



LONGITUDINAL LOADING: FACT VS MYTH

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LONGITUDINAL LOAD TYPES

1. Stringing Longitudinal Load
2. Service Longitudinal Load
3. Broken Conductor Longitudinal Load

Myth: all 3 longitudinal loads are covered by the load curve. FALSE

During Stringing...

Fact: The line post can be easily deflected with little force.

Fact: The longer the post, the higher the deflection.

Fact: The base connection to the tower is critical limitation.



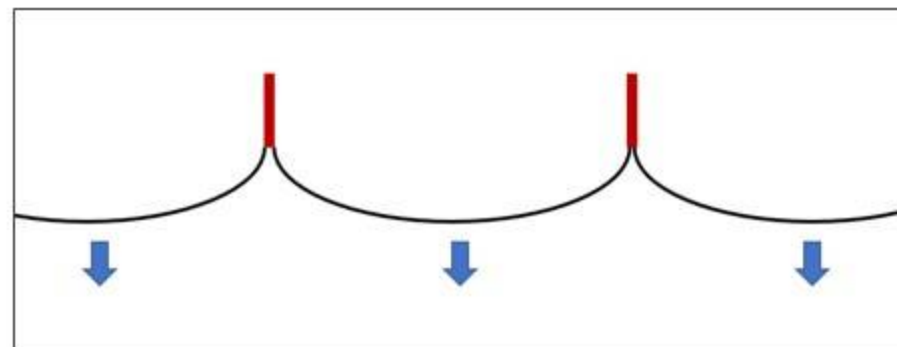
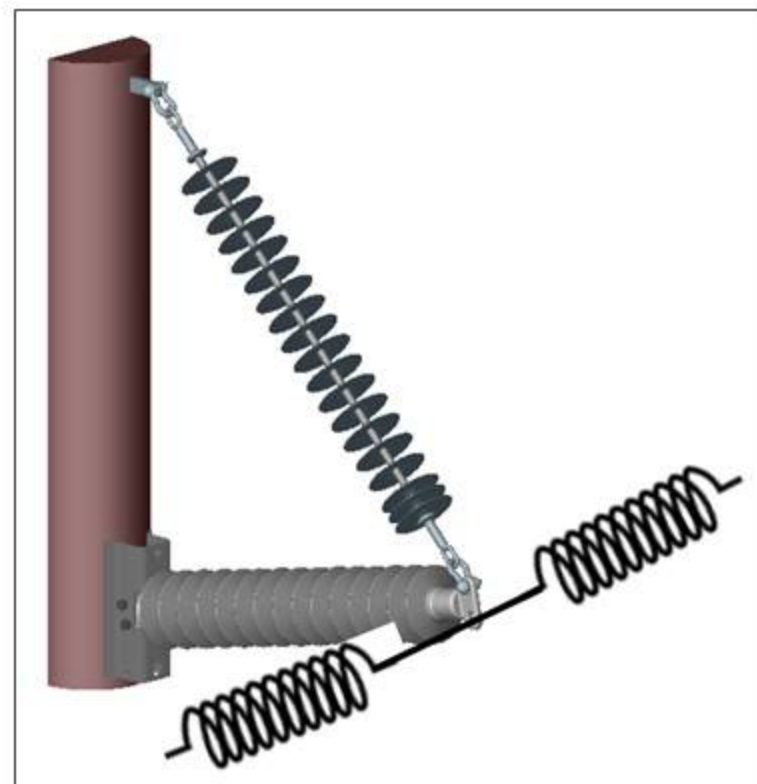
SERVICE LONGITUDINAL LOAD

- Tangent = equal load on both sides of the insulator.
- Conductor in tension acts like a spring
- Conductor adds longitudinal stiffness to the post.

Fact: when a spring is pulled open, it generates a recoil force to close it back.

Myth: A tangent application should be able to withstand >2000 lbs. longitudinal loads.

Fact: Service Longitudinal loads should range from 100 to 1000 lbs.



BROKEN CONDUCTOR LONGITUDINAL LOAD



- Onetime ultimate load event.
- Post absorbs a shock load (sudden load release of tension)

Fact: Primary objective is to **Prevent** cascading failure.

Fact: after withstanding a broken conductor event, the insulator should be replaced.

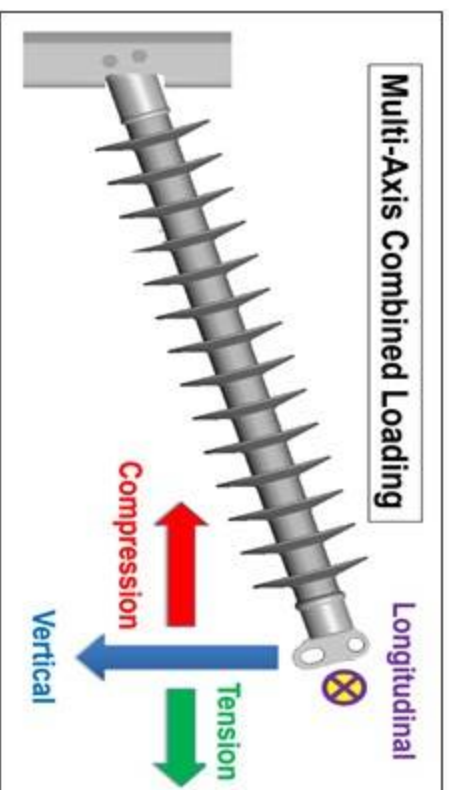


Fact: Line Post application – the base cannot break.

Fact: Braced Post application – the base can break off. The post absorbs the shock load, the brace holds the conductor.

TESTING FOR LONGITUDINAL CAPABILITY

LONGITUDINAL LOADS		
STRINGING	SERVICE	BROKEN CONDUCTOR
<ul style="list-style-type: none"> • First Test of the Post • Base is 1st Limitation <p><u>Test & Validation Method</u></p> <ul style="list-style-type: none"> • Side Load / Deflection • Slow Speed Pull Test 	<ul style="list-style-type: none"> • Includes Conductor & Tension • Loads = 0 to 1,500 lbs. <p><u>Test & Validation Method</u></p> <ul style="list-style-type: none"> • Multi-axis testing (w/ Vertical & Transverse Loads) • Controlled Speed Pull Test 	<ul style="list-style-type: none"> • Prevent Cascading Failure • Hold the Conductor <p><u>Test & Validation Method</u></p> <ul style="list-style-type: none"> • Sudden Load Release Event (Shock Load Withstand) • One Time Load Withstand



Fact: Combined loads including compression and longitudinal loads will cause the post to buckle sooner than combined loads with tension.

Fact: The base connection to the tower is most critical during stringing and broken conductor events.

BASE CONNECTIONS

Pinned Connection

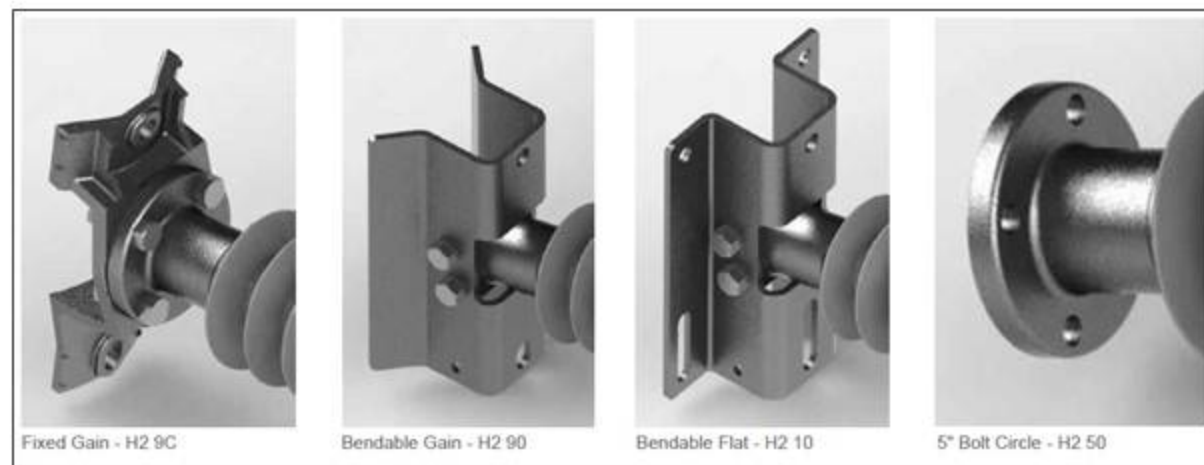
- Free to rotate in direction of longitudinal load
- Can restrain vertical and transverse loads
- Offers no resistance to longitudinal load

Fixed Connection

- Limited / No Rotation (depending on base)
- Can restrain vertical and transverse loads (with longitudinal loads)
- Resists longitudinal loads

Fact: Swivel bases are used for braced post applications only. Pinned / Pinned

Fact: Gain bases are the most commonly used tower connection for line post and braced post applications.

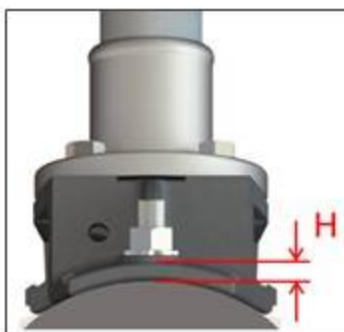
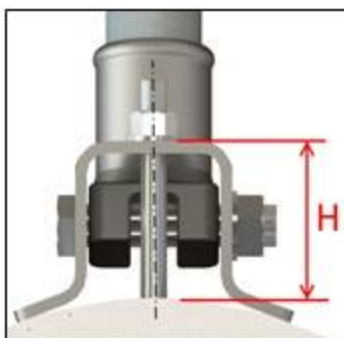


GAIN BASE

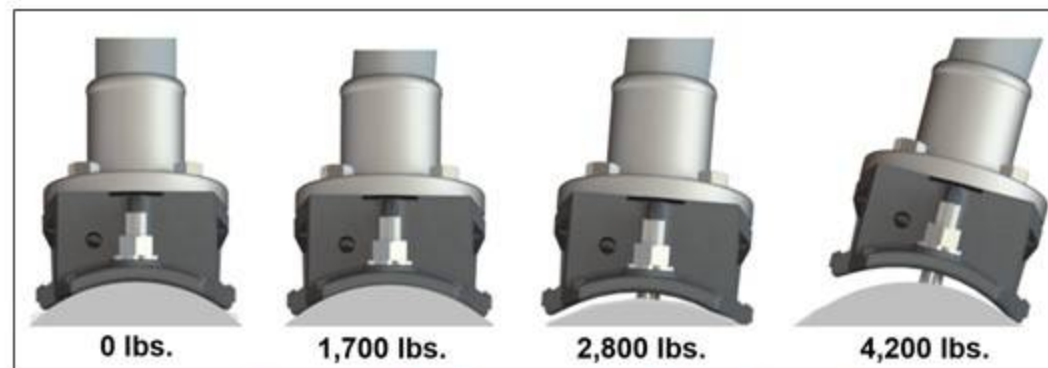
- 12" Mount Hole Spacing
- 12° Upsweep Angle
- Bendable Gain – Anchor fitting
- Fixed Gain – 5" Bolt Circle fitting
- Bolt grade is critical
- H = mount offset from pole

Standards

- No minimum performance criteria for the bases (what should they provide?)
- No definition of material
- Limited dimensional requirements



2.5" Line Post 47" length w/ Bendable Gain Base



2.5" Line Post 47" length w/ Fixed Gain Base

2.5" Gain Base Test Results		
Section Length	Base Type	Base Deformation
47"	Bendable Gain	1,400 lbs.
	Fixed Gain	2,800 lbs.
72"	Bendable Gain	800 lbs.
	Fixed Gain	1,700 lbs.
97"	Bendable Gain	500 lbs.
	Fixed Gain	1,100 lbs.

Fact: The Fixed Gain base provides more longitudinal resistance than a Bendable Gain base.

Fact: As the post length increase, it takes less load to deflect the line post.

BASE PERFORMANCE

- 5" Bolt Circle is the most reliable connection.
- Flat Bendable & Fixed Gain are comparable

Myth: All bases provide the same or comparable mechanical strength. FALSE

Fact: Each base type has different limitations.

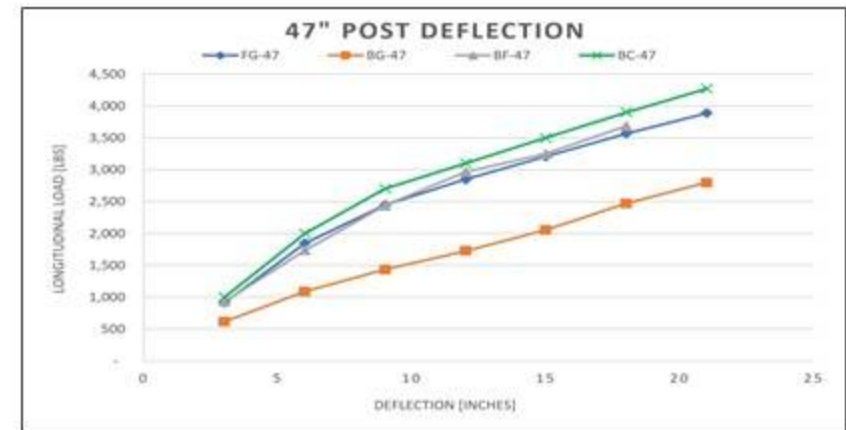
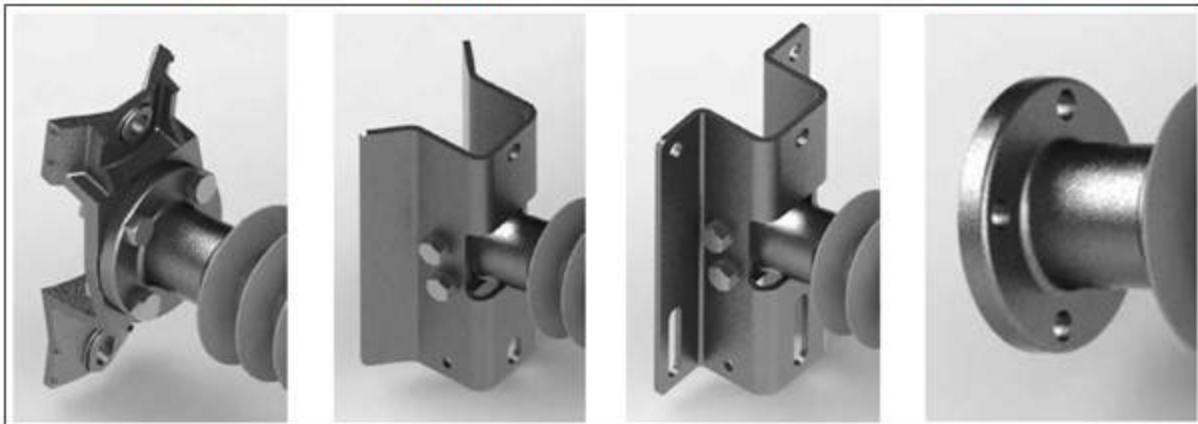
Fact: The same base type supplied by 2 MFG can have different mechanical strengths and weakness.

Fixed Gain

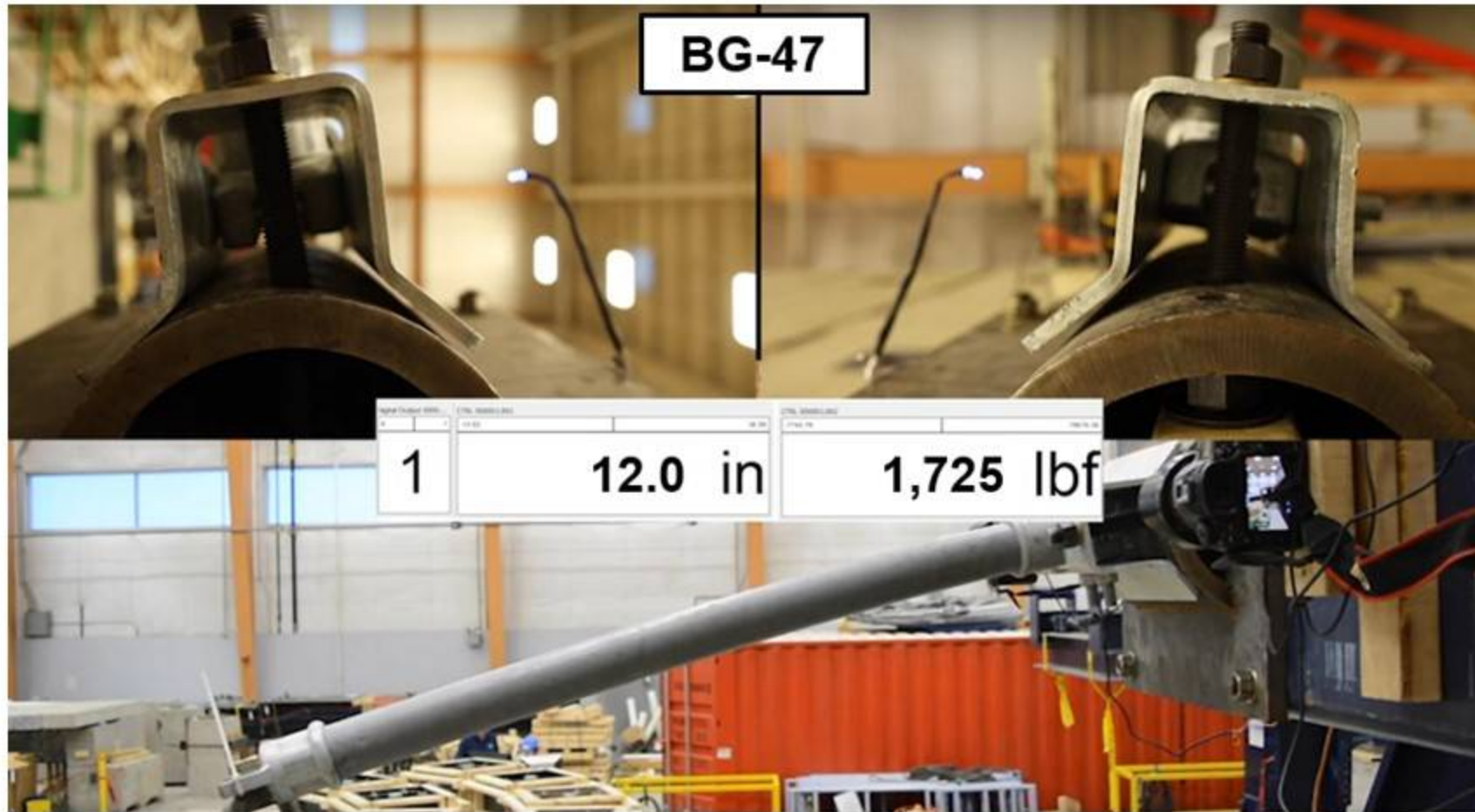
Bendable Gain

Bendable Flat

5" Bolt Circle



BENDABLE GAIN BASE LONGITUDINAL TESTING



REVIEW AND FINAL THOUGHTS

- Longitudinal loading adds complexity to an already complex process (Load Curves)
- Stringing / Service / Broken Conductor – Each is different
- Conductor adds Longitudinal Stiffness to the post.
- The base connection is critical to mechanical performance.
- Not all bases perform the same [they vary by base type and by MFG]
- ANSI C29.17 needs more dimensional requirements and minimum performance criteria for all base connections (all sizes / applications).
- We need a Testing Standard as a means to validate load curves / mechanical strength ratings at 3rd Party Labs. [similar to electrical testing]



THANK YOU

FOR ADDITIONAL INFORMATION
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