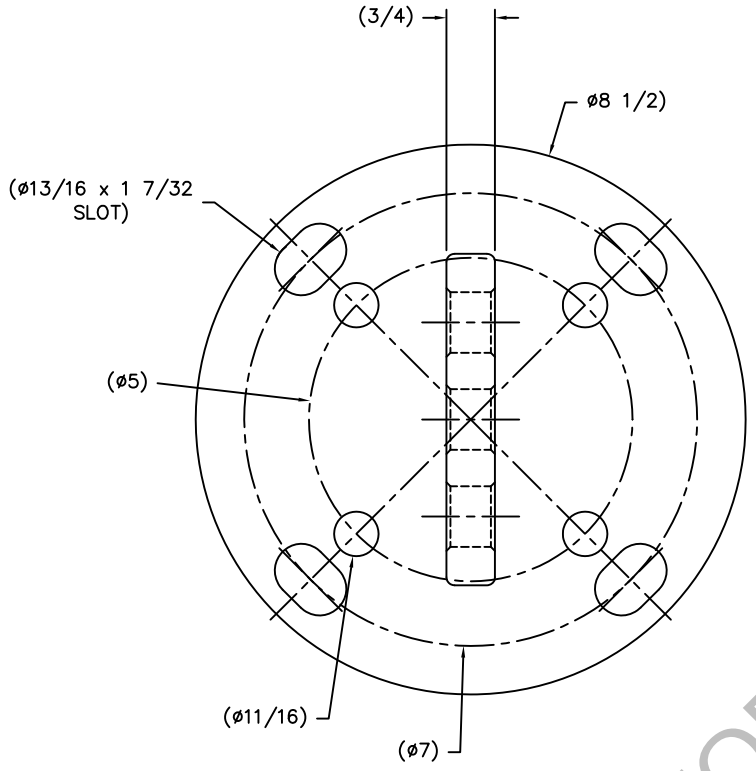


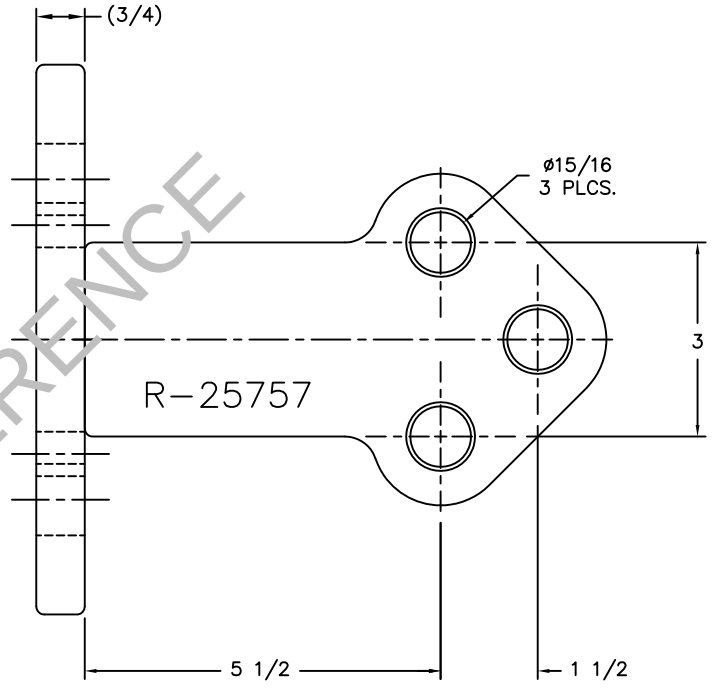
3. WEIGHT: 37 LBS.
2. FINISH: HOT DIP GALVANIZE PER ASTM STD. A-123.
1. MATERIAL: SEE B.O.M.

NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	POST INSULATOR MOUNT			
DRAWN PAUL LARA	6/19/17				
CHECKED MARWA ELSHRAGTY	6/19/17	SIZE B	SCALE 1:8	DWG R-25756	REV 1
ENGINEER SERGIO CORTEZ	6/19/17				

REVISIONS			
LTR	DESCRIPTION	ENG/DATE	BY/DATE
1	INITIAL SALES DRAWING RELEASE	P.L. 7/12/17	P.L. 7/24/17



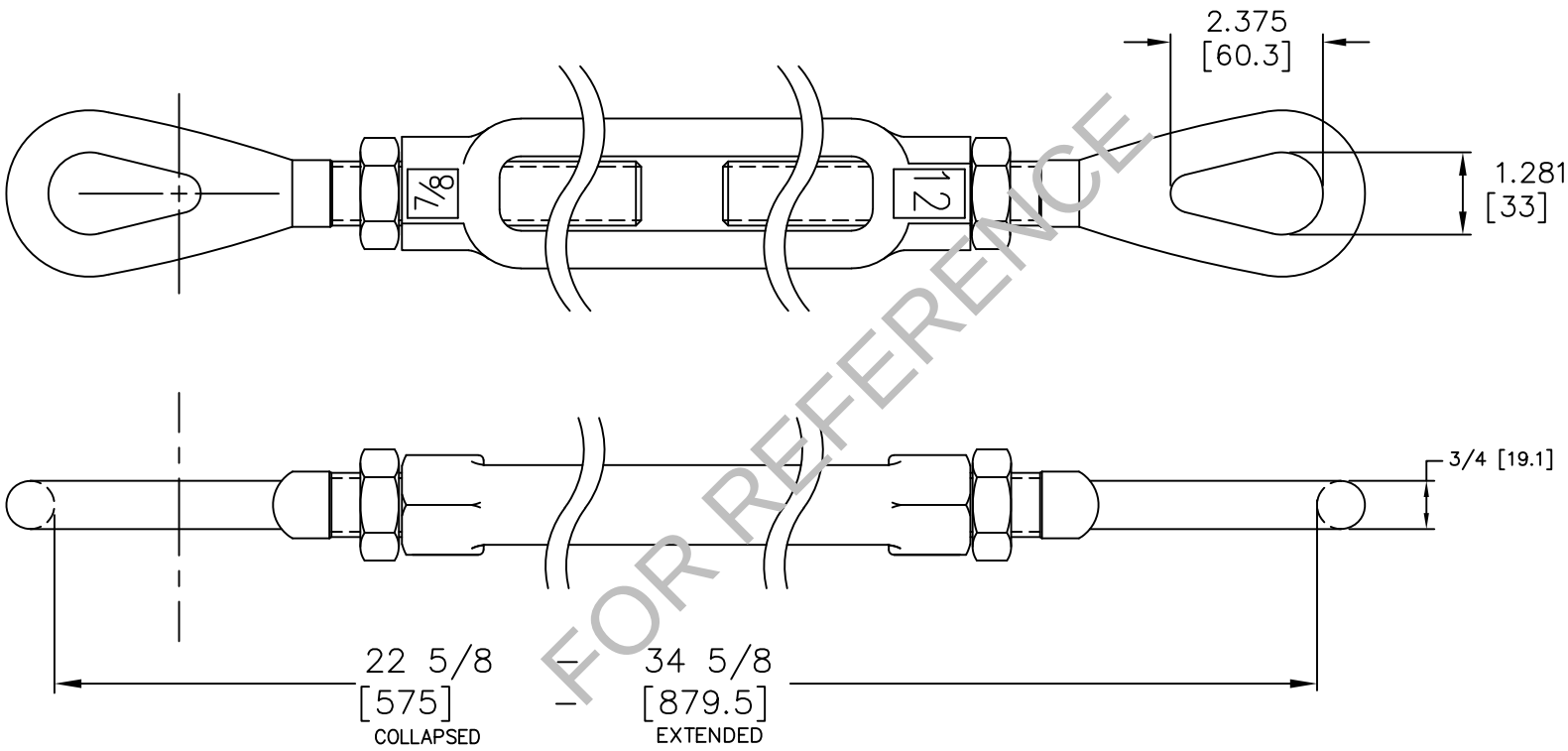


3. WEIGHT: 18 LBS.
2. FINIHSH: HOT DIP GALVANIZER PER ASTM A-123.
1. MATERIAL: STEEL

NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	POST END CAP ASSY.			
DRAWN PAUL LARA	6/19/17				
CHECKED MARWA ELSAHRGATY	7/24/17	SIZE B	SCALE 1:1	DWG R-25757	REV 1
ENGINEER SERGIO CORTEZ	7/24/17				

REVISIONS 962			
LTR	DESCRIPTION	ENG/DATE	BY/DATE
1	SALES RELEASE	P.L. 10/7/05	W.L. 7/21/08
2	UPDATE WEIGHT	H.A. 5/01/24	



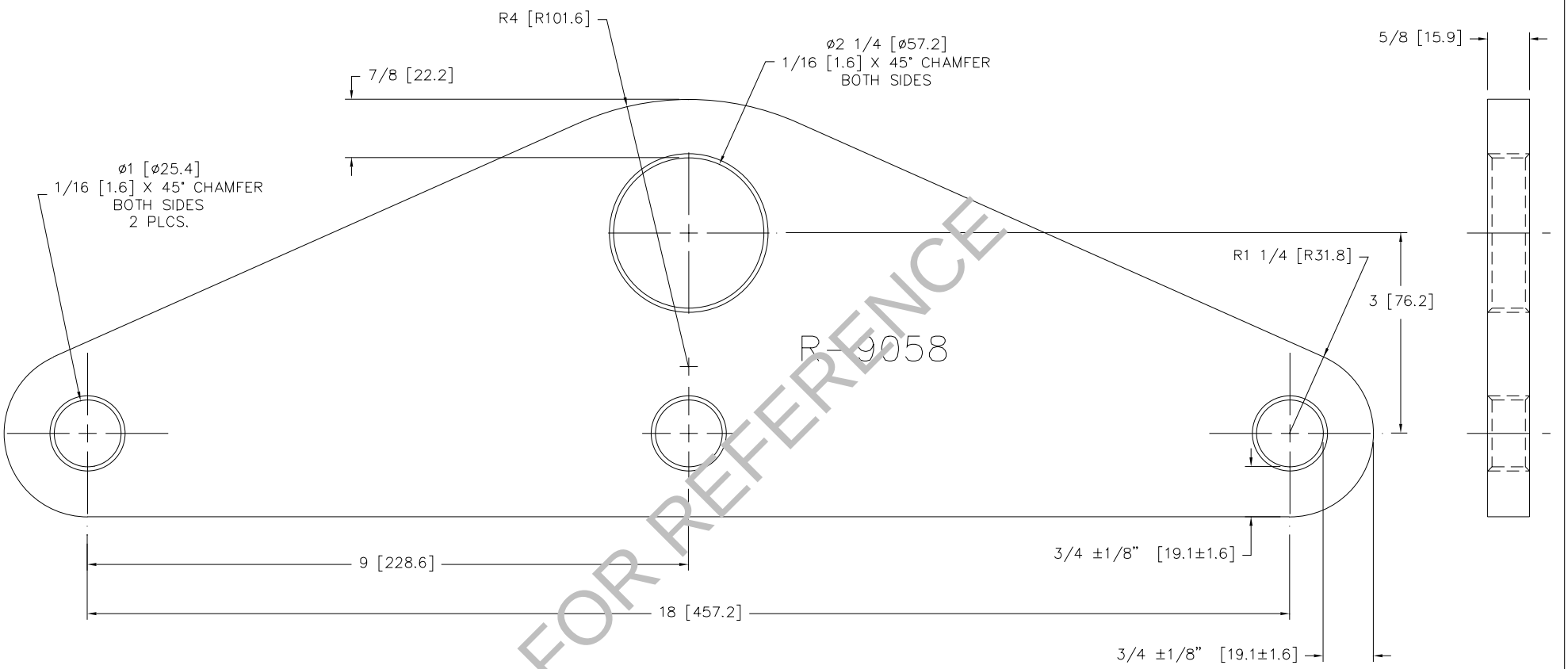
6. ALL DIMENSIONS IN [x] ARE METRIC.
5. ULTIMATE STRENGTH: 35 KIP [156kN].
4. WEIGHT: 7.6 LBS. [3.5kG]
3. ALL FERROUS FASTENERS ARE HOT DIP GALVANIZED PER ASTM STD. A-153.
2. ALL FERROUS PARTS ARE HOT DIP GALVANIZED PER ASTM STD. A-123.
1. MAT'L: FORGED STEEL PER REQUIRED ASTM STANDARDS.

NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	35KIP TURNBUCKLE EYE-EYE (7/8")			
DRAWN PAUL LARA	2/11/03				
CHECKED PAT ROWAN	2/17/03	SIZE B	SCALE 1:2	DWG 3790EE	REV 1
ENGINEER AJAY BHAKTA	2/17/03				

REVISIONS 963

ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	1	INITIAL SALES DRAWING RELEASE	P.L. 3/7/06		



4. WEIGHT: 14.2 LBS. [16.4Kg.]
3. STAMP PART NO "R-9058" WITH 3/8" [9.5] STL DIES
2. FINISH: HOT DIP GALV. PER ASTM STD. A-123.
1. MAT'L: 5/8" [15.9] THK PLT. A-572 H.R.S.

NOTES: UNLESS OTHERWISE SPECIFIED

SALES

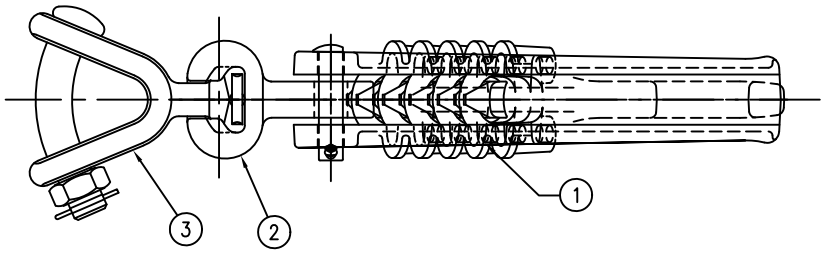
INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

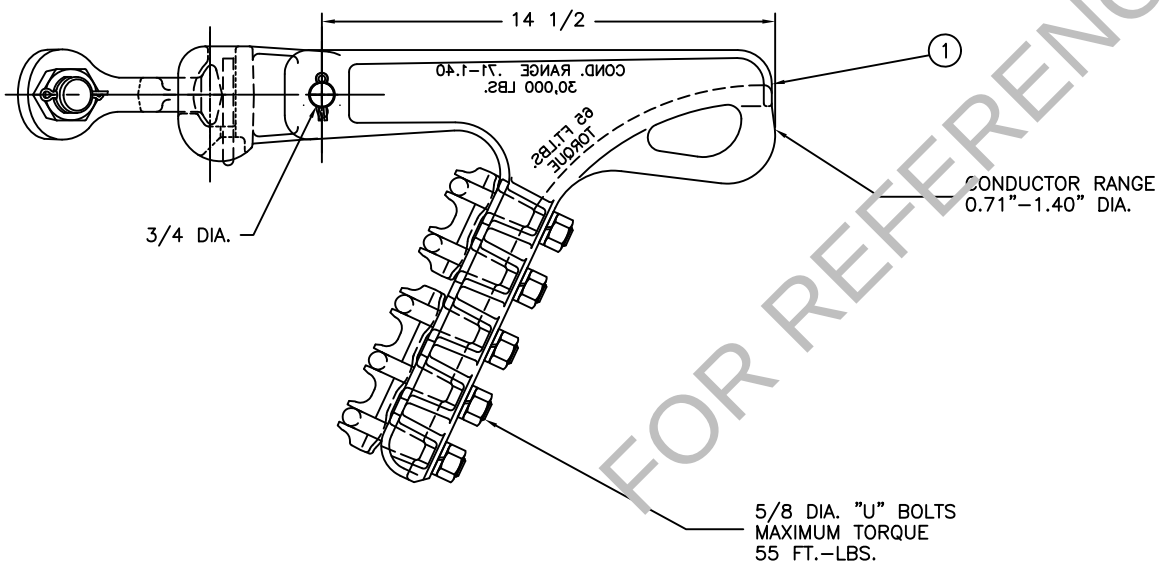
APPROVALS		DATE
DRAWN	PAUL LARA	6/28/02
CHECKED	PAT ROWAN	7/1/02
ENGINEER	PAT ROWAN	7/1/02

30 KIP [133.4 kN] TRIANGULAR YOKE PLATE

SIZE	SCALE	DWG	REV
B	1:1.5	R-9058	1



ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION	MAT'L
1	1	1710	35 KIP STRAIN CLAMP ASSEMBLY	AL.
2	1	R-10024	30 KIP SOCKET EYE ASSEMBLY	D.I.
3	1	3089	30 KIP "Y" CLEVIS-BALL ASSEMBLY	F.S.



GENERAL NOTES

1. MATERIAL: CLAMP, ALUMINUM A356-T6.
   SOCKET EYE, 60-40-18 DUCTILE IRON PER ASTM STD. A-536
   Y-CLEVIS BALL, FORGED STL. PER ASTM STD. A-576
2. ALL FERROUS PARTS ARE HOT DIP GALVANIZED PER ASTM STD. A-123
3. ALL FERROUS FASTENERS ARE HOT DIP GALVANIZED PER ASTM STD. A-153
4. ALL COTTER KEYS ARE HUMPBACK STAINLESS STEEL (TYPE 304)
5. WEIGHT : 16.0 LBS. (7.0 KGS.)
6. ULTIMATE STRENGTH: 30,000 lbs. [134 Kn].

USED ON NUMBERS

NO.	DATE	BY	APP.	DESCRIPTION
REVISIONS				

-STRENGTH- LBS. | REQ-

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

TITLE: 30KIP QUADRANT STRAIN CLAMP ASSEMBLY

TOLERANCES UNLESS OTHERWISE NOTED	FRACTIONS	DECIMALS	
CAST			
FORGE			
MACHINE			
FABRICATION			

WEIGHT		
ASMB-	RAW	FIN.
MATERIAL	FINISH	
SEE NOTES	SEE NOTES	

NOTE! DO-NOT SCALE DRAWING
BREAK ALL SHARP EDGES

APP.
CHK.
DRG. S.C. 05/02/95

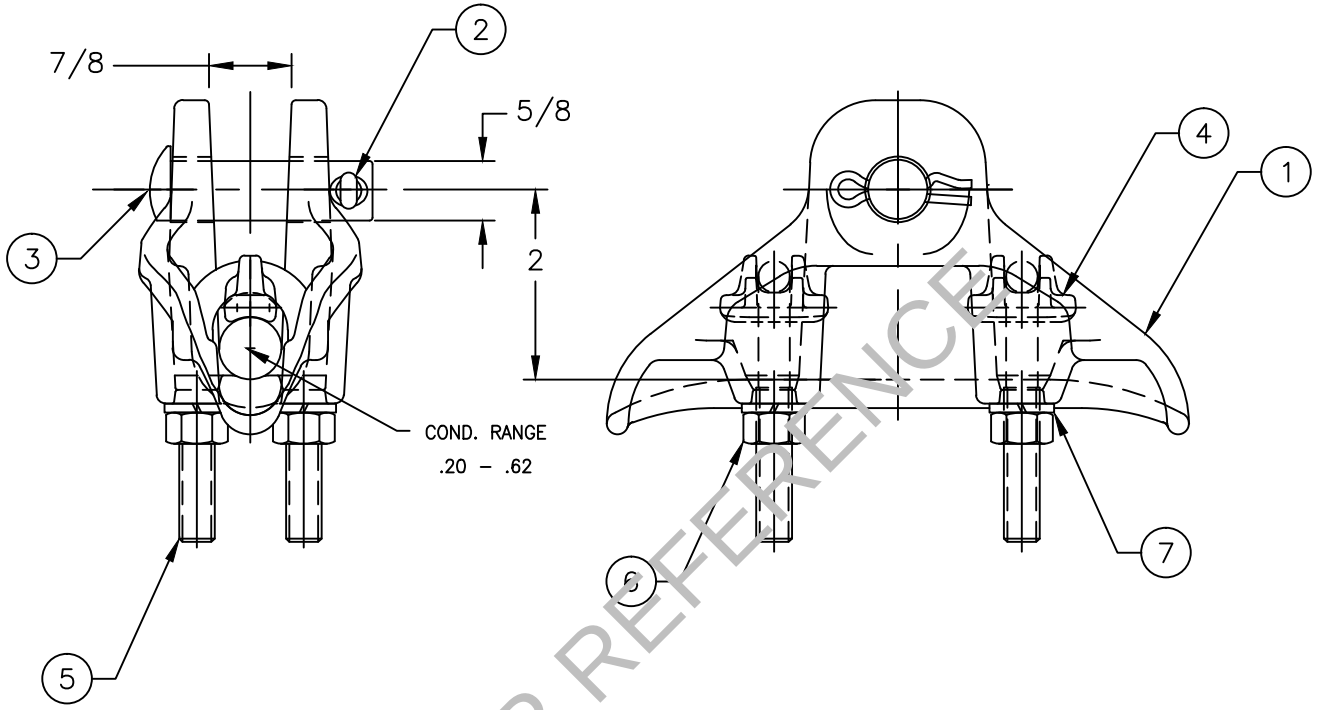
SCALE: NONE

NUMBER:

LAST-REVISION NO. | DATE

DRAWING-NUMBER: 1710SY

REVISIONS					
ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	B	BOLT REPLACED WITH CLEVIS PIN	HB 9/12/06		



1. MAT'L: 60–40–18 DUCTILE IRON PER ASTM A536
2. FINISH: ALL FERROUS PARTS ARE HOT DIPPED GALV. PER ASTM STD. A–123.
   ALL FERROUS FASTENERS ARE HOT DIPPED GALV. PER ASTM STD. A–153.
3. ALL COTTER KEYS ARE HUMPBACK STAINLESS STEEL (TYPE 304).
4. CALL OUTS ARE FOR INTERNAL BOM REFERENCE ONLY

DIMS IN INCHES BREAK EDGES 0.015
TOLERANCES – UNLESS OTHERWISE SPECIFIED
X/X ±1/32
X.X ±0.06
X.XX ±0.02
X.XXX ±0.005
ANGLES ±1°

ASSY

APPROVALS	DATE
DRAWN HASKELL BARNETT	9/12/06
CHECKED STEVE SCHOLFIELD	9/12/06
ENGINEER HASKELL BARNETT	9/12/06

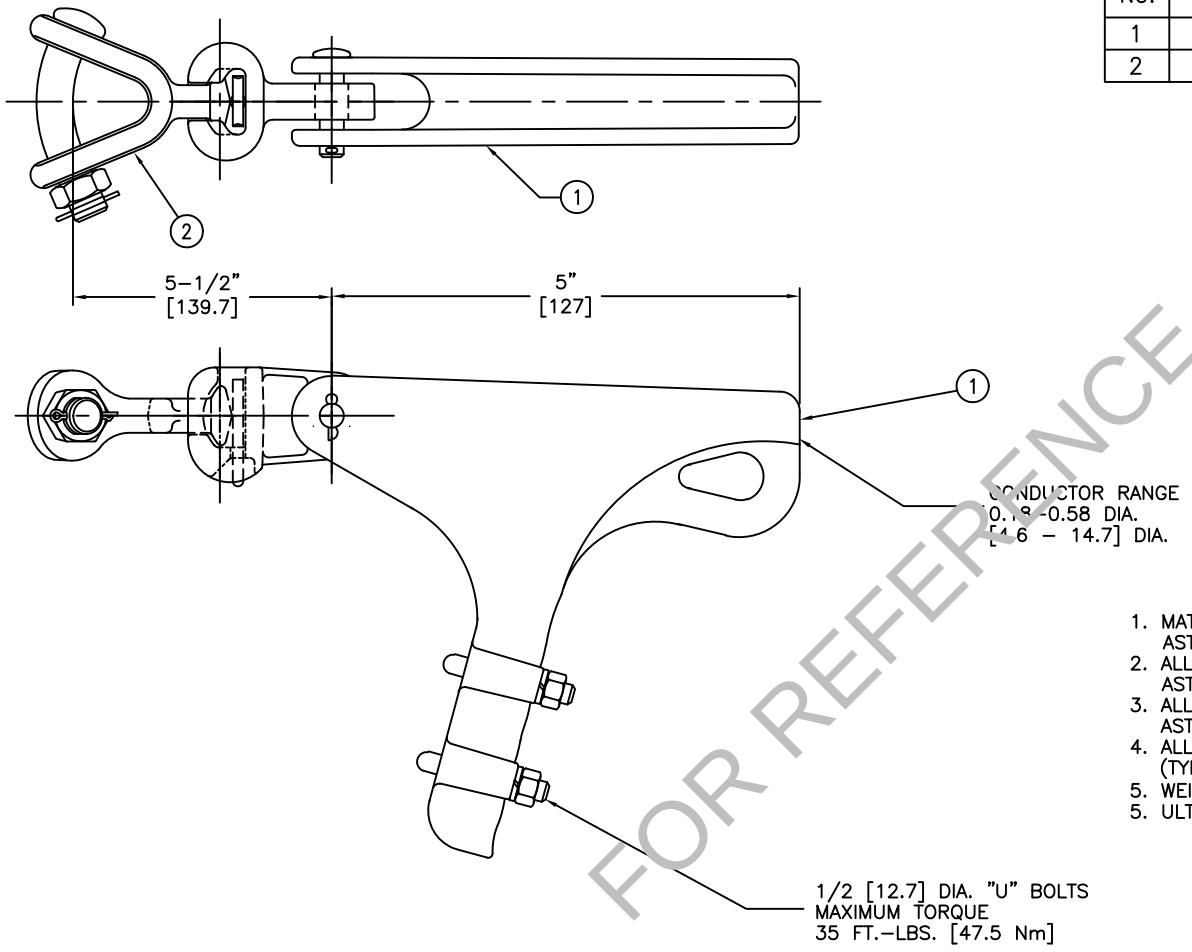
INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (626) 969-3471

17KIP SUSPENSION CLAMP

MATERIAL	FINISH	SIZE	SCALE	DWG	REV
SEE NOTES	SEE NOTES	B	1 : 2	1329	B

ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION	MAT'L
1	1	1701S	20KIP STRAIN CLAMP ASSY. W/S-E	D.I.
2	1	3089	30 KIP "Y" CLEVIS-BALL ASSEMBLY	F.S.



GENERAL NOTES

1. MATERIAL: CLAMP AND SOCKET EYE 60-40-18 DUCTILE IRON PER ASTM STD.A-536, Y-CLEVIS BALL FORGED STL. PER ASTM STD.A-576
2. ALL FERROUS PARTS ARE HOT DIP GALVANIZED PER ASTM STD. A-123
3. ALL FERROUS FASTENERS ARE HOT DIP GALVANIZED PER ASTM STD. A-153
4. ALL COTTER KEYS ARE HUMPBACK STAINLESS STEEL (TYPE 304)
5. WEIGHT : 3.5 LBS.
5. ULTIMATE STRENGTH: 20,000 LBS. [89 Kn]

USED ON NUMBERS	NO.	DATE	BY	APP.	DESCRIPTION
					REVISIONS

-STRENGTH- LBS. | REQ-

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

TITLE: 20 KIP QUADRANT STRAIN CLAMP ASSEMBLY

TOLERANCES UNLESS OTHERWISE NOTED	FRACTIONS	DECIMALS	ANGLES
CAST			
FORGE			
MACHINE			
FABRICATION			

WEIGHT		
ASMB-	RAW	FIN.

MATERIAL	FINISH
SEE NOTES	SEE NOTES

NOTE! DO-NOT SCALE DRAWING
BREAK ALL SHARP EDGES

APP.
CHK.
DRG. 09/21/93

SCALE: NONE

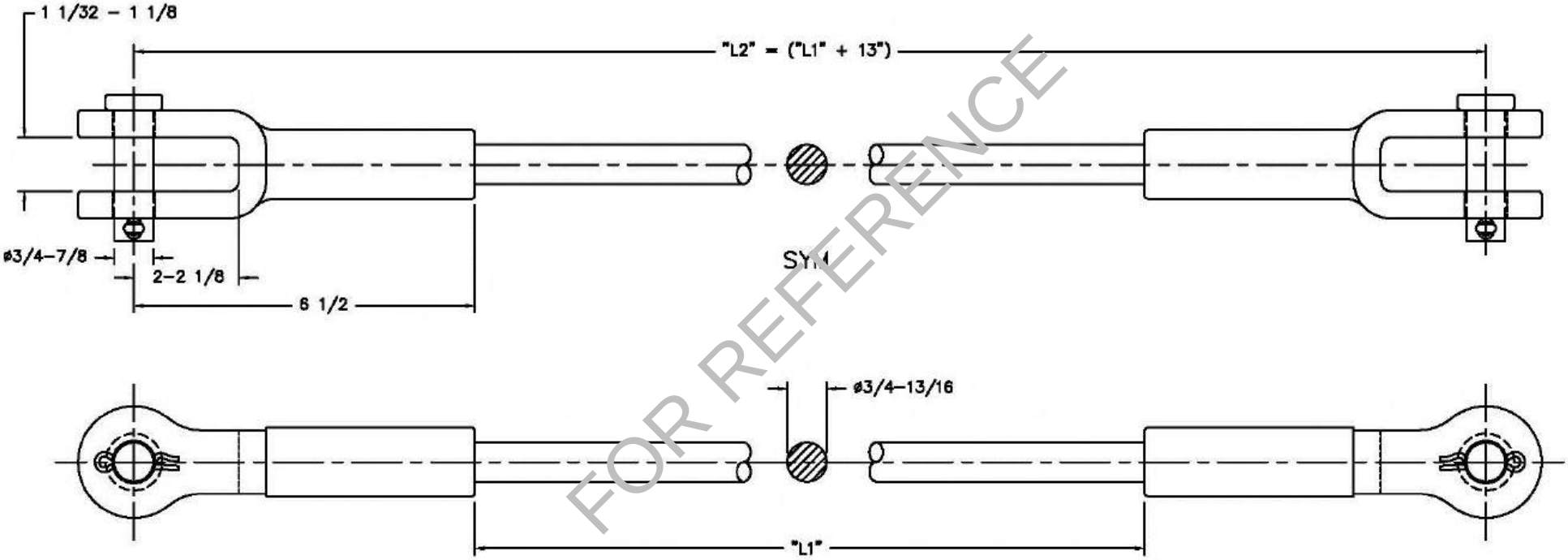
LAST-REVISION NO. | DATE

NUMBE

DRAWING-NUMBER: 1701SY

LINDSEY PART NO.	LENGTH "L1"	LENGTH "L2"	MACLEAN POWER SYSTEMS PT.NO.
7900/103	90"	103"	GCC36-90
7900/109	96"	109"	GCC36-96
7900/132	120"	132"	GCC36-120
7900/158	144"	158"	GCC36-144

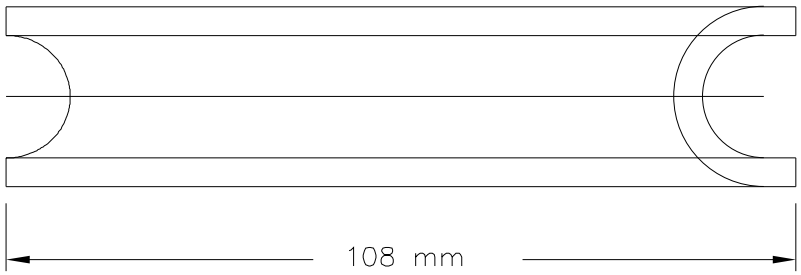
REVISIONS			
LTR	DESCRIPTION	BY /DATE	APPD BY /DATE
C	REVISED DRAWING TO MATCH A RANGE OF SUPPLIERS	P.L. 5/31/16	M.K. 5/31/16

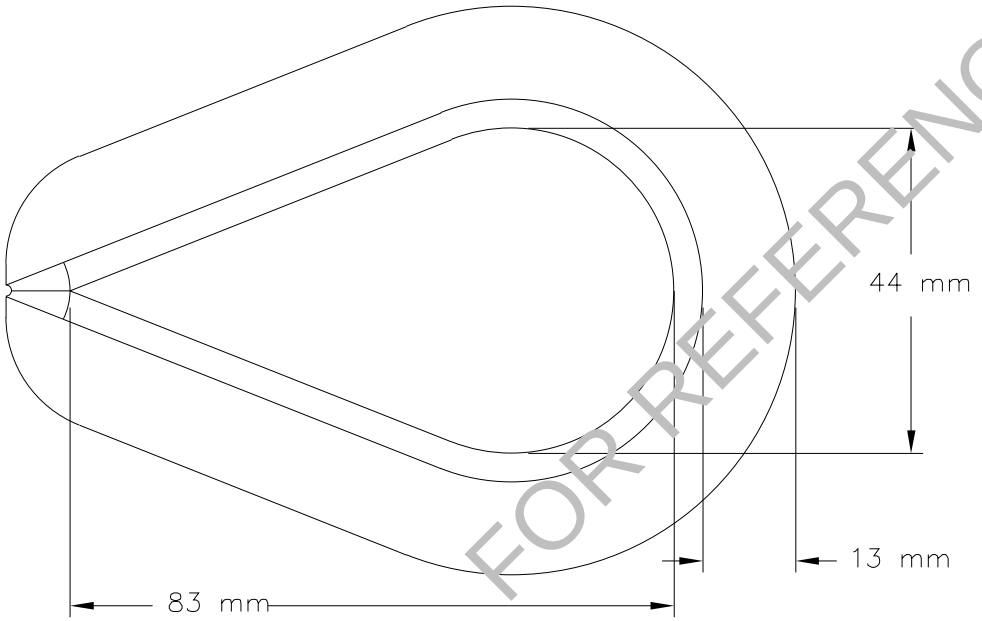


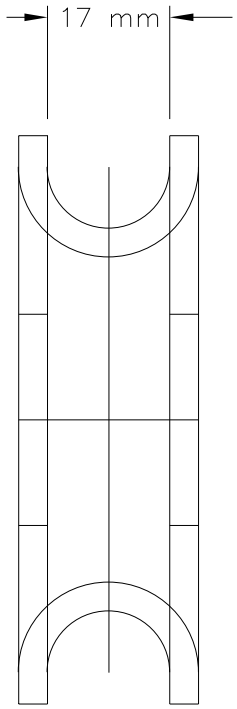
2. FINISH: FIBERGLASS: NEMA BLUE–GREY WITH ULTRA–VIOLET PROT
ALL FERROUS PARTS: HOT DIP GALV. PER ASTM STD. A–153.
1. MAT'L: SHAFT: 13/16 SOLID FIBERGLASS ROD
ENDS: 60–40–18 DUCTILE IRON.
NOTES: UNLESS OTHERWISE SPECIFIED

SALES		LINDSEY MANUFACTURING COMPANY				
APPROVALS	DATE	36KIP [156kN] STRAIN INSULATOR				
DRAWN PAUL LARA	8/19/14					
CHECKED RICK ZONNEVILLE	8/19/14	SIZE B	SCALE 1:2	DWG 7900/L	REV C	
ENGINEER SERGIO CORTEZ	8/19/14					

REVISIONS					
ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	A	REDRAWN IN CAD, NO CHANGE	P.L. 10/26/05		







3. WEIGHT: 0.34 Kgs.
2. FINISH: HOT DIP GALV. PER ASTM A-153.
1. MAT'L: FORGING QUALITY STEEL PER ASTM STD. A-576.

NOTES: UNLESS OTHERWISE SPECIFIED

DIMS IN INCHES BREAK EDGES 0.015
TOLERANCES - UNLESS OTHERWISE SPECIFIED
X/X ±1/32
X.X ±0.06
X.XX ±0.02
X.XXX ±0.005
ANGLES ±1°

FAB

APPROVALS		DATE
DRAWN	PAUL LARA	10/26/05
CHECKED	PAT ROWAN	10/26/05
ENGINEER	PAT ROWAN	10/26/05

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

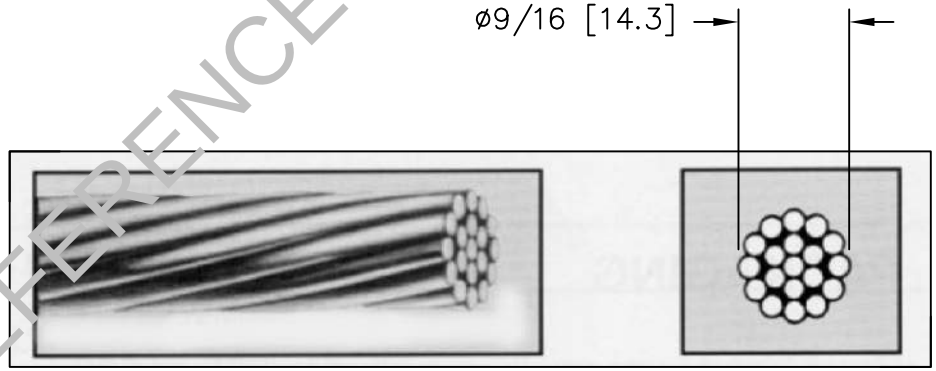
GUY WIRE THIMBLE

MATERIAL	FINISH	SIZE	SCALE	DWG	REV
SEE NOTE 1	SEE NOTE 2	A	1:1	7950	A

PART NO.	LENGTH (FT.) "L"	LENGTH (METERS) "L"
7045/180	180 FT.	55 M
7045/246	246 FT.	75 M
7045/328	328 FT.	100 M

REVISIONS		
LTR	DESCRIPTION	BY/DATE
2	UPDATED DRAWING	P.L. 4/5/06

969



3. NET WEIGHT: .637 LBS./FT. (.947 Kgs./M).
2. BREAKING STRENGTH: 33,700 LBS. (150 kN).
1. MAT'L: ø9/16" [14.3] 1x19 STRAND
GALVANIZED STEEL
EXTRA HIGH STRENGTH GUY WIRE.

NOTES: UNLESS OTHERWISE SPECIFIED

SALES

APPROVALS		DATE
DRAWN	PAUL LARA	10/19/04
CHECKED	PAT ROWAN	11/3/04
ENGINEER	PAT ROWAN	11/3/04

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

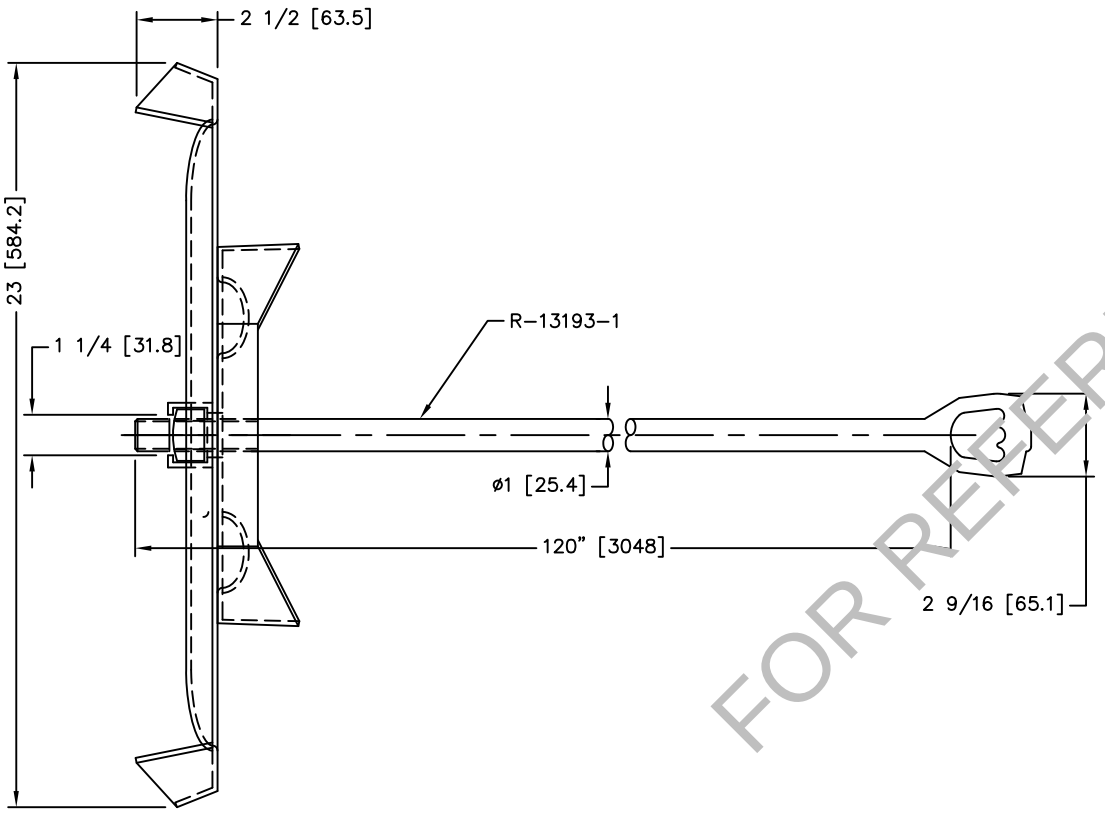
LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

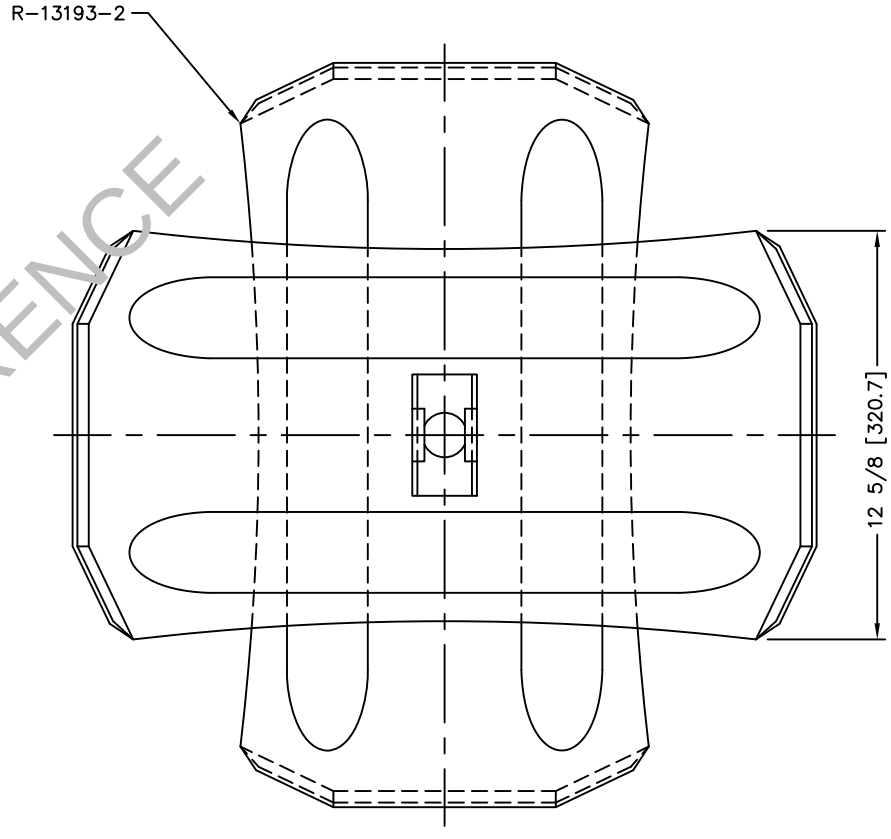
ø9/16" [14.3] EHS GUY WIRE

SIZE	SCALE	DWG	REV
A	1 : 1	7045/L	2

970

REVISIONS			
LTR	DESCRIPTION	ENG/DATE	BY/DATE
1	INITIAL SALES DRAWING RELEASE	P.L. 11/30/12	

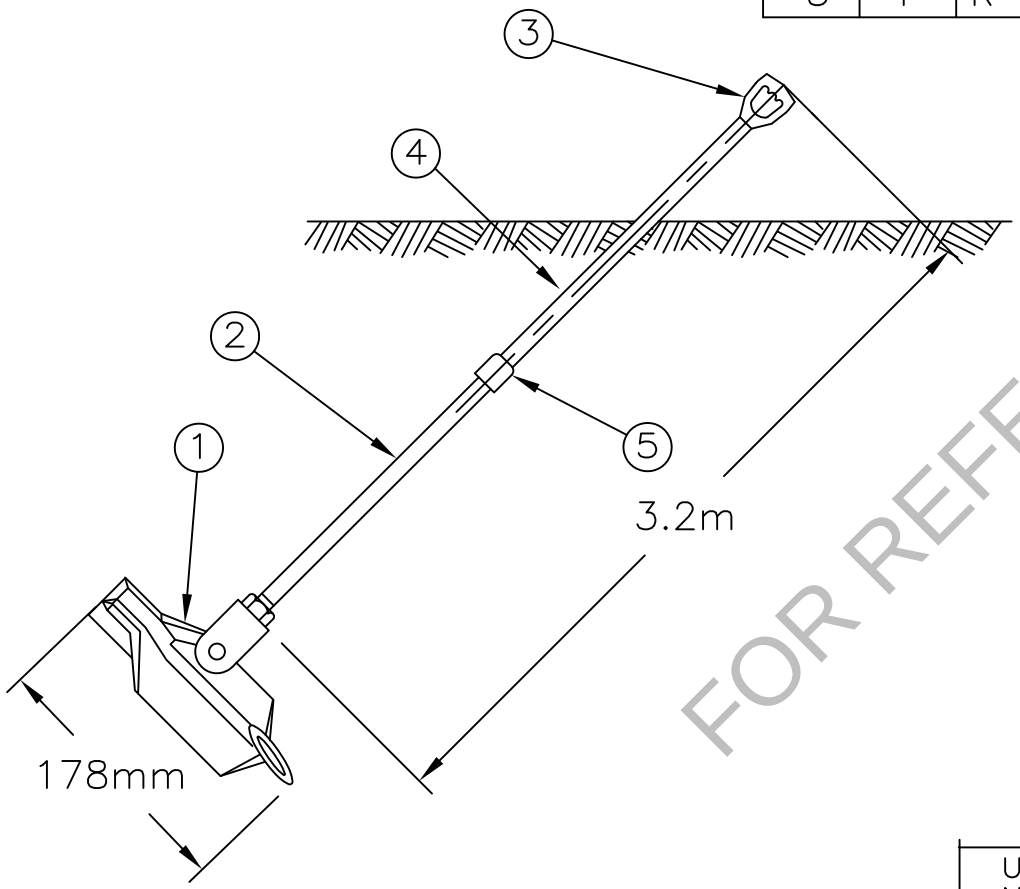




2. FINISH: HOT DIP GALV. PER ASTM STD. A-123
1. MAT'L:FORGED STEEL
NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471				
APPROVALS	DATE	CROSS PLATE ANCHOR				
DRAWN PAUL LARA	11/30/12					
CHECKED SERGIO CORTEZ	11/30/12	SIZE B	SCALE 1:4	DWG R-13193	REV 1	
ENGINEER SERGIO CORTEZ	11/30/12					

ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION	MAT'L	WT.EA. KGS.
1	1	R-16624-1	ANCHOR MR-1 GALV.	D.I.	6.0
2	1	R-16624-2	ANCHOR ROD 1"(25) x 7'-0"(2133) GALV.	STL.	7.5
3	1	R-16624-3	TRIPLE THIMBLE EYE NUT GALV.	STL	1.0
4	1	R-16624-4	ANCHOR ROD 1"(25) x 3'-6"(1067) GALV.	STL.	4.0
5	1	R-16624-5	ROUND STYLE COUPLING NUT 1"(25) UNC GALV.	STL	0.2



ULITMATE STRENGTH: 40 KIP (178 kN).
MATERIAL: ANCHOR PLATE CAST IRON
EXTENSION BARS C. R. STEEL.
FINISH: HOT DIP GALVANIZED PER ASTM STD. A-123.

USED ON NUMBERS

NO.	DATE	BY	APP.	DESCRIPTION
REVISIONS				

-STRENGTH- LBS. | REQ-

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (626) 969-3471 FAX. (626) 969-3177

TITLE:
M.R.-NORMAL SOIL ANCHOR ASSY.

TOLERANCES UNLESS OTHERWISE NOTED			
	FRACTIONS	DECIMALS	ANGLES
CAST			
FORGE			
MACHINE			
FABRICATION			

WEIGHT		
ASMB-	RAW	FIN.

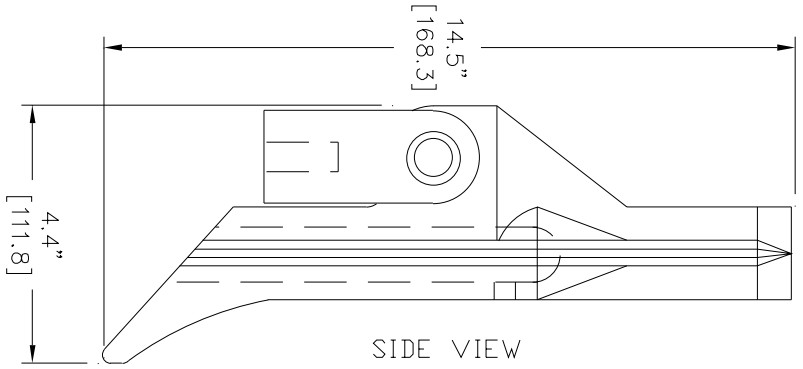
MATERIAL	FINISH
SEE NOTES	SEE NOTES

NOTE!	DO-NOT SCALE DRAWING
	BREAK ALL SHARP EDGES

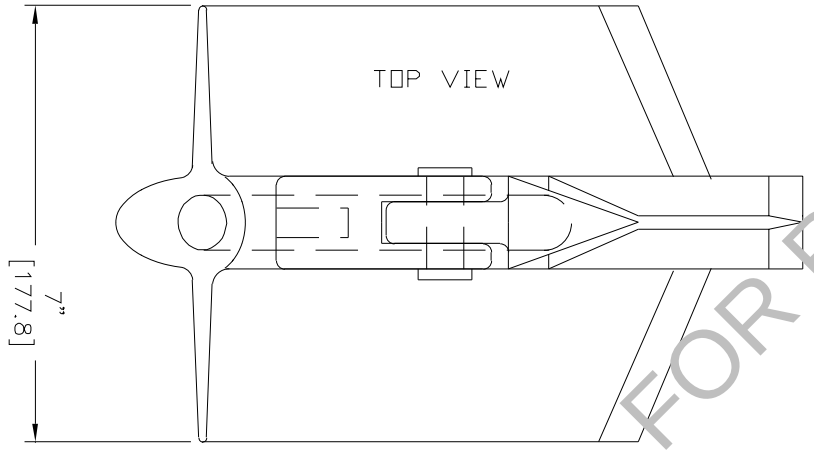
APP.	
CHK.	
DRG.	10/24/17

SCALE	NUMBER
NONE	

LAST-REVISION NO.	LAST-REVISION DATE	DRAWING-NUMBER
		R-16624



SIDE VIEW



TOP VIEW

GENERAL NOTES
DESCRIPTION: IMPACT, TRACK DRILL, OR VIBRATION DRIVEN SOIL ANCHOR.
ANCHOR WIDTH: 7" (17.8 Cms.)
ANCHOR LENGTH: 14.5" (36.8 Cms.)
BEARING AREA: 71 SQ. INCHES (180 SQ. Cms.)
ANCHOR WEIGHT: 12 Lbs. (5.4 Kgs.)
INSTALLATION DEPTH: 7-30 FT. (2.1-9 Mts.)
YIELD STRENGTH: 30 KIPS (134 kN)
ULTIMATE STRENGTH: 40 KIPS (178 kN)
WORKING LOAD: UP TO 27 KIPS
HOLDING CAPACITY: 15-20 KIPS (66-89 kN)
AT 2.1 Mts. (7 FT.) DEPTH IN MEDIUM DENSE COARSE SAND AND SANDY GRAVEL OR STIFF CLAYS
WITH BLOW COUNT (N) = 14-25
MATERIAL: DUCTILE IRON CAST
FINISH: HOT DIP GALVANIZED

USED ON NUMBERS

NO.	DATE	BY	APP.	DESCRIPTION
REVISIONS				

-STRENGTH- LBS. | REQ-

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (626) 969-3471 FAX. (626) 969-3177

TITLE: ANCHOR PLATE

TOLERANCES UNLESS OTHERWISE NOTED	FRACTIONS	DECIMALS	ANGLES
CAST			
FORGE			
MACHINE			
FABRICATION			

WEIGHT		
ASMB-	RAW	FIN.

MATERIAL	FINISH
SEE NOTES	

NOTE!	DO-NOT SCALE DRAWING
	BREAK ALL SHARP EDGES

APP.	
CHK.	
DRG.	S.C.
03/12/01	

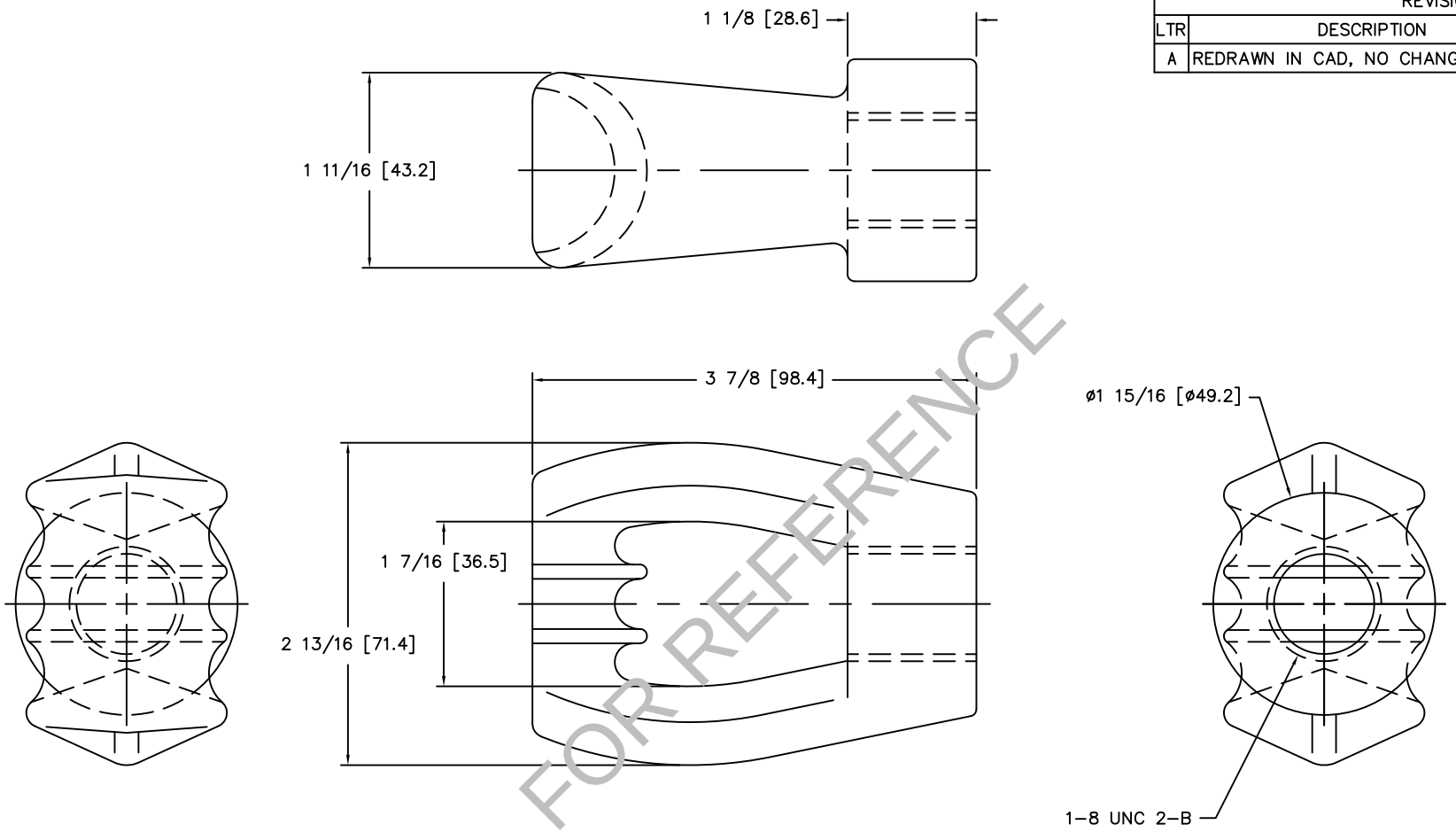
SCALE
NONE

LAST-REVISION NO.	DATE

NUMBER

DRAWING-NUMBER
R-16624-1

REVISIONS		
LTR	DESCRIPTION	BY/DATE
A	REDRAWN IN CAD, NO CHANGE	P.L. 8/28/06



3. WEIGHT: 2.2 lbs. (1.0 kgs.)
2. FINISH: HOT DIP GALV. PER ASTM STD. A-123
1. MAT'L: DUCTILE IRON CASTING PER ASTM STD. A-536
NOTES: UNLESS OTHERWISE SPECIFIED

DIMS IN INCHES BREAK EDGES 0.015
TOLERANCES - UNLESS OTHERWISE SPECIFIED
X/X ±1/32
X.X ±0.06
X.XX ±0.02
X.XXX ±0.005
ANGLES ±1°

MATERIAL: SEE NOTE 1
FINISH: SEE NOTE 2

FAB

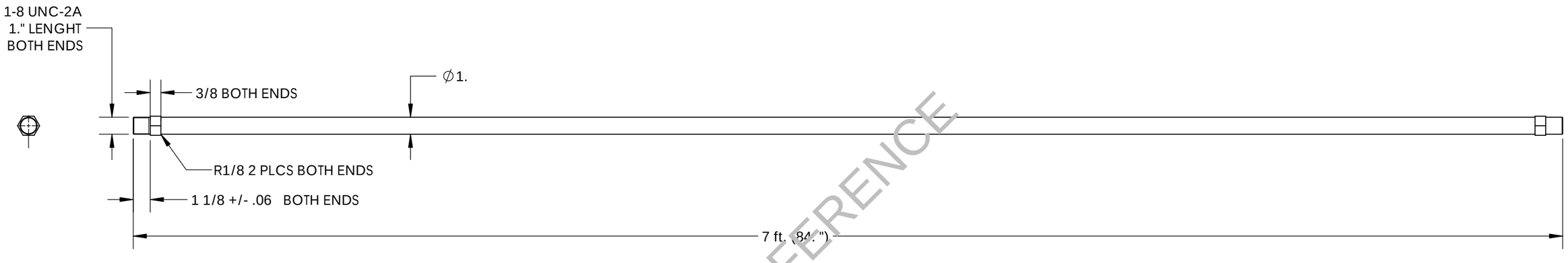
APPROVALS		DATE
DRAWN	PAUL LARA	8/28/06
CHECKED	HASKELL BARNETT	8/29/06
ENGINEER	HASKELL BARNETT	8/29/06

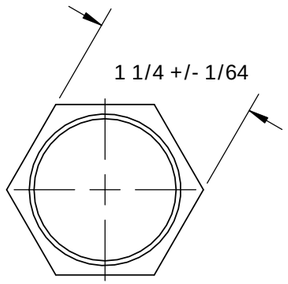
INNOVATIONS IN TRANSMISSION AND DISTRIBUTION
LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

36 KIP TRIPLE THIMBLE EYE

SIZE	SCALE	DWG	REV
B	1 : 1	R-16624-3	A

REVISIONS			
LTR	DESCRIPTION	ENG/DATE	BY/DATE
1	REDDRAWEN IN CAD. NO CHANGES	A.K. 10/14/21	E.A. 10/14/21





1: 1 SCALED LEFT VIEW

NOTES: UNLESS OTHERWISE SPECIFIED
1. MATERIAL: FORGED STEEL PER ASTM STD. A-576
2. FINISH: HOT DIP GALVANIZE PER ASTM A-153
3. WEIGHT: 16.5 LBS. (7.5 KG.)

DIMS IN INCHES BREAK EDGES 0.015
TOLERANCES - UNLESS OTHERWISE SPECIFIED

X/X ±0.06
X.X ±0.06
X.XX ±0.03
X.XXX ±0.010
ANGLES ±1°

MATERIAL	FINISH
SEE NOTE 1	SEE NOTE 2

SALES

APPROVALS	DATE
DRAWN ARA K.	10/14/21
CHECKED EMIGDIO A.	10/14/21
ENGINEER SERGIO C.	10/14/21

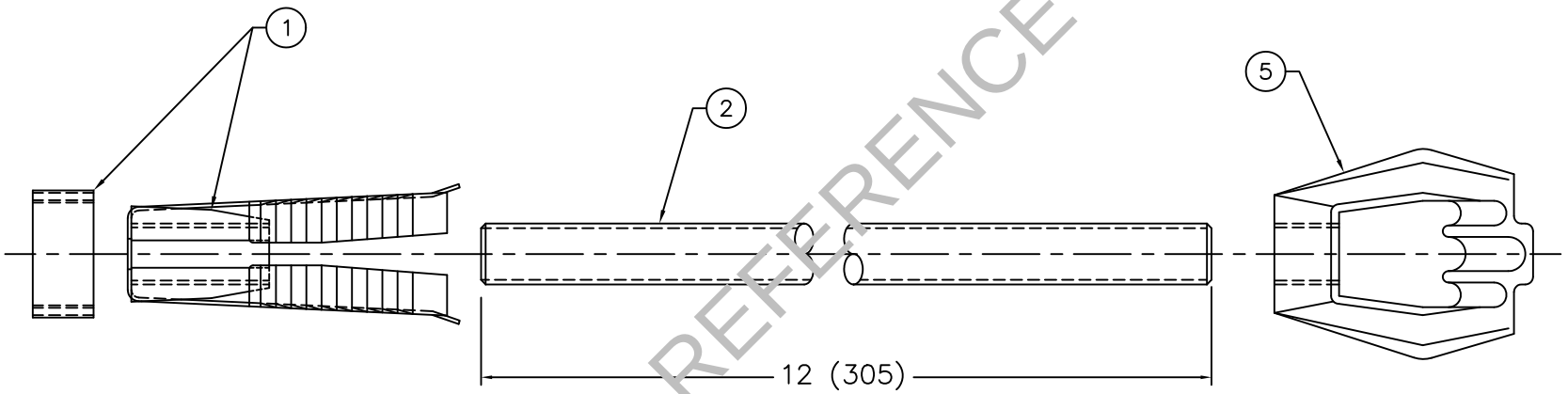
INNOVATIONS IN TRANSMISSION AND DISTRIBUTION
LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3671

STRAP10A 1INX7FT ROD
1-8 UMC ENDS

SIZE	SCALE	DWG	REV
B	1:6	R-16624-2	1

ITEM	P/N	DESCRIPTION	QTY.	WEIGHT (Kgs.)
1	R-16978-1	ROCK ANCHOR HEAD	1	0.75
2	R-16978-2	1"(25) x 12" (305) THREADED ROD	1	1.0
5	R-16624-3	TRIPLE THIMBLE EYE	1	1.0

REVISIONS		
LTR	DESCRIPTION	ENG/DATE
1	REDRAWN IN CAD, NO CHANGE	P.L. 12/9/05
2	DELETE 3.5 AND 7.0 FT. EXTENTIONS AND C-NUT	S. C. 04/01/10



ULTIMATE STRENGTH: 35 KIP [155.7 kN]

1. FINISH: ALL FERROUS PARTS ARE HOT DIP GALVANIZE PER ASTM STD. A-123.
ALL FERROUS FASTENERS ARE HOT DIP GALVANIZE PER ASTM STD. A-153.

NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471				
APPROVALS	DATE	ROCK ANCHOR ASSY.				
DRAWN PAUL LARA	12/9/05					
CHECKED PAT ROWAN	XXXX	SIZE B	SCALE 1:2	DWG R-16978	REV 2	
ENGINEER PAT ROWAN	XXXX					

REVISIONS		
LTR	DESCRIPTION	BY/DATE
1	SALES RELEASE	P.L. 10/22/04

976

SPECIFICATIONS

ITEM	U.S.A.	METRIC
CAPACITY (SK58130)	7/8 in. Hex x 4-1/4 in. Shank	
CAPACITY	1 in. Hex x 4-1/4 in. Shank	
PERFORMANCE	3 in. x 20 ft. Deep Hole	
FLOW RANGE	7 - 9 gpm	26 - 34 lpm
PRESSURE	1500 - 2000 psi	105 - 140 bar
PORTS*	-8 SAE O-Ring (H), 1/2 in. NPT (A)	
WEIGHT	67 lbs	30 kg
LENGTH	26 in.	66 cm
WIDTH	18 in.	46 cm
CONNECTION	3/8 in. Male NPT Hose End	
HOSE WHIPS	Yes	
MOTOR	Integral	

* (H) = Hydraulic
(A) = Air

1. MAT'L: REF. STANLEY P/N SK58120

NOTES: UNLESS OTHERWISE SPECIFIED

DIMS IN INCHES BREAK EDGES 0.015
TOLERANCES – UNLESS OTHERWISE SPECIFIED
X/X ±1/32
X.X ±0.06
X.XX ±0.02
X.XXX ±0.005
ANGLES ±1°

MATERIAL: SEE NOTE 1
FINISH: NONE

SALES

APPROVALS		DATE
DRAWN	PAUL LARA	10/22/04
CHECKED	PAT ROWAN	11/3/04
ENGINEER	PAT ROWAN	11/3/04

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

ROCKDRILL TOOL SET

SIZE: A
SCALE: 1 : 1
DWG: R-16979
REV: 1

977

REVISIONS			
LTR	DESCRIPTION	BY/DATE	APPD.BY/DATE
1	INITIAL SALES DRAWING RELEASE	09/09/10	09/09/10

WEIGHT : 30 LBS. (13.6 KGS)

SALES

APPROVAL		DATE
DRAWN	PAUL LARA	09/09/10
CHECKED	STEVE SCHOLFIELD	09/09/10
ENGINEER	STEVE SCHOLFIELD	09/09/10

INNOVATIONS DANS LA TRANSMISSION ET DISTRIBUTION

LINDSEY MANUFACTURING COMPANY

STANLEY ROCK DRILL HD45

TAILLE	SCALE	DESSIN	RÉV
A	NONE	R-16979-1	1

978

REVISIONS			
LTR	DESCRIPTION	BY/DATE	APPD.BY/DATE
1	INITIAL SALES DRAWING RELEASE	09/09/10	09/09/10

WEIGHT: 5 LBS. (2.27 KGS)

SALES			
	APPROVAL	DATE	
DRAWN	PAUL LARA	09/09/10	7/8" [22.2mm] X 2' [1219.2mm] ROD
CHECKED	STEVE SCHOLFIELD	09/09/10	
ENGINEER	STEVE SCHOLFIELD	09/09/10	

INNOVATIONS DANS LA TRANSMISSION ET DISTRIBUTION

LINDSEY MANUFACTURING COMPANY

TAILLE	SCALE	DESSIN	RÉV
A	NONE	R-16979-2	1

REVISIONS			
LTR	DESCRIPTION	BY/DATE	APPD.BY/DATE
1	INITIAL SALES DRAWING RELEASE	09/09/10	09/09/10

WEIGHT : 8 LBS. (3.63 KGS)

SALES		INNOVATIONS DANS LA TRANSMISSION ET DISTRIBUTION — LINDSEY MANUFACTURING COMPANY
APPROVAL	DATE	7/8" [22.2mm] X 4' [2438.4mm] ROD
DRAWN PAUL LARA	09/09/10	
CHECKED STEVE SCHOLFIELD	09/09/10	TAILLE A / SCALE NONE / DESSIN R-16979-3 / RÉV 1
ENGINEER STEVE SCHOLFIELD	09/09/10	

980

REVISIONS			
LTR	DESCRIPTION	BY/DATE	APPD.BY/DATE
1	INITIAL SALES DRAWING RELEASE	09/09/10	09/09/10

WEIGHT : 1 LB. (0.454 KGS)

SALES

INNOVATIONS DANS LA TRANSMISSION ET DISTRIBUTION

LINDSEY MANUFACTURING COMPANY

APPROVAL		DATE
DRAWN	PAUL LARA	09/09/10
CHECKED	STEVE SCHOLFIELD	09/09/10
ENGINEER	STEVE SCHOLFIELD	09/09/10

COUPLEAURS

TAILLE	SCALE	DESSIN	RÉV
A	NONE	R-16979-4	1

981

REVISIONS			
LTR	DESCRIPTION	BY/DATE	APPD.BY/DATE
1	INITAL SALES DRAWING RELEASE	09/09/10	09/09/10

WEIGHT : 1.0 LB. (0.455 KGS)

SALES		INNOVATIONS DANS LA TRANSMISSION ET DISTRIBUTION — LINDSEY MANUFACTURING COMPANY
APPROVAL	DATE	1" [25.4mm] SHANK
DRAWN PAUL LARA	09/09/10	
CHECKED STEVE SCHOLFIELD	09/09/10	TAILLE A · SCALE NONE · DESSIN R-16979-5 · RÉV 1
ENGINEER STEVE SCHOLFIELD	09/09/10	

REVISIONS			
LTR	DESCRIPTION	BY/DATE	APPD BY/DATE
1	INITIAL SALES DRAWING RELEASE	09/09/10	09/09/10

982

WEIGHT : 1.0 LB. (0.455 KGS) EACH.

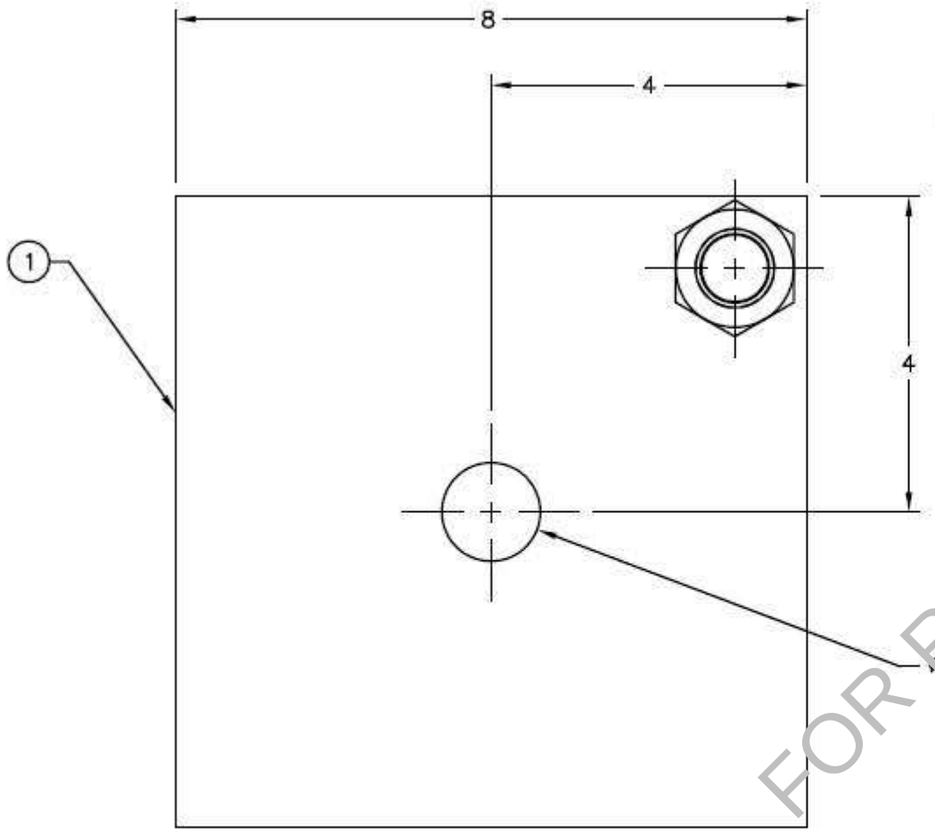
SALES			
APPROVAL	DATE		
DRAWER PAUL LARA	09/09/10	1-3/4" [44.5mm] CARBIDE BITS	
CHECKED STEVE SCHOLFIELD	09/09/10		
ENGINEER STEVE SCHOLFIELD	09/09/10		

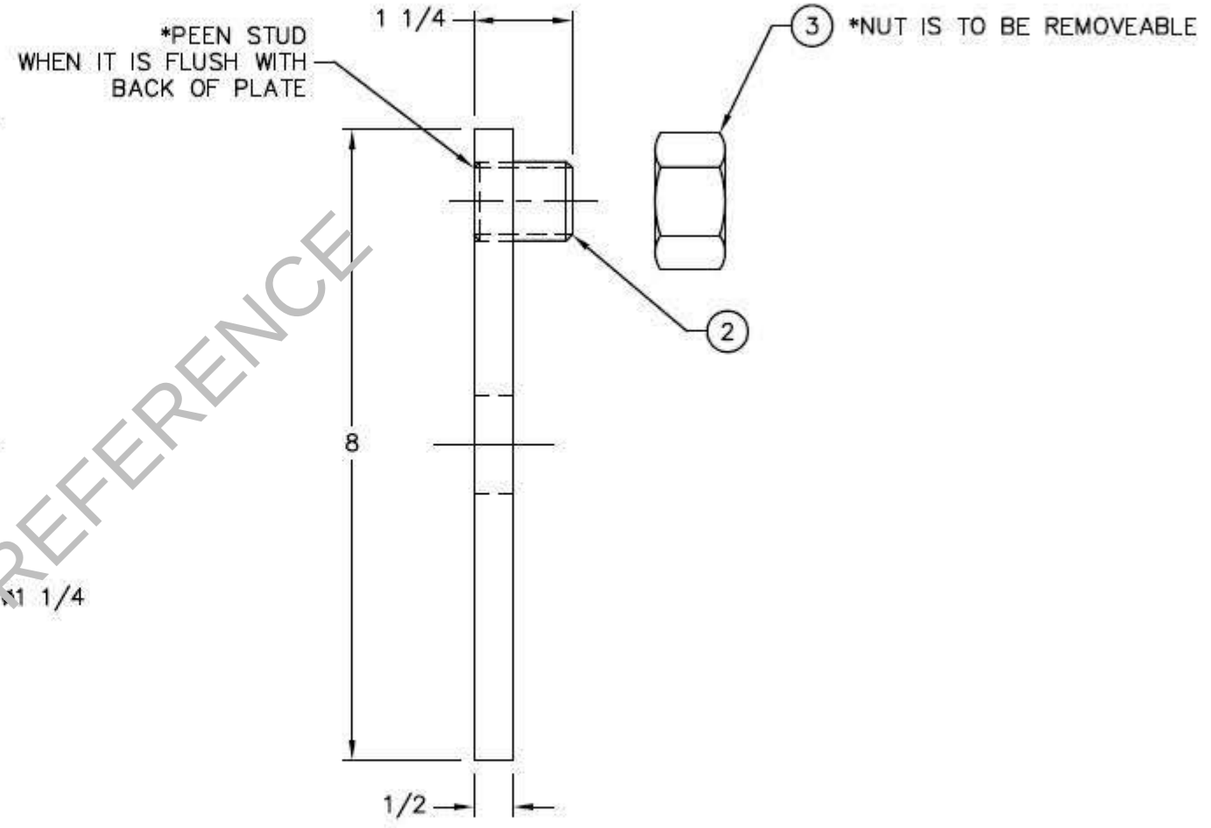
INNOVATIONS DANS LA TRANSMISSION ET DISTRIBUTION

LINDSEY MANUFACTURING COMPANY

TAILLE	SCALE	DESSIN	RÉV
A	NONE	R-16979-6	1

REVISIONS			
LTR	DESCRIPTION	ENG/DATE	APPD. BY/ DATE
B	ADDED STUD AND HEXNUT TO DRAWING	P.L. 5/21/08	S.D.S. 5/22/08





3. WEIGHT : 1.2 LBS. (0.55 KGS)
2. BREAK ALL SHARP EDGES.
1. SEE B.O.M.

NOTES: UNLESS OTHERWISE SPECIFIED

DIMS IN INCHES BREAK EDGES 0.015
TOLERANCES – UNLESS OTHERWISE SPECIFIED
X/X ±1/32
X.X ±0.06
X.XX ±0.02
X.XXX ±0.005
ANGLES ±1°

MATERIAL: NOTE 1
FINISH: NOTE 2

ASSY

APPROVALS		DATE
DRAWN	HASKELL BARNETT	8/8/07
CHECKED	STEVE SCHOLFIELD	8/9/07
ENGINEER	HASKELL BARNETT	8/8/07

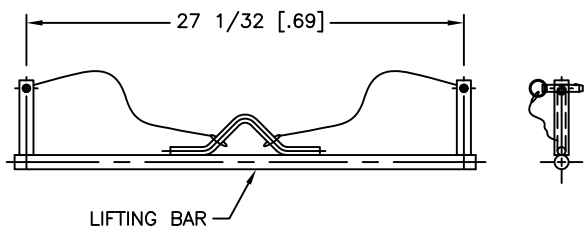
INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

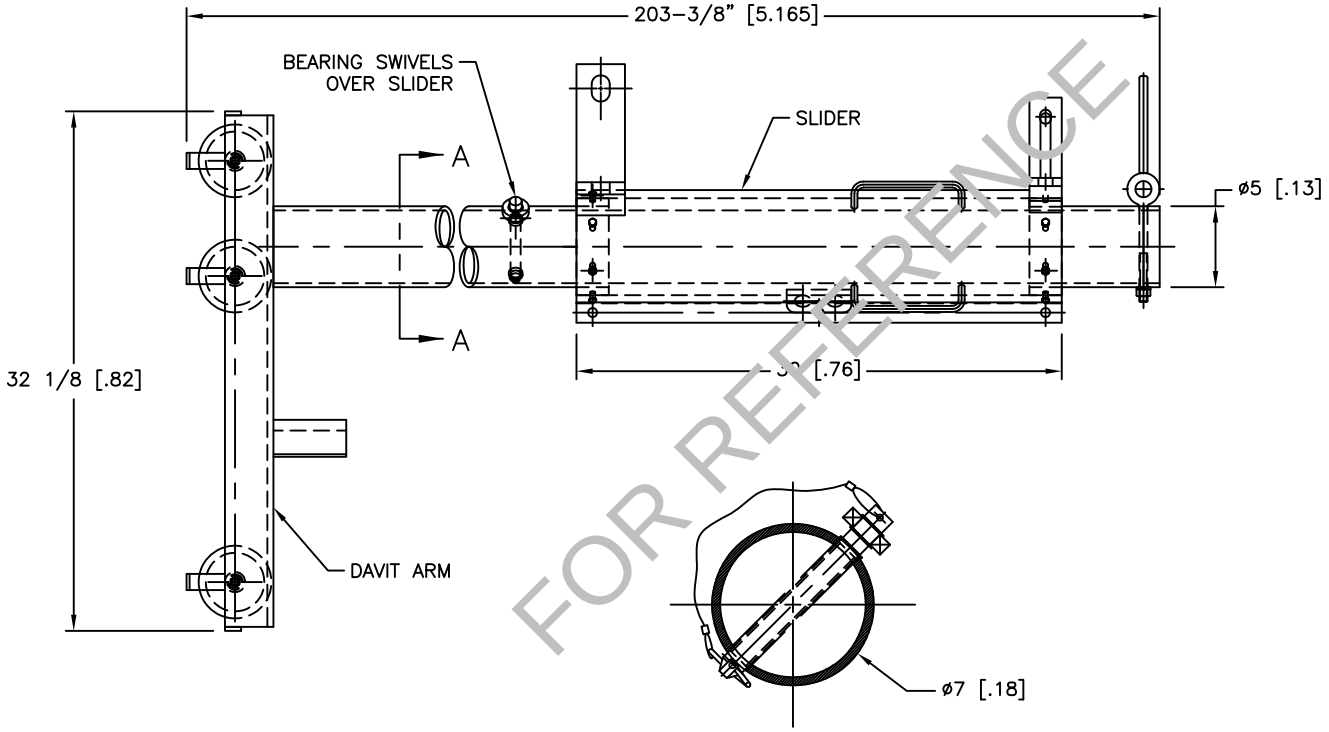
LINDSEY MANUFACTURING COMPANY
700 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

BEARING PLATE ASSY.

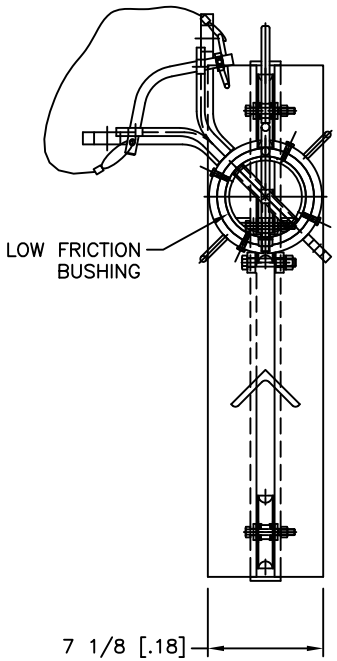
SIZE	SCALE	DWG	REV
B	1 : 2	R-16979-7	B

REVISIONS			
LTR	DESCRIPTION	ENG/DATE	APPD. BY/DATE
1	INITIAL SALES DRAWING RELEASE	P.L. 1/27/14	P.L. 1/27/14





SECTION A–A

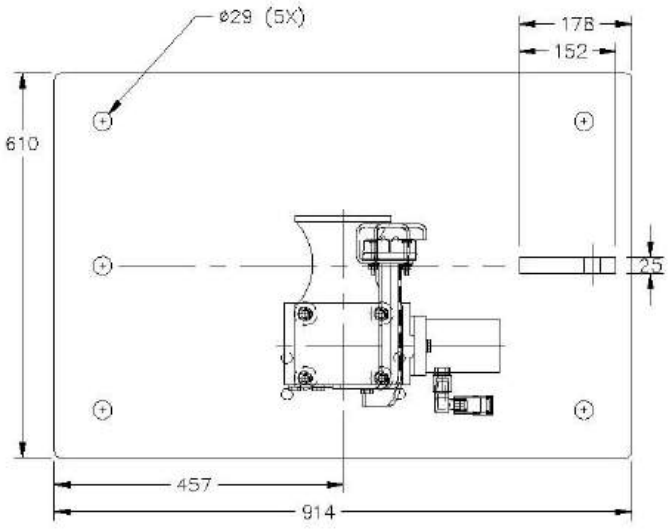


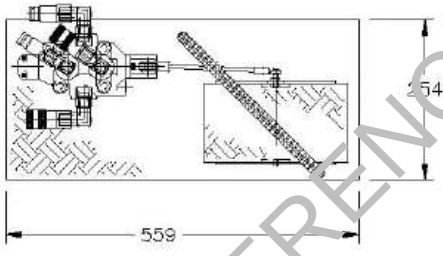
4. DIMESNIONS IN [.] ARE IN METERS.
3. WORKING LOAD LIMITS: 660 Lbs. [300 Kgs.]
2. WEIGHT: 120 Lbs. [54.4 Kgs.]
1. MATERIAL: ALUMINUM

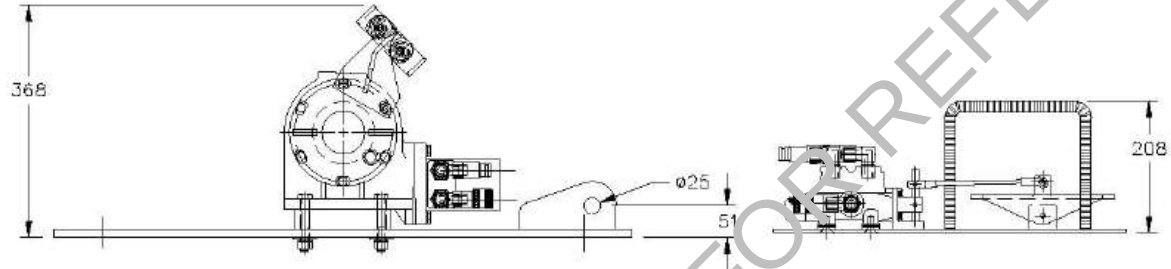
NOTES: UNLESS OTHERWISE SPECIFIED

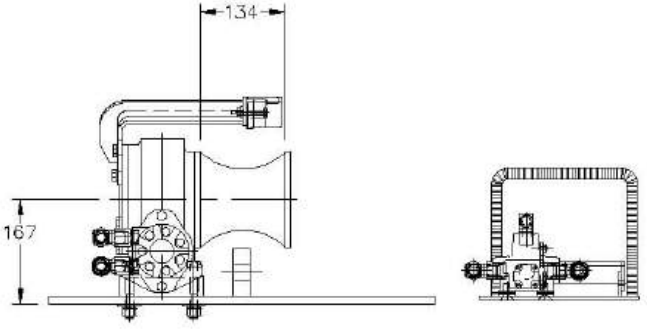
SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471				
APPROVALS	DATE	GIN POLE				
DRAWN PAT ROWAN	1/21/04					
CHECKED AJAY BHAKTA	1/21/04	SIZE B	SCALE 1:8	DWG 7271	REV 1	
ENGINEER PAT ROWAN	1/21/04					

REVISIONS 985					
ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	2	APUG RELEASE	4/16/04		









4. WEIGHT: 50.7 Lbs. (22 Kgs)

3. CAPACITY 1,000 lbs. (450 Kg).
2. SOME FITTINGS REMOVED TO REDUCE DRAWING COMPLEXITY
1. VIEWS REORGANIZED TO FIT PAGE
NOTES: UNLESS OTHERWISE SPECIFIED

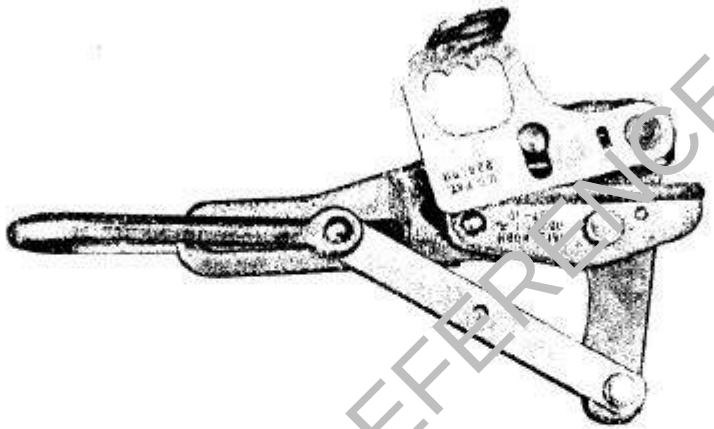
SALES		
APPROVALS		DATE
DRAWN	AJAY BHAKTA	4/16/04
CHECKED	PAT ROWAN	4/16/04
ENGINEER	AJAY BHAKTA	4/16/04

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GRIFFIN / AZUSA, CA 91702 (626) 969-3491

CAPSTAN AND FOOTPEDAL ASSY.

SIZE	SCALE	DWG	REV
B	1: 200	7004H	2



1. MATL: STEEL
2. WEIGHT: 15-1/2 LBS [7.03 kg]
3. GUY WIRE RANGE: 0.31-0.62 (8-16)

MAXIMUM SAFE LOAD: 15 KIP [67 kN]

USED ON NUMBERS	NO.	DATE	BY	APP.	DESCRIPTION
					REVISIONS

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818)969-2471

TITLE: AUTOMATIC WIRE GRIP

-STRENGTH- LBS. REQ-

TOLERANCES UNLESS OTHERWISE NOTED

	FRACTIONS	DECIMALS
CAST		
FORGE		
MACHINE		
FABRICATION		

WEIGHT: ASME- RAW | FIN.

APP.

MATERIAL: STEEL | FINISH: ZINC PLATED

CHK.

NOTE: DO-NOT SCALE DRAWING; BREAK ALL SHARP EDGES

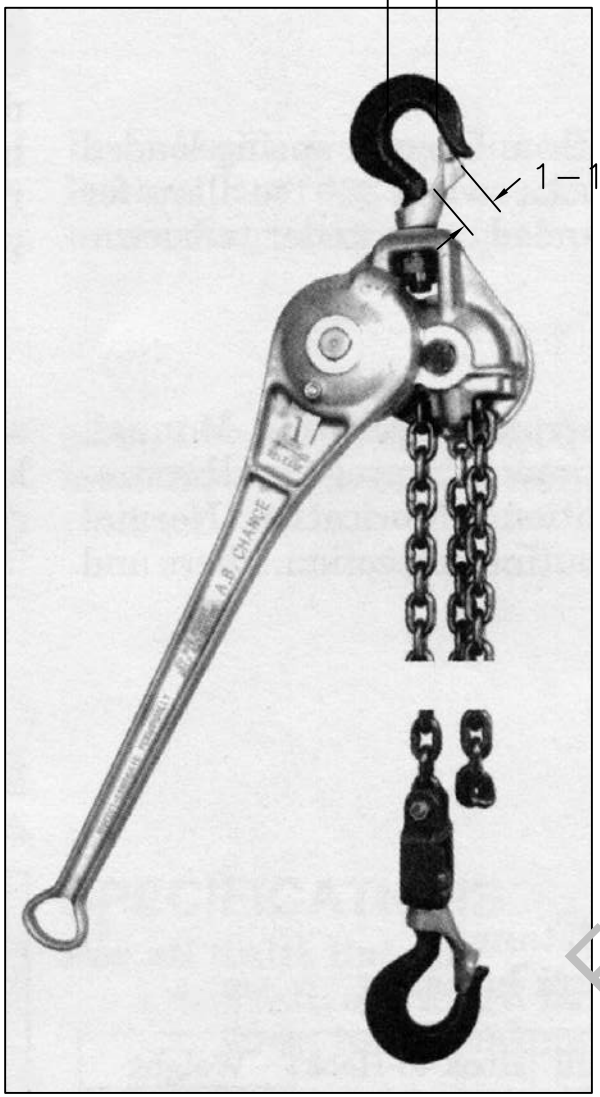
DWG. | S.C. 05/01/95

SCALE: NONE

NUMBER

LAST-REVISION: NO. | DATE

DRAWING-NUMBER: R-14301



MIN. 10 FT [3.1m] CHAIN WITH (STANDARD LIFT 3m)
FORGED PULLING HOOKS & SAFETY LATCH
WEIGHT: 53 LBS. (24Kgs)
WORKING CAPACITY: 26.7kN [3000Kg]

USED ON NUMBERS

NO.	DATE	BY	APP.	DESCRIPTION
				REVISIONS

-STRENGTH- LBS. | REQ-

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

TITLE: 3 TON. CHAIN HOIST WITH 10 FT. TAKE-UP

TOLERANCES UNLESS OTHERWISE NOTED			
	FRACTIONS	DECIMALS	ANGLES
CAST			
FORGE			
MACHINE			
FABRICATION	±1/16	-	±1°

WEIGHT		
ASMB-	RAW	FIN.

MATERIAL	FINISH
SEE NOTES	SEE NOTES

NOTE!	DO-NOT SCALE DRAWING
	BREAK ALL SHARP EDGES

APP.	
CHK.	
DRG.	P.L.
9/8/2017	

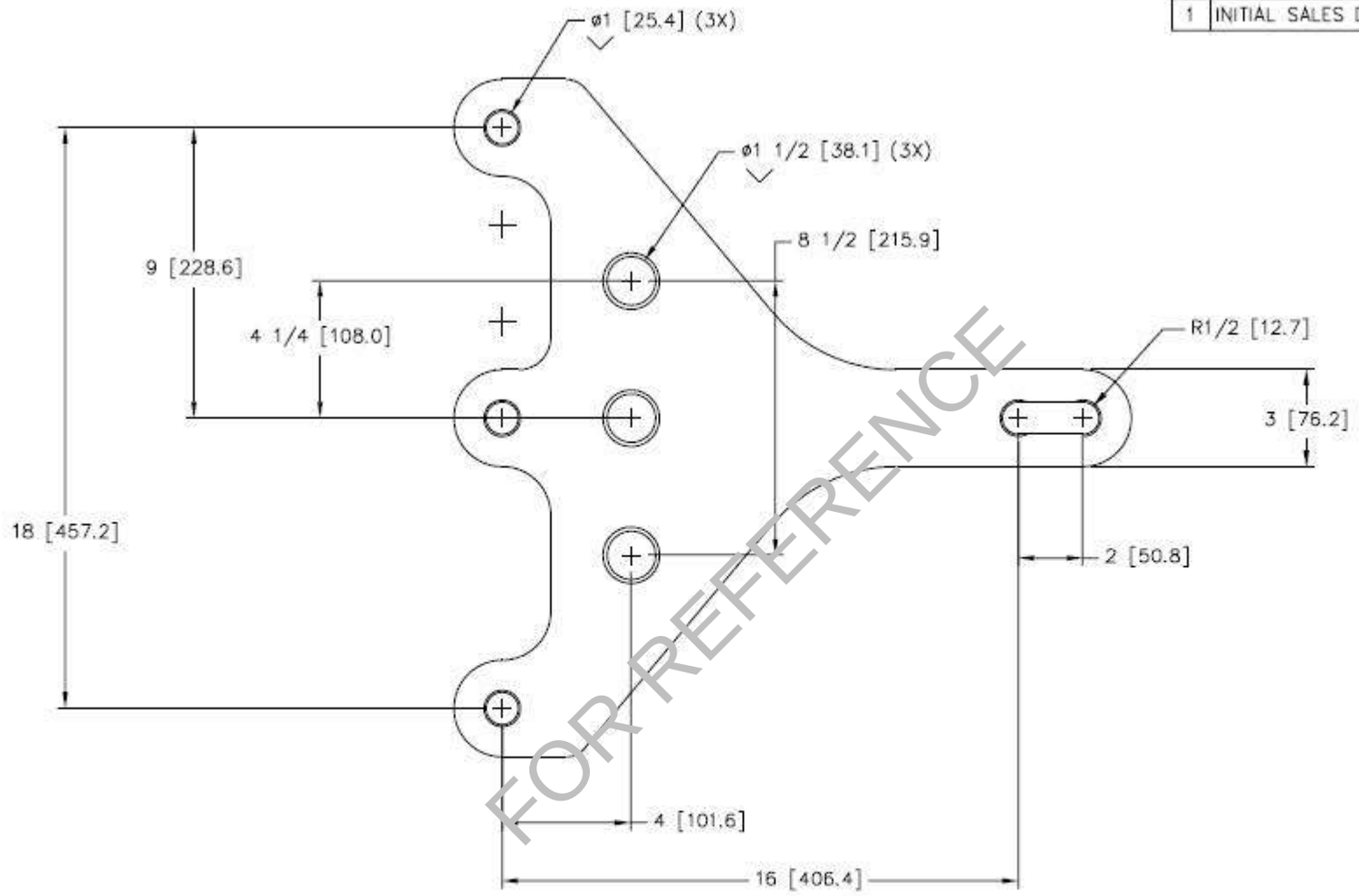
SCALE
NONE

LAST-REVISION	
NO.	DATE
1	9/8/2017

NUMBER

DRAWING-NUMBER
R-15107

REVISIONS		
LTR	DESCRIPTION	ENG/DATE
1	INITIAL SALES DRAWING RELEASE	P.L 11/11/05



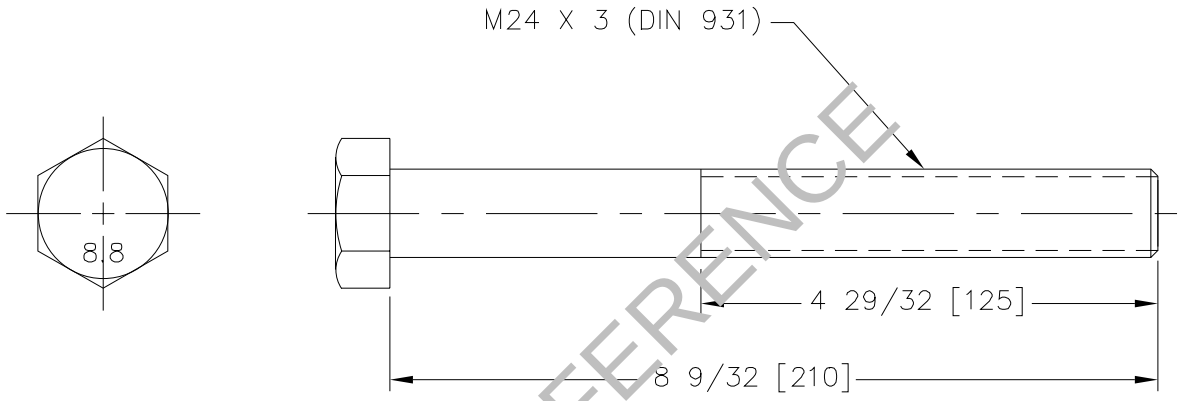
ULTIMATE STRENGTH: 20 KIP [89 kN]

2. TOTAL WEIGHT = 3 Kgs. (7 Lbs.)

1. MAT'L: 1/2" 6061-T6 ALUMINUM PLATE
NOTES: UNLESS OTHERWISE SPECIFIED

SALES			INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY			
APPROVALS		DATE	CONSTRUCTION YOKE			
DRAWN	AJAY BHAKTA	2/4/04				
CHECKED	PAT ROWAN	2/4/04	SIZE B	SCALE 1:4	DWG 7272	REV 1
ENGINEER	AJAY BHAKTA	2/4/04				

REVISIONS					
ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	1	INITIAL SALES DRAWING RELEASE	P.L. 10/20/05		



4. THREAD LENGTH PROVIDED IS A MINIMUM, MAY BE FULL THREAD
3. MARK VENDOR AND CLASS MARKING ON HEAD
2. FINISH: HOT DIP GALV. PER ASTM STD. A 153
1. MAT'L: EQ TO METRIC CLASS 8.8 MEDUIM STRENGTH, DIN 931

NOTES: UNLESS OTHERWISE SPECIFIED

SALES

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

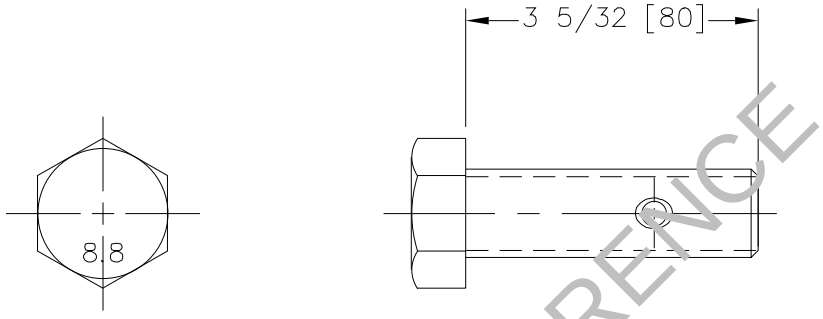
LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

APPROVALS	DATE
DRAWN AJAY BHAKTA	10/7/03
CHECKED PAT ROWAN	10/7/03
ENGINEER AJAY BHAKTA	10/7/03

24 X 3 X 210 METRIC BOLT

SIZE	SCALE	DWG	REV
A	1 : 2	7250/210	1

REVISIONS					990
ZONE	LTR	DESCRIPTION	ENG/DATE	BY/DATE	ECO#
	1	SALES RELEASE	1/23/04		



3. WEIGHT: 0.37 kg.
2. FINISH: HOT DIP GALV. PER ASTM STD. A-153
1. MAT'L: METRIC CLASS 8.8 MEDUIM STRENGTH, DIN 931 (M24-3)

NOTES: UNLESS OTHERWISE SPECIFIED

DIMS IN INCHES BREAK EDGES 0.015
TOLERANCES - UNLESS OTHERWISE SPECIFIED
X/X ±1/32
X.X ±0.06
X.XX ±0.02
X.XXX ±0.005
ANGLES ±1°

SALES

APPROVALS	DATE
DRAWN AJAY BHAKTA	1/23/04
CHECKED PAT ROWAN	1/23/04
ENGINEER AJAY BHAKTA	1/23/04

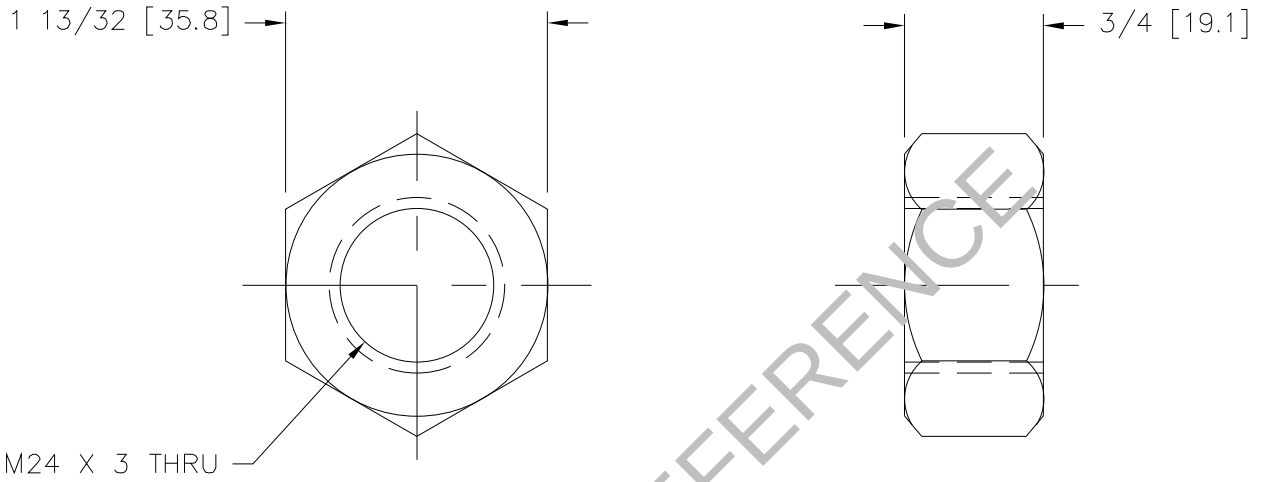
INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

24 X 3 X 80 METRIC BOLT

MATERIAL	FINISH	SIZE	SCALE	DWG	REV
SEE NOTE 1	SEE NOTE 2	A	1:2	7249/24/80	1

REVISIONS		991
LTR	DESCRIPTION	BY/DATE
1	INITIAL SALES DRAWING RELEASE	P.L. 4/5/06

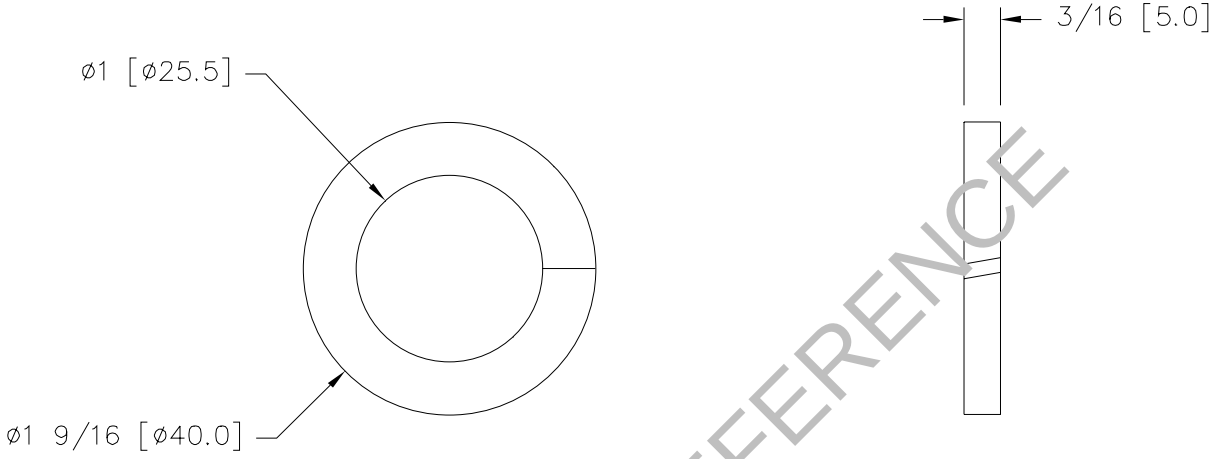


3. BREAK ALL SHARP EDGES AND DEBURR ALL DRILLED HOLES.
2. FINISH: HOT DIP GALV. PER ASTM A-153.
1. MAT'L: MAKE FROM P/N 7249-1X.

NOTES: UNLESS OTHERWISE SPECIFIED

SALES		INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY, 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471			
APPROVALS	DATE	M24 X 3 HEX NUT			
DRAWN PAUL LARA	4/5/06				
CHECKED PAT ROWAN	XXXX	SIZE A	SCALE 1:1	DWG 7249-1	REV 1
ENGINEER PAT ROWAN	XXXX				

REVISIONS		992
LTR	DESCRIPTION	BY/DATE
1	INITIAL SALES DRAWING RELEASE	P.L. 4/5/06



3. BREAK ALL SHARP EDGES AND DEBURR ALL DRILLED HOLES.
2. FINISH: HOT DIP GALV. PER ASTM A-123.
1. MAT'L: MAKE FROM 7249-2X.

NOTES: UNLESS OTHERWISE SPECIFIED

SALES

APPROVALS		DATE
DRAWN	PAUL LARA	4/5/06
CHECKED	PAT ROWAN	XXXX
ENGINEER	PAT ROWAN	XXXX

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION

LINDSEY MANUFACTURING COMPANY
760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471

M24 LOCKWASHER

SIZE	SCALE	DWG	REV
A	1 : 1	7249-2	1

REVISIONS		
LTR	DESCRIPTION	BY/DATE
1	SALES RELEASE	MK 08/22/16

993

R-21645-3

R-21645-2

R-21645-1

SALES					
APPROVALS	DATE	INNOVATIONS IN TRANSMISSION AND DISTRIBUTION	LINDSEY MANUFACTURING COMPANY 760 N. GEORGIA / AZUSA, CA 91702 (818) 969-3471		
DRAWN PAUL LARA	10/18/04	FALL ARREST LIFELINE KIT			
CHECKED PAT ROWAN	11/3/04	SIZE A	SCALE NTS	DWG R-21645	REV 1
ENGINEER PAT ROWAN	11/3/04				

NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS			
LTR	DESCRIPTION	BY/DATE	APPR/DATE
1	REDRAWN IN CAD, NO CHANGE	11/11/10	11/11/10

1. MATERIAL : SHEET METAL PAINTED
2. WEIGHT : 11 Lbs. (5.0 Kgs)

SALES		LINDSEY MANUFACTURING COMPANY			
APPROVALS	DATE	RED TOOL BOX -E.R.S.			
DRAWN PAUL LARA	11/11/10				
CHECKED STEVE SCHOLFIELD	11/11/10	SIZE A	SCALE NTS	DWG R-17798	REV 1
ENGINEER STEVE SCHOLFIELD	11/11/10				

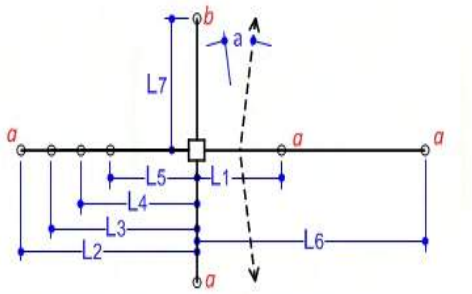
11 ERS PROSPOT® ANALYSIS

LINDSEY

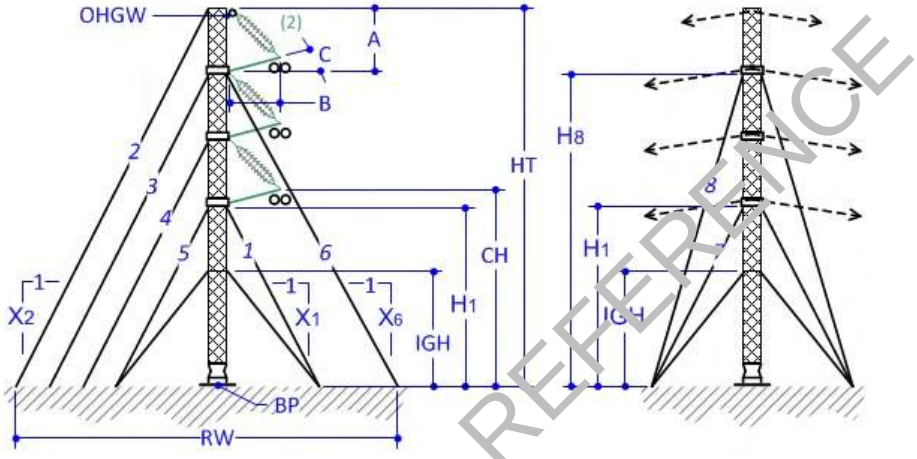
Emergency Restoration System - ProSpot 5.0.85
Series 600H - ERS Series 600H (2.9m column height interval)

Printed: 9/6/2023
Registered To: HARUT AVETISYAN
Version 5.0.85

Horizontal Vee - 400KV



Plan View



Conductors Per Phase: 2

Elevation View

Insulators Per Phase: 2

a =	20.0 degrees
A =	8.7 m
B =	3.8 m
BP =	194.06 kPa
C =	0.0 degrees
CH =	21.9 m
H1 =	21.9 m
H8 =	39.3 m
HT =	48.0 m
IGH =	13.20 m
L1 =	22.5 m
L2 =	48.6 m
L3 =	40 m
L4 =	31 m
L5 =	23 m
L6 =	39.9 m
L7 =	21 m
RW =	88.5 m
X1 =	1.0
X2 =	1.0
X6 =	1.0

Conductor / OHGW Data - RUBUS

Cond. Diameter = 3.15 cm | Cond. Unit Weight = 1.62 kg/m | Cond. Tension (Tension 1) = 34.0 kN
OHGW Diameter = 1.02 cm | OHGW Unit Weight = 0.45 kg/m | OHGW Tension (Tension 1) = 13.3 kN

Geometry Data - 400KV

Post Buckling = 75 kN

Loading Data - LOAD 1

Conductor Wind = 1200.0 Pa | Column Wind = 1200.0 Pa | Radial Ice = 0.00 cm | Addl. Ecc. = 10.0 cm
Shape Factor = 2.10 | OLF Vertical = 1.10 | OLF Horizontal = 1.10 | OLF Line Tension = 1.10

Wind and Weight Span Data - PRO 1

Allowable Wind Span = 400.0 m | Allowable Weight Span = 400.0 m

Insulator Loads

Max Post Insulator Load = -13 kN, 53 kN | Max Suspension Insulator Tensile Load = 8 kN

Guy Loads (kN)/Lead

T1 = 37 kN | T2 = 27 kN | T3 = 92 kN
T4 = 92 kN | T5 = 83 kN | T6 = 28 kN
Int. Front (IF) = 8 kN | Int. Back (IB) = 8 kN | T7, T8 Anchor Load = 60 kN

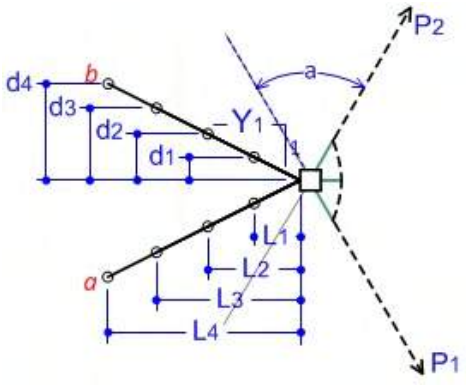
Guy Wire Lengths	
	a
Int Guy 1	26.1 m
Int Guy 5	26.1 m
Front Guy 1	31.4 m
Back Guy 2	68.3 m
Back Guy 3	56.0 m
Back Guy 4	43.7 m
Back Guy 5	31.4 m
Midphase Guy 6	56.0 m
Int. Longitudinal Guy 7	25.6 m
Longitudinal Guy 7	31.0 m
Longitudinal Guy 8	45.0 m

LINDSEY

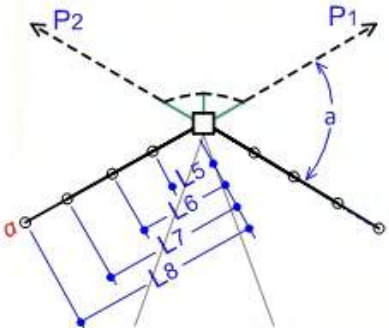
Emergency Restoration System - ProSpot 5.0.85
Series 600H - ERS Series 600H (2.9m column height interval)

Printed: 9/6/2023
Registered To: HARUT AVETISYAN
Version 5.0.85

Dead End - 400KN DEAD END

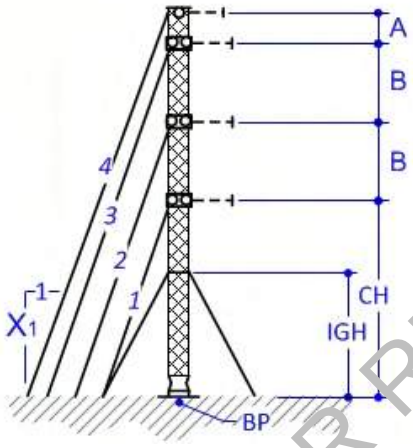


Side 1 Back Guys
Total Back Anchors - 8 req'd

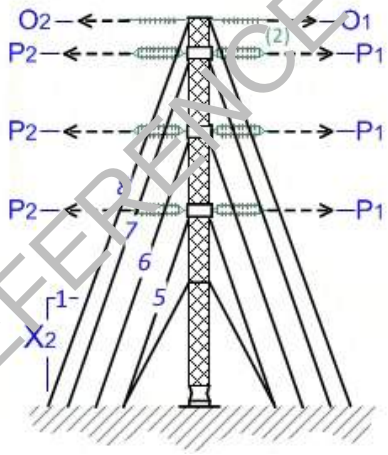


Plan View

Side 2 Guys
Total Side Anchors - 8 req'd



Back Guys
Conductors Per Phase: 2
Insulators Per Phase: 2



Elevation View

Side Guys

a =	60.0 degrees
A =	8.7 m
B =	8.7 m
BP =	344.79 kPa
CH =	21.9 m
d1 =	11.0 m
d2 =	15.3 m
d3 =	19.7 m
d4 =	24.0 m
IGH =	13.20 m
L1 =	21.9 m
L2 =	30.6 m
L3 =	39.3 m
L4 =	48.0 m
L5 =	21.9 m
L6 =	30.6 m
L7 =	39.3 m
L8 =	48.0 m
O1 =	OHGW In
O2 =	OHGW Out
P1 =	Phase In
P2 =	Phase Out
X1 =	1.0
X2 =	1.0
Y1 =	2.00

Conductor / OHGW Data - RUBUS

Cond. Diameter = 3.15 cm | Cond. Unit Weight = 1.62 kg/m | Cond. Tension = 38.0 kN
OHGW Diameter = 1.02 cm | OHGW Unit Weight = 0.45 kg/m | OHGW Tension = 13.3 kN

Loading Data - WIND ZONE 4

Conductor Wind = 1220.0 Pa | Column Wind = 1220.0 Pa | Radial Ice = 0.00 cm | Addl. Ecc. = 10.0 cm
Shape Factor = 2.10 | OLF Vertical = 1.10 | OLF Horizontal = 1.10 | OLF Line Tension = 1.10

Wind and Weight Span Data - PROF 1

Allowable Wind Span = 400.0 m | Allowable Weight Span = 400.0 m

Guy Loads (kN)/Lead

Back	T1 = 94 kN	T2 = 94 kN	T3 = 94 kN	T4 = 18 kN	Int = 4 kN
Side	T5 = 32 kN	T6 = 32 kN	T7 = 32 kN	T8 = 8 kN	Int = 8 kN
Front	F-Int = 7 kN				

Guy Wire Lengths		
	a	*b*
Int Guy 1	27.8 m	27.8 m
Int Guy 5	25.6 m	
Back Guy 1	32.9 m	32.9 m
Back Guy 2	45.9 m	45.9 m
Back Guy 3	59.0 m	59.0 m
Back Guy 4	72.0 m	72.0 m
Side Guy 5	31.0 m	
Side Guy 6	43.3 m	
Side Guy 7	55.6 m	
Side Guy 8	67.9 m	

India Jaigad Proposal

Contents

Scope of work

Type of Towers: 400 kV Emergency Restoration Tower Systems (ERS)

Client: Jaigad Power Transco

Quantity of Towers Per Set: 2x 400 kV Towers used as vertical suspension and 1 x 400 kV Tension Tower

Tower Solutions Proposal

Technical Specifications

Table 1 summarizes the technical specifications that were used to complete this proposal as per the customer's request.

Table 1: Tower Components Specifications

	Suspension	Tension
Quantity	2	1
Voltage (kV)	230	400
Back and Front Span (m)	400	400
Height of tower from ground to top (m)	52.5	52.5
Line Angle degrees	0 - 15	0-90
Number of conductors	4	4
Max Wind Speed (km/h)	144	144

Tower Solutions Conformance to Tender

- 230 kV ERS towers with a height of 52.5 m as per client request.
- Tower sections are 46 cm by 46 cm by 2.58 m and weigh 120 kg, as Appendix A shows.
- The articulation base has a bronze bushing, shown in Appendix A.

Proposed Package

Tower Solutions proposes the following materials and services package.

Material

- 2 x 400 kV used as Vertical Suspension
- 1 x 400kV used as a Tension
- Insulator Assembly and Hardware
- Helical anchors
- Rock Anchors
- Conductor and Guying hardware
- One Tower Erection Tool Sets
- 3 x Customized Storage 20 ft High Cube Containers

Additional Services free of charge

- Online Engineering Design Support
- Engineering Design Library

FREE SERVICES	Qty	Price (CAD)
Continuous Online Engineering Design Support to Our Customer	1	Free of charge
Access to our vast Engineering experience in ERS Installation support to solve emergencies or other situations.	1	Free of charge
Unlimited access to our Engineering Design Library	1	Free of charge
Tower Solutions Rapid Design Software	1	Free of charge

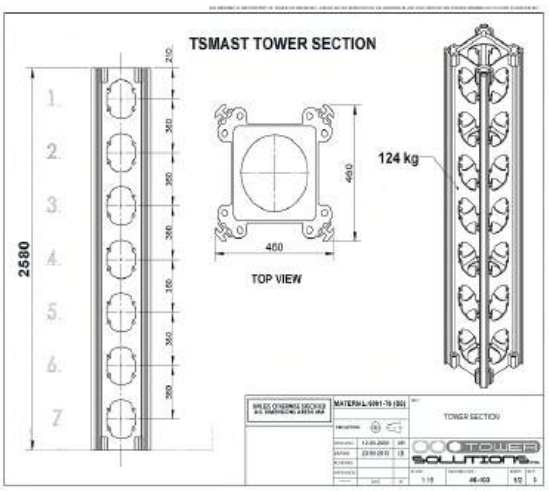
Warranty

- 5 Years, best warranty in the industry.

Appendix A

Details of Value-Added Components That Sets Us Apart

Tower Section:

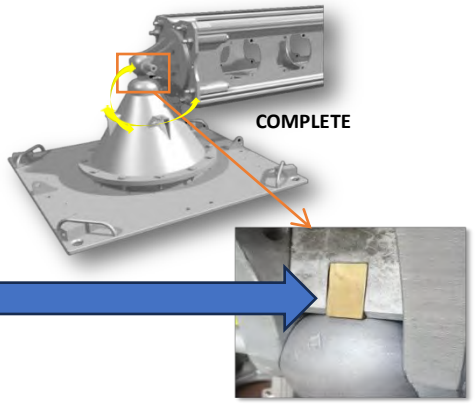


The tower section has a moment of inertia (MOI) 30% higher than the competitor. MOI is a key factor in designing ERS. Higher MOI translate in less guy wires higher forces. The unique square design section measures.

The 0.46m X 0.46m x 2.58m weighing 120kg provides:

1. A fall arrestor that is continually running along the corner providing a safe tether for the lineman.
2. A gin pole that is continuously running along the corner provides a safe and efficient means of erecting the tower.

Articulation:



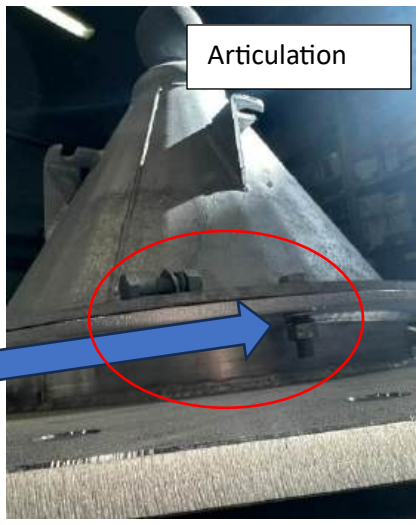
The articulation consists of a fixed steel attached to the foundation plate and a pivoting upper plate attached to the tower column.

A unique bronze alloy element that minimizes friction between the ball and the socket to:

1. Prevents the wearing of the steel ball.
2. Eliminates the seizing of the metal surfaces if the tower is left in place for longer periods.

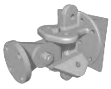
Bolted Articulation

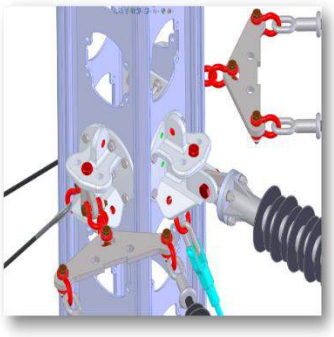
- The steel cone of the Articulation is bolted to the base plate through a specially designed raised flange. M16x65 mm bolts are NOT permanently fixed to the base plate but rather used to freely bolt steel cone to flange. A unique feature to prevent damaging and bending of bolts.



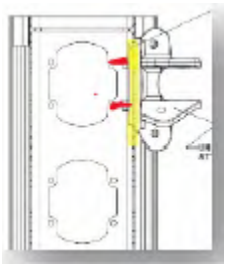
M16x65 bolt are used to connect the articulation to the base plate thru a raised flange

Universal Attachment:



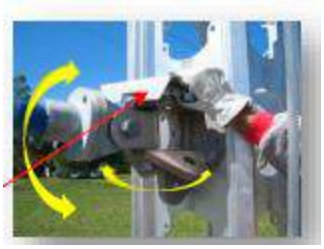


The guy wires, insulators, and any other hardware are attached to the tower via a universal attachment (UA). A single UA can handle many items.



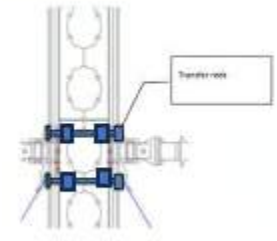
The UA is bolted (in red) right on the tower and it has a back up plate (in yellow) on the inside face of the tower to distribute the load evenly on the tower from the UA. A bolted UA is safe because it will never slip down due to a download force.

A clever design of hardware parts to install on the UA provides two degrees for the composite post insulator. A safe way to :



1. Equalizes the unbalanced longitudinal conductor loads of adjacent spans and enables the vertical inclination of the post-insulator.
2. The conductor movement is damped, and not transmitted to the tower.
3. A temporary locking device can be used to fix the post insulator when stringing.

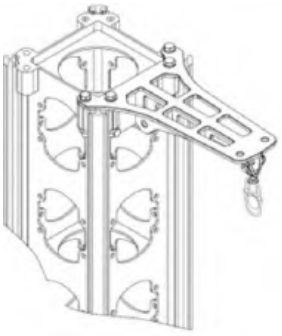
Transfer rods (Not connecting rods) can be installed to connect two opposing attachment plates on the tower in order to improve the balance and overall strength of the tower.



Fall Arrestors:

This third generation Fall Arrestor has been designed for better safety for the lineman. This new design allows a free and ease movement upward, but it will not move in the downward direction unless moved manually by the lineman. It can be attached to any corner of the tower and provides continuous protection.

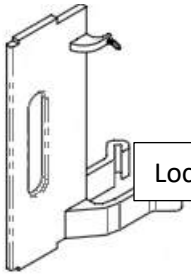
Sky wire arm extension:



A unique design for better protection against lightning our sky/earth/ground wire bracket provides an extension of 400 mm from the tower and can be extended to 500 mm. The only one design in the industry which provides such and extension and can be used equally for suspension or tension clamp for either OHGW or OPGW.

Gin Pole:

The gin pole is the most important tool used for raising and lowering tower sections, insulators, etc. It slides up and down along any of the 4 corners of the tower. Positioning the gin pole along the tower in a precise position is important for the safety of their operation efficiency and ease of work for lineman.

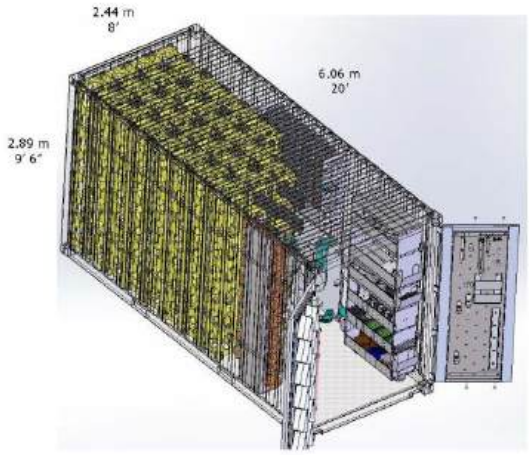


Locking Device for Gine Pole

Storage of ERS:

We have spent countless engineering hours in collaboration with some of our most loyal customers to design the perfect storage design. The result is a Tower Solutions ERS kit with 20' high cube containers. Inside each container, we store TWO x up to 45 m tall ERS, suspension and/or tension, with all the insulators for 135, 230, and 500 kV, all the hardware accessories, equipment, guy wire, capstan, hand tools, and more necessary to erect and dismantle the two ERS. Everything is stored in a precise manner on specially designed racks and shelving so that it is easy and efficient to reach for the materials and return them at the end of the job. An inventory count is easy and visual at the same time. We are unique in the industry for this.

CONTAINER WITH RACKING



Schematic View of Loaded Container
Loaded Container Weight ~15 000 kg

The container is loaded in such a way that all materials needed for installation first (i.e. the base) are in front.

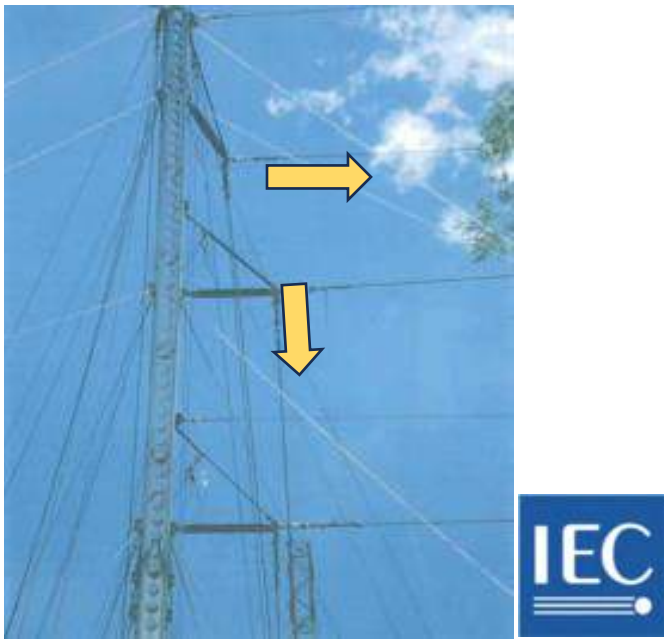
Everything piece of material has a designated place, making it easy to organize and keep track of all components and tools.

IEEE 1070 – 2006 and IEC 60652

TS is the only manufacturer that has physically preformed both tests on our ERS.

IEEE 1070 2006 is North American standards for the testing of ERS. The intent of this type test is to test every individual component of the tower to a set load. Acceptance criteria are spelled out in the standards. Tower Solutions towers has no problem meeting these standards. See our test results in Appendix E.

IEC 60652 is a European type test that requires the manufacturer to test its tower as a whole assembled unit and under loads described by the customer. Typically, beside the loads for conductors, span wind ice etc. There are also tests for broken conductor and increasing the load to 150 % / 200% or original to see how the structure behaves. It is a mandatory test for any new structures steel or aluminum, not mandatory for ERS yet buy we believe it should be. It is not a test that can be simulated or substituted with an FEA or PLS calculation. See or test results in Appendix E.



Appendix B

Bill of Materials

PICTURE	DESCRIPTION	SINGLE 400 kV SUSPENSION	SINGLE 400 kV TENSION	TOTAL 400 kV SUSPENSION	TOTAL 400 Kv TENSION	SPARE PARTS	Total Quantity
TOWER COMPONENTS, BOLTS, RODS, AND NUTS							
	BASE PLATE	1	1	2	1	0	3
	BASE ARTICULATION	1	1	2	1	0	3
	TOWER SECTION	20	20	40	20	0	60
	UNIVERSAL ATTACHMENT ASSEMBLY FOR GUYWIRE / INSULATOR (with Back Plate (bolts listed separately)	18	33	36	33	0	69
	BACK PLATE (254 x 292 x 12.7mm Thk)	18	33	36	33	0	69
	OHGW / EARTHWIRE MOUNTING DEVICE	1	1	2	1	0	3

PICTURE	DESCRIPTION	SINGLE 400 kV SUSPENSION	SINGLE 400 kV TENSION	TOTAL 400 kV SUSPENSION	TOTAL 400 Kv TENSION	SPARE PARTS	Total Quantity
	STAKE RODS (4 per tower base)	4	4	8	4	0	12
	BOLT ASSEMBLY for hardware M16x65	114	174	228	174	0	402
	BOLT ASSEMBLY for OHGW mount M20x150	4	4	8	4	0	12
	BOLT ASSEMBLY for Tower Sections M20x240	160	160	320	160	0	480
	TRANSFER ROD for UNIVERSAL ATTACHMENT	12	21	24	21	0	45
INSULATOR ASSEMBLY							0
	SUSPENSION INSULATOR WITHOUT CORONA RING AND HARDWARE 245KV (CHANGE PRICE)	6	18	12	18	0	30
	LINE POST INSULATOR WITHOUT CORONA RING AND HARDWARE 245KV (CHANGE PRICE)	9	9	18	9	0	27
	BASE PIVOT FOR LINE POST INSULATOR	3	3	6	3	0	9
	VERTICAL PIVOT BOLT	3	3	6	3	0	9
	BASE MOUNT FOR LINE POST INSULATOR	3	3	6	3	0	9

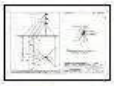
PICTURE	DESCRIPTION	SINGLE 400 kV SUSPENSION	SINGLE 400 kV TENSION	TOTAL 400 kV SUSPENSION	TOTAL 400 Kv TENSION	SPARE PARTS	Total Quantity
	HORIZONTAL PIVOT BOLT	3	3	6	3	0	9
	LINE POST INSULATOR LOCK	3	3	6	3	0	9
	TIP MOUNT FOR LINE POST INSULATOR	3	3	6	3	0	9
	STRAIN ROD INSULATOR	4	4	8	4	0	12
	2 BUNDLE YOKE PLATE	9	24	18	24	0	42
	ANCHORS						0
	HELICAL ANCHOR SET with 1x 8-10-12 Triple Helix, 2 X 5' extensions and 1x triple eye adapter	12	20	24	20	0	44
	ROCK ANCHOR – ~1.8m total length with triple eye termination	1	2	2	2	0	4
	CONDUCTOR HARDWARE AND CLAMPS						0
	TURNBUCKLE, Jaw-Jaw	12	20	24	20	0	44

PICTURE	DESCRIPTION	SINGLE 400 kV SUSPENSION	SINGLE 400 kV TENSION	TOTAL 400 kV SUSPENSION	TOTAL 400 Kv TENSION	SPARE PARTS	Total Quantity
	TURNBUCKLE EYE-EYE	3	3	6	3	0	9
	SUSPENSION CLAMP for Conductor with socket and ball clevis	12	12	24	12	0	36
	DEAD-END CLAMP for Conductor with socket and ball clevis	0	24	0	24	0	24
	SUSPENSION CLAMP for OHGW with socket and ball clevis	1	0	2	0	0	2
	DEAD-END CLAMP for OHGW with socket and ball clevis	0	2	0	2	0	2
	BALL CLEVIS FOR SUSPENSION AND DEAD END CLAMPS, U TYPE	13	38	26	38	0	64
	GUYING and OTHER HARDWARE						0
	ANCHOR SHACKLES	29	76	58	76	0	134
	Turn Buckle to Triple Eye Attachement	12	20	24	20	0	44
	THIMBLE FOR GUY WIRE	24	40	48	40	0	88

PICTURE	DESCRIPTION	SINGLE 400 kV SUSPENSION	SINGLE 400 kV TENSION	TOTAL 400 kV SUSPENSION	TOTAL 400 Kv TENSION	SPARE PARTS	Total Quantity
	PREFORMED GRIP FOR GUY WIRE	24	40	48	40	0	88
	GUY WIRE [Total quantity is the number of 1000 m rack]	0.65	1.1	1.3	1.1	0.6	3
	CHAIN LINK	7	7	14	7	0	21

PICTURE	DESCRIPTION	TOTAL QTY OF TOOLS
	ANCHOR INSTALLATION TOOLS	
	MULTI HELIX ANCHOR INSTALLER KIT, INCLUDING BAR ADAPTER, TORQUE INDICATOR, HYDRAULIC POWER UNIT AND HOSES	1
	ROCK ANCHOR INSTALLER KIT INCLUDING HYDRAULIC HAMMER AND DRILL BITS	1
	TOWER ERECTION TOOLS	
	CAPSTAN HOIST Gas Powered, 8000 rpm, Load Rate: 1000 Lb (454 Kg), Foot Throttle Control, Control Brake and Support Plate c/w 4 stake rods, bolts, nuts and washers	1
	STAKE RODS FOR CAPSTAN HOIST Ø1" (25.4) x 60" (1524mm)	4
	FALL ARRESTER (LINEMAN SAFETY CLAMP/TOWER ATTACHMENT)	2
	AUTOMATIC GRIP FOR GUY WIRE	4
	PULLING EYE WITH ADOPTER BUSHING, BOLTS AND NUTS	4
	STAKE ROD REMOVER	1
	SLIDING GIN POLE TO LIFT TOWER SECTIONS AND EQUIPMENT	1
	Rope Dolly	1
	POLYESTER ROPE - Green Tracer: ø 1/2" x 600ft (ø 12.7mm x 183m) Heavy Duty Double Braid, per 40-CP-6 Rating: 9000 lbf (40kN); Spool Quantity: 600 ft	1
	POLYESTER ROPE - Red Tracer: ø 1/2" x 600ft (ø 12.7mm x 183m) Heavy Duty Double Braid, per 40-CP-6 Rating: 9000 lbf (40kN); Spool Quantity: 600 ft	1
	1.5 TON CHAIN HOIST	4

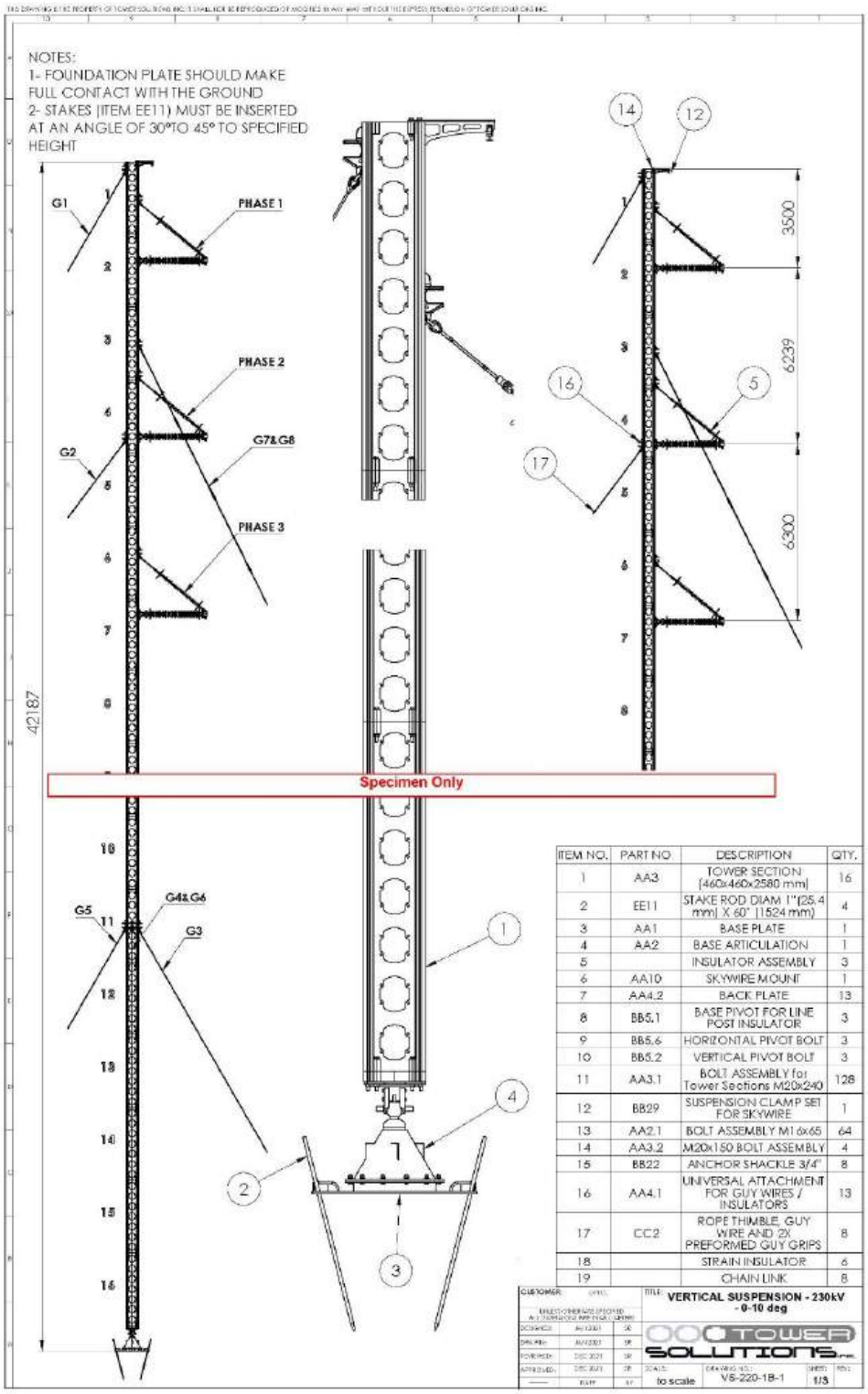
PICTURE	DESCRIPTION	TOTAL QTY OF TOOLS
	POLYESTER SLING, 2 ply, 3" x 10 ft	2
	ENDLESS POLYESTER SLING	2
	LINEMAN STEP, FOR LINE CREW TO STAND ON WHILE WORKING ON THE TOWER	2
	TOOL BOX (Hand tools are arranged within tool box) Size: 19.1"L x 10.3"W x 9.6"H (485Lx262Wx244H mm) Includes pliers, measuring tape, flat head screwdriver, plumb bob	1
	15" REVERSIBLE RATCHET 1/2" Drive x 15" LG	2
	10" REVERSIBLE RATCHET 1/2" Drive x 10" LG	2
	SQUARE DIVE DEEP SOCKET FOR M20 HEAVY HEX NUTS	2
	SQUARE DIVE DEEP SOCKET FOR M16 HEAVY HEX NUTS 1-1/16" Deep Socket - 1/2" Drive for 5/8" Heavy Duty Hex Nuts	2
	BOX WRENCH FOR M20 STRUCTURAL BOLTS 1-1/4" Wrench for 3/4" Heavy Duty Hex Nuts	2
	BOX WRENCH FOR M16 STRUCTURAL BOLTS 1-1/16" Wrench for 5/8" Heavy Duty Hex Nuts	2
	CANVAS LINEMAN TOOL BUCKET WITH SLIP HOOK	1
	ALIGNMENT TOOL (VISE-GRIP CLAMP)	2
	ADJUSTABLE HEAD SPUD WRENCH	1
	Battery Operating Zip Cutter	1
	10 lb HAMMER	1

PICTURE	DESCRIPTION	PROJECT QUANTITY
	STORAGE	
	STORAGE CONTAINER 20' HIGH CUBE, ANTICORROSIVE PROTECTION AND PAINT with racking to store 2x towers per container	3
	SOFTWARE	
	SOFTWARE LICENSE PACK INCLUDING 2 PROGRAMS: 1) PLS CADD/LITE 2) PLS POLE LW+ MAST	1 License Pack
	TRAINING	
	SOFTWARE TRAINING - 4 days	1
	FIELD TRAINING - 5 days	1
	SUPPORT (FREE SERVICES)	
	ONLINE ENGINEERING SUPPORT. TS engineers will help client engineers with tower designs in emergency situations	1
	TOWER SOLUTIONS' ERS SOFTWARE TS RAPID DESIGN	1
	ERS TOWER DESIGN SOFTWARE WITH DESIGN LIBRARY	1

Appendix C

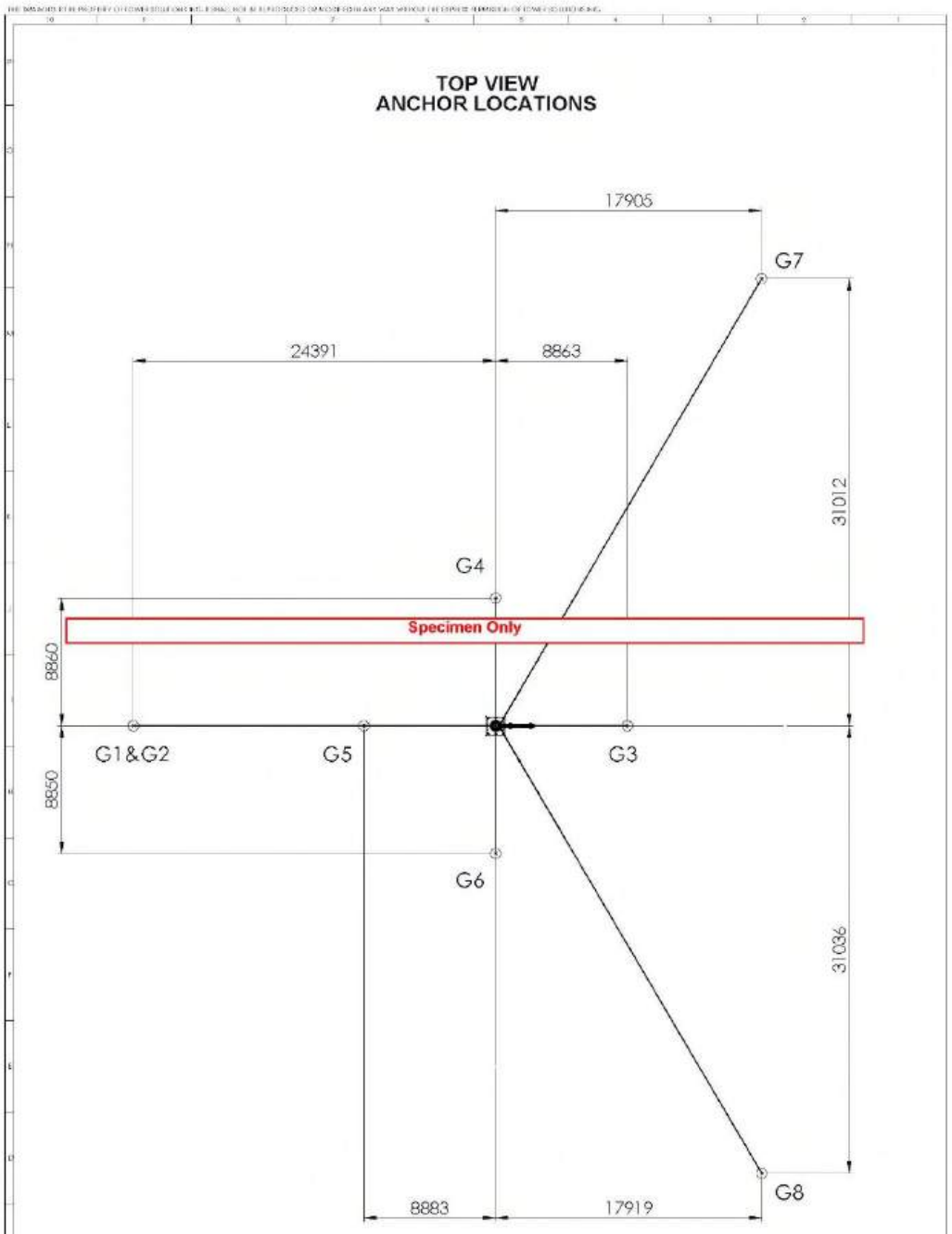
Specimen Only Tower Drawings

SINGLE CIRCUIT VERTICAL SUSPENSION TOWER SPECIMEN DRAWINGS



ITEM NO.	PART NO.	DESCRIPTION	QTY.
1	AA3	TOWER SECTION (460x460x2580 mm)	16
2	EE11	STAKE ROD DIAM 1"(25.4 mm) X 60" (1524 mm)	4
3	AA1	BASE PLATE	1
4	AA2	BASE ARTICULATION	1
5		INSULATOR ASSEMBLY	3
6	AA10	SKYWIRE MOUNT	1
7	AA4.2	BACK PLATE	13
8	BB5.1	BASE PIVOT FOR LINE POST INSULATOR	3
9	BB5.6	HORIZONTAL PIVOT BOLT	3
10	BB5.2	VERTICAL PIVOT BOLT	3
11	AA3.1	BOLT ASSEMBLY for Tower Sections M20x240	128
12	BB29	SUSPENSION CLAMP SET FOR SKYWIRE	1
13	AA2.1	BOLT ASSEMBLY M16x65	64
14	AA3.2	M20x150 BOLT ASSEMBLY	4
15	BB22	ANCHOR SHACKLE 3/4"	8
16	AA4.1	UNIVERSAL ATTACHMENT FOR GUY WIRES / INSULATORS	13
17	CC2	ROPE THIMBLE, GUY WIRE AND 2X PREFORMED GUY GRIPS	8
18		STRAIN INSULATOR	6
19		CHAIN LINK	8

CUSTOMER
TITLE: VERTICAL SUSPENSION - 230kV - 0-10 deg
TOWER SOLUTIONS
SCALE: to scale
DRAWING NO.: VS-220-1B-1
SHEET: 1/3
REV:



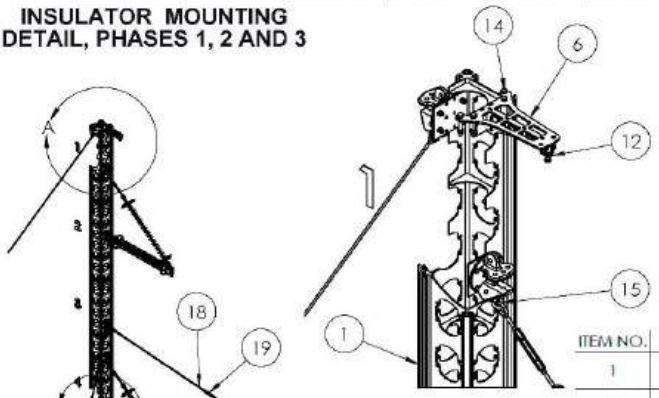
NOTE:

1. ALL DIMENSIONS ARE SYMMETRICAL UNLESS OTHERWISE SPECIFIED
2. LINE ANGLE MINIMUM 0 MAXIMUM 20 DEG
3. MAXIMUM WIND SPEED 198 km/hr
4. DESIGN VALID FOR SINGLE BUNDLE ACSR ZEBRA 0

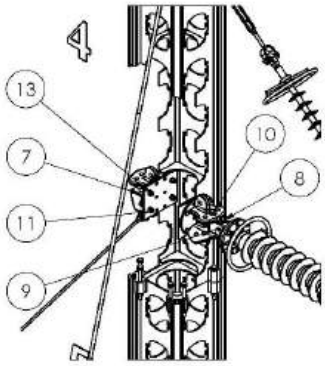
CUSTOMER:	TITLE: VERTICAL SUSPENSION - 230kV - 0-10 deg
SCALE: no scale	DRAWING NO.: VS-220-1B-1
SHEET: 2/8	

TOWER SOLUTIONS INC.

INSULATOR MOUNTING DETAIL, PHASES 1, 2 AND 3



DETAIL A
SCALE 1 : 25

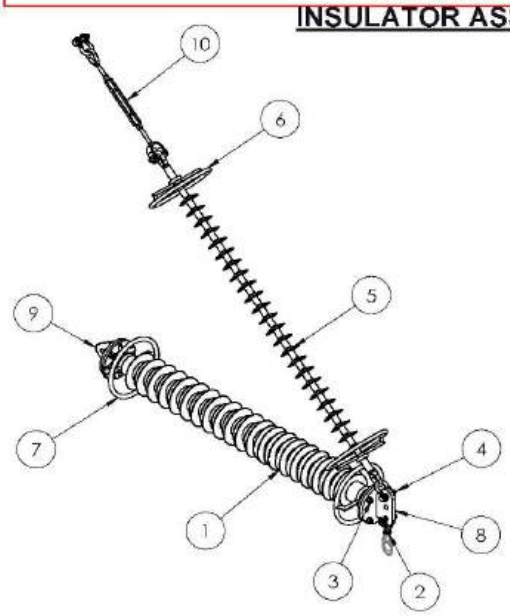


DETAIL B
SCALE 1 : 25

ITEM NO.	PART NO	DESCRIPTION	QTY.
1	AA3	TOWER SECTION (460x460x2580 mm)	16
2	EE11	STAKE ROD DIAM 1"(25.4 mm) X 60" (1524 mm)	4
3	AA1	BASE PLATE	1
4	AA2	BASE ARTICULATION	1
5		INSULATOR ASSEMBLY	3
6	AA10	SKYWIRE MOUNT	1
7	AA4.2	BACK PLATE	13
8	BB5.1	BASE PIVOT FOR LINE POST INSULATOR	3
9	BB5.6	HORIZONTAL PIVOT BOLT	3
10	BB5.2	VERTICAL PIVOT BOLT	3
11	AA3.1	BOLT ASSEMBLY for Tower Sections M20x240	128
12	BB29	SUSPENSION CLAMP SET FOR SKYWIRE	1
13	AA2.1	BOLT ASSEMBLY M16x65	64
14	AA3.2	M20x150 BOLT ASSEMBLY	4
15	BB22	ANCHOR SHACKLE 3/4"	8
16	AA4.1	UNIVERSAL ATTACHMENT FOR GUY WIRES / INSULATORS	13
17	CC2	ROPE THIMBLE, GUY WIRE AND 2X PREFORMED GUY GRIPS	8
18		STRAIN INSULATOR	6
19		CHAIN LINK	8

Specimen Only

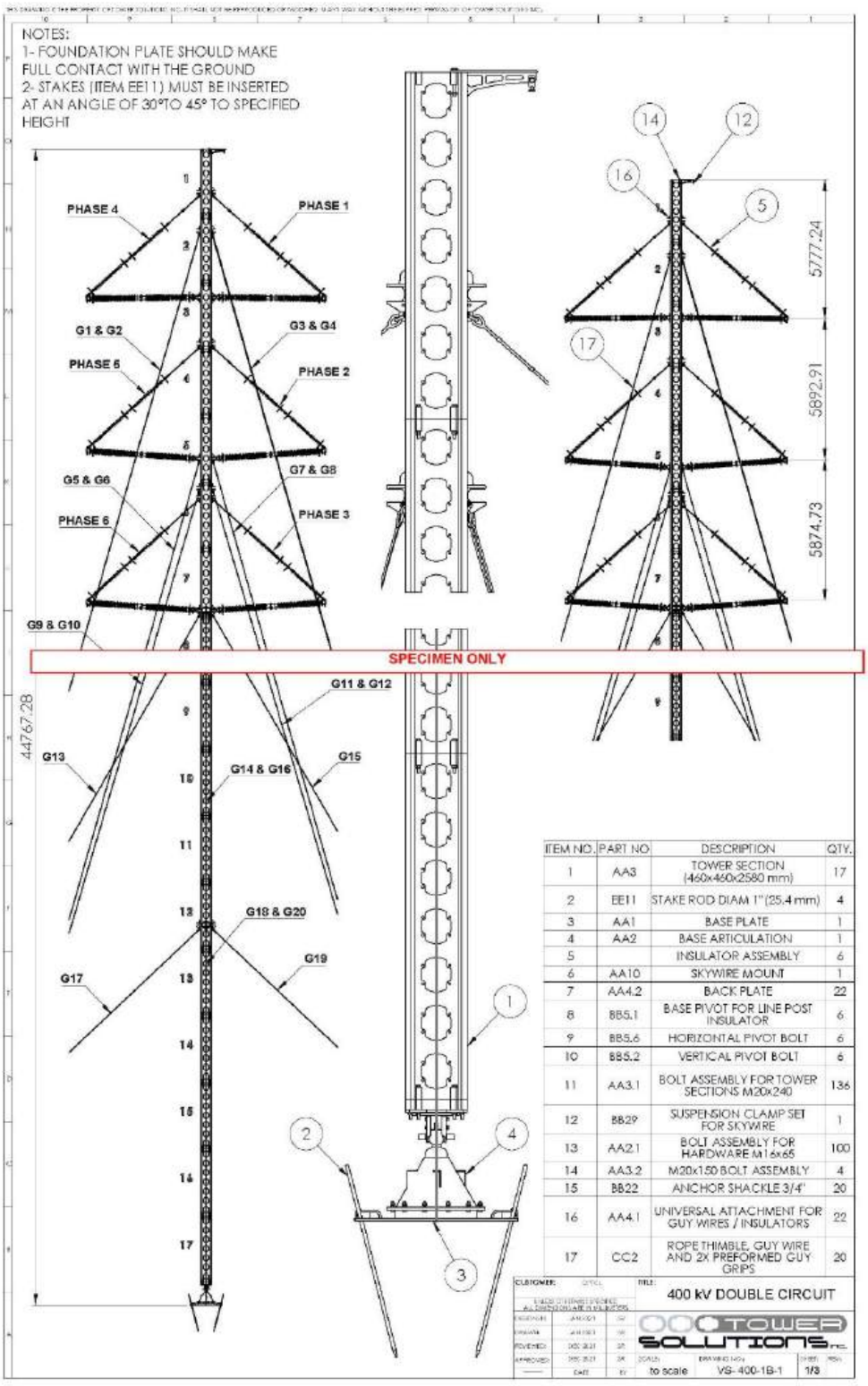
INSULATOR ASSEMBLY



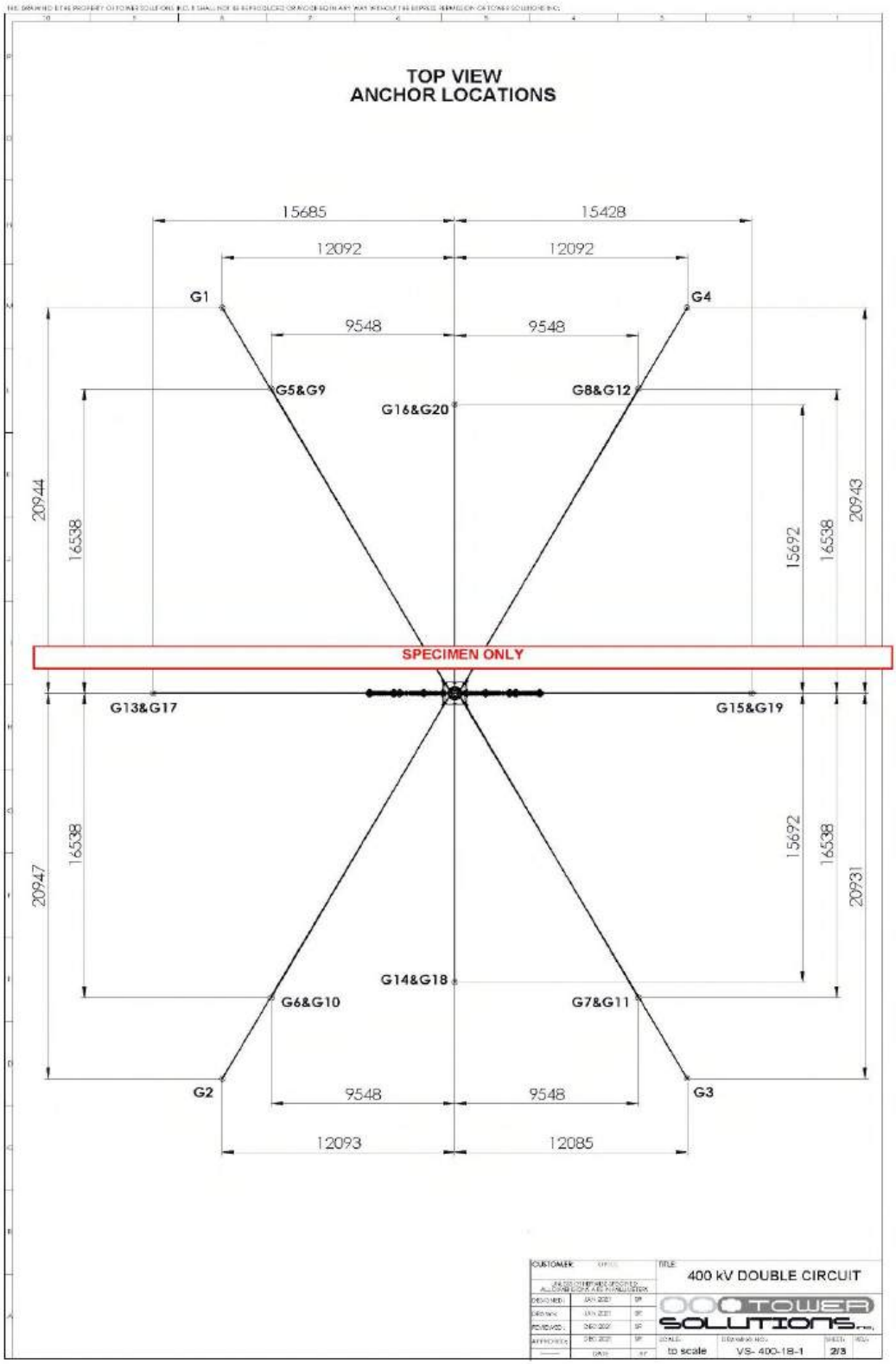
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	BB2	LINE POST INSULATOR	1
2	BB27	SUSPENSION CLAMP FOR ACSR	1
3	AA2.1	BOLT ASSEMBLY for Hardware M16x65	8
4	BB22	ANCHOR SHACKLE 3/4"	2
5	BB1	SUSPENSION INSULATOR	1
6	PART OF BB1	CORONA RING FOR SUSPENSION INSULATOR	2
7	PART OF BB2	CORONA RING FOR LINE POST INSULATOR	2
8	BB6	TIP MOUNT	1
9	BB5.3	BASE MOUNT	1
10	BB24.1JE	TURN BUCKLE EYE-EYE	1

CUSTOMER:	QTY.:	TITLE: INSULATOR DETAILS
DESIGNED	JULY 2021	TOWER SOLUTIONS INC.
DRAWN	JULY 2021	
REVIEWED	DEC 2021	
APPROVED	DEC 2021	SCALE: to scale / DRAWING NO.: VS-220-18-1 / SHEET: 3/3 / REV:
———	DATE	

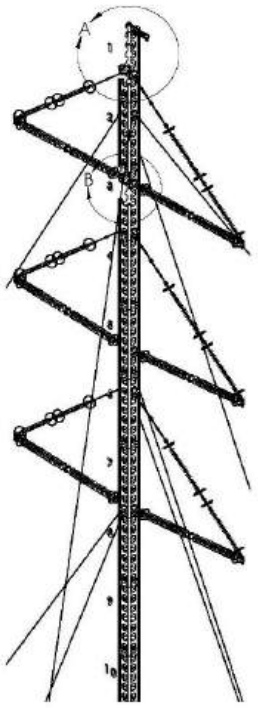
DOUBLE CIRCUIT VERTICAL SUSPENSION SPECIMEN DRAWINGS

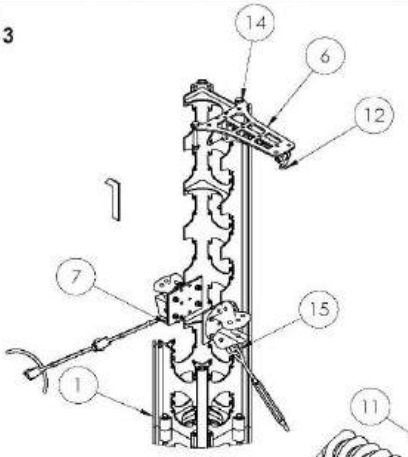


ITEM NO.	PART NO	DESCRIPTION	QTY.
1	AA3	TOWER SECTION (460x460x2580 mm)	17
2	EE11	STAKE ROD DIAM 1" (25.4 mm)	4
3	AA1	BASE PLATE	1
4	AA2	BASE ARTICULATION	1
5		INSULATOR ASSEMBLY	6
6	AA10	SKYWIRE MOUNT	1
7	AA4.2	BACK PLATE	22
8	BB5.1	BASE PIVOT FOR LINE POST INSULATOR	6
9	BB5.6	HORIZONTAL PIVOT BOLT	6
10	BB5.2	VERTICAL PIVOT BOLT	6
11	AA3.1	BOLT ASSEMBLY FOR TOWER SECTIONS M20x240	136
12	BB29	SUSPENSION CLAMP SET FOR SKYWIRE	1
13	AA2.1	BOLT ASSEMBLY FOR HARDWARE M16x65	100
14	AA3.2	M20x150 BOLT ASSEMBLY	4
15	BB22	ANCHOR SHACKLE 3/4"	20
16	AA4.1	UNIVERSAL ATTACHMENT FOR GUY WIRES / INSULATORS	22
17	CC2	ROPE THIMBLE, GUY WIRE AND 2X PREFORMED GUY GRIPS	20

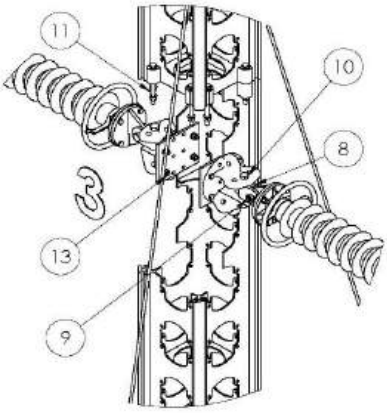

TOP VIEW
ANCHOR LOCATIONS
15685
15428
12092
12092
G1
G4
9548
9548
G5&G9
G8&G12
G16&G20
20944
16538
15692
16538
20943
SPECIMEN ONLY
G13&G17
G15&G19
20947
16538
15692
16538
20931
G14&G18
G6&G10
G7&G11
G2
G3
9548
9548
12093
12085
400 kV DOUBLE CIRCUIT
TOWER SOLUTIONS
to scale
VS- 400-18-1
2/3

INSULATOR MOUNTING DETAIL, PHASES 1, 2 AND 3





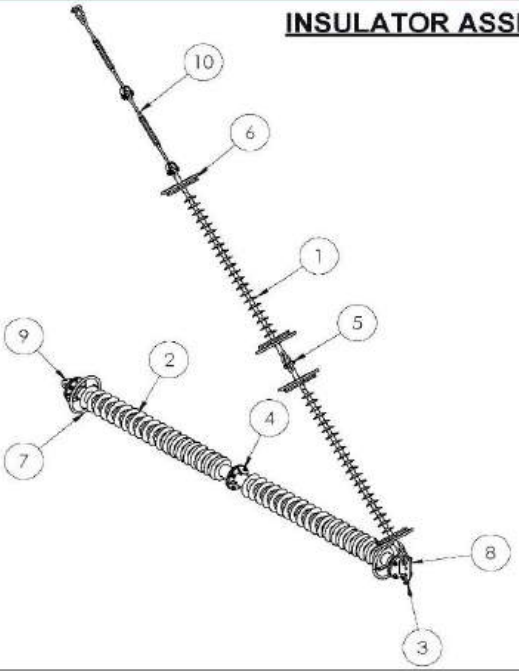
DETAIL A
SCALE 1 : 25



DETAIL B

SPECIMEN ONLY

INSULATOR ASSEMBLY



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	BB1	SUSPENSION INSULATOR	2
2	BB2	LINE POST INSULATOR	2
3	BB27	SUSPENSION CLAMP FOR ACSR	1
4	AA2.1	BOLT ASSEMBLY for Hardware M16x65	12
5	BB22	ANCHOR SHACKLE 3/4"	3
6	PART OF BB1	CORONA RING FOR SUSPENSION INSULATOR	4
7	PART OF BB2	CORONA RING FOR LINE POST INSULATOR	2
8	BB6	TIP MOUNT	1
9	BB5.3	BASE MOUNT	1
10	BB24.1	TURN BUCKLE EYE-EYE	2

CUSTOMER:		TITLE: INSULATOR DETAILS		
		TOWER SOLUTIONS INC.		
SCALE: to scale	DRAWING NO.: VS-400-1B-2	SHEETS: 3/3	REV.:	

Appendix D

Testing

IEC Testing

SGS	FACTORY ACCPTANCE TEST SERVICES OF ERS TOWER	Page : 20 of 112
		Ref SGSBD - IND
	POWER GRID COMPANY OF BANGLADESH	Revision :00
		Date : 22.11.2020

SGS Canada Inc.
1450, 407 – 2nd Street SW
Calgary, Alberta Canada, T2P 2Y3
Ph: +1 (403) 278 9730

INSPECTION REPORT

Inspection report N°: SUR-120138-01_01
Report submission date: Nov. 16, 2020

A. Project:	Bypass Equipment (ERS) Tower	**B.** Supplier:	Tower Solutions Inc.
Project Ref. No.:	PGCB/BASIC-DEDA/LOT-2/2019-2020/1011	Details:	
P.O. Ref No:		Job No:	
C. Inspection:	Transmission Modular Restoration Structure Components	**D.** Sub-Supplier:	
Customer Ref. No:		Details:	
Int. Ref. No (EA):	SUR-120138-01	Job No:	
E. Customer:	Desh Engineering & Development Agency	**F.** Place of Inspection:	Tower Solutions Inc.
Country:	Bangladesh	Contact Person:	Ciro Pasini
Customer Ref. No.:	IDHK/20/066	Address:	Brechin, ON Canada
G. Executing SGS office data:	SGS Canada Inc.	Phone/Fax:	647-782-7758
		Email-Address:	cpasini@towersolutions.ca
Country:	Canada	P.O. at supplier:	
Coordinator:	Tariq Ilyas		

H. Inspection type:		**Spot inspection** ☐		**Project inspection** ☐	
Pre-production	☐	During prodution	☐	Pre-Shipment	☒

I. Scope of Work:	*Requested*			*Performed*	*Comments*
	inspect	*witness*	*review*		
According to the approved ITP No.	☐	☒	☐	☐	
Pre-Shipment Inspection	☐	☐	☐	☐	
Hydrostatic Test	☐	☐	☐	☐	
Pre-Inspection Meeting	☐	☐	☐	☐	
Final Testing/Inspection	☒	☐	☐	☐	
Others:	☐	☐	☐	☐	
Others:	☐	☐	☐	☐	
Others: (as specified):	☐	☐	☐	☐	
Further description:					

J. Equipment/Goods requested for inspection:	Transmission Modular Restoration Structure Components	**Deviations during inspection:** No (if yes, see report details)
K. Applicable Norms, Standards and specifications:	IEEE 1070: 2006 Testing	**Verified during inspection:** ☒

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INSPECTION REPORT

Inspection report N°: SUR-120138-01_01

Report submission date: Nov. 16, 2020

L. Referenced Documents:	Reference No	Rev No.	Attached to request	At place of inspection	Document used
Purchase Order	27.21.0000.411 49.001.20.59/1	4	☐	☐	☒
Purchase Order Specifications	Transmission Modular Restoration Structure Components		☐	☐	☒
Purchasers Standards	IEEE 1070:2006	NA	☐	☒	☒
Data Sheet			☐	☐	☐
Approved Drawings			☐	☐	☐
Inspection Test Plan	Tower Solution		☐	☒	☒
Test Procedures	IEEE 1070:2006	NA	☐	☒	☒
Weld Procedures Specifications			☐	☐	☐
Weld Procedure Approval Certificates			☐	☐	☐
Welder Approval Certificates			☐	☐	☐
Operational/Functional Test Procedures	IEEE 1070:2006	NA	☐	☒	☒
NDE Procedures			☐	☐	☐
Post Heat Treatment Procedure			☐	☐	☐
Others			☐	☐	☐

M. Inspection Dates:	**November 12 & 13, 2020**
N. No. of inspection man days: (based on 8h)	**2 Mandays + 8 hrs (travel) + 450 kms**

		P. NCR/Punch list issued:
O. Inspection result:	☒ satisfactory ☐ **conditionally accepted** (see report details) ☐ **non conforming** (see report details) ☐ **rejected** (see report details) ☐ **aborted inspections** (see report details)	☒ No ☐ Yes (see report details)
Q. Inspection summary and short conclusion:	The above described system of towers was tested according to IEEE standard with satisfactory results	

Inspector:	Mike Kamyab	Date:	Nov. 13, 2020
Approved:	Tariq Ilyas	Date:	Nov-16-2020

SGS Canada Inc.
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Calgary, Alberta Canada, T2P 2Y3
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INSPECTION REPORT

Inspection report N°: SUR-120138-01_01
Report submission date: Nov. 16, 2020

R. REPORT DETAILS

R.1. Attendees

Joe Sarrgski	Director of TGC
Nafiz Chowdhury	Technical Director LIL Nasikko & Co
Mike Kamyab	Sr. Inspector, SGS Canada

R.2. Documents used
IEEE 1070:2006
Tower Solution ITP

R.3. Measuring equipment used
Test Bench According to IEEE 1070
Dial Gauge
Analog gauges
Calliper

R.4. Equipment / Goods inspected
Transmission Modular Restoration Structure Components

R.5. Inspection activities and results

Description	***Result***
R.5.1. Compression of columns 6.643 M column is tested to 290 KN (65,000 Lb.) with compression applied at the centre of axis	**Satisfactory**
R.5.2. Bending of columns 6.643 M column is bolted on one end to a suitable test structure and a Cantilever load of 11.34KN (2,550Lb.) should be applied at the centre Axes if the opposite end without failure.	**Satisfactory**
R.5.3. Torsion of columns 6.643 M column is bolted on one end to a suitable test structure. A cantilever load of 8KN (1800Lb) should be applied at 0.457 mm from the center axes of the opposite end without failure	**Satisfactory**
R.5.4. Combined bending and compression test 6.643 M column is loaded to 445KN (100,000lb) compression and 2 22.2KN (5000Lb) cantilever loads simultaneously.	**Satisfactory**
R.5.5. Ultimate strength bending-bolts Using production bolts and nuts a 6.643 M column bolted on one end to a suitable test structure. cantilever loads applied at a rate of not exceeding 8.9 KN/minute.	**Satisfactory**
R.5.6. Ultimate strength bending welds 6.643 M column bolted on one end to a suitable test structure. A cantilever load should be applied at a rate of 8.9 KN/min.	**Satisfactory**
R.5.7. Insulator attachments test The insulator attachment should be pull tested at the transverse holes Locations to 267 KN (60,000 lb.)	**Satisfactory**
R.5.8. Guy attachments Test Guy attachment test should be pull tested to 180 KN.	**Satisfactory**

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Report submission date: Nov. 16, 2020

R.5.9. Bolt and nut ultimate strength test Three samples from the production run of 20 mm tower connections bolts should be pull tested	**Satisfactory**
R.5.10. Columns buckling Test 7 column sections should be bolted together with production bolts and Nuts in horizontal position with 156 KN axial load	**Satisfactory**
R.5.11. Articulation of Gimbal The gimbal rotation about 3 axes should be tested	**Satisfactory**
R.5.12. Compression of Gimbal The first production of gimbal should be tested in compression of 578 KN with the load applied to the axes of the gimbal	**Satisfactory**
.5.13. Gimbal Transverse Test The first production of gimbal should be tested in compression of 44.5 KN	**Satisfactory**
R.5.14. Strength Proof Test (Production Test) Each column section is subject to proof test of 290 KN compressive load on the center of axis of the structure	**Satisfactory**
R.5.15. End Plate dimensional test (Production Test) Each column section, universal attachment and gimbal is checked to verify tolerance for pin and hole alignment ensuring interchangeability of tower section	**Satisfactory**
R.5.16. End Plate dimensional test- Articulation Each gimbal is checked to verify tolerances for pin and hole alignment ensuring interchangeability of tower section	**Satisfactory**
R.5.17.End Plate dimensional test- tower section Each column section, universal attachment and gimbal is checked to verify tolerance for pin and hole alignment ensuring interchangeability of tower section	**Satisfactory**
R.5.18. End Plate dimensional test- Universal Attachment Each universal attachment is checked to verify tolerances for pin and hole alignment ensuring interchangeability	**Satisfactory**
R.5.19. Parallel End Plate Dimension Test Column sections are measured with squaring gauge to verify Perpendicularity of column	**Satisfactory**

R.6. Non Conformities
None

R.7. Actions required
The system including 6 towers in 5 containers will be shipped to the client

R.8. Conclusion
The above described system of tower Powers was tested according to IEEE standard with satisfactory results

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INSPECTION REPORT

Inspection report N°: SUR-120138-01_01
Report submission date: Nov. 16, 2020

R.9. Attachments

Test results and ITP
Calibration certs
Pictures

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INSPECTION REPORT

Inspection report N°: SUR-120138-01_01
Report submission date: Nov. 16, 2020

S. Inspection Photos

The column ready for inspection

Making adjustment

Applying the pressure

The gauge showing the pressure

Checking the pressure

Holding for three minutes

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INSPECTION REPORT

Inspection report N°: SUR-120138-01_01
Report submission date: Nov. 16, 2020

Recording the results	Increasing the pressure
Checking the movement of the column	Torsion of the column
Stepping up the pressure	Checking the degree of the movement

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INSPECTION REPORT

Inspection report N°: SUR-120138-01_01
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The column has bended

Visual inspection

Visual inspection

Checking the degree of the movement

Combined bending and compression test

Combined bending and compression test

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INSPECTION REPORT

Inspection report N°: SUR-120138-01_01
Report submission date: Nov. 16, 2020

Stepping up the pressure

Recording the results

Stepping up the pressure

The column under pressure

Insulator attachments pull test vertical

Insulator attachments pull test horizontal

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INSPECTION REPORT

Inspection report N°: SUR-120138-01_01
Report submission date: Nov. 16, 2020


Insulator pull test under way


Insulator pull test under way


Checking the holes after pulling test


Articulation of gimbal


Checking the articulation of gimbal 45°


Checking the articulation of gimbal 90°

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INSPECTION REPORT

Inspection report N°: SUR-120138-01_01
Report submission date: Nov. 16, 2020

 Compression of gimbal	 Visual inspection after compression
 Compression of gimbal	 Compression of gimbal
 Visual inspection after compression	 Bolt and nut Ultimate Strength Test

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INSPECTION REPORT

Inspection report N°: SUR-120138-01_01
Report submission date: Nov. 16, 2020

Bolt and nut Ultimate Strength Test

Bolt and nut Ultimate Strength Test

Strength Proof Test (Production Test)

Applying he force

Making the measurment

Recoding the measurment

IEEE Testing

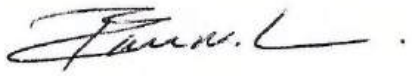
REPORT FROM IEEE 1070:2006 TESTING
ON
MODULAR RESTORATION STRUCTURE COMPONENTS WHICH ARE DESIGNED AND MANUFACTURED
BY
TOWER SOLUTIONS INC., CANADA

DATE: 28 February 2017
CLIENT: Terna, Italy
PLACE OF TESTING: Granby, QC
CONDUCTED BY: Ciro Pasini

Testing conducted per IEEE STD. 1070™-2006
(IEEE Guide for the Design and testing of Transmission Modular Restoration Structure Components)

CONCLUSION:
ALL IEEE 1070™ TESTS WERE CONCLUDED SUCCESSFULLY.

Contents



OVERVIEW

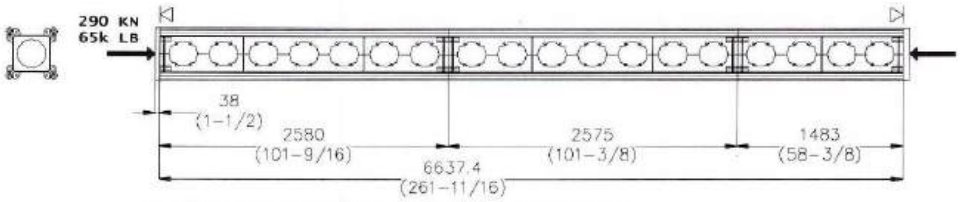
All structural materials used in fabrication of all parts of the ERS tower are of AL 6061-T6 alloy with filler alloy used meeting the IEEE 1070:2006 requirement. Bolts, nuts and washers also meet the specifications.

While agreeing that the IEEE 1070 is a guide created for the industry in its infancy, and was prepared for an older and primitive model of ERS, we appreciate the advances that Tower Solutions has made at their manufacturing and engineering divisions and certify them to standards that we find to exceed other certified ERS manufacturers in the market.

For matter of convenience the hydraulic cylinders used in the testing are marked. The technical details of these cylinders are provided in the relevant appendix, within this report.

4.1.1 COMPRESSION OF COLUMNS

A 6.6374 m (21 feet, 9 $^{11}/_{16}$ inches) column is tested to 290 kN (65,000 lb), with compression applied at the center axis (Figure 1). Maximum permanent deformation must be less than 0.508 mm (0.020 in).



▽ DEFLECTION CHECK POINT

Testing Stages	Force applied			Duration (minutes)	Measurement (mm)	Deformation (mm)
	kN	kLB	PSI			
0%	0	0	0	N/A	151.64	N/A
50%	145	32.5	2229	5	152.40	0.76
75%	217.5	48.75	3344	5	152.83	1.19
90%	261	58.5	4012	5	153.07	1.43
100%	290	65	4458	5	153.27	1.63
0%	0	0	0	5	151.65	0.01

Conclusion:
Minimal Permanent Deformation is within accepted value of <0.508 mm (0.020 in). This meets IEEE 1070:2006 requirements.

Test witnessed by:

1._____ (TOWER SOLUTIONS Inc.)

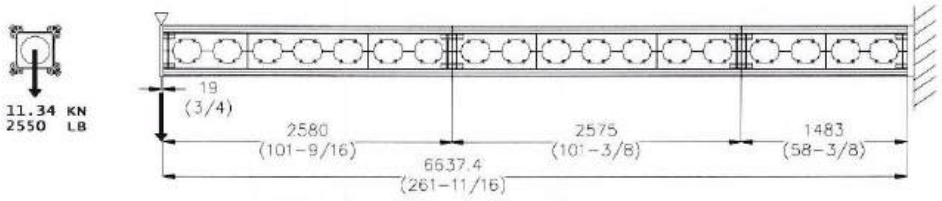
2. _____ (TOWER SOLUTIONS Inc.)

Test performed by:

1._____ (Quality / Technician)

4.1.2. BENDING OF COLUMNS

A 6.6374 m (21 feet, 9 $^{11}/_{16}$ inches) column is bolted on one end to a suitable test structure, using production bolts and nuts. A cantilever load of 11.34kN (2,550 lb) should be applied at the center axes of the opposite end without failure (Figure 2). Maximum permanent deformation should be less than 2.032 mm (0.080 in).



Testing Stages	Force applied (*) (% of 10.67 kN)			Duration (minutes)	Measurement (mm)	Deformation (mm)
	kN	LB	PSI			
0%	0	0	0	N/A	271.84	N/A
50%	5.335	1200	536	5	248.27	23.57
75%	8.0	1800	804	5	238.42	33.42
90%	9.6	2160	964	5	232.88	38.96
100%	10.67	2400	1071	5	227.59	44.25
0%	0	0	0	5	271.31	0.53

Conclusion:
Minimal Permanent Deformation is within accepted value of <2.032 mm (0.080 in). This meets IEEE 1070:2006 requirements.

Test witnessed by:

1._ (TOWER SOLUTIONS Inc.)

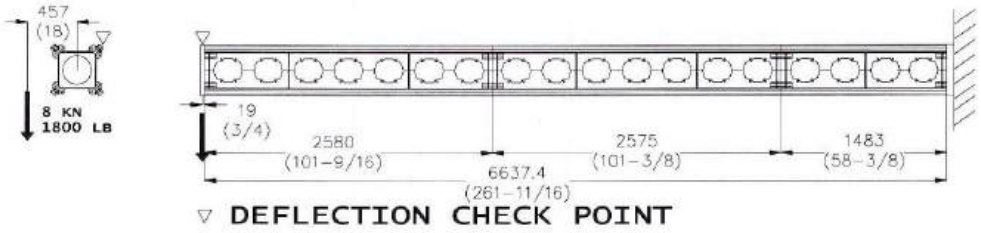
2. (TOWER SOLUTIONS Inc.)

Test performed by;

1._
(Quality / Technician)

4.1.3. TORSION OF COLUMNS

A 6.6374 m (21 feet, 9 $^{11}/_{16}$ inches) column is bolted on one end to a suitable test structure. A cantilever load of 8 kN (1800 lb) should be applied at 0.457 mm (18") from the center axes of the opposite end without failure (shown below). Maximum permanent rotational deformation should be less than 0.5 degrees (2.65 mm).



Testing Stages	Force applied			Duration (minutes)	Measurement (opposite corners) (mm)	Deformation (mm)
	kN	LB	PSI			
0%	0	0	0	N/A	270.11	N/A
50%	4	900	402	5	N/A	N/A
75%	6	1350	603	5	N/A	N/A
90%	7.2	1620	723	5	N/A	N/A
100%	8	1800	804	5	N/A	N/A
0%	0	0	0	5	270.14	0.03

Conclusion:
Maximum permanent rotational deformation is within accepted value of < 0.5 degrees (2.65 mm). This meets IEEE 1070:2006 requirements.

Test witnessed by:

1._____ (TOWER SOLUTIONS Inc.)

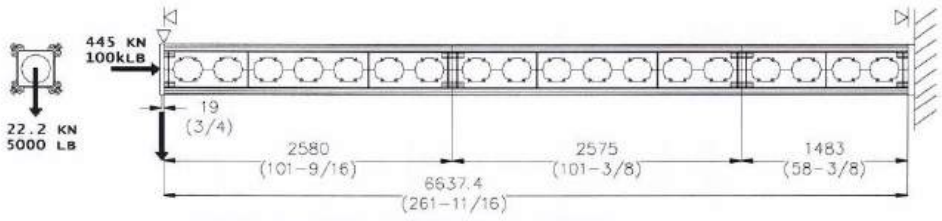
2. Amarnath D _____ (TOWER SOLUTIONS Inc.)

Test performed by:

1._____ .
(Quality / Technician)

4.1.4. COMBINED BENDING AND COMPRESSION TEST

A 6.6374 m (21 feet, 9 $^{11}/_{16}$ inches) column is loaded to 445 kN (100,000 lb) compression and 22.2 kN (5,000 lb) cantilever loads simultaneously. The loads, elastic or permanent deflections, should be measured and recorded (Figure 4). Maximum permanent deformation should be less than 0.508 mm (0.020in) in compression and 2.54mm (0.100 in) in bending.



▽ DEFLECTION CHECK POINT

Testing Stages	Force applied						Duration (min)	Compression		Bending	
	Compression			Bending (*)				Measure	Deformation	Measure	Deformation
	kN	kLB	PSI	kN	kLB	PSI		mm	mm	mm	mm
0%	0	0	0	0	0	0	N/A	151.74	N/A	262.07	N/A
50%	222.5	50	3430	11.1	2.5	1160	5	N/A	N/A	N/A	N/A
75%	333.75	75	5144	16.65	3.75	1675	5	N/A	N/A	N/A	N/A
90%	400.5	90	6173	19.98	4.5	2010	5	N/A	N/A	N/A	N/A
100%	445	100	6859	22.2	5.0	2230	5	N/A	N/A	N/A	N/A
0%	0	0	0	0	0	0	5	151.74	0	264.35	2.28

Conclusion:
Maximum permanent deformation in compression is within accepted value of <0.508 mm (0.020in) in compression, and within accepted value of 2.54mm (0.100 in) in bending. This meets IEEE 1070:2006 requirements.

Test witnessed by:

1._ (TOWER SOLUTIONS Inc.)

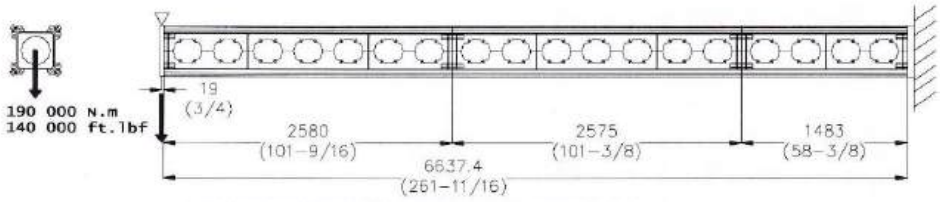
2. (TOWER SOLUTIONS Inc.)

Test performed by:

1._
(Quality / Technician)

4.1.5. ULTIMATE STRENGTH BENDING-BOLTS

Using production bolts and nuts, a 6.6374 m (21 feet, 9 $^{11}/_{16}$ inches) column is bolted on one end to a suitable test structure (same as in 4.1.2, except with the loads specified below). Cantilever Load is applied at a rate not exceeding 8.9 kN/minute (2000 lbf/min). The combined assembly must have ultimate strength greater than equivalent moment of 190,000 Nm (140,000 ft.lbf). First component to fail should be nut and bolt assemblies.



▽ DEFLECTION CHECK POINT

Testing Stages	Force applied (*)			Hold (min.)	Failure (Yes/no)
	kN	lb	PSI		
0%	0	0	0	N/A	No
50%	14.5	3260	1433	5	No
75%	21.75	4890	2150	5	No
90%	26.1	5868	2578	5	No
100%	29	6419	2866	5	No
0%	0	0	0	5	No

Conclusion:
None of the components fail, due to extra high strength bolts being used by Tower Solutions. This meets and exceeds IEEE 1070:2006 standards.

Test witnessed by:

1._ (TOWER SOLUTIONS Inc.)

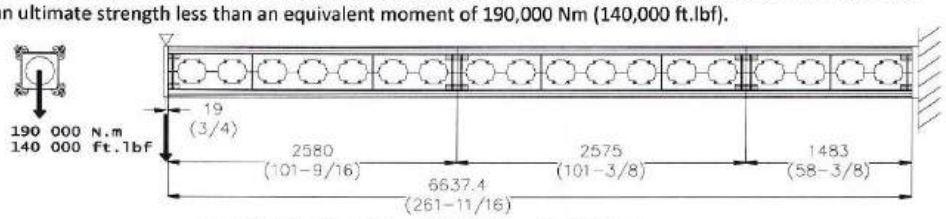
2. (TOWER SOLUTIONS Inc.)

Test performed by:

1._ (Quality / Technician)

4.1.6. ULTIMATE STRENGTH BENDING-WELDS

A 6.6374 m (21 feet, 9 $^{11}/_{16}$ inches) column is bolted on one end to a suitable test structure (same as in 4.1.2, except with the loads specified below). A cantilever load should be applied at a rate of 8.9 kN/min (2000 lbf/min). Four tests should be performed by rotating the column. In no case the column should have an ultimate strength less than an equivalent moment of 190,000 Nm (140,000 ft.lbf).



▽ DEFLECTION CHECK POINT

Testing stages	Force applied (*)			Hold (min.)	Measure (mm)	Deformation (mm)
	kN	lb	PSI			
0%	0	0	0	N/A	268.89	N/A
50%	14.5	3260	1433	5	202.42	66.47
75%	21.75	4890	2150	5	165.29	103.60
90%	26.1	5868	2578	5	127.46	141.43
100%	29	6419	2866	5	125.04	143.85
0%	0	0	0	5	267.65	1.24

Conclusion:
The ultimate strength of the column is never less than the equivalent moment of 190,000 Nm. This meets IEEE 1070:2006 requirements.

Test witnessed by:

1._ (TOWER SOLUTIONS Inc.)

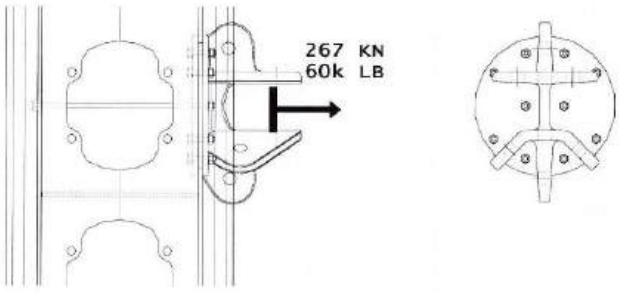
2. (TOWER SOLUTIONS Inc.)

Test performed by:

1._ (Quality / Technician)

4.1.7. INSULATOR ATTACHMENT TEST

The insulator attachment should be pull tested at the transverse holes locations to 267 kN (60,000 lb). For this test the insulator attachment was installed onto the section fixed on the bench. The load should be held for 5 minutes then released. There should not be any kind of failure nor excessive permanent deformation.



Testing Stages	Force applied			Hold (min.)	Measure (mm)	Deformation (mm)
	kN	klb	PSI			
0%	0	0	0	N/A	N/A	N/A
100%	267	60	4875	5	N/A	N/A
0%	0	0	0	5	N/A	No

Conclusion:
No failure or excessive permanent deformation.. This meets IEEE 1070:2006 requirements.

Test witnessed by:

1._ (TOWER SOLUTIONS Inc.)

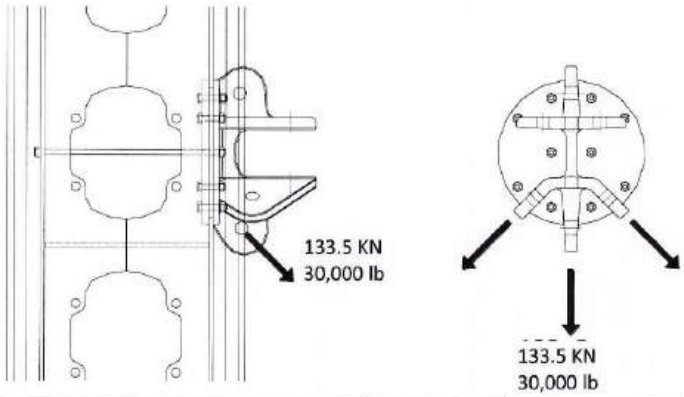
2. Amanath D (TOWER SOLUTIONS Inc.)

Test performed by:

1._ (Quality / Technician)

4.1.8. GUY ATTACHMENT TEST

The Guy Attachment should be pull tested to 133.5 kN (30,000 lb). For this test the universal attachment is installed onto the section fixed on the bench. The load should be held for 5 minutes then released. There should not be any kind of failure nor excessive permanent deformation.



Testing Stages	Force applied			Hold (min.)	Measure (mm)	Perm. Def. (mm)
	kN	kLB	PSI			
0%	0	0	0	0	N/A	N/A
100%	133.5	30	2437	5	N/A	N/A
0%	0	0	0	5	N/A	No

Conclusion:
No failure or excessive permanent deformation.. This meets IEEE 1070:2006 requirements.

Test witnessed by:

1._ (TOWER SOLUTIONS Inc.)

2. (TOWER SOLUTIONS Inc.)

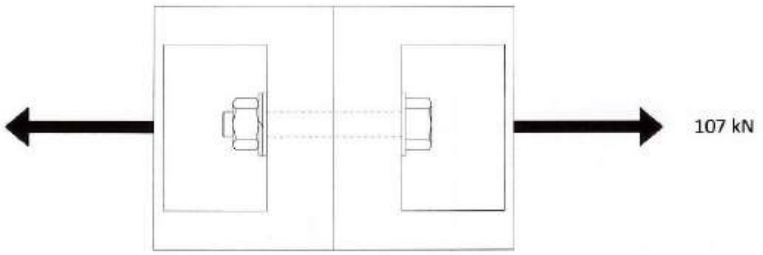
Test performed by:

1._
(Quality / Technician)

4.1.9. BOLT AND NUT ULTIMATE STRENGTH TEST

Three samples from the production run of 20 mm tower connections bolts(*) should be pull tested. The average ultimate strength of three assemblies should be greater than 107 kN (24,000 lb).

Although the IEEE indicates 8x15.9 mm (5/8") splicing bolts, TS uses 8 x 19.04 mm (3/4") splicing bolts with a designed UTS = 178 kN (40,100 lb). This, in principle, makes this test unnecessary.



Sample #	UTS (Breaking point)			Failure at or below 107 kN (Yes/No)
	kN	kLB	PSI	
1	107	24	1950	No
2	107	24	1950	No
3	107	24	1950	No
4	107	24	1950	No
The cylinder used has an effective area of 12.31 in^2				

Conclusion:
No failure at or below 107kN. Actual failure is only at 3300 psi, which exceeds the requirements. This meets and exceeds IEEE 1070:2006 standards.

Test witnessed by:

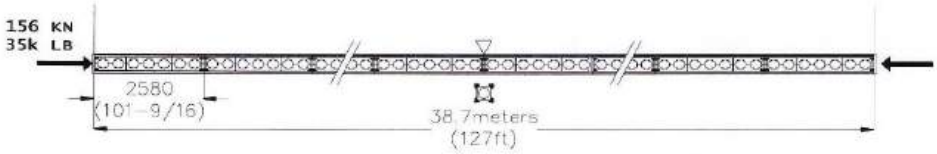
1._ (TOWER SOLUTIONS Inc.) 2. (TOWER SOLUTIONS Inc.)

Test performed by:

1._ (Quality / Technician)

4.1.10. COLUMNS BUCKLING TEST

A quantity of 15 column sections should be bolted together with production bolts and nuts. The column should be tested horizontally and a simultaneous 156 kN (35000 lb) axial load should be applied to the column (shown below). The load should be held for 5 minutes, and then released.
Maximum permanent deformation should be less than 3.2 mm (0.125 in).



Testing Stages	Force applied			Hold (min.)	Measure (mm)	Deformation (mm)
	kN	kLB	PSI			
0%	0	0	0	N/A	280.07	N/A
100%	156	35	2844	5	186.33	93.74
0%	0	0	0	5	281.94	1.87

Conclusion:
Maximum permanent deformation is within accepted value of <3.2 mm (0.125 in). This meets IEEE 1070:2006 Standards.

Test witnessed by:

1._____ (TOWER SOLUTIONS Inc.)

2._____ (TOWER SOLUTIONS Inc.)

Test performed by:

1._____ (Quality / Technician)

4.2.1. ARTICULATION OF GIMBAL

The first production units of gimbal section should be tested to meet requirements of Note 2 of Figure 3 of IEEE 1070:2006 standards document.

This clause is provided below:
Holes on gimbal section flanges must be interchangeable with holes on towers, foundation base, and universal attachment.

Conclusion:
The bolting holes are interchangeable in all ERS components of the main ERS structure including tower section, gimbal flanges, and universal attachment. This meets IEEE 1070:2006 Standards.

Test witnessed by:

1._ (TOWERSOLUTIONS Inc.)

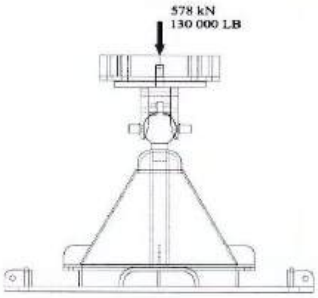
2. (TOWER SOLUTIONS Inc.)

Test performed by:

1._ (Quality / Technician)

4.2.2. COMPRESSION OF GIMBAL

The first production unit of a gimbal should be tested in compression to 578 kN (130,000 lb) with the load applied to the axes of the gimbal, as shown below. No sign of excessive permanent deformation of the gimbal should be noted at this load.



Testing Stages	Force applied			Hold (min.)	Measure (mm)	Permanent Deformation (mm)
	kN	kLB	PSI			
0%	0	0	0	N/A	N/A	N/A
100%	578	130	8916	5	N/A	N/A
0%	0	0	0	5	N/A	No

Conclusion:
No sign of excessive permanent deformation of the gimbal. This meets IEEE 1070:2006 Standards.

Test witnessed by:

1._ (TOWER SOLUTIONS Inc.)

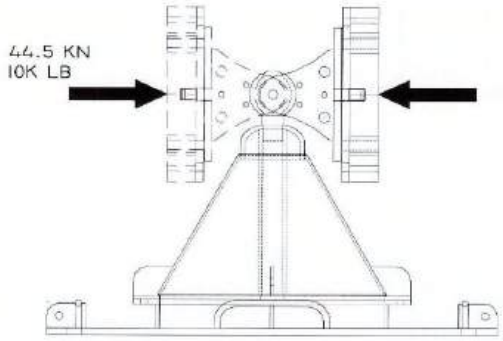
2. (TOWER SOLUTIONS Inc.)

Test performed by:

1._ (Quality / Technician)

4.2.3. GIMBAL TRANSVERSE TEST

The first production unit of a gimbal should be tested in compression to 44.5 kN (10,000 lb) as shown below. No sign of excessive permanent deformation of the gimbal should be noted at this load.



Testing Stages	Force applied			Hold (min.)	Measure (mm)	Perm. Def. (mm)
	kN	LB	PSI			
0%	0	0	0	N/A	N/A	N/A
100%	44.5	10000	690	5	N/A	N/A
0%	0	0	0	5	N/A	No

Conclusion:
No sign of excessive permanent deformation of the gimbal. This meets IEEE 1070:2006 Standards.

Test witnessed by:

1._____ (TOWER SOLUTIONS Inc.)

2._____ (TOWER SOLUTIONS Inc.)

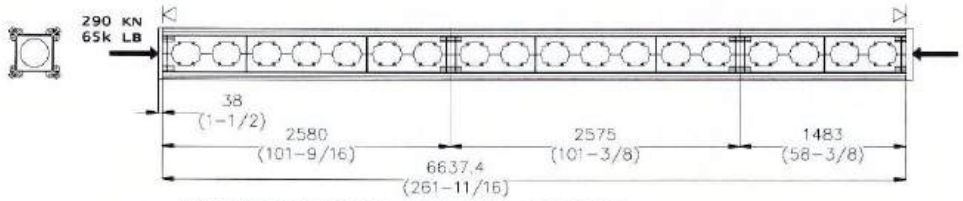
Test performed by:

1._____ (Quality / Technician)

5.1 STRENGTH PROOF TEST

Each column section is subject to proof test of 290 kN (65,000 lb)compressive load on the center axis of the structure, held for 5 minutes. No failure should occur.

This test is same as 4.1.1 performed on all sections.



▽ DEFLECTION CHECK POINT

Testing Stages	Force applied			Duration (minutes)	Samples tested and failure
	kN	kLB	PSI		
0%	0	0	0	N/A	N/A
100%	290	65	4458	5	Yes, No Failure
0%	0	0	0	5	Yes, No Failure

Conclusion:
No failure of sections at 290 kN. This meets IEEE 1070:2006 requirements.

Test witnessed by:

1._____ (TOWER SOLUTIONS Inc.)

2._____ (TOWER SOLUTIONS Inc.)

Test performed by:

1._____ .
(Quality / Technician)

5.2.1 END PLATE DIMENSIONAL TEST

Each column section, universal attachment and gimbal is checked to verify tolerances for pin and hole alignment, ensuring interchangeability of tower sections.

Conclusion:
No failure of sections at 290 kN. This meets IEEE 1070:2006 requirements.

Test witnessed by:

1._ _____ (TOWER SOLUTIONS Inc.)

2. _____ (TOWER SOLUTIONS Inc.)

Test performed by:

1._ _____ (Quality / Technician)

5.2.2 PARALLEL END PLATE DIMENSIONAL TEST

Column sections are measured with squaring gauge to verify perpendicularity of end face to length of column. Check should be repeated on all four sides and at both ends of column. Maximum deviation must be 3.17mm over a 610mm distance.

Conclusion:
Squareness verified and TS section squareness found to exceed IEEE requirements by a factor of 10.

Test witnessed by:

1._ _____ (TOWER SOLUTIONS Inc.)

2. _____ (TOWER SOLUTIONS Inc.)

Test performed by:

1._ _____ (Quality / Technician)

ISO Certificate

intertek
Total Quality. Assured.

CERTIFICATE OF REGISTRATION

This is to certify that the management system of:

Tower Solutions Inc.

Main Site: 1452 Concessions Road 3,
Brechin, Ontario, L0K 1B0, Canada

See appendix for additional sites and additional site scopes

has been registered by Intertek as conforming to the requirements of:

ISO 9001:2015

The management system is applicable to:

Overall scope: The sales, manufacturing, design, engineering and supply of emergency towers for the high voltage transmission industry, training of electrical utility companies in using temporary tower and consulting to electrical utility companies in emergency procedures for restoring high voltage transmission lines.

Certificate Number:
CERT-0118517

Initial Certification Date:
25 April 2013

Date of Certification Decision:
15 March 2024

Issuing Date:
15 March 2024

Valid Until:
04 May 2027

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President, Business Assurance

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