



GZTACSR : Conductor Installation Guidelines

WORK INSTRUCTION: AILS/IM/GZTACSR/03

Rev. 02 Rev. Date : 03.04.2026

1. PURPOSE

- 1.1. The purpose of this document is to provide experienced transmission engineers, field inspectors, utility personnel and linemen with guidelines, recommendations and requirements necessary to safely install the bare overhead conductor. This document is intended to provide an overview of the differences in installation techniques between GZTACSR (GAP Type) conductor and conventional steel-core conductor, but is not intended to serve as a more intensive training manual or act as a substitute for required personnel skill sets or industry experience.

2. SCOPE

- 2.1. These guidelines apply to equipment and techniques required to install GZTACSR (GAP type) conductor.

3. DEFINITIONS

- 3.1. GZTACSR is defined as Thermal-resistant Aluminum-alloy Conductor, Steel Reinforced.

4. RESPONSIBILITY

- 4.1 It is the responsibility of the Installation Contractor and Field Inspectors to ensure a safe installation by following the instructions provided in this guideline, as well as customary safe installation practices.

5. TOOLS, GAUGES, FIXTURES

- 5.1. All equipment shall be maintained in accordance with applicable safety standards.

6. SAFETY REQUIREMENTS

- 6.1. All safety requirements associated with the operation of approved equipment shall be followed.
- 6.2. The conductor can be broken or damaged if bent or handled in a careless manner that exceeds this document recommended bend radiuses.
- 6.3. Electrical grounds shall be placed on all equipment and conductor per OSHA Regulation 1910.269 and 1926.950 in the U.S. and similar requirements in other countries; must include Equi-potential. First and last traveler shall be grounded along with the running ground at the tensioner. The grounds shall be placed approximately 20 feet (6 meters) out from the insulators during the dead-ending process and likewise the grounds shall be placed 20 feet (6 meters) on each side of the splice during the splicing process. The placement of the grounds at 20 feet (6 meters) helps to eliminate the bird caging process that could occur in Aluminium alloy wire of conductors.



Figure: 1

6.4. CONDUCTOR GROUNDS MUST BE PLACED DIRECTLY ON THE ALUMINUM STRANDS.

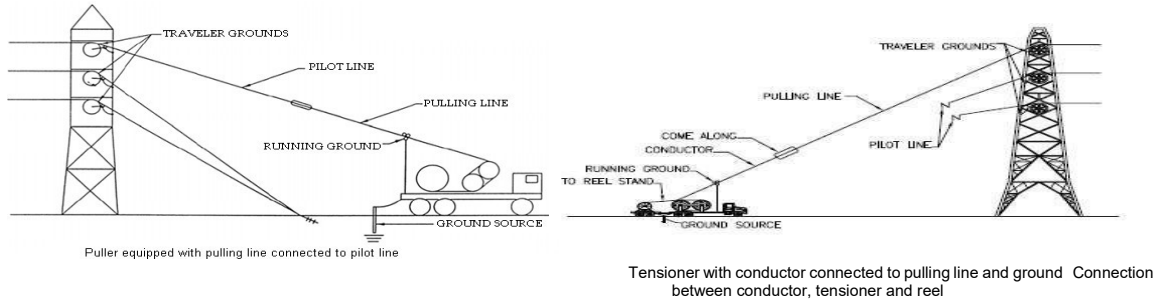


Figure : 2

6.5. We at APAR are always committed to the health and safety of the people who produce and work with our conductor in the field. Our MSDS makes accurate recommendations on how personnel should protect themselves from the dust that is created by cutting conductor. While the amount of dust that is created is very small, appropriate protections such as a dust mask are recommended to filter out dust particles and the use of appropriate skin protection (gloves) should be considered by the people working with the conductor when installing the TACSR conductor to minimize the irritation that could be caused by the dust resulting from cutting or sanding.

7. SHIPPING AND REEL HANDLING REQUIREMENTS

- 7.1. Aluminum conductors are shipped in sturdy, carefully designed containers or reels that safeguard the conductor from damage in transit, storage, and at the point of installation. The conductor is carefully inspected during all stages of fabrication; packaging is inspected prior to shipment, and only properly packaged material is delivered to the carrier. The reel shall have a spindle hole diameter as per the project specific approved drum drawing.
- 7.2. Reels are constructed so that they must be supported either on an axle through the arbor hold or by the reel flange. Returnable metal reels may be supported by a singletree arrangement that clamps to the flange and is lifted from above. When an axle supported from above lifts the reels, a spreader bar must be employed to prevent damage to the conductor or reel, or both, by inward pressure on the reel flange. Proper equipment must be available to lift the reels.
 - 7.2.1. Reel stands are designed to be used with tensioners to supply the necessary back tension to the conductor. The stand(s) are selected to accommodate the conductor (or ground wire) reel dimensions and weight.
 - 7.2.2. Some reels are not designed to withstand the forces developed by breaking during tension stringing operations. Direct tension stringing from the reel at transmission line stringing tensions should not be attempted. The conductor may be pulled directly from the reel stand when employing slack stringing methods.
 - 7.2.3. If the reel stand is not self-loading, a crane, forklift or other suitable equipment is used to load the reel into the stand.
- 7.3. Reels should be properly controlled during the loading, unloading and staging processes.

- 7.4. Cranes or other equipment of adequate capacity should be used to avoid damage and to avoid safety hazards.
- 7.5. It is important that reels of GZTACSR conductor are not lifted by placing the forks of the forklift directly under the drum area of the reel which would allow the forks to come in direct contact with the conductor or its wrapping material. Slings, winch lines, nylon straps or other types of lifting devices shall never be placed around the conductor to lift the reel. The conductor could be damaged if such devices are used.
- 7.6. Lift reel by approaching from the side and placing forks under flanges.



Figure : 3

- 7.7. A spreader bar with slings or chains attached directly to the reel is the preferred method of unloading.
- 7.8. At no time should the reel be laid on its side either during unloading or storage.



Figure : 4

- 7.9. If the conductor is to be rewound on the existing reel or onto another reel, extreme caution shall be exercised. The conductor must have backpressure applied at all times. Personnel must ensure that the conductor doesn't cross over itself during the rewinding process.

NOTE: PREVENTING CONDUCTOR CROSS-OVER ON THE REELS AND KEEPING BACK PRESSURE WHILE REWINDING HELPS TO ENSURE THAT THE CONDUCTOR REMAIN INTACT.

8. STORAGE

- 8.1. If the conductor is to be stored for an extended period of time before use, the reel containing the conductor should be kept off of the ground and otherwise protected from possible damage. It is recommended that steel reels be used for storage of backup conductor.
- 8.2. Identification tags and other markings should be retained on all packages until such time as the conductor is to be used. Identification tags should be protected from weather to retain information
- 8.3. The reels are delivered from the factory with a wooden lagging cover held down with steel bands over the outermost layer of conductor. It is recommended that the cover be left on the reels if they are going to be stored for an extended period of time.
- 8.4 **Please refer APAR’s instruction manual for “Handling, Loading, Unloading and Storage Guide of Conductor Drums”.**

9 INSTALLATION TOOLS INTRODUCTION

9.1 Tensioner and stringing block

Table 1-1 Recommended tensioner and stringing block

Conductor Size	185mm ² to 300mm ²	300mm ² to 600mm ²
Tensioner Diameter	≥ 1500mm	
Stringing Block Diameter	≥ 450mm	≥ 600mm



Figure 5 : Tensioner and stringing block

9.2 Crimping machine

Type	Tension (KN)	Working stroke (mm)	Crimping rage (mm ²)	Weight (Kg)	Note
--	1000	38.5	16-800	30	Double acting



Figure 6 : Crimping machine

9.3 Compression type stringing clamp

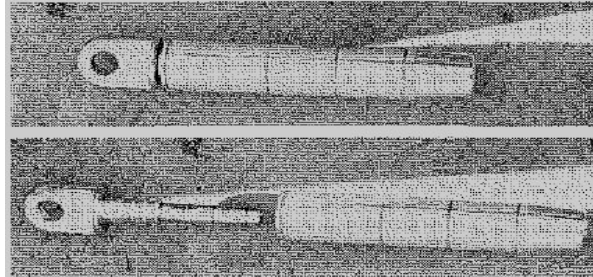


Figure 7 : Compression type stringing clamp

9.4 Come-along Clamp



Figure 8 : Aluminum come-along clamp

Steel core come-along clamp

10. DIFFERENT INSTALLATIONS BETWEEN GAP TYPE CONDUCTOR AND ORDINARY CONDUCTOR

10.1 Payout the conductor

(1) The interval of paying out the conductor is less than the ordinary conductor Max. Length of paying out conductor is 5km, the drum cannot exceed 3.

(2) The crimp type strain clamp is different from the normal conductor.

Purpose: avoid the sliding between the aluminum layer and steel core, and avoid the steel core into the aluminum layer.

Measure 1: Using the crimping clamp.

Measure 2: Using the pulling socket.

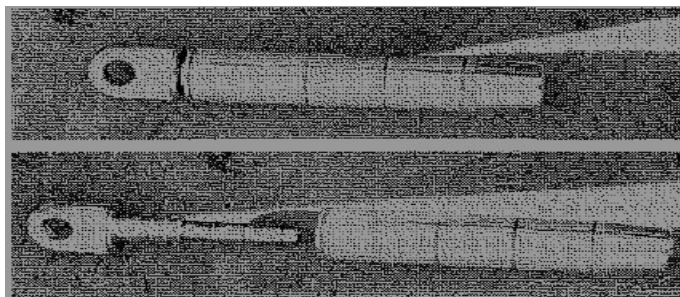


Figure 9

10.2 Sagging

(1) Pre-sagging

Using the aluminum come-along clamp for gripping conductors and the tension shall not exceed 70% of final sagging tension.

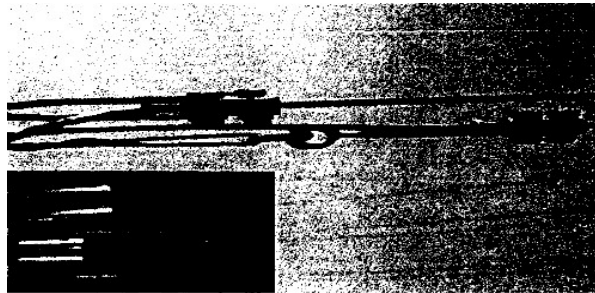


Figure 10

(2) Final sagging

Using the steel core come-along clamp to reaching the sag.



Figure 11

(3) Eliminate the aluminum department tension

After 12 hours, crimp the strain clamp and install the suspension clamp when there is no tension in aluminum layer

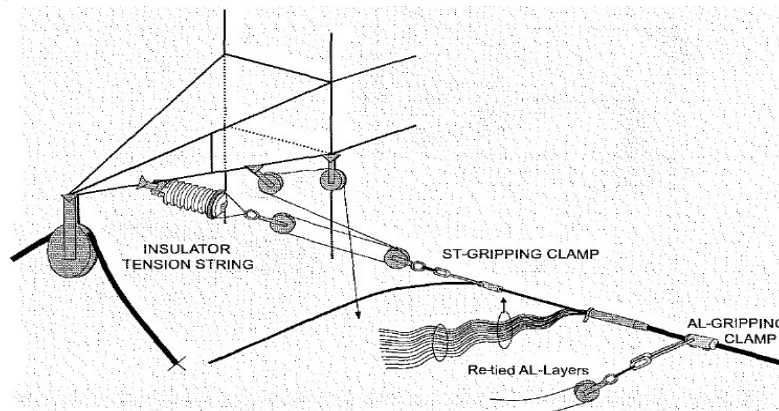


Figure 12

(4) Length of tight line interval

Normal tight line interval: about 5-8 span, within 2000m.

Gap type conductor tight line length: about 5-8 span, beyond 2000m.

You can also change the suspension clamp in the middle of suspension tower into the straight strain clamp or straight joint.

11. INSTALLATION PROCEDURES

11.1 Stringing plan

Prior to stringing work, the distribution of conductor and conditions of existing lines in a careful study, decided to the drum distribution and the interval of the line.

11.2 Preparation work at site

11.2.1 Towers, conductors, fittings etc. of existing are checked.

11.2.2 Put the tensioner and conductor in the area.

11.2.3 If necessary, set the scaffolding.

11.2.4 If construction loads of stringing work exceed the design loads of existing towers, the towers are temporarily reinforced accordingly.

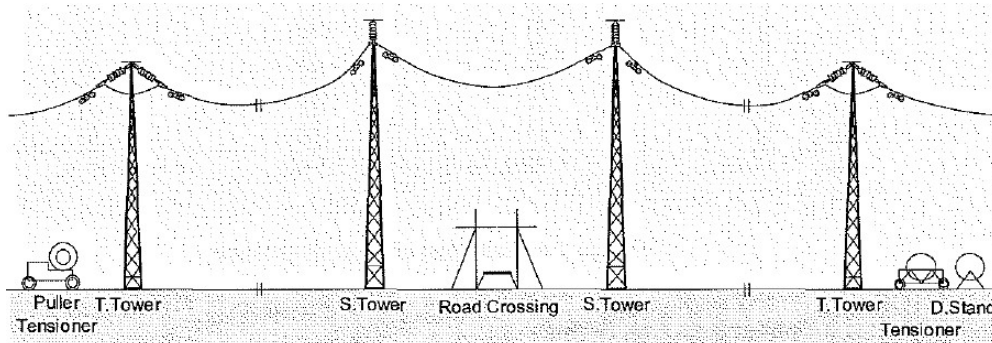


Figure : 13

11.3 Installation of stringing block

11.3.1 Remove the suspension clamp, place the stringing block, reshipe the conductor to the stringing block.

11.3.2 Tight the original conductor in strain tower by using the clamping line device, remove the strain clamp, connect the conductor, then reshipe the conductor to the stringing block.

11.3.3 Connect the original conductor with the Gap type conductor, then install the tractor between the Gap type conductor and steel rope.

11.4 Paying out of new conductor

11.4.1 Paying out of new conductor is carried out with low tension and speed as

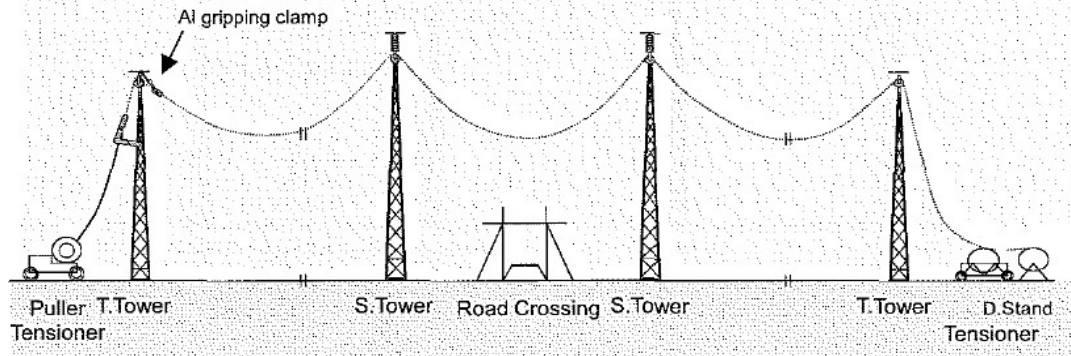


Figure 14

11.4.2 Guarantee the bending radius above 0.5 meter, you shall stop the conductor going around if temporarily suspension in installation.

11.4.3 When the joint clamp reaches to the strain tower, you should fasten temporarily, and then you can cut the connection clamp.

12.4.3 Because the tension of the clamp in the final end is so big, it will lead to the aluminum layer transformation, you should cut it.

11.5 Pre-sagging

According to the different lines, there are 3 methods:

- (1) Pre-sagging in the middle straight suspension tower.
- (2) Pre-sagging in the both ends of strain tower.
- (3) Pre-sagging two-way in the middle straight tower and both ends of strain tower. In a word, no matter adopt what kind of method to sagging, the tension of pre-sagging shall not exceed 70% the tension of final sagging.

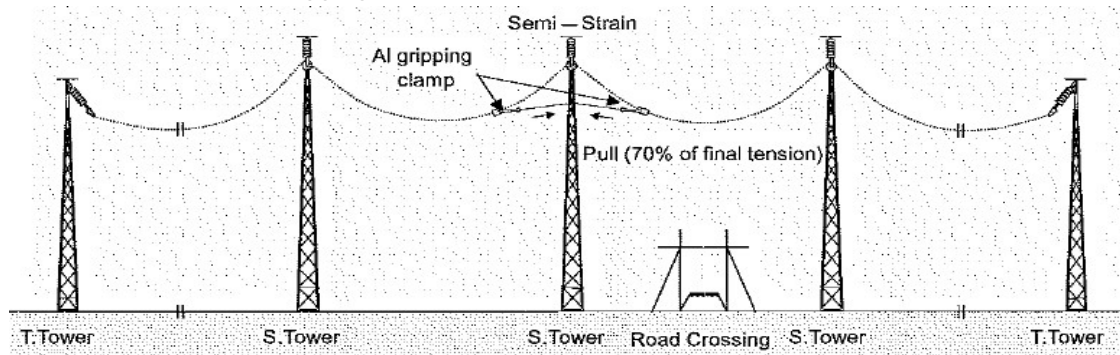


Figure 15 : Pre-sagging

11.6 Sagging

Following to the pre-sagging for each case described in the above article 12.5 by aluminum gripping clamps, aluminum layers are de-stranded at the tensioning towers with enough precaution to avoid any damage of aluminum wires. Steel gripping clamps are set up on steel cores and then pulled up to final tension observing the sags at specified spans.

After leaving the sagged conductor for the specified time, final sag is adjusted by pulling steel gripping clamp and then suspension clamps are clipped in.

Detail sagging procedure is shown in Clause 13.

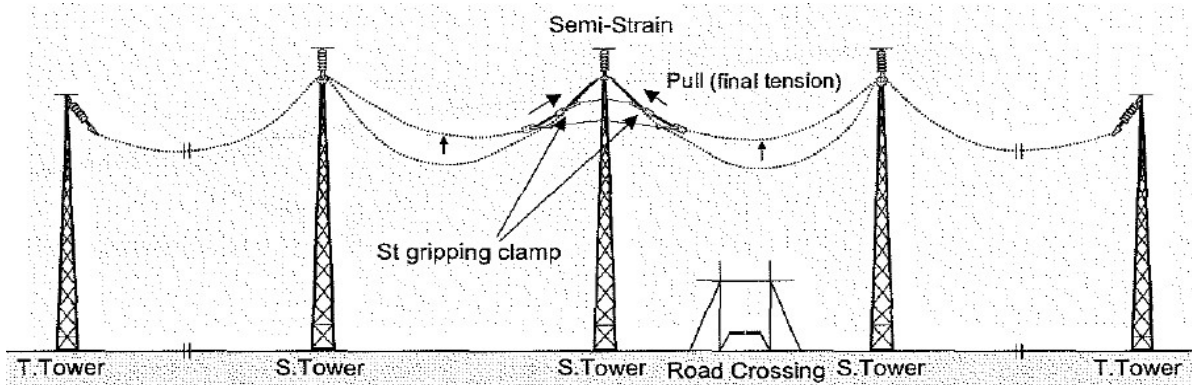


Figure 16 : Sagging

12. SAGGING DETAIL

12.1 Sagging Detail at Tension Tower

- (1) After paying out of new conductor, aluminum gripping clamp is set up on the conductor. At that time, the lubber tube should be attached to the conductor to avoid the conductor surface damage caused by the arm of aluminum gripping clamp.

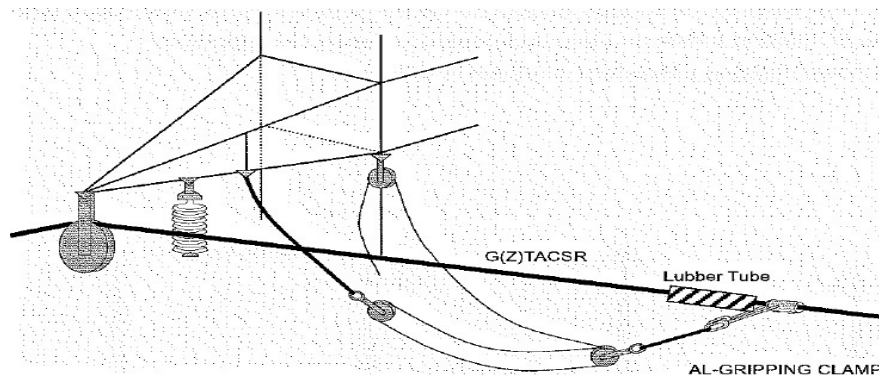


Figure : 17

- (2) Pre-sagging is made up to approx. 70% of final tension pulling by aluminum gripping clamp. The conductor is cut off considering sufficient length for deadending by hydraulic cutter and aluminum clamp is inserted to conductor.

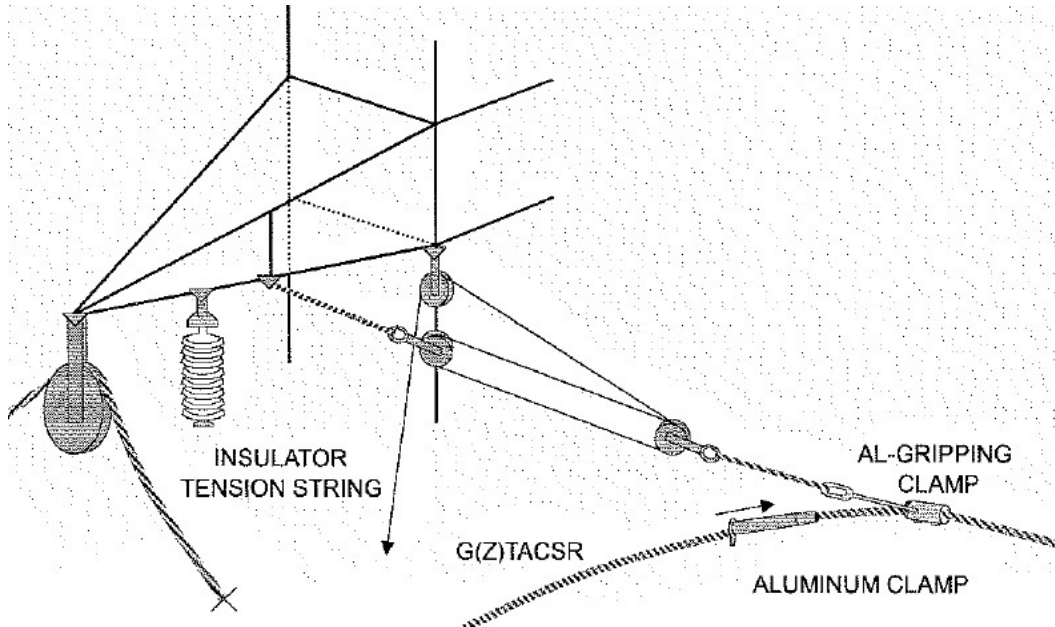


Figure : 18

- (3) Aluminum layers are de-stranded **with** enough precaution to avoid any damage of aluminum wires, and grease on steel core is wiped up where steel gripping clamp is fixed. Steel gripping clamp is set up on the steel core and final sagging is made by pulling steel gripping clamp.

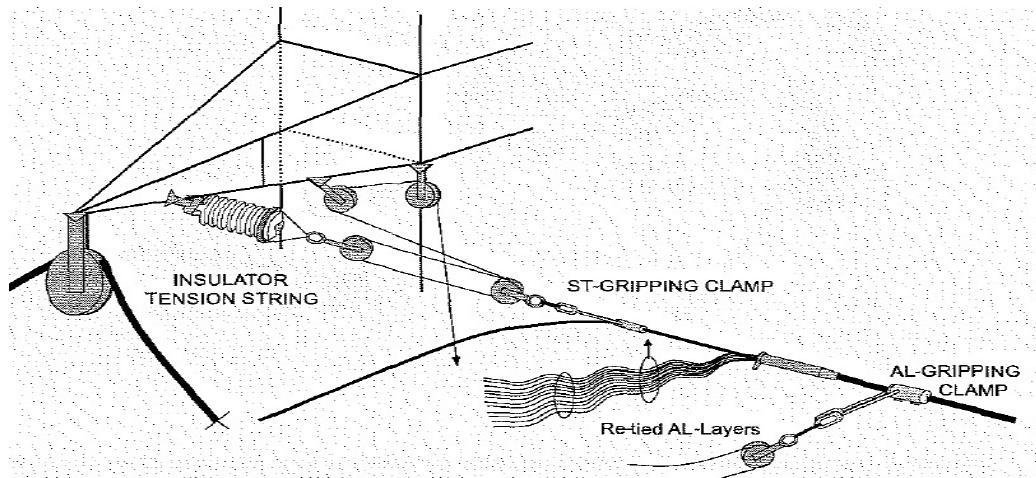


Figure : 19

- (4) After leaving the sagged conductor for the specified time, final sag is adjusted pulling by steel gripping clamp and then steel core is made straight to examine the length of steel core. Steel core is cut off at the exact measured point and steel clamp is compressed.

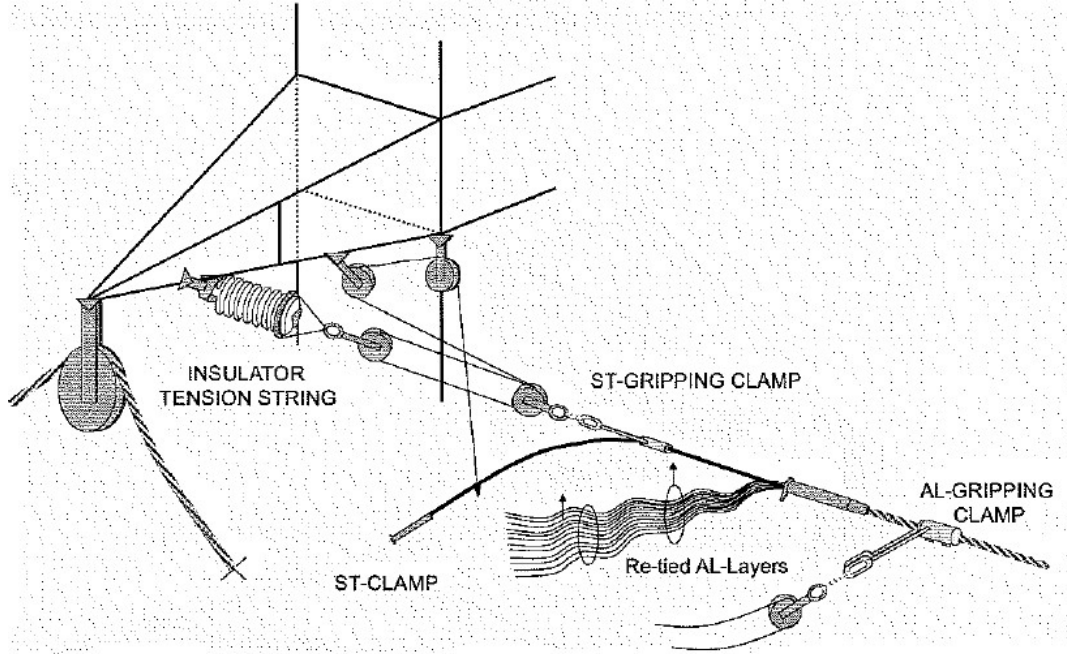


Figure : 20

- (5) Steel clamp is connected with insulator tension string. De-stranded aluminum layers are wound up as original shape of conductor.

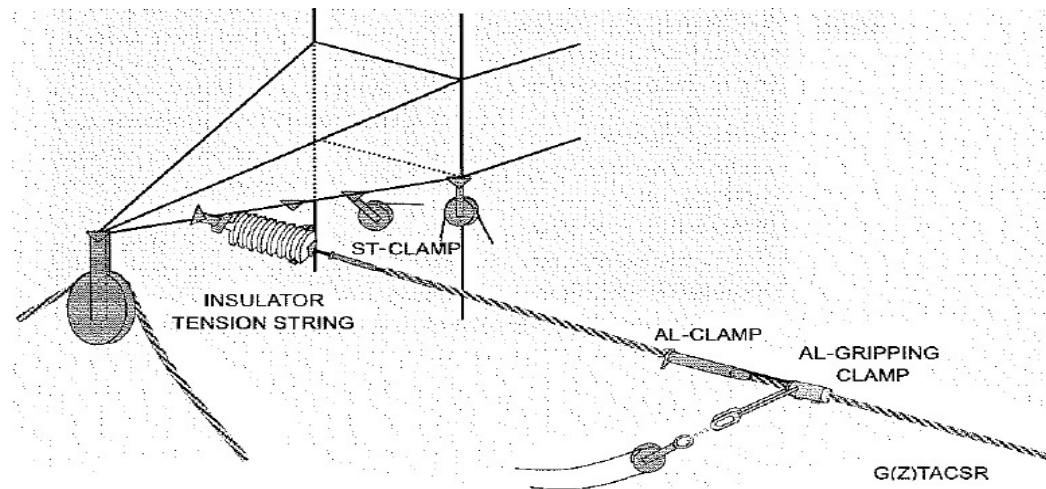


Figure : 21

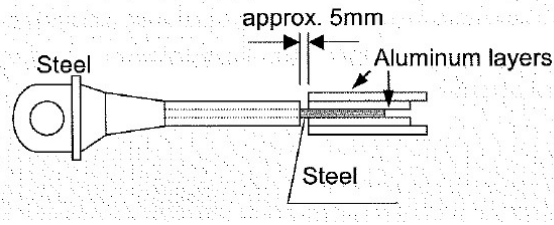


Figure 22 : Aluminum layers strand-back

- (6) Aluminum dead end clamp is compressed at correct position and Aluminum gripping clamp is removed from conductor.

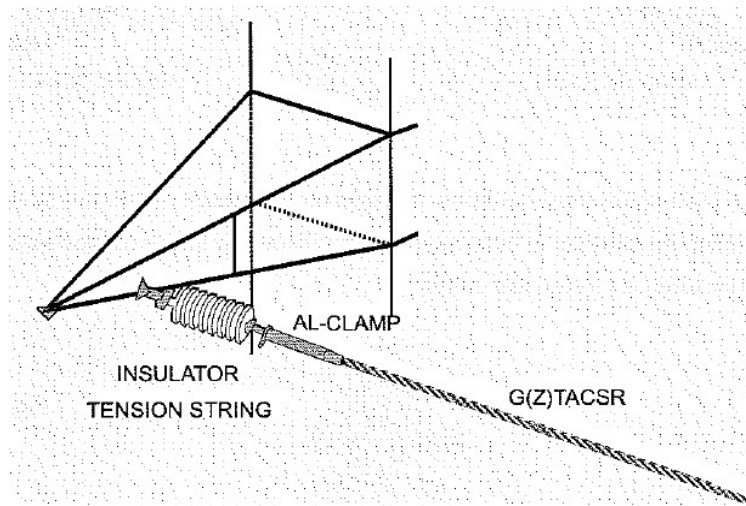


Figure : 23

12.2 SAGGING DETAIL AT SUSPENSION TOWER (SEMI-STRAIN)

Insulator suspension string is changed to semi-strain assembly prior to sagging.

- (1) After paying out of new conductor, the aluminum gripping clamps are set up on the conductor of both sides tower.

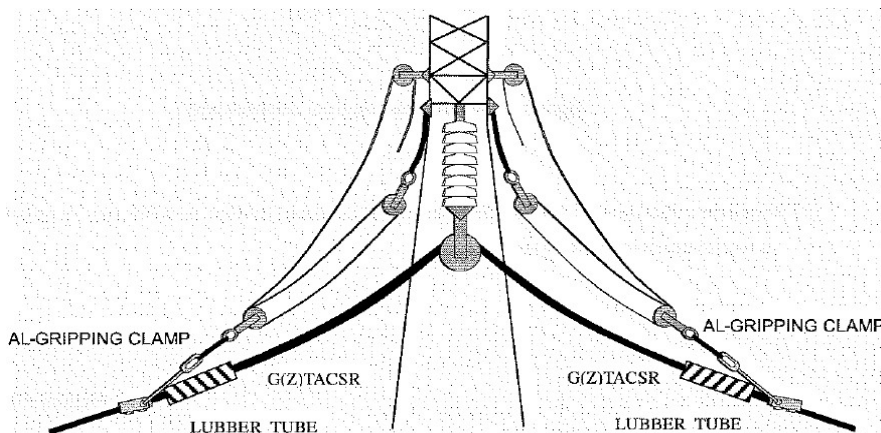


Figure : 24

- (2) Pre-sagging of both tensioning sections is made up to approx. 70% of final tension pulling by aluminum gripping clamps of both sides. The conductor is cut off considering sufficient length for deadening by hydraulic cutter.

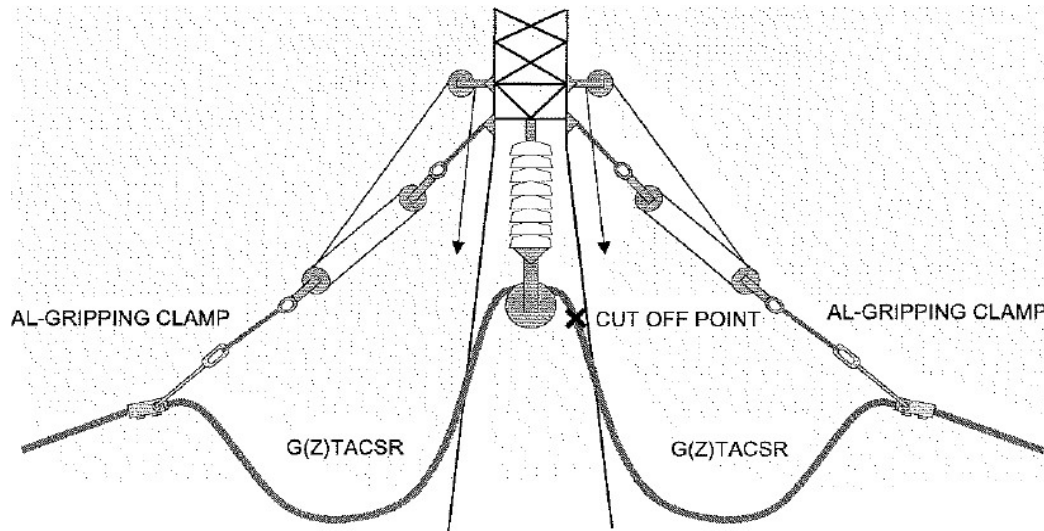


Figure : 25

- (3) Following works are carried out at both side conductors of tower respectively. Aluminum dead-end clamps are inserted to conductors and aluminum layers are de-stranded with enough precaution to avoid any damage of aluminum wires. Grease on steel core is wiped up where steel gripping clamps are fixed and steel gripping clamps are set up on steel core and then final sagging is made pulling by steel gripping clamps. After leaving the sagged conductor for specified time, final sag is adjusted pulling by steel gripping clamp and then steel core is made straight to examine the length of steel core.

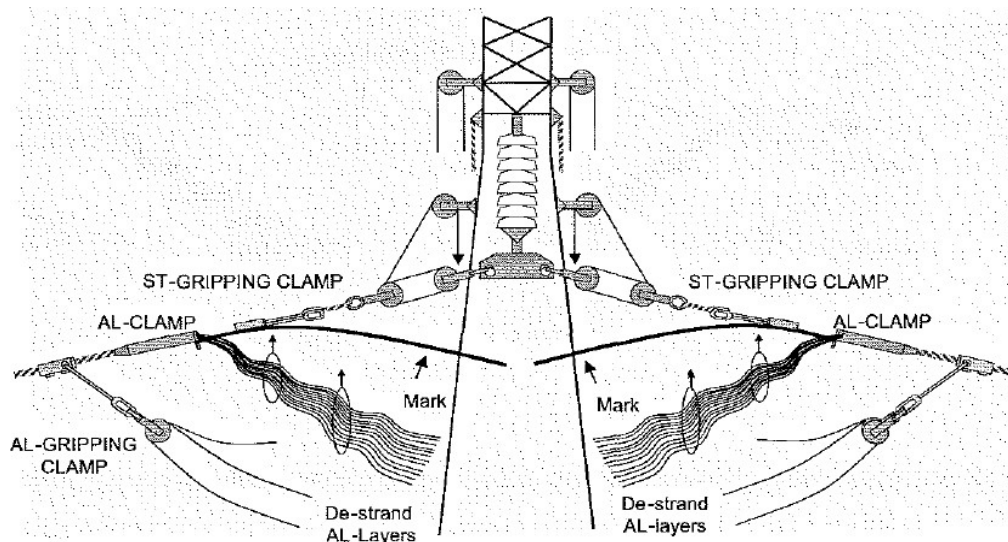


Figure : 26

- (4) Steel core is cut off at exact measured point. Steel clamps of both sides are compressed on steel cores.

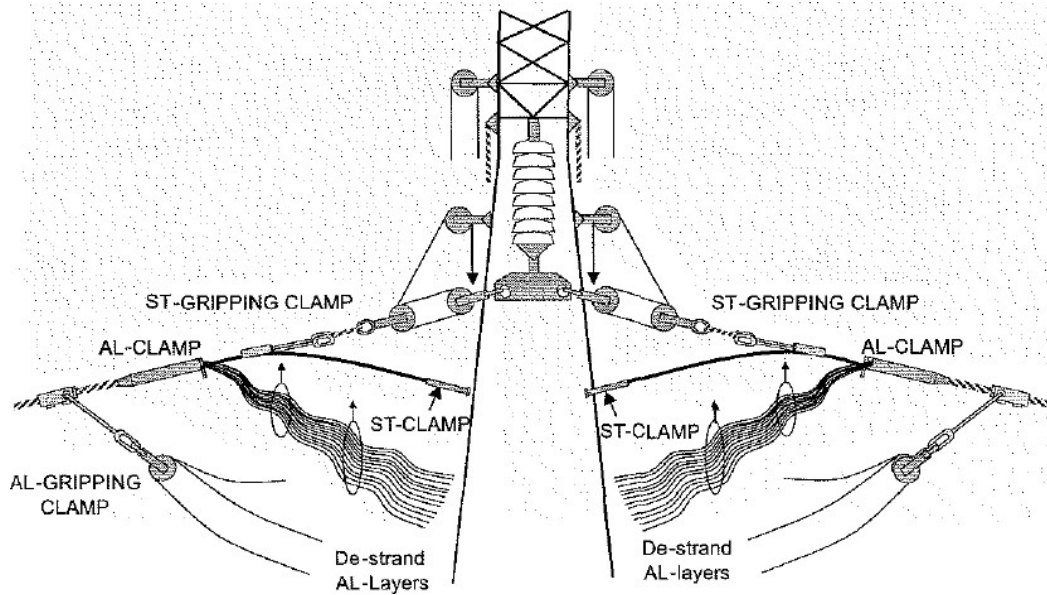


Figure : 27

- (5) Steel clamps are connected with yoke plate. De-stranded aluminum layers are strand as original shape of conductor.

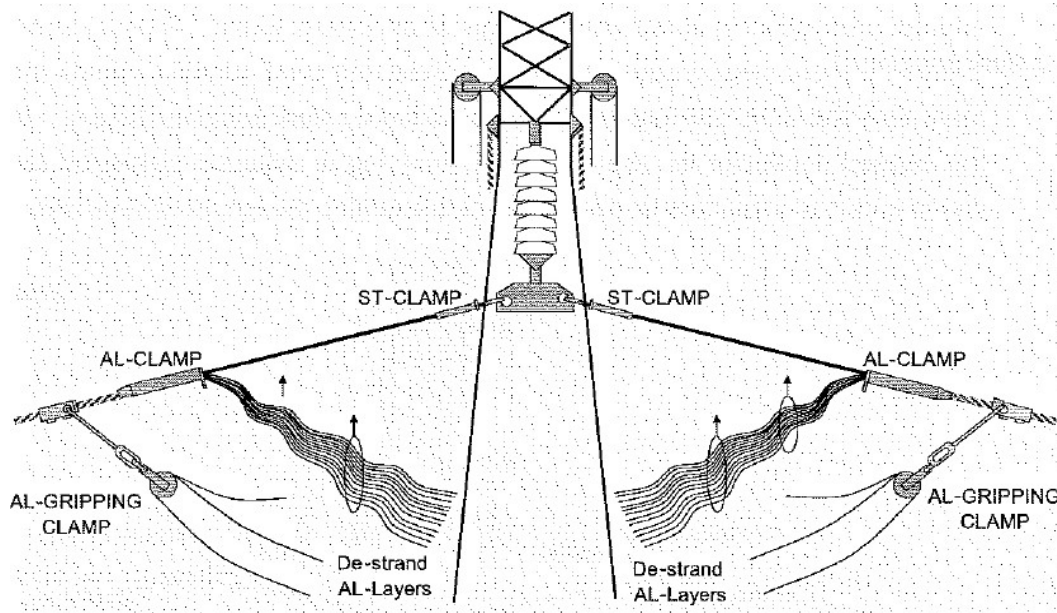


Figure : 28

(6) Aluminum dead end clamps of both sides tower are compressed at correct position.

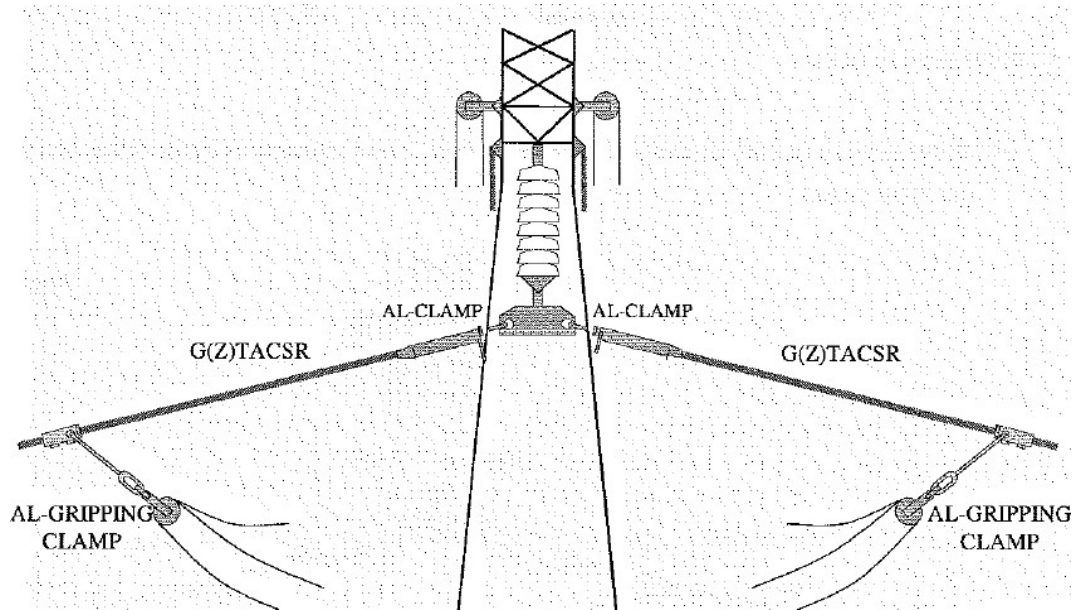


Figure : 29

(7) Aluminum gripping clamps are removed from conductors.

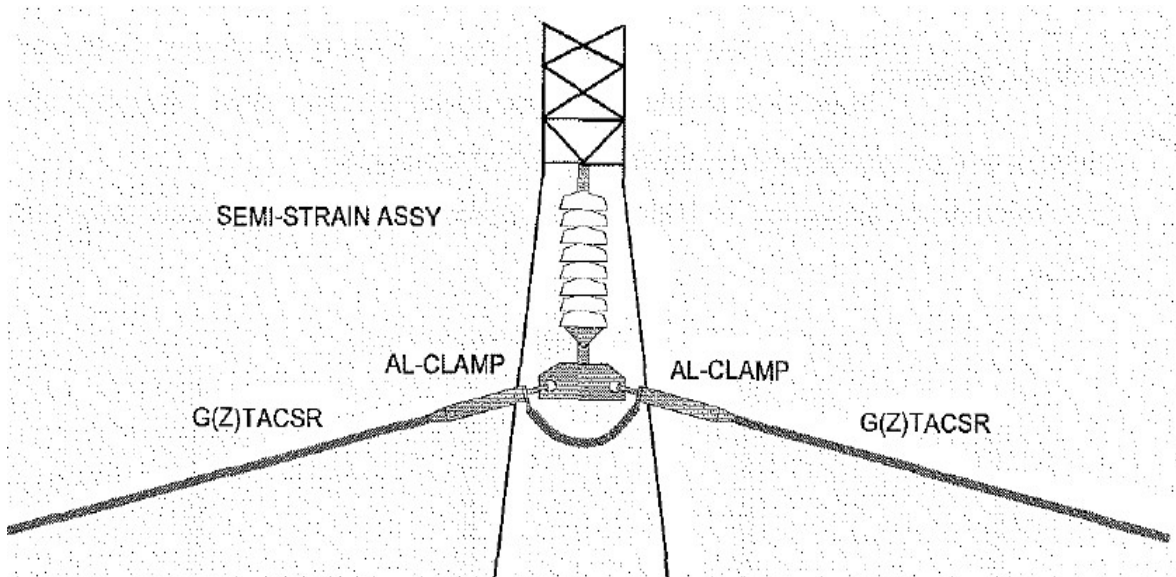


Figure : 30

13. LEGAL NOTICES

PLEASE READ THESE LEGAL NOTICES CAREFULLY.

Disclaimer: This guide provides suggestions for methods, equipment and tools that have been found practical based on field-testing. GZTACSR conductor requires same shipping, handling, storage and installation procedures like conventional ACSR conductors. These guidelines are meant to provide procedures that will help provide a high quality, trouble-free installation so that the GZTACSR conductor once installed, will perform its intended function.

Failure to follow these guidelines may cause a hazardous condition or result in premature line failure.

The information contained herein or related hereto is intended for evaluation by technically skilled persons, with any use thereof to be at their independent discretion and risk. Such information is believed to be reliable, but the accuracy or completeness thereof is not guaranteed. The user assumes all risks and liability whatsoever in connection with such use.

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WARNING: A potential for electrical shock exists when using cables energized with electrical power. Use appropriate safety procedures.

*** END ***