State of Nebraska - INVITATION TO BID
ONE TIME PURCHASE

Date	5/1/23	**Page**	1 of 2
Solicitation Number	6781 OF		
Opening Date and Time	05/23/23 2:00 PM		
Buyer	BRENDA SENSIBAUGH (AS)		

DESTINATION OF GOODS
EDUCATIONAL TELECOMM COMM
CARROLL
56263 HIGHWAY 98
CARROLL NE 68723-2358

Per Nebraska's Transparency in Government Procurement Act, DAS is required to collect statistical information regarding the number of contracts awarded to Nebraska contractors. This information is for statistical purposes only and will not be considered for contract award purposes.

_____NEBRASKA CONTRACTOR AFFIDAVIT: Bidder hereby attests that bidder is a Nebraska Contractor. "Nebraska Contractor" shall mean any bidder who has maintained a bona fide place of business and at least one employee within this state for at least the six (6) months immediately preceding the posting date of this ITB.

_____ I hereby certify that I am a Resident disabled veteran or business located in a designated enterprise zone in accordance with Neb. Rev. Stat. §73-107 and wish to have preference, if applicable, considered in the award of this contract.

One Time Purchase to supply and deliver Transmission Line and Antenna Replacement and Installation for KXNE-FM to the State of Nebraska as per the attached specifications.

A response to this Solicitation is subject to, but not limited to, the Standard Terms and Conditions. PLEASE READ CAREFULLY!

This form is part of the specification package and must be signed and returned, along with all documents, by the opening date and time specified.

No facsimile or email solicitation responses will be accepted on bids $25,000 and over.

(4-18-23 BMS)

BIDDER MUST COMPLETE THE FOLLOWING

DISCOUNT PAYMENT TERMS: 0 % 30 DAYS

By signing this Invitation to Bid form, the bidder guarantees compliance with the provisions stated in this Invitation to Bid, agrees to the terms and conditions unless otherwise agreed to and certifies that bidder maintains a drug free work place environment. Vendor will furnish the items requested within 90 days after receipt of order. Failure to enter Delivery Date may cause quotation to be REJECTED.

Sign Here _____

(Authorized Signature Mandatory – Form must be signed manually in ink or by DocuSign)

Enter Contact Information Below

VENDOR# 504660

VENDOR: Electronics Research, Inc.

Address: 7777 Gradner Road

Chandler, IN 47610

Contact Bill Harland

Telephone +1 (812) 925-6000 Ext. 214

Email bharland@eriinc.com

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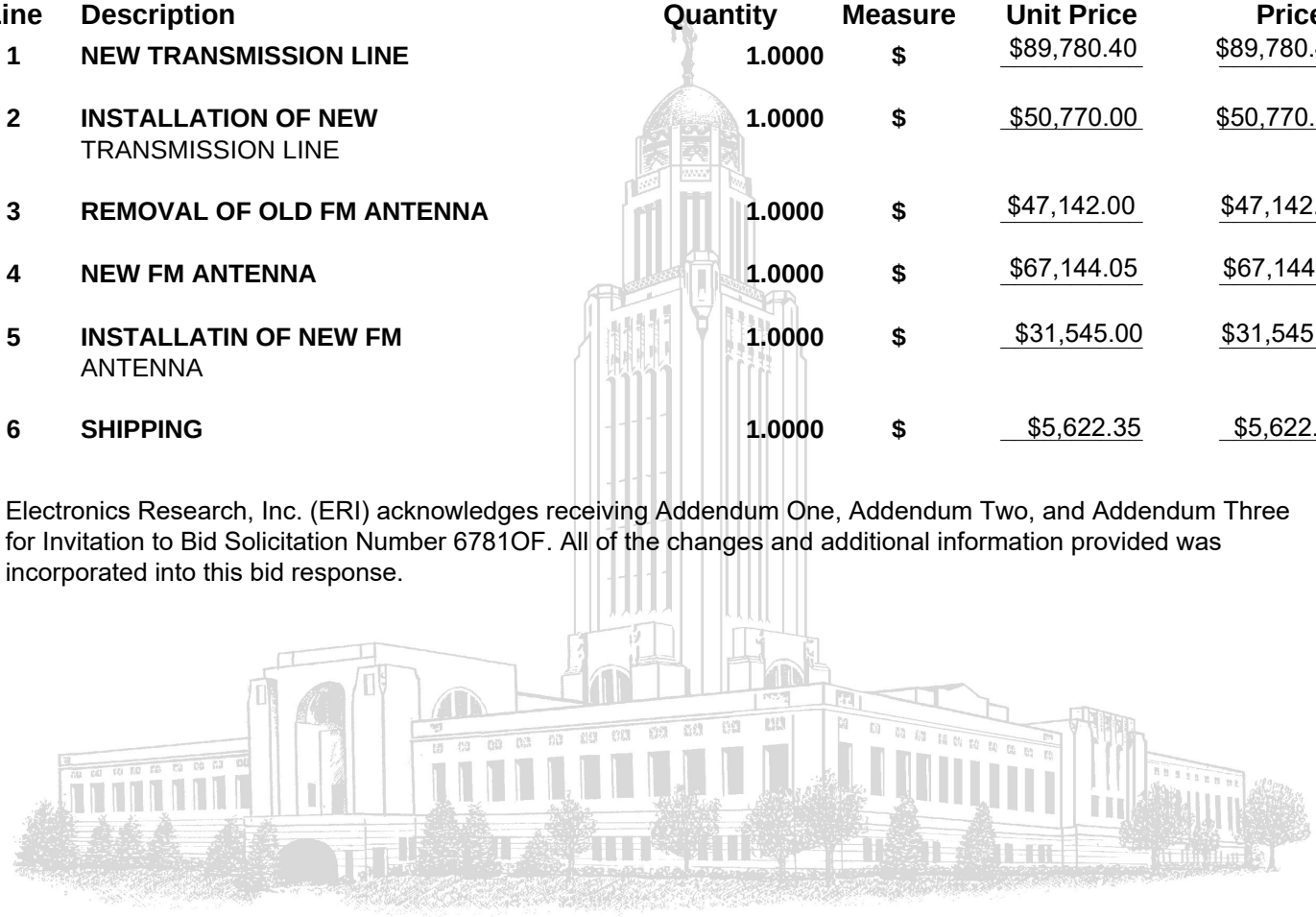
INVITATION

Line	Description	Quantity	Unit of Measure	Unit Price	Extended Price
1	**NEW TRANSMISSION LINE**	**1.0000**	**$**	$89,780.40	$89,780.40
2	**INSTALLATION OF NEW** TRANSMISSION LINE	**1.0000**	**$**	$50,770.00	$50,770.00
3	**REMOVAL OF OLD FM ANTENNA**	**1.0000**	**$**	$47,142.00	$47,142.00
4	**NEW FM ANTENNA**	**1.0000**	**$**	$67,144.05	$67,144.05
5	**INSTALLATIN OF NEW FM** ANTENNA	**1.0000**	**$**	$31,545.00	$31,545.00
6	**SHIPPING**	**1.0000**	**$**	$5,622.35	$5,622.35

Electronics Research, Inc. (ERI) acknowledges receiving Addendum One, Addendum Two, and Addendum Three for Invitation to Bid Solicitation Number 6781OF. All of the changes and additional information provided was incorporated into this bid response.



INVITATION TO BID

Number 6781 OF

The State of Nebraska (State), Department of Administrative Services (DAS), Materiel Division, State Purchasing Bureau (SPB), is issuing this solicitation for a one-time purchase contract, ITB Number 6781 OF for the purpose of selecting a qualified Contractor to provide **Transmission line and Antenna replacement and installation for KXNE-FM**. A more detailed description can be found in Section VI. The resulting contract may not be an exclusive contract as the State reserves the right to contract for the same or similar goods from other sources now or in the future.

INFORMATION PERTINENT TO THIS SOLICITATION CAN BE FOUND ON THE INTERNET AT:
http://das.nebraska.gov/materiel/purchasing.html

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http://das.nebraska.gov/materiel/purchasing.html

PUBLIC POSTING NOTICE:

Pursuant to the Taxpayer Transparency Act (Neb. Rev. Stat. §§ 84-602.01 to 84-602.04) and in furtherance of public records statutes (Neb. Rev. Stat. § 84-712 et seq.), State contracts, must be posted to a public website. The resulting Contract, the ITB, and the successful Bidder's entire bid and response will be posted to a public website managed by DAS, which can be found at:

https://statecontracts.nebraska.gov & https://www.nebraska.gov/das/materiel/purchasing/contract_search/index.php

In addition and in furtherance of the State's public records Statute (Neb. Rev. Stat. § 84-712 et seq.), all bids or responses received regarding this solicitation will be posted to the SPB public website. **These postings will include the entire bid.**

When submitting proprietary information, the following steps must be followed:

1. **The bidder(s) must request that proprietary information be excluded from the posting;**
2. **The bidder must identify and mark the proprietary information with the words "PROPRIETARY INFORMATION" according to State law;**
3. **Any proprietary information must be submitted as a separate electronic file(s) titled "PROPRIETARY INFORMATION" or in a separate container or envelope marked conspicuously;**
   a. **If file(s) are submitted electronically they must not be password protected.**
4. **The bidder must submit a detailed written document showing that the release of the proprietary information would give a business advantage to named business competitor(s) and explain how the named business competitor(s) will gain an actual business advantage by disclosure of information.**
   a. **The mere assertion that information is proprietary or that a speculative business advantage might be gained is not sufficient (See Attorney General Opinion No. 92068, April 27, 1992).**
5. **The bidder may not assert that the entire bid is proprietary.**
6. **Bids will not be considered proprietary and are a public record in the State of Nebraska.**

The State will determine, in its sole discretion, if the disclosure of the information designated by the Bidder as proprietary would:

1. **Give advantage to business competitors; and,**
2. **Serve no public purpose.**

The Bidder will be notified of the State's decision. Absent a determination by the State that the information may be withheld pursuant to Neb. Rev. Stat. § 84-712.05, the State will consider all information a public record subject to disclosure.

If the Agency determines it is required to release Proprietary information, the bidder will be informed. **It will be the bidder's responsibility to defend the bidder's asserted interest in non-disclosure.**

To facilitate such public postings, with the exception of **"PROPRIETARY INFORMATION"**, the State of Nebraska reserves a royalty-free, nonexclusive, and irrevocable right to copy, reproduce, publish, post to a website, or otherwise use any contract or bid to this solicitation for any purpose, and to authorize others to use the documents. Any individual or entity awarded a contract, or who submits a bid to this solicitation, specifically waives any copyright or other protection the bidder bid to the solicitation may have; and, acknowledges that they have the ability and authority to enter into such waiver. This reservation and waiver is a prerequisite for submitting a bid to this solicitation, and award of a contract. **Failure to agree to the reservation and waiver will result in the bid to the solicitation being found non-responsive and rejected**.

Any entity awarded a contract or submitting a bid to the solicitation agrees not to sue, file a claim, or make a demand of any kind, and will indemnify and hold harmless the State and its employees, volunteers, agents, and its elected and appointed officials from and against any and all claims, liens, demands, damages, liability, actions, causes of action, losses, judgments, costs, and expenses of every nature, including investigation costs and expenses, settlement costs, and attorney fees and expenses, sustained or asserted against the State, arising out of, resulting from, or attributable to the posting of the contract or the bids and responses to the solicitation, awards, and other documents.

If the Bidder wishes to withhold proprietary or other commercial information from disclosure, the Bidder must do the following:

a. **Identify the Proprietary Information;**
b. **Mark the Proprietary Information; and**
c. **Submit the Proprietary Information under separate cover marked clearly using an indelible method with the words "PROPRIETARY INFORMATION".**
d. **The mere assertion that information is Proprietary or that a speculative Business advantage might be gained is not sufficient. (See Attorney General Opinion No. 92068, April 27, 1992). THE BIDDER MAY NOT ASSERT THAT THE ENTIRE BID IS PROPRIETARY. COST WILL NOT BE CONSIDERED PROPRIETARY AND IS A PUBLIC RECORD SUBJECT TO DISCLOSURE.**
   The State may require a Bidder to submit more information, including, but not limited to, a detailed explanation as to how and why the designated information is Proprietary.

The State will determine, in its sole discretion, if the disclosure of the designated Proprietary Information would:

a. **Give advantage to Business competitors; and**
b. **Serve no public purpose.**

Absent a determination by the State that the information may be withheld pursuant to Neb. Rev. Stat. § 84-712.05, the State will consider all information a public record subject to disclosure.

In the event that disclosure of Proprietary Information is ordered or requested, it will be the Bidder's responsibility to assert and defend the non-disclosure.

To facilitate public postings, with the exception of Proprietary Information, the State reserves a royalty-free, nonexclusive, and irrevocable right to copy, reproduce, publish, post to a website, or otherwise use any contract, bid, or response to this ITB for any purpose, and to authorize others to use the documents. Any individual or entity Awarded a contract, or who submits a bid in response to this ITB, specifically waives any Copyright or other protection the contract, bid, or response to the ITB may have; and acknowledges that they have the ability and authority to enter into such waiver. This reservation and waiver are a prerequisite for submitting a bid or response to this ITB, and Award of a contract. Failure to agree to the reservation and waiver will result in the bid being found non-responsive and rejected.

Any entity Awarded a contract or submitting a bid or response to the ITB agrees not to sue, file a claim, or make a demand of any kind, and will indemnify and hold harmless the State and its employees, volunteers, Agents, and its elected and appointed officials from and against any and all claims, liens, demands, damages, liability, actions, causes of action, losses, judgments, costs, and expenses of every nature, including investigation costs and expenses, settlement costs, and attorney fees and expenses, sustained or asserted against the State, arising out of, resulting from, or attributable to the posting of the contract or the bids and responses to the ITB, Awards, and other documents.

TABLE OF CONTENTS

GLOSSARY OF TERMS

Acceptance Test Procedure: Benchmarks and other performance criteria, developed by the State or other sources of testing standards, for measuring the effectiveness of products or goods and the means used for testing such performance

Addendum: Something to be added or deleted to an existing document; a supplement

After Receipt of Order: After Receipt of Order

Agency: Using agencies shall mean and include all officers of the state, departments, bureaus, boards, commissions, councils, and institutions receiving legislative appropriations

Agent/Representative: A person authorized to act on behalf of another

Amend: To alter or change by adding, subtracting, or substituting

Amendment: A written correction or alteration to a document

Appropriation: Legislative authorization to expend public funds for a specific purpose. Money set apart for a specific use

Automated Clearing House : Electronic network for financial transactions in the United States

Award: All purchases, leases, or contracts which are based on competitive proposals will be awarded according to the provisions in the solicitation

Best and Final Offer: In a competitive bid, the final offer submitted which contains bidder's most favorable terms for price

Bid: An offer or quote submitted by a bidder in a response to a written solicitation

Bidder: A contractor who submits a bid in response to a written solicitation

Breach: Violation of a contractual obligation by failing to perform or repudiation of one's own promise.

Business: Any corporation, partnership, individual, sole proprietorship, joint-stock company, joint venture, or any other private legal entity

Business Day: Any weekday, except State-recognized holidays

Calendar Day: Every day shown on the calendar including Saturdays, Sundays, and State/Federal holidays

Cancellation: To call off or revoke a bid, purchase order or contract without expectation of conducting or performing at a later time

Catalog/Non-Core: A printed or electronic list of products a bidder may provide at a discounted rate or discount off list price to the State. Initial contract award(s) is not based on Catalog/Non-Core items

Central Processing Unit: Any computer or computer system that is used by the State to store, process, or retrieve data or perform other functions using Operating Systems and applications software

Change Order: Document that provides amendments to an executed purchase order

Collusion: An agreement or cooperation between two or more persons or entities to accomplish a fraudulent, deceitful, or unlawful purpose

Commodities: Any equipment, material, supply, or goods; anything movable or tangible that is provided or sold

Commodities Description: Detailed descriptions of the items to be purchased; may include information necessary to obtain the desired quality, type, color, size, shape, or special characteristics necessary to perform the work intended to produce the desired results

Competition: The effort or action of two or more commercial interests to obtain the same business from third parties

Confidential Information: Unless otherwise defined below, "Confidential Information" shall also mean proprietary trade secrets, academic and scientific research work which is in progress and unpublished, and other information which if released would give advantage to business competitors and serve no public purpose (see Neb. Rev. Stat. §84-712.05(3)). In accordance with Nebraska Attorney General Opinions 92068 and 97033, proof that information is proprietary requires identification of specific, named competitor(s) who would be advantaged by release of the information and the specific advantage the competitor(s) would receive

Contract: An agreement between two or more parties creating obligations that are enforceable or otherwise recognizable at law; the writing that sets forth such an agreement

Contract Administration: The management of the contract which includes and is not limited to contract signing, contract amendments and any necessary legal actions

Contract Management: The management of day-to-day activities at the agency which includes and is not limited to ensuring deliverables are received, specifications are met, handling meetings, and making payments to the Bidder

Contract Period: The duration of the contract

Contractor: An individual or entity lawfully conducting business in the State, who seeks or agrees to provide goods or services under the terms of a written contract.
Cooperative Purchasing: The combining of requirements of two or more political entities to obtain advantages of volume purchases, reduction in administrative expenses or other public benefits

Copyright: A property right in an original work of authorship fixed in any tangible medium of expression, giving the holder the exclusive right to reproduce, adapt and distribute the work

Core List: Items specifically listed on the solicitation upon which a bid is evaluated for award.

Critical Program Error: Any Program Error, whether or not known to the State, which prohibits or significantly impairs use of the Licensed Software as set forth in the documentation and intended in the contract

Customer Service: The process of ensuring customer satisfaction by providing assistance and advice on those products or goods provided by a Bidder

Default: The omission or failure to perform a contractual duty

Deviation: Any proposed change(s) or alteration(s) to either the terms and conditions or deliverables within the scope of the written solicitation or contract

Evaluation: The process of examining an offer after opening to determine the bidder's responsibility, responsiveness to requirements, and to ascertain other characteristics of the offer that relate to determination of the successful award

Evaluation Committee: Committee(s) appointed by the requesting agency that advises and assists the procuring office in the evaluation of bids (offers made in response to written solicitations)

Extension: Continuance of a contract for a specified duration upon the agreement of the parties beyond the original Contract Period. Not to be confused with "Renewal Period"

Free on-Board Destination: The delivery charges are included in the quoted price and prepaid by the Bidder. Bidder is responsible for all claims associated with damages during delivery of product

Free on-Board Point of Origin: The delivery charges are not included in the quoted price and are the responsibility of the agency. Agency is responsible for all claims associated with damages during delivery of product

Freight – Pre-Paid and Add: The delivery charges are paid by the shipper and agency pays after receipt of goods when invoiced.

Foreign Corporation: A foreign corporation that was organized and chartered under the laws of another state, government, or country.

Grievance: A complaint about a governmental action or decision related to the solicitation or resultant contract, brought by a bidder who has timely submitted a bid response in connection with the award in question, to AS Materiel Division or another designated agency with the intention of achieving a remedial result

Installation Date: The date when the procedures described in "Installation by Contractor ", and "Installation by State", as found in the solicitation, or contract are completed.

Interested Party: A person, acting in their personal capacity, or an entity entering into a contract or other agreement creating a legal interest therein

Invalid Bid: A bid that does not meet the requirements of the solicitation or cannot be evaluated against the other bids.

Invitation to Bid: A written solicitation utilized for obtaining competitive offers for Services or Goods

Late Bid: An offer received after the Opening Date and Time

Licensed Software Documentation: The user manuals and any other materials in any form or medium customarily provided by the

Bidder to the users of the Licensed Software which will provide the State with sufficient information to operate, diagnose, and maintain the Licensed Software properly, safely, and efficiently

Mandatory: Required, compulsory, or obligatory

May: Discretionary, permitted; used to express possibility

Module (see System): A collection of routines and data structures that perform a specific function of software

Must: See "Mandatory"

National Institute for Governmental Purchasing: National Institute of Governmental Purchasing – Source used for assignment of universal commodity codes to goods and services

Non-core: See "Catalog".

Open Market Purchase: Authorization may be given to an agency to purchase items above direct purchase authority due to the unique nature, price, quantity, location of the using agency, or time limitations by the AS Materiel Division, State Purchasing Bureau

Opening Date and Time: Specified date and time for the public opening of received, labeled, and sealed formal bids

Operating System: The control program in a computer that provides the interface to the computer hardware and peripheral devices, and the usage and allocation of memory resources, processor resources, input/output resources, and security resources

Outsourcing: The contracting out of a business process which an organization may have previously performed internally or has a new need for, to an independent organization from which the process is purchased back

Payroll & Financial Center: Electronic procurement system of record

Performance Bond: An insurance agreement, accompanied by a monetary commitment, by which a third party (the surety) accepts liability and guarantees that the Bidder fulfills any and all obligations under the contract

Platform: A specific hardware and Operating System combination that is different from other hardware and Operating System combinations to the extent that a different version of the Licensed Software product is required to execute properly in the environment established by such hardware and Operating System combination

Point of Contact: The person designated to receive communications and to communicate

Product: Something that is distributed commercially for use or consumption and that is usually (1) tangible personal property, (2) the result of fabrication or processing, and (3) an item that has passed through a chain of commercial distribution before ultimate use or consumption

Program Error: Code in Licensed Software which produces unintended results or actions, or which produces results or actions other than those described in the specifications. A program error includes, without limitation, any Critical Program Error

Program Set: The group of programs and products, including the Licensed Software specified in the solicitation, plus any additional programs and products licensed by the State under the contract for use by the State

Project: The total scheme, program, or method worked out for the accomplishment of an objective, including all documentation, commodities, and goods to be provided under the contract

Proprietary Information: Proprietary information is defined as trade secrets, academic and scientific research work which is in progress and unpublished, and other information which if released would give advantage to business competitors and service no public purpose (see Neb. Rev. Stat. § 84-712.05(3)). In accordance with Attorney General Opinions 92068 and 97033, proof that information is proprietary requires identification of specific named competitor(s) advantaged by release of the information and the demonstrated advantage the named competitor(s) would gain by the release of information

Protest See "Grievance":

Public Bid Opening: The process of opening correctly submitted offers at the time and place specified in the written solicitation and in the presence of anyone who wished to attend

Quote: See "Bid"

Recommended Hardware Configuration: The data processing hardware (including all terminals, auxiliary storage, communication, and other peripheral devices) to the extent utilized by the State as recommended by the Contractor.

Release Date: The date of public release of the written solicitation to seek offers

Renewal Period: Optional contract periods subsequent to the original Contract Period for a specified duration with previously agreed to terms and conditions. Not to be confused with Extension

Request for Information: A general invitation to bidder is requesting information for a potential future solicitation. The RFI is typically used as a research and information gathering tool for preparation of a solicitation

Responsible Bidder: A Bidder who has the capability in all respects to perform fully and lawfully all requirements with integrity and reliability to assure good faith performance

Responsive Bidder: A Bidder who has submitted a bid which conforms to all requirements of the solicitation document

Shall: See "Must"

Should: Expected; suggested, but not necessarily mandatory

Software License: Legal instrument with or without printed material that governs the use or redistribution of licensed software

Sole Source – Commodity: When an item is available from only one source due to the unique nature of the requirement, its contractor, or market conditions

Sole Source – Service: A service of such a unique nature that the contractor selected is clearly and justifiably the only practical source to provide the service. Determination that the contractor selected is justifiably the sole source is based on either the uniqueness of the service or sole availability at the location required

Specifications: The detailed statement, especially of the measurements, quality, materials, and functional characteristics, or other items to be provided under a contract

Statutory: These clauses are controlled by state law and are not subject to negotiation

Subcontractor: Individual or entity with whom the Bidder enters a contract to perform a portion of the work awarded to the bidder

System (see Module): Any collection or aggregation of two (2) or more Modules that is designed to function, or is represented by the Bidder as functioning or being capable of functioning, as an entity

Termination: Occurs when the contract expires or either party, pursuant to a power created by agreement or law puts an end to the contract prior to the stated expiration date. All obligations which are still executory on both sides are discharged but any right based on prior breach or performance survives

Third-Party: Any person or entity, including but not limited to fiduciaries, shareholders, owners, officers, managers, employees, legally disinterested persons, and sub-contractors or agents, and their employees. It shall not include any entity or person who is an interested Party to the contract or agreement

Trade Secret: Information, including, but not limited to, a drawing, formula, pattern, compilation, program, device, method, technique, code, or process that (a) derives independent economic value, actual or potential, from not being known to, and not being ascertainable by proper means by, other persons who can obtain economic value from its disclosure or use; and (b) is the subject of efforts that are reasonable under the circumstances to maintain its secrecy (see Neb. Rev. Stat. § 87-502(4))

Trademark: A word, phrase, logo, or other graphic symbol used by a manufacturer or bidder to distinguish its product from those of others, registered with the U.S. Patent and Trademark Office

Upgrade: Any change that improves or alters the basic function of a product of service

Vendor Performance Report: A report completed by the using agency and submitted to State Purchasing Bureau documenting products or services delivered or performed which exceed or fail to meet the terms of the purchase order, contract, and/or solicitation specifications.

Vendor: Inclusive term for any Bidder or Contractor.

Will: See "Mandatory"

Work Day: See "Business Day"

ACRONYM LIST

ACH – Automated Clearing House

ARO – After Receipt of Order

BAFO – Best and Final Offer

COI – Certificate of Insurance

CPU – Central Processing Unit

DAS – Department of Administrative Services

F.O.B. – Free on Board

ITB – Invitation to Bid

NIGP – National Institute for Governmental Purchasing

PA – Participating Addendum

PCO: Procurement Contracts Officer

POC: Point of Contact

RFI – Request for Information

RFP – Request for Proposal

SPB – State Purchasing Bureau

I. PROCUREMENT PROCEDURE

A. GENERAL INFORMATION

The ITB is designed to solicit bids from qualified Bidders who will be responsible for providing **Transmission Line and Antenna Replacement and Installation for KXNE-FM**. at a competitive and reasonable cost. Terms and Conditions, Project Description and Scope of Work, Bid instructions, and Cost Proposal Requirements may be found in Sections II through VI.

The State may utilize this ITB to procure T**ransmission Line and Antenna Replacement and Installation for KXNE-FM.** following the Intent to Award, provided the Bidders honor and agree to their bids in this ITB.

Bids shall conform to all instructions, conditions, and requirements included in the solicitation. Prospective Bidders are expected to carefully examine all documents, schedules, and requirements in this solicitation, and respond to each requirement in the format prescribed. Bids may be found non-responsive if they do not conform to the solicitation.

By signing the ITB, the Vendor guarantees compliance with the provisions stated in this ITB.

The State reserves the right to reject a Bidder's bid, withdraw an Intent to Award, and terminate a contract...

B. PROCURING OFFICE AND COMMUNICATION WITH STATE STAFF AND EVALUATORS

Procurement responsibilities related to this solicitation reside with SPB. The point of contact (POC) for the procurement is as follows:

Name: Brenda Sensibaugh, PCO
Agency: State Purchasing Bureau
Address: 1526 K Street, Suite 130
Lincoln, NE 68508

Telephone: 402-471-6500

E-Mail: as.materielpurchasing@nebraska.gov

From the date the solicitation is issued until the Intent to Award is issued, communication from the Bidder is limited to the POC listed above. After the Intent to Award is issued, the Bidder may communicate with individuals the State has designated as responsible for negotiating the contract on behalf of the State. No member of the State Government, employee of the State, or member of the Evaluation Committee is empowered to make binding statements regarding this solicitation. The POC will issue any answers, clarifications, or amendments regarding this solicitation in writing. Only the SPB or awarding agency can award a contract. Bidders shall not have any communication with or attempt to communicate or influence any evaluator involved in this solicitation.

The following exceptions to these restrictions are permitted:

1. Contact made pursuant to pre-existing contracts or obligations;
2. Contact required by the schedule of events, or an event scheduled later by POC; and
3. Contact required for negotiation and execution of the final contract.

The State reserves the right to reject a bidder's bid, withdraw an Intent to Award, or terminate a contract if the State determines there has been a violation of these procurement procedures.

C. SCHEDULE OF EVENTS

The State expects to adhere to the procurement schedule shown below, but all dates are approximate and subject to change.

	ACTIVITY	DATE/TIME
1.	Release solicitation	May 3, 2023
2.	Last day to submit written questions. **Upload questions for 6781 OF via ShareFile to:** https://nebraska.sharefile.com/r-rf54afae1c5f34eb3958694d9701f0193	May 15, 2023
3.	State responds to written questions through a solicitation "Addendum" and/or "Amendment" to be posted to the Internet at: https://das.nebraska.gov/materiel/bidopps.html#	May 17, 2023
4.	Electronic Bid Opening via Zoom: **Upload electronic Bid submissions for 6781 OF via Sharefile to:** https://nebraska.sharefile.com/r-r74ca8739d5ce451ab438591dad79dc17 **Zoom Meeting Information:** Topic: 6781 OF, 115622 OR Antenna One Time Purchase Time: May 23, 2023, 02:00 PM Central Time (US and Canada) Join Zoom Meeting https://us02web.zoom.us/j/2629176739?pwd=NkhobXNpOU94UmFmTG1wYmJqTXhpUT09 Meeting ID: 262 917 6739 Passcode: 5VwBuR **IT IS THE BIDDERS' RESPONSIBILITY TO ENSURE ALL BIDS SHALL BE SUBMITTED AND RECEIVED BY THE DATE AND TIME INDICATED IN THE SCHEDULE OF EVENTS FOR EACH BID SUBMITTED.**	May 26, 2023 2:00 PM Central Time
5.	Review for conformance with bid requirements	TBD
6.	Evaluation period	TBD
7.	Post "Notification of Intent to Award" to Internet at: http://das.nebraska.gov/materiel/purchasing.html	TBD
8.	Purchase Order finalization period	TBD
9.	Purchase Order award	TBD
10.	Purchase Order Issuance	TBD

D. WRITTEN QUESTIONS AND ANSWERS

Questions regarding the meaning or interpretation of any solicitation provision must be submitted in writing to SPB and clearly marked "ITB Number 6781 OF; **Transmission Line and Antenna Replacement and Installation for KXNE-FM.** Questions". POC is not obligated to respond to questions that are received late per the Schedule of Events.

Questions should be uploaded to ShareFile at:
https://nebraska.sharefile.com/r-rf54afae1c5f34eb3958694d9701f0193

Bidders should present, as questions, any assumptions upon which the Bidder's bid is or might be developed. Bids will be evaluated without consideration of any known or unknown assumptions of a Bidder. The contract will not incorporate any known or unknown assumptions of a Bidder.

It is preferred that questions be sent via e-mail to as.materielpurchasing@nebraska.gov, but may be delivered by hand or by U.S. Mail. It is recommended that Bidders submit questions using the following format.

Solicitation Section Reference	Solicitation Page Number	Question

Written answers will be posted at http://das.nebraska.gov/materiel/purchasing.html per the Schedule of Events.

E. SECRETARY OF STATE/TAX COMMISSIONER REGISTRATION REQUIREMENTS (Statutory)

All Bidders must be authorized to transact business in the State and comply with all Nebraska Secretary of State Registration requirements. The Bidder who is the recipient of an Intent to Award will be required to certify that it has complied and produce a true and correct copy of its current (within ninety (90) calendar days of the intent to award) Certificate or Letter of Good Standing, or in the case of a sole proprietorship, provide written documentation of sole proprietorship and the United States Citizenship Attestation Form, available on the DAS website at: http://das.nebraska.gov/materiel/purchasing.html. This must be accomplished prior to execution of the contract.

F. ETHICS IN PUBLIC CONTRACTING

The State reserves the right to reject bids, withdraw an intent to award or award, or terminate a contract if a Bidder commits or has committed ethical violations, which include, but are not limited to:

1. Offering or giving, directly or indirectly, a bribe, fee, commission, compensation, gift, gratuity, or anything of value to any person or entity in an attempt to influence the bidding process;
2. Utilize the services of lobbyists, attorneys, political activists, or consultants to influence or subvert the bidding process;
3. Being considered for, presently being, or becoming debarred, suspended, ineligible, or excluded from contracting with any state or federal entity:
4. Submitting a bid on behalf of another party or entity;
5. Collude with any person or entity to influence the bidding process, submit sham bids, preclude bidding, fix pricing or costs, create an unfair advantage, subvert the bid, or prejudice the State.

The Bidder shall include this clause in any subcontract entered into for the exclusive purpose of performing this contract.

Bidder shall have an affirmative duty to report any violations of this clause by the Bidder throughout the bidding process, and throughout the term of this contract for the successful Bidder and their subcontractors.

G. DEVIATIONS FROM THE INVITATION TO BID

The requirements contained in the solicitation (Sections II through VI) become a part of the terms and conditions of the contract resulting from this solicitation. Any deviations from the solicitation in Sections II through VI must be clearly defined by the Bidder in its bid and, if accepted by the State, will become part of the contract. Any specifically defined deviations must not be in conflict with the basic nature of the solicitation, solicitation requirements, or applicable state or federal laws or statutes. "Deviation", for the purposes of this solicitation, means any proposed changes or alterations to either the contractual language or deliverables within the scope of this solicitation. The State discourages deviations and reserves the right to reject proposed deviations.

H. ELECTRONIC SUBMISSION OF BIDS

All bids must be submitted to SPB in the matter set forth below. It is the Bidder's responsibility to submit the Electronic Bid(s) and be received by the date and time of the Bid Opening indicated in the Schedule of Events. The State is not responsible for bids that are late or lost, regardless of cause (e.g., hardware, software, or electronic failure) or fault. Late bids will not be accepted.

1. UPLOADING ELECTRONIC BID(S) TO SHAREFILE
(SUBMITTED DOCUMENTS MUST NOT BE PASSWORD PROTECTED)

a. Bidders should upload bid(s) via ShareFile to:
https://nebraska.sharefile.com/r-r74ca8739d5ce451ab438591dad79dc17

b. Each bid will have an individual ShareFile link. **Bidders must sure to upload their Bid(s) to the correct ShareFile link.**

c. Not all browsers are compatible with ShareFile. Currently Chrome, Internet Explorer and Firefox are compatible, but Microsoft Edge is not.

d. **After the bidder clicks the bid submission link, the bidder will be prompted to enter contact information including an e-mail address so that the bidder will receive a confirmation email confirming the successful upload directly from ShareFile.**

e. If it is the bidder's intent to submit multiple bids, the bidder must clearly identify each submission separately (see "Electronic ITB File Names" below).

f. The Bidder is solely responsible for any variance between the copies submitted.

g. If multiple bids are submitted, the State will retain only the most recently submitted bid.

h. Any **Proprietary information** (if applicable) should be uploaded as separate and distinct files.

i. **Do not submit bid file(s) more than 30 days prior to the Bid Opening. Once uploaded the bid documents are only available for 30 days.**

2. ELECTRONIC ITB FILE NAMES

a. The Bidder should clearly identify the uploaded Bid files.

b. **DO NOT ADD any language to the naming conventions below**. Long titles can make the files difficult to work with.

c. **If the bidder submits the bid/bid documents as one (1) complete packet (preferred method), please use the following naming convention:**

- 6781 OF **Transmission Line and Antenna Replacement and Installation for KXNE-FM** NAME OF BIDDER Bid.

d. **If the bidder submits the bid/bid documents as separate files, please use the following naming convention(s):**

- 6781 OF T**ransmission Line and Antenna Replacement and Installation for KXNE-FM** NAME OF BIDDER Bid/File 1/File 2, etc.…

e. **If multiple bids are submitted for the same ITB number and Attachment, follow the same naming convention as letter "e", for example:**

- 6781 OF T**ransmission Line and Antenna Replacement and Installation for KXNE-FM** NAME OF BIDDER Bid 2/Bid 2 File 1/Bid 2 File 2, etc...

SPB will **ONLY** accept bids by mail, email, voice, or telephone for one-time purchases under $50,000.00.

It is the responsibility of the Bidder to check the website often at https://das.nebraska.gov/materiel/bidopps.html for all information relevant to this ITB to include Addenda issued prior to the Opening Date and Time.

I. BID PREPARATION COSTS

The State shall not incur any liability for any costs incurred by Bidders in replying to this solicitation, including any activity related to bidding on this solicitation.

J. FAILURE TO COMPLY WITH INVITATION TO BID

Violation of the terms and conditions contained in this solicitation or any resultant contract, at any time before or after the award, shall be grounds for action by the State which may include, but is not limited to, the following:

1. Rejection of a Bidder's bid;
2. Withdrawal of the Intent to Award;
3. Withdrawal of the Award;
4. Negative Vendor Performance Report(s)
5. Termination of the resulting contract;
6. Legal action; or,
7. Suspension of the Bidder from further bidding with the State for the period of time relative to the seriousness of the violation, such period to be within the sole discretion of the State.

K. BID CORRECTIONS

A bidder may correct a mistake in a bid prior to the time of opening by giving written notice to the State of intent to withdraw the bid for modification or to withdraw the bid completely. Changing a bid after opening may be permitted if the change is made to correct a minor error that does not affect price, quantity, quality, delivery, or contractual conditions. In case of a mathematical error in extension of price, unit price shall govern.

L. LATE BIDS

Bids received after the time and date of the bid opening will be considered late bids. Late bids will be returned unopened, if requested by the Bidder and at Bidder's expense. The State is not responsible for bids that are late or lost regardless of cause or fault.

M. BID OPENING

Anyone may attend the opening. It is considered a public opening. The Buyer will read the names of the respondents. Depending upon the complexity of the bid for goods, the buyer may read the bids aloud or allow bids be available for viewing by the public during the bid opening. Once the bid opening has concluded, the bids will not be available for viewing until the Intent to Award has been posted. An initial bid tabulation will be posted to the website as soon as feasible. Information identified as proprietary by the submitting Bidder, in accordance with the solicitation and state statute, will not be posted. If the state determines submitted information should not be withheld, in accordance with the Public Records Act, or if ordered to release any withheld information, said information may then be released. The submitting Bidder will be notified of the release and it shall be the obligation of the submitting Bidder to take further action if it believes the information should not be released.

N. ITB REQUIREMENTS

The bids will first be examined to determine if all requirements listed below have been addressed and whether further evaluation is warranted. Bids not meeting the requirements may be rejected as non-responsive. The requirements are:

1. Original Commodity ITB form signed using an indelible method (electronic signatures are acceptable);
2. Clarity and responsiveness of the bid;
3. Completed Sections II through VI;
4. Completed ITB Form or State's Cost Sheet.

O. EVALUATION OF BIDS

All bids that are responsive to the solicitation will be evaluated based on the following:

Neb. Rev. Stat. §81-161 allows the quality of performance of previous contracts to be considered when evaluating responses to competitively bid solicitations in determining the lowest responsible bidder. Information obtained from any Vendor Performance Report (See Terms & Conditions, Section H) may be used in evaluating responses to solicitations for goods and services to determine the best value for the State.

Neb. Rev. Stat. §73-107 allows for a preference for a resident disabled veteran or business located in a designated enterprise zone. When a state contract is to be awarded to the lowest responsible contractor, a resident disabled veteran or a business located in a designated enterprise zone under the Enterprise Zone Act shall be allowed a preference over any other resident or nonresident contractor, if all other factors are equal.

Resident disabled veterans means any person (a) who resides in the State of Nebraska, who served in the United States Armed Forces, including any reserve component or the National Guard, who was discharged or otherwise separated with a characterization of honorable or general (under honorable conditions), and who possesses a disability rating letter issued by the United States Department of Veterans Affairs establishing a service-connected disability or a disability determination from the United States Department of Defense and (b)(i) who owns and controls a business or, in the case of a publicly owned business, more than fifty percent of the stock is owned by one or more persons described in subdivision (a) of this subsection and (ii) the management and daily business operations of the business are controlled by one or more persons described in subdivision(a) of this subsection. Any contract entered into without compliance with this section shall be null and void.

Therefore, if a resident disabled veteran or business located in a designated enterprise zone submits a proposal in accordance with Neb. Rev. Stat. §73-107 and has so indicated on the ITB cover page under "Contractor must complete the following" requesting priority/preference to be considered in the award of this contract, the following will need to be submitted by the contractor within ten (10) business days of request:

1. Documentation from the United States Armed Forces confirming service;
2. Documentation of discharge or otherwise separated characterization of honorable or general (under honorable conditions);
3. Disability rating letter issued by the United States Department of Veterans Affairs establishing a service-connected disability or a disability determination from the United States Department of Defense; and
4. Documentation which shows ownership and control of a business or, in the case of a publicly owned business, more than fifty percent of the stock is owned by one or more persons described in subdivision (a) of this subsection; and the management and daily business operations of the business are controlled by one or more persons described in subdivision (a) of this subsection.

Failure to submit the requested documentation within ten (10) business days of notice will disqualify the contractor from consideration of the preference.

P. BEST AND FINAL OFFER

If BAFO's are requested by the State and submitted by the bidder, they will be evaluated (using the stated BAFO criteria) and ranked by the Evaluation Committee. The State reserves the right to conduct more than one BAFO. The award will then be granted to the lowest responsible bidder. However, a bidder should provide its best offer in its original bid. Bidders should not expect that the State will request a BAFO.

Q. REFERENCE AND CREDIT CHECKS

The State reserves the right to conduct and consider reference and credit checks. The State reserves the right to use third parties to conduct reference and credit checks. By submitting a bid in response to this solicitation, the bidder grants to the State the right to contact or arrange a visit in person with any or all of the bidder's clients. Reference and credit checks may be grounds to reject a bid, withdraw an intent to award, or rescind the award of a contract.

R. AWARD

The State reserves the right to evaluate bids and award contracts in a manner utilizing criteria selected at the State's discretion and in the State's best interest. After evaluation of the bids, or at any point in the solicitation process, the State of Nebraska may take one or more of the following actions:

1. Amend the solicitation;
2. Extend the time of or establish a new bid opening time;
3. Waive deviations or errors in the State's solicitation process and in bidder bids that are not material, do not compromise the solicitation process or a bidder's bid, and do not improve a bidder's competitive position;
4. Accept or reject a portion of or all of a bid;
5. Accept or reject all bids;
6. Withdraw the solicitation;
7. Elect to rebid the solicitation;
8. Award single lines or multiple lines to one or more bidders; or,
9. Award one or more all-inclusive contracts.

The State of Nebraska may consider, but is not limited to considering, one or more of the following award criteria:

1. Price;
2. Location;
3. Quality;
4. Delivery time;
5. Contractor qualifications and capabilities;
6. State contract management requirements and/or costs; and,

The solicitation does not commit the State to award a contract. Once intent to award decision has been determined, it will be posted to the Internet at:
http://das.nebraska.gov/materiel/purchasing.html

Any protests must be filed by a contractor within ten (10) business days after the intent to award decision is posted to the Internet. Grievance and protest procedure is available on the Internet at:
http://das.nebraska.gov/materiel/purchasing.html

S. SPECIFICATIONS

Any manufacturer's names, trade names, brand names, information and/or catalog numbers listed in a specification are for reference and not intended to limit competition but will be used as the standard by which equivalent material offered will be judged. The Materiel Administrator will be the sole judge of equivalency. The Bidder may offer any brands which meets or exceeds the specification. When a specific product is required, the solicitation will so state. Any item bid is to be the latest current model under standard production at the time of order. No used or refurbished equipment will be accepted, unless otherwise stated.

T. ALTERNATE/EQUIVALENT BIDS

Bidder may offer bids which are at variance from the express specifications of the solicitation. The State reserves the right to consider and accept such bids if, in the judgment of the Materiel Administrator, the bid will result in goods and/or services equivalent to or better than those which would be supplied in the original bid specifications. Bidder must indicate on the solicitation the manufacturer's name, number and shall submit with their bid, sketches, descriptive literature and/or complete specifications. Reference to literature submitted with a previous bid will not satisfy this provision. Bids which do not comply with these requirements are subject to rejection. In the absence of any stated deviation or exception, the proposal will be accepted as in strict compliance with all terms, conditions and specification, and the Bidder shall be held liable, therefore.

U. LUMP SUM OR" ALL OR NONE" BIDS

The State reserves the right to purchase item-by-item, by groups or as a total when the State may benefit by so doing. Bidders may submit a bid on an "all or none" or "lump sum" basis but should also submit a bid on an item-by-item basis. The term "all or none" means a conditional bid which requires the purchase of all items on which bids are offered and Bidder declines to accept award on individual items; a "lump sum" bid is one in which the Contractor offers a lower price than the sum of the individual proposals if all items are purchased but agrees to deliver individual items at the prices quoted.

V. EMAIL SUBMISSIONS

SPB will not accept bids by email, electronic, voice, or telephone proposals **except** for one-time purchases under $50,000.00.

W. BID TABULATIONS

Bid tabulations are available on the website at DAS Website: Materiel (nebraska.gov).

X. REJECTION OF BIDS

The State reserves the right to reject any or all bids, wholly or in part, in the best interest of the State.

Y. RESIDENT BIDDER

Pursuant to Neb. Rev. Stat. §§ 73-101.01 through 73-101.02, a Resident Bidder shall be allowed a preference against a Non-resident Bidder from a state which gives or requires a preference to Bidders from that state. The preference shall be equal to the preference given or required by the state of the Nonresident Bidders. Where the lowest responsible bid from a resident Bidder is equal in all respects to one from a nonresident Bidder from a state which has no preference law, the resident Bidder shall be awarded the contract. The provision of this preference shall not apply to any contract for any project upon which federal funds would be withheld because of the provisions of this preference.

II. TERMS AND CONDITIONS

Bidders should complete Section II through VI as part of their bid. Bidder is expected to read the Terms and Conditions and must initial either accept, reject, or reject and provide alternative language for each clause. The Bidder should also provide an explanation of why the Bidder rejected the clause or rejected the clause and provided alternate language using "Track Changes". Upon request an electronic copy of the bid with "Track Changes" must be submitted in an editable Word format. By signing the solicitation, Bidder is agreeing to be legally bound by all the accepted terms and conditions, and any proposed alternative terms and conditions submitted with the bid. The State reserves the right to negotiate rejected or proposed alternative language. If the State and Bidder fail to agree on the final Terms and Conditions, the State reserves the right to reject the bid. The State is soliciting bids in response to the solicitation. The State reserves the right to reject bids that attempt to substitute the Bidder's commercial contracts and/or documents for this solicitation.

The Bidder should submit with their proposal any license, user agreement, service level agreement, or similar documents that the Bidder wants incorporated in the Contract. Upon notice of Intent to Award, the Bidder must submit a copy of these documents in an editable Word format. The State will not consider incorporation of any document not submitted with the Bidder's bid. These documents shall be subject to negotiation and will be incorporated as addendums if agreed to by the Parties.

If a conflict or ambiguity arises after the addendums have been negotiated and agreed to, the addendums shall be interpreted as follows:

1. If only one (1) Party's document has a particular clause, then that clause shall control;
2. If both Party's documents have a similar clause, but the clauses do not conflict, the clauses shall be read together;
3. If both Party's documents have a similar clause, but the clauses conflict, the State's clause shall control.

A. GENERAL

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:
WAP			

The contract resulting from this solicitation shall incorporate the following documents:

1. Invitation to Bid and Addenda;
2. Amendments to the solicitation;
3. Questions and Answers;
4. Bidders bid response;
5. The executed Contract and any Addenda, if applicable, and properly submitted documents; and,
6. Amendments to the Contract

These documents constitute the entirety of the contract.

Unless otherwise specifically stated in a future contract amendment, in case of any conflict between the incorporated documents, the documents shall govern in the following order of preference with number one (1) receiving preference over all other documents and with each lower numbered document having preference over any higher numbered document: 1) Amendment to the executed Contract with the most recent dated amendment having the highest priority, 2) executed Contract and any attached Addenda, 3) Amendments to solicitation and any Questions and Answers, 4) the original solicitation document and any Addenda, and 5) the Bidder's submitted Bid.

Any ambiguity or conflict in the contract discovered after its execution, not otherwise addressed herein, shall be resolved in accordance with the rules of contract interpretation as established in the State.

B. **NOTIFICATION**

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:
MAH			

Communications regarding the executed contract shall be in writing and shall be deemed to have been given if delivered personally or mailed, by U.S. Mail, postage prepaid, return receipt requested, to the parties at their respective addresses, or at such other addresses as may be specified in writing by either of the parties. All notices, requests, or communications shall be deemed effective upon personal delivery or five (5) calendar days following deposit in the mail.

Contractor Contract Manager	Brian Zittlau
Contractor	Nebraska Educational Telecommunications Commission
Contractor Street Address	1800 N 33rd St.
Contractor City, State, Zip	Lincoln, NE 68503

Either party may change its address for notification purposes by giving notice of the change and setting forth the new address and an effective date.

C. **PCO REPRESENTATIVE**

The State reserves the right to appoint a PCO's Representative to manage [or assist the PCO in managing] the contract on behalf of the State. The PCO's Representative will be appointed in writing, and the appointment document will specify the extent of the PCO's Representative authority and responsibilities. If a PCO's Representative is appointed, the Bidder will be provided a copy of the appointment document and is expected to cooperate accordingly with the PCO's Representative. The PCO's Representative has no authority to bind the State to a contract, amendment, addendum, or other change or addition to the contract.

D. **GOVERNING LAW (Statutory)**

Notwithstanding any other provision of this contract, or any amendment or addendum(s) entered into contemporaneously or at a later time, the parties understand and agree that, (1) the State of Nebraska is a sovereign state and its authority to contract is therefore subject to limitation by the State's Constitution, statutes, common law, and regulation; (2) this contract will be interpreted and enforced under the laws of the State of Nebraska; (3) any action to enforce the provisions of this contract must be brought in the State of Nebraska per state law; (4) the person signing this contract on behalf of the State of Nebraska does not have the authority to waive the State's sovereign immunity, statutes, common law, or regulations; (5) the indemnity, limitation of liability, remedy, and other similar provisions of the final contract, if any, are entered into subject to the State's Constitution, statutes, common law, regulations, and sovereign immunity; and, (6) all terms and conditions of the final contract, including but not limited to the clauses concerning third-party use, licenses, warranties, limitations of liability, governing law and venue, usage verification, indemnity, liability, remedy or other similar provisions of the final contract are entered into specifically subject to the State's Constitution, statutes, common law, regulations, and sovereign immunity.

The Parties must comply with all applicable local, state, and federal laws, ordinances, rules, orders, and regulations.

E. **BEGINNING OF WORK**

The Bidder shall not commence any billable work until a valid contract has been fully executed by the State and the successful Bidder. The Bidder will be notified in writing when work may begin.

F. **AMENDMENT**

This Contract may be amended in writing, within scope, upon the agreement of both parties.

G. CHANGE ORDERS OR SUBSTITUTIONS

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

The State and the Bidder, upon the written agreement, may make changes to the contract within the general scope of the solicitation. Changes may involve specifications, the quantity of work, or such other items as the State may find necessary or desirable. Corrections of any deliverable, service, or work required pursuant to the contract shall not be deemed a change. The Bidder may not claim forfeiture of the contract by reasons of such changes.

The Bidder shall prepare a written description of the work required due to the change and an itemized cost sheet for the change. Changes in work and the amount of compensation to be paid to the Bidder shall be determined in accordance with applicable unit prices if any, a pro-rated value, or through negotiations. The State shall not incur a price increase for changes that should have been included in the Bidder's bid, were foreseeable, or result from difficulties with or failure of the Bidder's bid or performance.

No change shall be implemented by the Bidder until approved by the State, and the Contract is amended to reflect the change and associated costs, if any. If there is a dispute regarding the cost, but both parties agree that immediate implementation is necessary, the change may be implemented, and cost negotiations may continue with both Parties retaining all remedies under the contract and law.

*****Bidder will not substitute any item that has been awarded without prior written approval of SPB*****

H. VENDOR PERFORMANCE REPORT(S)

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

The State may document any instance(s) of products or services delivered or performed which exceed or fail to meet the terms of the purchase order, contract, and/or solicitation specifications. The State Purchasing Bureau may contact the Vendor regarding any such report. Vendor performance report(s) will become a part of the permanent record of the Vendor.

I. NOTICE OF POTENTIAL BIDDER BREACH

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

If Bidder breaches the contract or anticipates breaching the contract, the Bidder shall immediately give written notice to the State. The notice shall explain the breach or potential breach, a proposed cure, and may include a request for a waiver of the breach if so desired. The State may, in its discretion, temporarily or permanently waive the breach. By granting a waiver, the State does not forfeit any rights or remedies to which the State is entitled by law or equity, or pursuant to the provisions of the contract. Failure to give immediate notice, however, may be grounds for denial of any request for a waiver of a breach.

J. **BREACH**

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

Either Party may terminate the contract, in whole or in part, if the other Party breaches its duty to perform its obligations under the contract in a timely and proper manner. Termination requires written notice of default and a thirty (30) calendar day (or longer at the non-breaching Party's discretion considering the gravity and nature of the default) cure period. Said notice shall be delivered by Certified Mail, Return Receipt Requested, or in person with proof of delivery. Allowing time to cure a failure or breach of contract does not waive the right to immediately terminate the contract for the same or different contract breach which may occur at a different time.

In case of breach by the Bidder, the State may, without unreasonable delay, make a good faith effort to make a reasonable purchase or contract to purchased goods in substitution of those due from the contractor. The State may recover from the Bidder as damages the difference between the costs of covering the breach. Notwithstanding any clause to the contrary, the State may also recover the contract price together with any incidental or consequential damages defined in UCC Section 2-715, but less expenses saved in consequence of Bidder's breach. OR In case of default of the Bidder, the State may contract the service from other sources and hold the Bidder responsible for any excess cost occasioned thereby.

The State's failure to make payment shall not be a breach, and the Bidder shall retain all available statutory remedies. (See Indemnity - Self-Insurance and Payment)

K. **NON-WAIVER OF BREACH**

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

The acceptance of late performance with or without objection or reservation by a Party shall not waive any rights of the Party nor constitute a waiver of the requirement of timely performance of any obligations remaining to be performed.

L. **SEVERABILITY**

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

If any term or condition of the contract is declared by a court of competent jurisdiction to be illegal or in conflict with any law, the validity of the remaining terms and conditions shall not be affected, and the rights and obligations of the parties shall be construed and enforced as if the contract did not contain the provision held to be invalid or illegal.

M. INDEMNIFICATION

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:
WK			

1. GENERAL

The Bidder agrees to defend, indemnify, and hold harmless the State and its employees, volunteers, agents, and its elected and appointed officials ("the indemnified parties") from and against any and all claims, liens, demands, damages, liability, actions, causes of action, losses, judgments, costs, and expenses of every nature, including investigation costs and expenses, settlement costs, and attorney fees and expenses ("the claims"), sustained or asserted against the State for personal injury, death, or property loss or damage, arising out of, resulting from, or attributable to the willful misconduct, negligence, error, or omission of the Bidder, its employees, Subcontractors, consultants, representatives, and agents, resulting from this contract, except to the extent such Bidder liability is attenuated by any action of the State which directly and proximately contributed to the claims.

2. PERSONNEL

The Bidder shall, at its expense, indemnify and hold harmless the indemnified parties from and against any claim with respect to withholding taxes, worker's compensation, employee benefits, or any other claim, demand, liability, damage, or loss of any nature relating to any of the personnel, including subcontractor's and their employees, provided by the Bidder.

3. SELF-INSURANCE (Statutory)

The State is self-insured for any loss and purchases excess insurance coverage pursuant to Neb. Rev. Stat. § 81-8,239.01 (Reissue 2008). If there is a presumed loss under the provisions of this contract, Bidder may file a claim with the Office of Risk Management pursuant to Neb. Rev. Stat. §§ 81-8,829 through 81-8,306 for review by the State Claims Board. The State retains all rights and immunities under the State Miscellaneous (Section 81-8,294), Tort (Section 81-8,209), and Contract Claim Acts (Section 81-8,302), as outlined in Neb. Rev. Stat. § 81-8,209 et seq. and under any other provisions of law and accepts liability under this contract to the extent provided by law.

N. ATTORNEY'S FEES

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:
WK			

In the event of any litigation, appeal, or other legal action to enforce any provision of the contract, the Parties agree to pay all expenses of such action, as permitted by law and if ordered by the court, including attorney's fees and costs, if the other party prevails.

O. ASSIGNMENT, SALE, OR MERGER

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:
MK			

Either party may assign the contract upon mutual written agreement of the other party. Such agreement shall not be unreasonably withheld.

The Bidder retains the right to enter into a sale, merger, acquisition, internal reorganization, or similar transaction involving Bidder's business. Bidder agrees to cooperate with the State in executing amendments to the contract to allow for the transaction. If a third party or entity is involved in the transaction, the Bidder will remain responsible for performance of the contract until such time as the person or entity involved in the transaction agrees in writing to be contractually bound by this contract and perform all obligations of the contract.

P. CONTRACTING WITH OTHER POLITICAL SUB-DIVISIONS OF THE STATE OR ANOTHER STATE

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:
MK			

The Bidder may, but shall not be required to, allow agencies, as defined in Neb. Rev. Stat. § 81-145, to use this contract. The terms and conditions, including price, of the contract may not be amended. The State shall not be contractually obligated or liable for any contract entered into pursuant to this clause.

The Bidder may, but shall not be required to, allow other states, agencies or divisions of other states, or political subdivisions of other states to use this contract. The terms and conditions, including price, of this contract shall apply to any such contract, but may be amended upon mutual consent of the Parties. The State of Nebraska shall not be contractually or otherwise obligated or liable under any contract entered into pursuant to this clause. The State shall be notified if a contract is executed based upon this contract.

Q. FORCE MAJEURE

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:
MK			

Neither party shall be liable for any costs or damages, or for default resulting from its inability to perform any of its obligations under the contract due to a natural or man-made event outside the control and not the fault of the affected party ("Force Majeure Event"). The Party so affected shall immediately make a written request for relief to the other party and shall have the burden of proof to justify the request. The other Party may granted the relief requested; relief may not be unreasonably withheld. Labor disputes with the impacted party's own employees will not be considered a Force Majeure Event.

R. CONFIDENTIALITY

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:
			

All materials and information provided by the Parties or acquired by a Party on behalf of the other Party shall be regarded as confidential information. All materials and information provided or acquired shall be handled in accordance with federal and state law, and ethical standards. Should said confidentiality be breached by a Party, the Party shall notify the other Party immediately of said breach and take immediate corrective action.

It is incumbent upon the Parties to inform their officers and employees of the penalties for improper disclosure imposed by the Privacy Act of 1974, 5 U.S.C. 552a. Specifically, 5 U.S.C. 552a (i)(1), which is made applicable by 5 U.S.C. 552a (m)(1), provides that any officer or employee, who by virtue of his/her employment or official position has possession of or access to agency records which contain individually identifiable information, the disclosure of which is prohibited by the Privacy Act or regulations established thereunder, and who knowing that disclosure of the specific material is prohibited, willfully discloses the material in any manner to any person or agency not entitled to receive it, shall be guilty of a misdemeanor and fined not more than $5,000.

III. BIDDER DUTIES

A. INDEPENDENT BIDDER / OBLIGATIONS

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

It is agreed that the Bidder is an independent contractor and that nothing contained herein is intended or should be construed as creating or establishing a relationship of employment, agency, or a partnership.

The Bidder is solely responsible for fulfilling the contract. The Bidder or the Bidder's representative shall be the sole point of contact regarding all contractual matters.

The Bidder shall secure, at its own expense, all personnel required to perform the services under the contract. The personnel the Bidder uses to fulfill the contract shall have no contractual or other legal relationship with the State; they shall not be considered employees of the State and shall not be entitled to any compensation, rights, or benefits from the State, including but not limited to, tenure rights, medical and hospital care, sick and vacation leave, severance pay, or retirement benefits.

By-name personnel commitments made in the Bidder's bid shall not be changed without the prior written approval of the State. Replacement of these personnel, if approved by the State, shall be with personnel of equal or greater ability and qualifications.

The Bidder warrants that all persons assigned to the project shall be employees of the Bidder or a Subcontractor and shall be fully qualified to perform the work required herein. Personnel employed by the Bidder or a subcontractor to fulfill the terms of the contract shall remain under the sole direction and control of the Bidder or the subcontractor respectively.

With respect to its employees, the Bidder agrees to be solely responsible for the following:

1. Any and all pay, benefits, and employment taxes and/or other payroll withholding;
2. Any and all vehicles used by the Bidder's employees, including all insurance required by state law;
3. Damages incurred by Bidder's employees within the scope of their duties under the contract;
4. Maintaining Workers' Compensation and health insurance that complies with state and federal law and submitting any reports on such insurance to the extent required by governing law;
5. Determining the hours to be worked and the duties to be performed by the Bidder's employees; and,
6. All claims on behalf of any person arising out of employment or alleged employment (including without limit claims of discrimination alleged against the Bidder, its officers, agents, or subcontractors or subcontractor's employees).

If the Bidder intends to utilize any subcontractor, the Subcontractor's level of effort, tasks, and time allocation must be clearly defined in the Bidder's bid. The Bidder shall agree that it will not utilize any Subcontractors not specifically included in its bid in the performance of the contract without the prior written authorization of the State.

The State reserves the right to require the Bidder to reassign or remove from the project any Bidder or Subcontractor employee.

Bidder shall insure that the terms and conditions contained in any contract with a sub-contractor does not conflict with the terms and conditions of this contract.

The Bidder shall include a similar provision, for the protection of the State, in the contract with any Subcontractor engaged to perform work on this contract.

B. EMPLOYEE WORK ELIGIBILITY STATUS

The Bidder is required and hereby agrees to use a federal immigration verification system to determine the work eligibility status of employees physically performing work within the State. A federal immigration verification system means the electronic verification of the work authorization program authorized by the Illegal Immigration Reform and Immigrant Responsibility Act of 1996, 8 U.S.C. 1324a, known as the E-Verify Program, or an equivalent federal program designated by the United States Department of Homeland Security or other federal agency authorized to verify the work eligibility status of an employee.

If the Bidder is an individual or sole proprietorship, the following applies:

1. The Bidder must complete the United States Citizenship Attestation Form, available on the DAS website at http://das.nebraska.gov/materiel/purchasing.html

The completed United States Attestation Form should be submitted with the solicitation response.

2. If the Bidder indicates on such attestation form that he or she is a qualified alien, the Bidder agrees to provide the U.S. Citizenship and Immigration Services documentation required to verify the Bidder's lawful presence in the United States using the Systematic Alien Verification for Entitlements (SAVE) Program.

3. The Bidder understands and agrees that lawful presence in the United States is required, and the Bidder may be disqualified, or the contract terminated if such lawful presence cannot be verified as required by Neb. Rev. Stat. § 4-108.

C. COMPLIANCE WITH CIVIL RIGHTS LAWS AND EQUAL OPPORTUNITY EMPLOYMENT / NONDISCRIMINATION (Statutory)

The Bidder shall comply with all applicable local, state, and federal statutes and regulations regarding civil rights laws and equal opportunity employment. The Nebraska Fair Employment Practice Act prohibits Bidders of the State, and their Subcontractors, from discriminating against any employee or applicant for employment, with respect to hire, tenure, terms, conditions, compensation, or privileges of employment because of race, color, religion, sex, disability, marital status, or national origin (Neb. Rev. Stat. §§ 48-1101 through 48-1125). The Bidder guarantees compliance with the Nebraska Fair Employment Practice Act, and breach of this provision shall be regarded as a material breach of contract. The Bidder shall insert a similar provision in all Subcontracts for goods or services to be covered by any contract resulting from this solicitation.

D. COOPERATION WITH OTHER BIDDERS

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:
MAR			

Bidder may be required to work with or in close proximity to other contractors or individuals that may be working on the same or different projects. The Bidder shall agree to cooperate with such other contractors or individuals and shall not commit or permit any act which may interfere with the performance of work by any other contractor or individual. Bidder is not required to compromise Bidder's intellectual property or proprietary information unless expressly required to do so by this contract.

E. DISCOUNTS

Prices quoted shall be inclusive of ALL trade discounts. Cash discount terms of less than thirty (30) days will not be considered as part of the bid. Cash discount periods will be computed from the date of receipt of a properly executed claim voucher or the date of completion of delivery of all items in a satisfactory condition, whichever is later.

F. PRICES

Prices quoted shall be net, F.O.B. Destination – Pre-Paid and Add for transportation and delivery charges to the destination named in the solicitation. No additional charges will be allowed for packing, packages, or partial delivery costs. When an arithmetic error has been made in the extended total, the unit price will govern. All prices, costs, and terms and conditions submitted in the proposal shall remain fixed and valid commencing on the opening date of the proposal until an award is made or the solicitation is cancelled.
All prices, costs, and terms and conditions submitted in the bid shall remain fixed and valid commencing on the opening date of the bid until an award is made or the solicitation is cancelled.

The State reserves the right to deny any requested price increase. No price increases are to be billed to any State Agencies prior to written amendment of the contract by the parties.

The State will be given full proportionate benefit of any decreases for the term of the contract.

G. COST CLARIFICATION

The State reserves the right to review all aspects of cost for reasonableness and to request clarification of any bid where the cost component shows significant and unsupported deviation from industry standards or in areas where detailed pricing is required.

H. PERMITS, REGULATIONS, LAWS

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

The contract price shall include the cost of all royalties, licenses, permits, and approvals, whether arising from patents, trademarks, copyrights or otherwise, that are in any way involved in the contract. The Bidder shall obtain and pay for all royalties, licenses, and permits, and approvals necessary for the performance of the contract. The Bidder must guarantee that it has the full legal right to the materials, supplies, equipment, software, and other items used to execute this contract.

I. INSURANCE REQUIREMENTS

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

The Bidder shall throughout the term of the contract maintain insurance as specified herein and provide the State a current Certificate of Insurance/Accord Form (COI) verifying the coverage. The Bidder shall not commence work on the contract until the insurance is in place. If Bidder subcontracts any portion of the Contract the Bidder must, throughout the term of the contract, either:

1. Provide equivalent insurance for each subcontractor and provide a COI verifying the coverage for the subcontractor;
2. Require each subcontractor to have equivalent insurance and provide written notice to the State that the Bidder has verified that each subcontractor has the required coverage; or,
3. Provide the State with copies of each subcontractor's Certificate of Insurance evidencing the required coverage.

The Bidder shall not allow any Subcontractor to commence work until the Subcontractor has equivalent insurance. The failure of the State to require a COI, or the failure of the Bidder to provide a COI or require subcontractor insurance shall not limit, relieve, or decrease the liability of the Bidder hereunder.

In the event that any policy written on a claims-made basis terminates or is canceled during the term of the contract or with in one (1) years of termination or expiration of the contract, the bidder shall obtain an extended discovery or reporting period, or a new insurance policy, providing coverage required by this contract for the term of the contract and one (1) years following termination or expiration of the contract.

If by the terms of any insurance a mandatory deductible is required, or if the Bidder elects to increase the mandatory deductible amount, the Bidder shall be responsible for payment of the amount of the deductible in the event of a paid claim.

Notwithstanding any other clause in this Contract, the State may recover up to the liability limits of the insurance policies required herein.

1. WORKERS' COMPENSATION INSURANCE

The Bidder shall take out and maintain during the life of this contract the statutory Workers' Compensation and Employer's Liability Insurance for all of the contactors' employees to be engaged in work on the project under this contract and, in case any such work is sublet, the Bidder shall require the Subcontractor similarly to provide Worker's Compensation and Employer's Liability Insurance for all of the Subcontractor's employees to be engaged in such work. This policy shall be written to meet the statutory requirements for

the state in which the work is to be performed, including Occupational Disease. **The policy shall include a waiver of subrogation in favor of the State. The COI shall contain the mandatory COI subrogation waiver language found hereinafter.** The amounts of such insurance shall not be less than the limits stated hereinafter. For employees working in the State, the policy must be written by an entity authorized by the State of Nebraska Department of Insurance to write Workers' Compensation and Employer's Liability Insurance for Nebraska employees.

2. **COMMERCIAL GENERAL LIABILITY INSURANCE AND COMMERCIAL AUTOMOBILE LIABILITY INSURANCE**

The Bidder shall take out and maintain during the life of this contract such Commercial General Liability Insurance and Commercial Automobile Liability Insurance as shall protect Bidder and any Subcontractor performing work covered by this contract from claims for damages for bodily injury, including death, as well as from claims for property damage, which may arise from operations under this contract, whether such operation be by the Bidder or by any Subcontractor or by anyone directly or indirectly employed by either of them, and the amounts of such insurance shall not be less than limits stated hereinafter.

The Commercial General Liability Insurance shall be written on an **occurrence basis**, and provide Premises/Operations, Products/Completed Operations, Independent Contractors, Personal Injury, and Contractual Liability coverage. **The policy shall include the State, and others as required by the contract documents, as Additional Insured(s). This policy shall be primary, and any insurance or self-insurance carried by the State shall be considered secondary and non-contributory. The COI shall contain the mandatory COI liability waiver language found hereinafter.** The Commercial Automobile Liability Insurance shall be written to cover all Owned, Non-owned, and Hired vehicles.

REQUIRED INSURANCE COVERAGE	
COMMERCIAL GENERAL LIABILITY	
General Aggregate	$2,000,000
Products/Completed Operations Aggregate	$2,000,000
Personal/Advertising Injury	$1,000,000 per occurrence
Bodily Injury/Property Damage	$1,000,000 per occurrence
Fire Damage	$50,000 any one fire
Medical Payments	$10,000 any one person
Damage to Rented Premises	$300,000 each occurrence
Contractual	Included
XCU Liability (Explosion, Collapse, and Underground Damage)	Included
Independent Contractors	Included
If higher limits are required, the Umbrella/Excess Liability limits are allowed to satisfy the higher limit.	
WORKER'S COMPENSATION	
Employers Liability Limits	$500K/$500K/$500K
Statutory Limits- All States	Statutory - State of Nebraska
Voluntary Compensation	Statutory
COMMERCIAL AUTOMOBILE LIABILITY	
Bodily Injury/Property Damage	$1,000,000 combined single limit
Include All Owned, Hired & Non-Owned Automobile liability	Included
Motor Carrier Act Endorsement	Where Applicable
UMBRELLA/EXCESS LIABILITY	
Over Primary Insurance	$5,000,000 per occurrence
MANDATORY COI SUBROGATION WAIVER LANGUAGE	
"Workers' Compensation policy shall include a waiver of subrogation in favor of the State of Nebraska."	
MANDATORY COI LIABILITY WAIVER LANGUAGE	
"Commercial General Liability & Commercial Automobile Liability policies shall be primary, and any insurance or self-insurance carried by the State shall be considered secondary and non-contributory. State of Nebraska shall be included as additionally insured."	

3. EVIDENCE OF COVERAGE

The Bidder should furnish the State, prior to beginning work and upon, a certificate of insurance coverage complying with the above requirements to the attention of:

Agency: Nebraska State Purchasing Bureau
Attention: Brenda Sensibaugh
1526 K Street, Suite 130
Lincoln NE 668508
Brenda.sensibaugh@nebraska.gov

These certificates or the cover sheet shall reference the ITB number, and the certificates shall include the name of the company, policy numbers, effective dates, dates of expiration, and amounts and types of coverage afforded. If the State is damaged by the failure of the Contractor to maintain such insurance, then the Contractor shall be responsible for all reasonable costs properly attributable thereto.

Reasonable notice of cancellation of any required insurance policy must be submitted to contract manager when issued and a new coverage binder shall be submitted immediately to ensure no break in coverage.

4. DEVIATIONS

The insurance requirements are subject to limited negotiation. Negotiation typically includes, but is not necessarily limited to, the correct type of coverage, necessity for Workers' Compensation, and the type of automobile coverage carried by the Bidder.

J. NOTICE OF POTENTIAL BIDDER BREACH

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

If Bidder breaches the contract or anticipates breaching the contract the Bidder shall immediately give written notice to the State. The notice shall explain the breach or potential breach and may include a request for a waiver of the breach if so desired. The State may, at its discretion, temporarily or permanently waive the breach. By granting a temporary waiver, the State does not forfeit any rights or remedies to which the State is entitled by law or equity, or pursuant to the provisions of the contract. Failure to give immediate notice, however, may be grounds for denial of any request for a waiver of a breach.

K. ANTITRUST

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

The Bidder hereby assigns to the State any and all claims for overcharges as to goods and/or services provided in connection with this contract resulting from antitrust violations which arise under antitrust laws of the United States and the antitrust laws of the State.

L. CONFLICT OF INTEREST

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

By submitting a bid, bidder certifies that no relationship exists between the bidder and any person or entity which either is, or gives the appearance of, a conflict of interest related to this Request for Bid or project.

Bidder further certifies that bidder will not employ any individual known by bidder to have a conflict of interest nor shall bidder take any action or acquire any interest, either directly or indirectly, which will conflict in any manner or degree with the performance of its contractual obligations hereunder or which creates an actual or appearance of conflict of interest.

If there is an actual or perceived conflict of interest, bidder shall provide with its bid a full disclosure of the facts describing such actual or perceived conflict of interest and a proposed mitigation plan for consideration. The State will then consider such disclosure and proposed mitigation plan and either approve or reject as part of the overall bid evaluation.

M. STATE PROPERTY

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

The Bidder shall be responsible for the proper care and custody of any State-owned property which is furnished for the Bidder's use during the performance of the contract. The Bidder shall reimburse the State for any loss or damage of such property; normal wear and tear is expected.

N. SITE RULES AND REGULATIONS

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

The Bidder shall use its best efforts to ensure that its employees, agents, and Subcontractors comply with site rules and regulations while on State premises. If the Bidder must perform on-site work outside of the daily operational hours set forth by the State, it must make arrangements with the State to ensure access to the facility and the equipment has been arranged. No additional payment will be made by the State on the basis of lack of access, unless the State fails to provide access as agreed to in writing between the State and the Bidder.

O. ADVERTISING

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

The Bidder agrees not to refer to the contract award in advertising in such a manner as to state or imply that the company or its goods and services are endorsed or preferred by the State. Any publicity releases pertaining to the project shall not be issued without prior written approval from the State.

P. DISASTER RECOVERY/BACK UP PLAN

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

The Bidder shall have a disaster recovery and back-up plan, of which a copy should be provided upon request to the State, which includes, but is not limited to equipment, personnel, facilities, and transportation, in order to continue delivery of goods and services as specified under the specifications in the contract in the event of a disaster.

Q. DRUG POLICY

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

Bidder certifies it maintains a drug free workplace environment to ensure worker safety and workplace integrity. Bidder agrees to provide a copy of its drug free workplace policy at any time upon request by the State.

R. WARRANTY

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

Despite any clause to the contrary, the Bidder represents and warrants that its services hereunder shall be performed by competent personnel and shall be of professional quality consistent with generally accepted industry standards for the performance of such services and shall comply in all respects with the requirements of this Contract. For any breach of this warranty, the Bidder shall, for a period of ninety (90) days from performance of the service, perform the services again, at no cost to Customer, or if Bidder is unable to perform the services as warranted, Bidder shall reimburse Customer the fees paid to Bidder for the unsatisfactory services. The rights and remedies of the parties under this warranty are in addition to any other rights and remedies of the parties provided by law or equity, including, without limitation actual damages, and, as applicable and awarded under the law, to a prevailing party, reasonable attorneys' fees, and costs.

IV. PAYMENT

A. PROHIBITION AGAINST ADVANCE PAYMENT (Statutory)

Neb. Rev. Stat. §§81-2403 states, "[n]o goods or services shall be deemed to be received by an agency until all such goods or services are completely delivered and finally accepted by the agency."

B. TAXES (Statutory)

The State is not required to pay taxes and assumes no such liability as a result of this solicitation. The Bidder may request a copy of the Nebraska Department of Revenue, Nebraska Resale or Exempt Sale Certificate for Sales Tax Exemption, Form 13 for their records. Any property tax payable on the Bidder's equipment which may be installed in a state-owned facility is the responsibility of the Bidder.

C. INVOICES

Invoices for payments must be submitted by the Bidder to the agency requesting the services with sufficient detail to support payment. **Email invoices to accounting@nebraskapublicmedia.org** The terms and conditions included in the Bidder's invoice shall be deemed to be solely for the convenience of the parties. No terms or conditions of any such invoice shall be binding upon the State, and no action by the State, including without limitation the payment of any such invoice in whole or in part, shall be construed as binding or estopping the State with respect to any such term or condition, unless the invoice term or condition has been previously agreed to by the State as an amendment to the contract.

D. INSPECTION AND APPROVAL

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:

Final inspection and approval of all work required under the contract shall be performed by the designated State officials.

E. PAYMENT (Statutory)

Payment will be made by the responsible agency in compliance with the State of Nebraska Prompt Payment Act (See Neb. Rev. Stat. §81-2403). The State may require the Bidder to accept payment by electronic means such as ACH deposit. In no event shall the State be responsible or liable to pay for any goods and services provided by the Bidder prior to the Effective Date of the contract, and the Bidder hereby waives any claim or cause of action for any such services.

F. LATE PAYMENT (Statutory)

The Bidder may charge the responsible agency interest for late payment in compliance with the State of Nebraska Prompt Payment Act (See Neb. Rev. Stat. §§ 81-2401 through 81-2408).

G. SUBJECT TO FUNDING / FUNDING OUT CLAUSE FOR LOSS OF APPROPRIATIONS (Statutory)

The State's obligation to pay amounts due on the Contract for a fiscal years following the current fiscal year is contingent upon legislative appropriation of funds. Should said funds not be appropriated, the State may terminate the contract with respect to those payments for the fiscal year(s) for which such funds are not appropriated. The State will give the Bidder written notice thirty (30) calendar days prior to the effective date of termination. All obligations of the State to make payments after the termination date will cease. The Bidder shall be entitled to receive just and equitable compensation for any authorized work which has been satisfactorily completed as of the termination date. In no event shall the Bidder be paid for a loss of anticipated profit.

H. RIGHT TO AUDIT (First Paragraph is Statutory)

The State shall have the right to audit the Bidder's performance of this contract upon a thirty (30) day written notice. Bidder shall utilize generally accepted accounting principles, and shall maintain the accounting records, and other records and information relevant to the contract (Information) to enable the State to audit the contract. (Neb. Rev. Stat. § 84-304 et seq.) The State may audit and the Bidder shall maintain the information during the term of the contract and for a period of five (5) years after the completion of this contract or until all issues or litigation are resolved, whichever is later. The Bidder shall make the Information available to the State at Bidder's place of business or a location acceptable to both Parties during normal business hours. If this is not practical or the Bidder so elects, the Bidder may provide electronic or paper copies of the Information. The State reserves the right to examine, make

copies of, and take notes on any Information relevant to this contract, regardless of the form or the Information, how it is stored, or who possesses the Information. In no circumstances will contractor be required to create or maintain documents not kept in the ordinary course of bidder's business operations, nor will contractor be required to disclose any information, including but not limited to product cost data, which is confidential or proprietary to bidder.

Accept (Initial)	Reject (Initial)	Reject & Provide Alternative Response (Initial)	NOTES/COMMENTS:
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The Parties shall pay their own costs of the audit unless the audit finds a previously undisclosed overpayment by the State. If a previously undisclosed overpayment exceeds three percent (3%) of the total contract billings, or if fraud, material misrepresentations, or non-performance is discovered on the part of the Contractor, the Contractor shall reimburse the State for the total costs of the audit. Overpayments and audit costs owed to the State shall be paid within ninety (90) days of written notice of the claim. The Contractor agrees to correct any material weaknesses or condition found as a result of the audit.

V. SCOPE OF WORK

The Contractor must provide the following information in response to this solicitation.

A. SCOPE

It is the intent of this solicitation to issue a purchase order for the item(s) requested.

All items proposed shall be of the latest manufacture in production as of the date of the solicitation and be of proven performance and under standard design complete as regularly advertised and marketed. All necessary materials for satisfactory performance of the supplies shall be incorporated into the transmission line and antenna replacement and installation for KXNE-FM. whether or not they may be specifically mentioned below.

Complete specifications, manufacturer's current descriptive literature and/or advertising data sheets with cuts or photographs must be included with the bid for the IDENTICAL items bid. Any information necessary to show compliance with these specifications not given on the manufacturer's descriptive literature and/or advertising data sheets must be supplied in writing on or attached to the bid document. If manufacturer's information necessary to show compliance with these specifications is not attached to the bid document, the Bidder may be required to submit requested information within three (3) business days of a written request. Failure to submit requested descriptive literature or advertising data sheets may be grounds to reject the bid.

VI. TECHNICAL SPECIFICATIONS

A. BIDDER INSTRUCTIONS

Bidder must respond to each of the following statements. Specifications listed are minimum conditions that must be met in order for a Bidder to qualify for the award.

"YES" response means the Bidder guarantees they can meet this condition.

"NO" response means the Bidder cannot meet this condition and will not be considered.

"NO & PROVIDE ALTERNATIVE" responses should be used only with a narrative response in the NOTES/COMMENTS section explaining in detail any deviation from the Bidder's ability to meet the condition, and an explanation of how this would be determined to be an acceptable alternative to meeting the condition. Alternatives must be detailed in such a way that allows such deviations to be fully evaluated. The State shall determine at its sole discretion whether or not the Bidder's alternative is an acceptable alternative.

B. NON-COMPLIANCE STATEMENT

YES	NO	NO & PROVIDE ALTERNATIVE		
			1.	Read these specifications carefully. Any and all exceptions to these specifications must be written on or attached to solicitation response. Any noncompliance may void your bid. Non-compliance to any single specification can void your bid.
			2.	It is the responsibility of Bidders to obtain information and clarifications as provided below. The State is not responsible for any erroneous or incomplete understandings or wrongful interpretations of this solicitation by any Bidder.
			3.	No interpretation related to the meaning of solicitation specifications or other pre-bid documents will be made orally to any Bidder by the State. Any solicitation interpretation must be put in writing by the Bidder to the State Purchasing Bureau, any request for Bid interpretation must be put in writing and submitted to the SPB per the Schedule of Events.
NOTES/COMMENTS:				

C. TECHNICAL SPECIFICATIONS: TRANSMISSION LINE AND ASSOCIATED HARDWARE

YES	NO	NO & PROVIDE ALTERNATIVE		
			4.	Removal of old transmission line and installation of new approx. 930' of FM transmission line with 50 0hm 3 1/8" air dielectric rigid coax.
			5.	New hangers, line pullers and misc. hardware required to mount transmission line and secure transmission line to tower that meets TIA-222H Specification.
			6.	New hangers and hardware used for installation shall be of a type recommended by transmission line manufacturer.
			7.	New line is to be installed on inside of tower. Existing line to be removed from inside tower. New line should be installed before old line

				is removed to minimize off air time. Required completion date prior to or on June 15, 2023.
			8.	Transmission line should include "expansion joints" or "bellows" on the inner conductor to allow for temperature related expansion or contraction of inner conductor.
			9.	Grounding kits should be installed on every 300' on vertical run of transmission line.
			10.	New line is to be run from existing gas barrier inside building to matching section at center fed antenna. Existing gas barrier will be retained in new installation.
NOTES/COMMENTS:				

D. TECHNICAL SPECIFICATION: REMOVAL AND DISPOSAL FROM JOB SITE OF EXISTING TRANSMISSION LINE

YES	NO	NO & PROVIDE ALTERNATIVE		
			1.	All line that is removed from tower shall be removed from premises by Bidder.
			2.	Line from transmitter to existing gas barrier at ground level will be retained in new installation.
NOTES/COMMENTS:				

E. TECHNICAL SPECIFICATION: TRANSMISSION LINE INSTALLATION AND SAFETY

YES	NO	NO & PROVIDE ALTERNATIVE		
			1.	Bidder shall install transmission line per manufacturers specifications.
			2.	Bidder will install and replace all of the line.
			3.	Does the crew have a climber certification program?
			4.	Does the crew have a site safety plan (emergency phone numbers, site address, etc.?)
			5.	Does the crew have a written rigging plan?
			6.	Does the crew have a man rated hoist?
			7.	Does the crew wear hard hats?

			8.	For bidding distributor(s) and general contractors, provide in the NOTES/COMMENTS section below the name of transmission line installation tower crew company that will be used for this project. If subcontractor is being used, bidder must provide subcontractor references. Unsatisfactory references may result in disqualification.
NOTES/COMMENTS:				

F. TECHNICAL SPECIFICATION: FM ANTENNA

YES	NO	NO & PROVIDE ALTERNATIVE		
			1.	Install new FM transmit antenna. Antenna must be tuned to 89.3MHz (channel 207)
			2.	Antenna should be 10 bays, side mount, center fed, omnidirectional, right hand circular polarization with a -.75° beam tilt.
			3.	Tower specification: Tower is a Stainless G7. Top of steel is 938' AGL. Center of radiation of current. antenna is 896' AGL.
			4.	ERP is 42kW (max 45kW) in the horizontal plane, 42kW (max 45kW) in the vertical plane. TPO (combined analog and digital) of transmitter is 9.85kW.
			5.	Antenna should include radomes.
			6.	Antenna must include matching section.
			7.	Bidder is responsible for removal of old antenna from property.
			8.	Bidder is responsible for tuning and proof of new antenna after installation.
			9.	Bidder must include all hardware needed for mounting new antenna.
			10.	Bidder must include removal of old antenna and installation of new antenna.
NOTES/COMMENTS:				

G. TECHNICAL SPECIFICATION: PERFORMANCE AND TESTING

YES	NO	NO & PROVIDE ALTERNATIVE		
			1.	The transmission line and antenna must be fully tested with Proof of Performance documentation and operational upon completion of installation with written sign-off acceptance from NETC.
			2.	Should there be a conflict regarding acceptable completion of performance testing, the State's opinion shall prevail.

NOTES/COMMENTS:

H. DELIVERY ARO

YES	NO	NO & PROVIDE ALTERNATIVE		
			1.	Delivery desired within 90 days after receipt of order(s).
NOTES/COMMENTS:				

I. DELIVERY LOCATIONS / INSTRUCTIONS (CONTRACTOR AGREES THAT THEY CAN MEET THE DELIVERY LOCATIONS/INSTRUCTIONS)

YES	NO	NO & PROVIDE ALTERNATIVE		
			1.	KXNE-TV/FM transmitter site, 56263 Highway 98, Carroll, NE 68723.
			2.	Contact Operations Manager Robert Vos at 308-991-7443 at least three (3) business days prior to delivery.
			3.	Bidder will be expected to provide equipment and crew necessary for delivery and off-loading of product(s). NETC will not provide equipment or crew for off-loading products at site.
			4.	No loading dock available at site.
NOTES/COMMENTS:				

J. PACKAGING

YES	NO	NO & PROVIDE ALTERNATIVE		
			1.	Packages are to be clearly marked with size, weight, color, quantity, and the purchase order number.
			2.	Packaging must be of suitable size and of sufficient strength to protect the contents during shipping, handling and storage.
NOTES/COMMENTS:				

K. ORDERS

YES	NO	NO & PROVIDE ALTERNATIVE		
			1.	Orders will be placed either by, phone, e-mail or Internet (if available and not to the exclusion of the other methods).
			2.	All orders must reference a purchase order number and the purchase order number must be referenced on the packing slip, and invoice. Invoices are to be sent to the "Invoice to" address on the purchase order.
NOTES/COMMENTS:				

L. QUALITY

YES	NO	NO & PROVIDE ALTERNATIVE		
			1.	Product quality must meet specifications and be consistent for the term of the contract. All materials must be of first quality, under standard production by the manufacturer and be of standard design, complete as regularly advertised and marketed and be of proven performance.
			2.	A guarantee of satisfactory performance by the bidder and meeting delivery dates are considered to be an integral part of the purchase contract resulting from this bid invitation.
			3.	Products are to be fully guaranteed and may be returned for full credit or replacement (at the State's option) for any reason during the initial warranty period with no additional charges for shipping or restocking.
NOTES/COMMENTS:				

M. GRAY MARKET PRODUCTS PROHIBITION

YES	NO	NO & PROVIDE ALTERNATIVE		
			1.	The State will not accept Gray Market Products for this solicitation. Gray Market is defined as the trade of a commodity through distribution channels which, while legal, are unofficial, unauthorized, or unintended by the original manufacturer. Gray Market items are not designed to be sold in a particular market and cannot be supported by the authorized importer because of various reasons.
NOTES/COMMENTS:				

N. WARRANTY

YES	NO	NO & PROVIDE ALTERNATIVE		
			1.	The Bidder warrants for a period of one (1) year from the date of Acceptance that: (a) the Products perform according to all specific claims that the Bidder made in its response to the solicitation, (b) the Product is suitable for the ordinary purposes for which such Product is used, (c) the Product is suitable for any special purposes identified in the solicitation or for which the State has relied on the Bidder's skill or judgment, (d) the Product is designed and manufactured in a commercially reasonable manner, and (e) the Product is free of defects. Upon breach of the warranty, the Bidder will repair or replace (at no charge to the State) the Product whose nonconformance is discovered and made known to the Bidder. If the repaired and/or replaced Product proves to be inadequate, or fails of its essential purpose, the Bidder will refund the full amount of any payments that have been made. The rights and remedies of the parties under this warranty are in addition to any other rights and remedies of the parties provided by law or equity, including, without limitation actual damages, and, as applicable and awarded under the law, to a prevailing party, reasonable attorneys' fees, and costs.
NOTES/COMMENTS:				

ERI Product Information for

Nebraska Educational Telecommunications Commission

FM Antenna and Transmission Line for KXNE-FM

State of Nebraska Purchasing Solicitation Number 6781OF

Table of Contents

ERI Equipment Proposal

Submitted to:

Nebraska State Purchasing Bureau
1526 K Street, Suite 130
Lincoln, NE 68508

Attn: Brenda Sensibaugh

by:

Electronics Research, Inc.

Bill Harland
Vice President of Marketing

Phone: +1 (812) 925-6000, Ext. 214

Fax: +1 (812) 925-4030

bharland@eriinc.com

This document includes pages 3 of 16 and is governed by the terms and conditions contained herein. Upon customer acceptance, order is subject to final review and written acceptance by ERI at our main business office. Unless otherwise stated in the body of this quotation, freight charges are not included and will be added to the final invoice. Also, unless listed separately in the body of this quotation, prices do not include any state, local, or other taxes or duties. Ant terms of sale that conflict with Nebraska State Procurement Statutes, Requlations, or Rules will be waived.

Proposal Number: 20230504-481

Date: May 26, 2023
Valid Through: August 24, 2023
FOB Destination
Reference: 6781 OF KXNE-FM, Norfolk, NE

Payment Terms: Payable as delivered and invoiced.

Please **complete** the Purchaser's Acceptance block, **scan** this document along with your deposit check and **e-mail** to: ahand@eriinc.com or **FAX** to: 812-925-4030. Please **remit** down payment to the address below, attn: Accounts Receivable.

Purchaser's Acceptance:

Please accept our order for the products and services contained in this proposal.

Signature:_____

Name:_____

Title:_____

P.O. Number:_____

Item	Qty	Part #	Description	Unit Price	Extended
001	1	SHPX-10AC	ROTOTILLER® SHPX Series Circularly Polarized FM Antenna. Full Wave Spaced Elements, 3-1/8-inch Interbay Line, 3-1/8-inch Element Stem, Female 50 Ohm Input 3-1/8-inch, Input Feed Center, Input Power Rating 39 kW. Channel / Frequency: 207 / 89.3 MHz Numeric Gain: 5.544 First Null Fill: None Second Null Fill: None Electrical Beam Tilt: 0.75 degrees Brackets: Pole or Leg Mount Pole or Leg OD: 4 (inches) Tower Face Width: 84 (inches) Electrical beam tilt, first null fill, and second null fill are additional cost options available for center fed FM antennas. If this antennas includes electrical beam tilt and/or null fill these are listed and priced as separate line items in this proposal to ensure that they are included on the antenna factory work order. Standard antenna pricing includes antenna mounts appropriate for mounting on a tower leg or on a pole up to 15 inches in diameter or for face mounting on non-tapered tower section 42 inches or less (from center to center of tower legs). Optional fiberglass or steel anti-rotation brackets are available for tower sections 42 inches or smaller. Steel anti-rotation brackets are available for tower sections larger than 42 inches. Special order fiberglass anti-rotation brackets are available for tower sizes larger than 42 inches. Anti-rotation brackets are required (one per bay) for leg mounted medium or high power antennas if the tower leg diameter is 3 inches (76 mm) or less or 5 inches (127 mm) or less for antennas equipped with radomes. Standard mounts and brackets assume that the tower face is unobstructed. If obstructions are present and prevent standard mounts or brackets from being used, custom mounts and/or brackets may be required at additional cost. Custom mounts and brackets for non-uniform cross section towers available upon special request. Tower details must be provided to ERI for all custom/special order brackets or mounts. Please contact ERI for all special order requests	53,208.00	45,226.80
002	10	ARB-84	Anti-rotation brackets, STEEL, for tower faces up to 84-inches center to center. One required per bay.	550.00	4,675.00
003	10	RAD-RT	Radomes (per bay) for SHPX, SHP, MPX, MP, LPX, and LP Series FM Antennas.	1,920.00	16,320.00
004	1	BT	Beam tilt (per system) (center fed FM antennas only)	1,085.00	922.25
005	46	MACX350A-1	3-1/8-inch, 50 ohm, 20 foot MACXLine section, flanged both ends, supplied with bellows, captivated inner connector, and flange hardware kit.with O ring. Price shown is **per line section** Vertical Run: 885 (feet) Horizontal Run: 50 (feet)	1,580.00	61,778.00

Item	Qty	Part #	Description	Unit Price	Extended
006	4	MACX350A-5	3-1/8-inch, 50 ohm, customer specified length, up to 60-inches, MACXLine section, flanged both ends, supplied with inner connector, and flange hardware kit. Specify flange to flange length of outer conductor in inches (two decimal places): _____ inches.	738.00	2,509.20
007	1	MACX350A-20	3-1/8-inch, 50 ohm, customer specified length, from 120-inches to 240-inches, MACXLine section, flanged both ends, supplied with bellows, captivated inner connector, and flange hardware kit. Specify flange to flange length of outer conductor in inches (two decimal places): _____ inches.	1,814.00	1,541.90
008	7	ACX350-10SE	3-1/8-inch, 50 ohm, 90 degree miter elbow, captivated inner conductor, includes inner connector, 'O' ring, silicone grease, and flange hardware kit. Not reinforced.	832.00	4,950.40
009	2	ACX350-20	3-1/8-inch, 50 ohm standard inner connector.	116.00	197.20
010	1	RLA350-16	3-1/8-inch, 50 ohm, heavy duty gas barrier, both sides have a pressure port, fixed male inner connectors both ends.	656.00	557.60
011	3	RLA300-13-2	3-1/8-inch Vertical Rigid Hanger. Use at tower top minimum of two required for up to 500 feet of vertical line. Mounting hardware included: 1/2-inch diameter hardware for mounting to 9/16 inch diameter hole. Two (2) hangers, mounted 10-feet (3.0 meters) apart will support a 500-foot vertical run of 3-1/8-inch rigid line. Add one (1) hanger for each additional 500-feet of vertical run length. Price shown is for one piece. Stainless steel.	153.00	390.15
012	42	RLA300A-11-H	3-1/8 inch hinged Vertical Spring Hanger, supports the transmission line, prevents lateral motion, and accommodates differential expansion and contraction. Use one Vertical Spring Hanger and one RLA300-19 Vertical Sliding Hanger per line section. Hinged to open from left or right side to save installation labor. Includes 1/2-inch mounting hardware.	199.00	7,104.30
013	42	RLA300-19	3-1/8 inch hinged Vertical Sliding Hanger, supports the transmission line, prevents lateral motion, and accommodates differential expansion and contraction. Use one Vertical Sliding Hanger and one RLA300A-11-H Vertical Spring Hanger per line section for each line section supported by a vertical spring hanger. Hinged to open from left or right side to save installation labor. Includes 1/2-inch mounting hardware.	118.00	4,212.60
014	2	RLA000-01VLB	Rigid transmission line vertical lateral brace for 3-1/8, 4-1/16, 6-1/8, 7-3/16 and 8-3/16-inch rigid transmission lines, restricts lateral motion while allowing vertical and horizontal line movement. Use two (2) braces at bottom of vertical run, equally spaced above the elbow at the base of the vertical run and the lowest vertical sliding hanger or vertical spring hanger. Includes 1/2-inch mounting hardware.	395.00	671.50

Item	Qty	Part #	Description	Unit Price	Extended
015	3	RLA000-01HLB	Rigid transmission line horizontal lateral brace for 3-1/8, 4-1/16, 6-1/8, 7-3/16 and 8-3/16-inch rigid transmission lines, restricts lateral motion while allowing vertical and horizontal line movement. Use at 240-inch intervals along the horizontal run. Includes 1/2-inch mounting hardware.	416.00	1,060.80
016	89	RLA001-00KIT	Universal Rigid Line Bracket for 1-5/8-inch, 3-1/8-inch, 4-1/16-inch, 6-1/8-inch, 7-3/16-inch, 8-3/16-inch, and 9-3/16-inch rigid transmission line vertical fixed, spring, and sliding ring hangers. Includes two (2) slots for 5/8-inch mounting hardware, 11/16 x 1-3/4-inches (17 x 44-millimeters), will accommodate 5/8-inch hardware spacing from 2-1/8 to 4-1/4-inches (54 to 108-millimeters); two (2) slots for 1/2-inch mounting hardware, 9/16 x 1-3/4-inches (14 x 44-millimeters), will accommodate 1/2-inch hardware spacing from 2 to 4-3/8-inches (51 to 111-millimters). Also includes one (1) centered 9/16-inch (14-millimeter) mounting hole for 1/2-inch hardware. Includes 5/8-inch hardware to attach to drilled or punched horizontal angle members. Also includes 2 each WF08GA 1/2-inch flat washers F436 galvanized structural and 2 each WF10GA 5/8-inch galvanized flat washers for use with attachment hardware included with hanger. Galvanized steel. Single piece. Hanger purchased separately.	44.00	3,328.60
017	3	RLA000-01VSCU	Horizontal Spring Hanger for RLA000-01ALL creates a single point horizontal spring hanger for copper outer conductor 3-1/8, 4-1/16, 6-1/8, 7-3/16 and 8-3/16-inch rigid transmission lines. Use with RLA000-01HLB to restrict lateral motion or add two (2) RLA000-01HS Horizontal Side Springs.	97.00	247.35
018	2	RLA000-01THRD	Horizontal Rigid Hanger for RLA000-01ALL creates a single point horizontal rigid hanger for 3-1/8, 4-1/16, 6-1/8, 7-3/16 and 8-3/16-inch rigid transmission lines. Use with RLA000-01HLB to restrict lateral motion or add a second RLA000-01THRD to create a two-point horizontal rigid hanger.	69.00	117.30
019	4	RLA000-01ALL	Rigid transmission line horizontal hanger bracket assembly for 3-1/8, 4-1/16, 6-1/8, 7-3/16 and 8-3/16-inch rigid transmission lines.	100.00	340.00
020	1	RLA300-15A	3-1/8-inch Wall Feed Thru, includes split mounting plate. Aluminum with EPDM weatherproofing sponge with backing. Uses 3/8-inch mounting hardware (not supplied).	176.00	149.60
021	2	RLA300-21	3-1/8-inch hardware kit, includes 'O' ring, silicone lubricant, nuts, bolts, and lock washers for one flange joint.	27.00	45.90
022	2	RLA300A-50	3-1/8-inch end cap to seal line.	340.00	578.00

Item	Qty	Part #	Description	Unit Price	Extended
023	1	RST-001	FM Antenna Tune ERI Factory Field Technician. One (1) ERI Technician to field match FM antenna after installation. Price includes travel, local living expense, and daily field service rate for one (1) day on site. ERI Field service price includes a single (per project) mobilization and indicated number of days on site, for one person. Additional days if required will be charged for at the rate of $2,150.00 per day. Price includes test equipment usage and tuning slugs. Field service prices are net to ERI and not discountable. Customer to provide tower crew to assist antenna field matching. Price valid for the location within the contiguous forty-eight (48) United States only. Contact ERI for pricing in other locations.	6,750.00	6,750.00
024	1	Radio Services	FM Installation Mobilize to site, inventory materials and rig tower. This tower is 1013' overall height above ground level guyed tower. The tower owner is Nebraska Educational Telecommunications Commission. ASRN 1027164. Install 930' of new 3-1/8" rigid line inside the tower structure with all new hangers and hardware as required. Install as much of the line run as possible to limit off airtime during the antenna replacement. This line runs from the gas barrier in the transmission building to the antenna. Quote assumes a clear line run exists on the tower. Drilling and punching of holes will not be required. Remove the existing Dielectric DCR-C10R 10 bay FM antenna at 896' COR. ERI will remove and dispose of the antenna and hardware. Install a new ERI SHPX-10AC antenna at 896' COR in the same location as the antenna that was removed. Hook the antenna to the new line that was previously installed. Check for air leaks. Breakdown of installation pricing by activity: Installation of new transmission line Removal of old FM antenna and removal of old transmission line after installation of new FM antenna. Installation of new FM antenna.	122,707.00 50.770.00 47,142.00 24,795.00	122,707.00

Total Price	$314,074.00
Net Package Price	$286,381.45
Material Freight	$5,622.35
Grand Total	$292,003.80

7777 Gardner Road
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USA
+1 812 925-6000 (tel)
+1 812 925-4030 (fax)
877 ERI-LINE (toll-free)
Sales@eriinc.com
CustomerSupport@eriinc.com
www.eriinc.com

Purchaser Information Page

Mail to Address:

Name:	
Company:	Nebraska State Purchasing Bureau
Address:	1526 K Street, Suite 130
City, ST, ZIP:	Lincoln, NE, 68508
Country:	
Phone:	+1 (402) 471-6500
FAX:	
E-Mail:	s.materielpurchasing@nebraska.gov

Ship to Address:

Name:	Robert Vos, Operations Manager
Company:	KXNE-TV/FM transmitter site
Address:	56263 Highway 98
City, ST, ZIP:	Carroll, NE, 68723
Country:	
Phone:	+1 (308) 991-7443
FAX:	
E-Mail:	

Submit to Address:

Name:	Brenda Sensibaugh
Company:	Nebraska State Purchasing Bureau
Address:	1526 K Street, Suite 130
City, ST, ZIP:	Lincoln, NE, 68508
Country:	
Phone:	+1 (402) 471-6500
FAX:	
E-Mail:	s.materielpurchasing@nebraska.gov

Consultant Address:

Name:	
Company:	
Address:	
City, ST, ZIP:	
Country:	
Phone:	
FAX:	
E-Mail:	

Ship Via:
ERI selected method, unless otherwise specified.

Special Shipping Method:
Custom cut sections Fed Ex and common carrier. The balance ERI designated truck.

Final CP Received? No

Comments:

1. Applicable to All Orders

1.1 Acceptance of Proposal: When the Proposal is signed by Buyer, returned to Electronics Research, Inc. (hereinafter called "ERI"), and accepted by ERI at its offices in Chandler, Indiana, USA, the Proposal shall become a binding agreement for the purchase by buyer from ERI of the Products and/or Services described therein, upon the terms specified, including these Terms and Conditions of Sale, attached to the Proposal. Refundable deposits are charged for some skids and large size cable reels. All orders are subject to a minimum charge of $50.00 net.

1.2 Acknowledgement of Terms: By signing the Proposal, Buyer represents and acknowledges that it has fully read, understands, and accepts the terms of the Proposal, including these "Terms and Conditions of Sale" included therein, that the Proposal contains the complete and final agreement of Buyer and ERI with respect to the Products and/or Services described therein; that all other agreements, representations, and warranties, whether oral or in writing, made prior to or at the time of the signing of the Proposal, are merged and replaced therein; and that no change or addition to the Proposal shall be valid and enforceable unless made in writing and signed by an authorized representative of ERI.

1.3 Buyer's Terms and Conditions: ERI desires to provide its customers with prompt and efficient service. However, to negotiate individually the terms and conditions of each sales contract would substantially impair ERI's ability to provide such service. Accordingly, Products and Services furnished by ERI are sold only on the terms and conditions stated herein, any terms or conditions on Buyer's order to the contrary notwithstanding. ERI's performance of any contract is expressly made conditional on Buyer's agreement to ERI's Terms and Conditions of Sale unless otherwise specifically agreed to, in writing, by ERI. In the absence of such agreement, commencement of performance and/or delivery shall be for Buyer's convenience only and shall not be deemed or construed to be acceptance of Buyer's terms and conditions. If a contract is not earlier formed by mutual agreement, in writing, acceptance of any Product or Service shall be deemed acceptance of the terms and conditions stated herein. In the case of a conflict between the terms and conditions stated herein and those appearing on the face of this Proposal, the latter shall control. All contracts for the sale of Products and/or Services shall be construed under and governed by the laws of the State of Indiana, the location of ERI's primary manufacturing facilities and its corporate headquarters.

1.4 Conditions of Proposal: ERI's Proposal is subject to the following:

1.4.1 The Buyer warrants that all information supplied by it to ERI for the preparation by ERI of the Proposal, including oral and written correspondence, reports, plans, and specifications are adequate, accurate, workable, and practicable of design, and, if the supplied information is followed, a sufficient and satisfactory result will be achieved. Buyer shall be responsible for all costs incurred by ERI by reason of any inaccurate or incomplete information supplied by Buyer.

1.4.2 Unless otherwise stated in the Proposal, the Buyer is responsible for obtaining any necessary permits and/or approvals (FCC, FAA, local, etc.) needed to install and use the Products included in the Proposal. If the Proposal includes Installation Services, the necessary permits must be obtained prior to mobilization.

1.4.3 UNLESS OTHERWISE SPECIFIED, IN WRITING, ALL PROPOSALS ARE FIRM FOR, AND EXPIRE, THIRTY (30) DAYS AFTER DATE THEREOF AND CONSTITUTE OFFERS, provided, however, that budgetary Proposals and estimates are for preliminary information only and shall neither constitute offers, nor impose any responsibility or liability upon ERI.

1.4.4 Unless otherwise stated in writing by ERI in the Proposal, all prices in a Proposal shall be exclusive of transportation, insurance, taxes (including, without limitation, any sales, use or similar tax, and any tax levied on or assessed to ERI after Product delivery by reason of ERI's security interest in Products), license fees, customs fees, duties and other charges related thereto, and Buyer shall report and pay any and all such shipping charges, premiums, taxes, fees, duties and other charges related thereto, and shall hold ERI harmless there from, provided, however, that if ERI, in its sole discretion, chooses to make any such payment, Buyer shall reimburse ERI in full upon demand.

1.4.5 Stenographical, typographical and clerical errors contained in the Proposal are subject to correction.

1.4.6 Prices set forth in a Proposal are for Products and/or Services only and do not include technical data, proprietary rights of any kind, patent rights, qualification, environmental or other than ERI's standard product performance tests, and other than ERI's normal domestic commercial packaging, unless expressly agreed to in writing by ERI.

1.4.7 Published weights and dimensions are approximate only. Certified dimension drawings can be obtained upon request. Manuals, programs, listings, drawings, or other documentation required hereunder must be referenced specifically.

1.5 Terms of Payment: Unless otherwise stated in the Proposal, payment is due upon delivery. All payments for Products released and shipped on approved credit accounts shall be due in upon receipt of invoice therefore. Past due balances shall be subject to a late charge of 1.8% per month. Partial shipments will be billed as made and payments therefore are subject to the above terms. Payment shall not be withheld for delay in delivery of required documentation unless a separate price is stated therefore, and then only to the extent of the price stated for such undelivered documentation. ERI may cancel or delay delivery of Products in the event Buyer fails to make prompt payment therefore or in the event of an arrearage in Buyer's account with ERI.

1.6 Performance: ERI will make all reasonable effort to observe its dates indicated for delivery or other performance. However, ERI shall not be liable in any way because of any delay in performance hereunder due to acceptance of prior orders; technical difficulties; strike; lockout; riot; war; fire; act of God; accident; failure or breakdown of components necessary to complete an order; subcontractor, supplier or Buyer caused delays; inability to obtain or constrain substantial rises in the price of labor, materials or manufacturing facilities; curtailment of or failure to obtain sufficient electrical or other energy supplies; or compliance with any law, or regulation or order, whether valid or invalid, of any cognizant governmental body or any instrumentality thereof now existing or hereafter created; or due to any unforeseen circumstances or causes beyond ERI's control, provided such delay is neither material nor indefinite. ERI's performance shall be deemed suspended during and extended for such time as it is so delayed, and thereafter Buyer shall accept performance hereunder. Delay in performance shall not be considered material or indefinite unless it exceeds or is reasonably estimated by ERI to exceed a period of six (6) months. ERI reserves the right, in its sole discretion, to allocate inventories and current production and substitute suitable materials when, in its opinion, such allocation or substitution is necessary due to such circumstances or causes in the interest of conservation of scarce materials and efficient utilization of high value parts and components. ERI's products may contain remanufactured parts and components. Such parts and components are covered by the same warranty and are subject to the same high standards of quality control applied to other parts and components. No penalty clause for delay in performance contained in any Buyer-originated documents of any kind shall be effective. As used herein, "performance" shall include, without limitation, fabrication, shipment, delivery, assembly, installation, testing and warranty repair or replacement, as applicable.

1.7 Change Orders: Buyer change orders must be in writing and no change shall be made pursuant to this clause unless agreed to in writing and signed by duly authorized representatives of ERI and Buyer. If any such change causes an increase or decrease in the cost or the time required for the performance of any part of the work, an equitable adjustment shall be made in the contract price and schedule. ERI shall have no obligation to commence any extra or changed work without written agreement as to adjustments to contract price and delivery schedules affected thereby.

1.8 Assignments and Terminations: Any assignment by Buyer of any contract created by the Proposal without the express written consent of ERI is void. No order may be terminated by Buyer except by mutual agreement in writing. Terminations by mutual agreement are subject to the following conditions: (a) Buyer will pay, at applicable contract prices, for all Products which are completely manufactured and allocable to Buyer at the time of ERI's receipt of a request for mutual termination; (b) Buyer will pay all costs, direct and indirect, which have been incurred by ERI with regard to Products which have not been completely manufactured at the time of ERI's receipt of a request for mutual termination, plus a pro rata portion of normal profit on the contract; (c) Buyer will pay a termination charge on all other Products affected by the termination. (d) Orders for standard catalog products may be canceled prior shipment, however any order that has been cut, filled or packaged prior to Seller's receipt of cancellation notice shall be subject to a 20% re-stocking charge. (e) Orders for non-standard products or specially manufactured products may be canceled prior to the start of manufacture provided Buyer reimburses ERI for any actual costs incurred on the order prior to the effective cancellation date. After manufacture commences, orders for non-standard products or specially manufactured products may not be canceled. In the event Buyer terminates such orders, Buyer shall be liable to ERI for termination charges, including, but not limited to, reasonable profits. ERI's normal accounting practices shall be used to determine costs and other charges. To reduce termination charges, ERI will divert completed parts, material or work in process from terminated contracts to other Buyers whenever, in ERI's sole discretion, it is practicable to do so.

1.9 Damage and Liability: ERI'S AGGREGATE LIABILITY IN DAMAGES OR OTHERWISE SHALL NOT EXCEED THE PAYMENT, IF ANY, RECEIVED BY ERI FOR THE UNIT OF PRODUCT OR SERVICE FURNISHED OR TO BE FURNISHED, AS THE CASE MAY BE, WHICH IS THE SUBJECT OF CLAIM OR DISPUTE. IN NO EVENT SHALL ERI BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, LIQUIDATED, OR SPECIAL DAMAGES, HOWSOEVER CAUSED. Liability to third parties for bodily injury, including death, resulting from ERI's performance shall be determined in accordance with applicable law and shall not be affected by the liability limitations stated above in this paragraph.

1.10 Disputes: All disputes under any contract concerning Products and/or Services not otherwise resolved between ERI and Buyer shall be resolved in a court of competent jurisdiction in the County of Warrick in the State of Indiana or the United States District Court for the Southern District of Indiana, Evansville Division, and in no other place. Provided, that in ERI's sole discretion, such action may be heard in some other place designated by ERI if necessary to acquire jurisdiction over third persons so that the dispute can be resolved in one action. Buyer hereby consents to the jurisdiction of such court or courts and agrees to appear in any such action upon written notice thereof. No action, regardless of form, arising out of, or in any way connected with, the Products or Services furnished by ERI, may be brought by Buyer more than one (1) year after the cause of action has occurred. If any part, provision or clause of these `Terms and Conditions of sale, or the application thereof to any person or circumstances, is held invalid, void or unenforceable, such holding shall not affect and shall leave valid all other parts, provisions, clauses or applications of these Terms and Conditions remaining, and to this end these Terms and Conditions shall be treated as severable.

1.11 General Conditions:

1.11.1 No delay or failure on the part of ERI in exercising any right or remedy under any contract resulting from, and/or partial or single exercise thereof, shall constitute a waiver of such right or any other remedy. ERI's rights and remedies under any contract resulting here from are cumulative and not alternative.

1.11.2 If any term of any contract resulting here from or the application thereof shall be illegal, such illegality shall not affect any other term or condition thereof, and such shall continue in full force and effect.

1.11.3 Any contract resulting here from shall be binding upon the heirs, personal representative, successors and permitted assigns of the parties.

2. Applicable to Orders for Products

2.1 Transportation and Risk of Loss: Transportation will normally follow Buyer's shipping instructions, but ERI reserves the right to ship Products freight collect and to select the means of transportation and routing when Buyers instructions are deemed unsuitable in ERI's judgment. Unless otherwise advised, ERI may, but shall be under no obligation to, insure to full value of the Products or declare full value thereof to the transportation company at the time of delivery, and all freight and insurance costs shall be for Buyer's account. Risk of loss and/or damage shall pass to Buyer upon delivery of the Products to the transportation company at the FOB point whether or not installation is provided by or under supervision of ERI. Confiscation or destruction of, or damage to Products shall not release, reduce or in any way affect the liability of Buyer therefore. Notwithstanding any defect or nonconformity, or any other matter, such risk of loss and/or damage shall remain in Buyer until the Products are returned at Buyer's expense to such place as ERI may designate, in writing. Buyer, at its expense, shall fully insure Products against all loss and/or damage until ERI has been paid in full or the Products have been returned for whatever reason to ERI. All Products must be inspected upon receipt and claims should be filed with the transportation company when there is evidence of shipping damage, either concealed or external. As used in the clauses appearing herein or attached hereto, "delivery" shall occur when the Product is delivered at the FOB point which shall be the point of manufacture or such other place as ERI shall specify, in writing, notwithstanding installation by or under supervision of ERI.

2.2 Acceptance: The shipment by ERI of a Product to the Buyer shall constitute acceptance of that Product by Buyer, unless notice of defect or nonconformity is received by ERI within thirty (30) days of receipt of the Product at Buyer's designated receiving address, provided, that for Products for which ERI agrees, in writing, to perform acceptance testing after installation, the completion of ERI's applicable acceptance test, or execution of ERI's acceptance form by Buyer, shall constitute acceptance of the Product by Buyer. Notwithstanding the foregoing, any use of a Product by Buyer, its agents, employees, contractors or licensees, for any purpose, after receipt thereof, shall constitute acceptance of that Product by Buyer. ERI may repair or, at its option, replace defective or nonconforming parts after receipt of notice of defect or nonconformity.

2.3 Shipment Delays/Billing in Place: Upon completion of Buyer's order, any delay in shipment attributable to Buyer, including, but not limited to, Buyer's request to defer the delivery date, shall cause the following to occur: Thirty (30) days after the original shipment date, a storage charge of 1½% of the invoice price per month will be billed to Buyer and title to the shipment will automatically pass to Buyer. ERI will invoice Buyer for completed goods and Buyer will pay in accordance with the terms of the original sale, as the goods will be deemed to have shipped in place. ERI will insure against risk of loss until physical shipment of the goods to a common carrier. A tower shipment date is contingent upon receipt by ERI of all necessary site specific information. This information must be included with the signed Proposal and tower order. Depending upon the nature of the project, site specific information may include, but is not limited to: a site survey showing plot dimensions, topography, and possible obstructions; a geotechnical report; the desired tower orientation; the desired antenna orientation; and a complete shipping address.

2.4 Returns: Standard catalog products may be returned for credit provided such products are returned within six (6) months after the original shipment date. The minimum value accepted for return from each purchase order is $50.00. The amount of credit issued for any returned product shall be determined solely by ERI based on the resalable condition of the product. Non-standard products, including products specially manufactured in accordance with Buyer's specifications or tuned to one or more specified operating frequencies may not be returned for credit. Buyer shall obtain ERI's written return goods authorization prior to returning any Product for credit.

2.5 Service Warning: The Products may be dangerous if improperly installed, handled, serviced, refurbished, or reinforced. In the event that repair, maintenance or servicing need to be performed on the Products, Buyer should contact ERI immediately. ERI shall not be liable for any damages or injuries occurring in connection with maintenance, servicing or repair work on the Products done by persons other than ERI or its duly authorized representatives.

2.6 Installation: Unless this Proposal includes installation services, Buyer is responsible for installation of the Products, including preparation and maintenance of all Products, materials, or services necessary for the operation of the Products not provided by ERI. All installations should be performed by qualified tower climbers and electricians. All OSHA, state and local safety regulations should be observed. Any photos or drawings in product literature, installation manuals, or drawings are used to illustrate a specific point and are not intended to supersede any OSHA, state or local safety regulations.

2.7 Patents and Other Intellectual Property Rights: ERI will, at its own expense and as set forth herein, defend any action brought against Buyer in respect to any claim that the design or manufacture of any Product in ERI's commercial line of Products or manufactured to specifications set by ERI and furnished hereunder, constitutes an infringement of any patents or other intellectual property rights of the United States. Subject to the provisions in the DAMAGES AND LIABILITY section hereof, ERI will pay all damages and costs either awarded in a suit or paid, in ERI's sole discretion, by way of settlement, which are based on such claim of infringement, provided, that Buyer promptly notifies ERI, in writing, of such claim or infringement and gives ERI full authority, information and assistance in settling or defending such claim, or ERI will, in its sole discretion and at its own expense, either procure a license which will protect Buyer against such claim without cost to Buyer, replace said Product with a non-infringing Product or remove said Product and refund an equitable portion of the price paid by the Buyer to ERI for said Product. ERI shall have no liability whatsoever hereunder with respect to any claims settled by Buyer without ERI's prior written consent. ERI EXPRESSLY EXCLUDES from any liability hereunder, and Buyer shall hold ERI harmless from and against, any expense, loss, costs, damages or liability resulting from claimed infringement of patents, trademarks, copyrights or other intellectual property rights: (a) arising from a use of or a combination of a Product with other equipment, processes, programming applications or materials not furnished under the Proposal; (b) based on items made with the Products furnished under the Proposal; (c) arising out of compliance by ERI with Buyer's designs, specifications or instructions; and/or (d) arising from use or manufacture by anyone of inventions in connection with Products or services sold, used or intended for sale or use in performing contracts with the United States or related subcontracts. The foregoing states ERI's entire liability for any claim based upon or related to any alleged Infringement of any patent or other intellectual property rights.

2.8 Standard Two (2) Year Product Limited Warranty: Electronics Research. Inc. (ERI) warrants to the original Buyer that its Product is free from defects in material or workmanship

2.8.1 existing at the time of shipment from the factory or

2.8.2 that develop under normal use in a properly installed and maintained system for a period of twenty-four (24) months following the date of shipment, ex-works.

2.8.3 ERI Exclusions: Expressly excluded from the terms of this limited warranty are defects caused by:

2.8.3.1 faulty installation;

2.8.3.2 all minor system leakage ("leakage" is defined in paragraph 2.8.15), below);

2.8.3.3 equipment leaks and detuning if caused by rough handling or installation;

2.8.3.4 lack of proper inspection and maintenance;

2.8.3.5 unusually severe weather, lightning, icing, acts of God; such events require inspection for, and correction of, such damage;

2.8.3.6 water intrusion, foreign materials in the system;

2.8.3.7 vandalism, physical abuse, tampering, or unauthorized disassembly, repair or modification without explicit written approval of ERI;

2.8.3.8 operation not in accordance with published ratings, specifications, or instructions.

2.8.4 ERI Products are delivered Ex-Works. Unless ERI supervises the transportation, delivery, and/or installation of the product, ERI is not responsible for damage that may result from incorrect or improper transportation, storage, handling or installation of Products.

2.8.5 Buyer shall regularly inspect and maintain all ERI manufactured parts and Resale parts in accordance with ERI's and/or manufacturer's inspection and maintenance guidelines and in accordance with all regulations and recommendations of any government agency or body and in accordance with generally accepted industry maintenance standards. An initial inspection shall be conducted promptly after installation to verify that the installation is properly performed in accordance with ERI's and/or the manufacturer's installation instructions and procedures. Such inspections shall be performed at Buyer's expense by qualified personnel, and inspection summary report(s) shall be prepared immediately upon inspection completion. Reports of initial inspections shall be submitted to ERI Customer Service. Buyer shall forever protect, defend, indemnify, and hold ERI free and harmless against all claims, demands, liabilities, cause of action (including, without limitation, legal costs and expenses and reasonable attorney's fees) arising out of, or relating to Buyer's failure to completely discharge its obligations hereunder.

2.8.6 Buyer shall follow promptly all recommendations from qualified inspectors and/or ERI regarding the maintenance of all ERI manufactured and Resale structural Products.

2.8.7 Upon making a warranty claim, make copies of all preceding inspection reports and dispositions available to ERI for review.

2.8.8 Any defective warranted component of an ERI product will be repaired or replaced at the place of manufacture, ex-works, without charge if all defective components are returned by the Buyer to ERI, and ERI inspection discloses that such defects are as reported and are not the result of ERI Exclusions.

2.8.9 Under some circumstances, continuity of service may necessitate immediate shipment of repair parts before ERI inspection of defective parts. Under these conditions, ERI requires that Buyer place an order for replacement parts and will require that all defective parts be packaged and returned for factory inspection and determination of warranty status. If failure is determined to be covered by this warranty, credit will be issued for parts ordered by Buyer to expedite replacement.

2.8.10 Other than the replacement of defective Products or components ex-works, ERI shall not be responsible for any costs or expenses incurred by the Buyer arising from the identification, removal, and replacement of defective products.

2.8.11 ERI, at its sole discretion, may choose to supply warranty parts for repairs on site. In such cases, materials shall be shipped free of additional charge to the site. Losses arising from repair or replacement activities, including those for delays, rigging, and additional installation or maintenance crew time, are not be covered under this warranty.

2.8.12 Warranty repairs/replacements, whether at factory or on site, will fulfill the term of the original warranty. No extension of the original warranty term will be allowed.

2.8.13 "Resale equipment/parts/components" are defined as equipment, parts, or components purchased from another manufacturer or supplier and resold by ERI, shall only carry such manufacturer's or supplier's standard warranty in effect at the time of Product shipment from the supplier.

2.8.14 Antenna warranties shall be void if Buyer does not (i) purge and pressurize the antenna system with dry nitrogen or dry air furnished by the Buyer immediately following the installation of the system to initially check for installation leaks and (ii) maintain the antenna under a positive pressure of approximately 2 to 5 pounds per square inch at all times, including prior to installation, using either dry nitrogen or dry air. This warranty is void in the event that the system is pressurized above ERI's published instructions.

2.8.15 Minor leakage in a large system can be difficult if not impossible to detect, especially since temperature variations can mask their extent. ERI recommends the installation of dehydration equipment in any significant pressurized system. Minor leakage is beneficial because it causes occasional cycling the dehydration equipment and provides a fresh purge to the system. ERI regards any leak resulting in a system pressure drop of 0.5 PSI per day or less, temperature compensated, as an acceptable leak rate not actionable under these warranty terms.

2.8.16 For the scope and purposes of this warranty with regard to ERI manufactured structural towers/parts and resale structural parts, the phrase "Current Standard" is defined as the most current revision of ANSI/TIA-222 Standard including, but not limited to, all relevant appendices and annexes thereof, and all relevant documents incorporated by reference there from. This warranty shall be void if the Buyer does not:

2.8.16.1 follow all relevant and applicable directives as set forth in the Current Standard;

2.8.16.2 consult and obtain explicit approval from ERI regarding the qualifications of the tower crew chosen to implement/install any structural repairs and/or modifications;

2.8.16.3 consult and obtain explicit approval from ERI prior to implementing changes to the structure serviceability requirements, structure classification, and/or tower appurtenance loading (such as antennas, transmission lines, mounts, ice shields, platforms, ladders, etc.) which varies significantly from the original design parameters as determined by ERI.

2.8.17 Adequate VSWR monitoring and protection equipment must be installed and properly maintained in the transmission system to prevent system damage from ice, lightning, and other natural phenomena. Failure to properly install, maintain, or observe the warnings of the VSWR protection equipment voids this warranty, and subsequent damage caused by such failure is not covered under this warranty. ERI recommends purchase of an ERI manufactured or approved VSWR protection unit at time of antenna purchase.

2.8.18 If warranty site service is requested, it will be provided pursuant to a Buyer issued purchase order. If defects are not found to be the result of a valid warranty claim an invoice for such service will be issued at prevailing rates.

2.8.19 Notification of warranty claim must be provided to ERI within 30 days of the triggering event or detection of the failure.

2.8.20 In no case may the value of the warranty claim exceed the purchase price of the Product.

2.8.21 Warranty services will be provided, and valid claims will be honored as long as Buyer is current on all accounts due and owing to ERI.

2.8.22 THE FOREGOING WARRANTY IS AND SHALL BE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY AND ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR APPLICATION OR PURPOSE. THERE ARE NO WARRANTIES, REPRESENTATIONS OF FACT, OR PROMISES WITH RESPECT TO SIGNAL COVERAGE OR STRENGTH.

2.8.23 UNDER NO CIRCUMSTANCES SHALL ERI BE OBLIGATED OR LIABLE FOR SPECIAL INCIDENTAL, INDIRECT, CONSEQUENTIAL OR OTHER DAMAGES, LOSSES, OR EXPENSES IN CONNECTION WITH OR BY REASON OF THE FOREGOING WARRANTY OR BY REASON OF SOME OTHER TYPE OF EXPRESS OR IMPLIED WARRANTY FOUND TO EXIST NOTWITHSTANDING THE FOREGOING DISCLAIMERS.

2.9 Warranty Replacement and Adjustment: All claims under warranty must be made promptly after occurrence of circumstances giving rise thereto and must be received within the applicable warranty period by ERI or its authorized representative. Such claims should include the Product type and serial numbers and a full description of the circumstances giving rise to the claim. Before any Products are returned for repair and/or adjustment, written authorization from ERI or its authorized representative for the return and instructions as to how and where such Products should be shipped must be obtained. Any Product returned to ERI for examination shall be sent prepaid via the means of transportation indicated as acceptable by ERI. ERI reserves the right to reject any warranty claim not promptly reported and any warranty claim on any item that has been altered or has been shipped by non acceptable means of transportation. When any Product is returned for examination and inspection, or for any

other reason Buyer shall be responsible for all damage resulting from improper packing or handling, and for loss in transit notwithstanding any defect or non conformity in the Product. In all cases ERI has sole responsibility for determining the cause and nature of failure, and ERI's determination with regard thereto shall be final. If it is found that ERI's Product has been returned without cause and is still serviceable, Buyer will be notified and the Product returned at its expense; in addition, a charge for testing and examination may, in ERI's sole discretion, be made on Products so returned.

2.10 General Conditions:

2.10.1 ERI reserves the right to change or modify its design and construction of the Products and/or to substitute materials equal to or superior to or functional equivalents to that originally specified herein provided, however, that any substitution, change or modification shall not materially and adversely affect Buyer's ability to use the Products.

2.10.2 ERI reserves the right to make changes in design and construction of the Products it manufactures for others and to make and/or add improvements in such Products at any time without incurring any obligation to install the same in the products sold herein.

2.10.3 The Buyer shall at its expense engage any qualified engineer necessary to approve ERI's design, obtain building permits, and insure structural integrity of existing structure considering any ERI addition or appurtenance unless otherwise specified in the Proposal. ERI shall furnish construction and installation drawings and engineering data for its Products upon request.

2.10.4 The Proposal is submitted in accordance with the ANSI/EIA/TIA-222 standard in effect as of the date of the Proposal, unless otherwise stated in the body of the Proposal. This standard is intended to set the minimum criteria for the structural design, fabrication and construction of antennas and antenna support structures. It is the responsibility of the Buyer to provide site specific data and design requirements and any requirements differing from those contained in this standard to ERI prior to accepting the Proposal. Please refer to the applicable edition of the ANSI/EIA/TIA-222 standard for further information.

2.10.5 Buyer is responsible for any and all disposal and recycling of Products, packaging, reels, shipping crates, and other items associated with the fulfillment of order, as well as for compliance with any mandated "green" initiatives.

2.10.6 If field services are provided Buyer may request to be named as an additional insured on ERI's Liability policy and be provided a Certificate of Insurance naming Buyer as a certificate holder.

3. Special Terms and Conditions Applied to Field and Installation Services

3.1 If ERI is not the current Engineer of Record (EOR) for the supporting structure, it shall be the Purchaser's responsibility to engage the current structure's EOR or a Qualified Engineer to review all Construction Class IV work activities to assess construction loads at rigging attachment points and/or work activities impacting the strength and stability of the supporting tower such as structural member replacements in direct accordance with the current ANSI/TIA-322, Loading, Analysis, and Design Criteria Related to the Installation, Alteration and Maintenance of Communication Structures. ERI shall retain the services of a Supervising Engineer to develop construction loads which will be provided to the Purchaser, or their named representative, along with specific rigging attachment points being made to the supporting structure no less than 2 weeks prior to planned Construction Class IV work activities to allow time for the EOR/Qualified Engineer review. Any work delays occurring from the Purchaser's engineering review may result in delayed mobilizations and/or change order fees for downtime. Please note, if the Purchaser is unable or unwilling to attain the required engineering services to facilitate the construction review in accordance with current industry standards, any and all fees incurred by ERI for performing additional engineering assessments including any potential field inspections shall be submitted to the Purchaser as part of a change order.

3.2 The Proposal is based on work carried out in one mobilization and continuous operation without interruption or delays due to Buyer supplied missing materials, such as, but not limited to antennas, transmission lines, transmission line hangers, installation drawings, tower components, or electrical power. All material necessary for completing installation to be furnished by Buyer, must be on the tower site prior to starting of installation or scheduled in such a manner as to avoid delaying crew. Proposal is also based upon the following conditions:

3.2.1 Painting of the tower components (i.e. antenna or line) is not included in Proposal unless specified in Proposal.

3.2.2 Antenna feed line system will end just inside the transmitter facility (max 20'). Purchaser to have existing port for the line to enter. ERI is not responsible for installation inside the transmitter facility, such as, but not limited to inside transmission line runs, hangers, wall feed through plates, etc. ERI can perform these tasks at our standard daily rate if so desired.

3.2.3 This Proposal is subject to mutually negotiated scheduling and availability of resources and personnel. In case of significant delays beyond the control of ERI that cause ERI increased costs due to the rescheduling of crews, additional charges may apply. For this purpose, a delay shall not be considered significant unless it exceeds a period of ninety (90) days.

3.2.4 All work is to be performed unrestricted during daylight hours. (Weekend, holiday, or evening/ night work, when requested by customer will be billed an additional charge of 1.5 times standard rate.)

3.2.5 No guy wires interlaced or overhead power lines in working areas.

3.2.6 No tower, antenna, feed line, and/or bracket modifications required unless specified in Proposal.

3.2.7 No onsite transmission line field cuts required. If necessary, additional charges will be billed.

3.2.8 Antennas are assumed to have no more than 2 parasitic directors per bay. Each additional will be billed as necessary.

3.2.9 Taxes, bond or permit costs/fees have been paid by buyer/customer.

3.2.10 All antennas to be non-radiating or reduced to a safe power level while ERI personnel are in the immediate RF zones.

3.3 Downtime resulting from situations beyond the control of ERI or its subsidiary ERI Installations, Inc. as described above, will be billed at normal labor rates.

3.4 The Proposal on labor to install tower and/or antenna and other related equipment is based upon weather and time of day suitable for outdoor construction. Installation, field services and hazardous operations shall not be performed under adverse weather conditions for the safety of ERI personnel. Adverse weather delays shall be charged to Buyer at normal day rates and will be added to the construction schedule as time extensions. Certain operations may be performed under adverse weather conditions by mutual agreement and shall be billed at special rates provided in the Proposal. The ERI representative is the sole determinant of suitable and safe conditions while ERI personnel are on site.

3.5 In the event adverse weather causes a delay, ERI will notify the Buyer of those conditions and additional charges as soon as it is practical to do so. The responsibility to determine this condition rests with the ERI supervisor on site.

3.6 The tower site shall be accessible to workman and installation equipment, using two-wheel drive vehicles (under their own power) and heavy construction equipment such as, but not limited to cranes, concrete trucks, semi-tractor trailers, forklifts, etc.

3.7 All labor is based upon non-union wages. Should any conditions exist such that the use of union trades for installation of the tower, accessories and/or foundations is necessary, the prices stated in the Proposal are subject to adjustment unless a union stipulation has been specifically noted in the Proposal. Unless provided by ERI, the foundations must be completed so as to permit continuous work from time ERI's crew reports on the job and must be finished in accordance with ERI's specifications.

3.8 The Buyer assumes all liability resulting from site conditions differing from those specified or agreed to by the Buyer.

3.9 Unless otherwise specified in the Proposal, it is also Buyer's responsibility to:

3.9.1 To provide one (1) tagline path (75 feet wide and equal in length to the height of the tower) at the work face, cleared of all obstructions in order to permit a truck to be driven thereon.

3.9.2 Clear a guy path alley and fire lane down each guy radial 25 feet wide on each side of the guy line; and extend this lane 50 feet beyond the outer guy anchor, a 10-foot width of this 50-foot lane must be cleared of all obstructions in order to permit a truck to be driven thereon.

3.9.3 So grade the area immediately surrounding the tower site so as to permit the movement of trucks, cranes and/or other equipment required to handle and install the tower or related appurtenances.

3.9.4 Clear an area a minimum of 200 feet x 200 feet adjacent to the center of the tower to permit unloading, sorting, assembling, working space, and shall provide a hoist and equipment area 20 feet x 50 feet with capabilities for anchoring.

3.9.5 Provide a free and clear radius of 100 feet at the tower base for construction equipment and to allow staging and landing during tower construction and for future service work. This area shall have a rock/gravel surface bedding to support heavy equipment.

3.9.6 Provide fittings and gas required in pressure checking all of the antennas and transmission lines, if required.

3.9.7 A safe and secure work site to prevent theft and vandalism of contractor provided equipment and materials and Buyer delivered materials.

3.9.8 Provide electric power to the base of the tower suitable for powering construction equipment and tools. This also includes permanent electric power for the tower lighting system, if required, in accordance with the current revision of FAA circular AC 70/7460-1.

3.9.9 Provide the police service to direct traffic, if in the event the guy lines should cross a public or private road and secure the site from theft or vandalism of ERI equipment.

3.9.10 Provide toilet facilities, water, and trash containers for waste disposal. If sufficient trash receptacles are not provided, all trash and removed steel, antennas, mounts, lines, etc. shall be neatly left on site.

3.9.11 Provide scaled site survey of proposed tower location specifying tower location and orientation, property boundaries, site topography, overhead or buried utility service lines, or any other construction hazards or obstructions. Also provide survey required for antenna location and/or directional proof.

3.9.12 Provide a cleared and level area suitable for and capable of anchoring a hoist with a minimum area of 30' x 25'.

3.9.13 Obtain a tower structural analysis from a licensed Professional Engineer appropriate to the scope of work being requested.

3.9.14 Obtain any necessary rights of way and/or easements to allow access to work sites.

3.9.15 Provide a local certified electrical worker to make final connections. ERI's responsibility for lighting conduit and electrical wiring ends at the base of the tower.

3.9.16 Coordinate any required RF reductions or off-air time to allow ERI to perform necessary work in a safe and acceptable RF environment without any work flow interruption. If this cannot be accomplished, standby charges will apply at standard rates. ERI is NOT responsible for any consequential damages or loss of revenue or audience as a result of having to reduce transmitter power or go off air in order to accomplish a safe working environment.

3.9.17 Provide surveyed and staked locations for utilities, foundations, and directional proof prior to arrival of tower installation and/or foundation installation crews. Surveys must be coordinated with ERI.

3.10 When foundations are specified as a part of the Proposal, the Proposal for such work is based upon such work being undertaken and completed under "assumed normal" soil conditions as described by the latest revision of the ANSI/EIA-222 code. It shall be the responsibility of the Buyer to supply specific soil descriptive parameters, and ERI shall have an absolute right to rely on written test reports furnished by Buyer in the preparation of foundation drawings and in the installation of foundations. Normal soil conditions do not include rock, saturated soil, frozen soil, peat, or other soil variations similar or dissimilar. If subsurface soil conditions differ from geotechnical report and delay foundation work, the project schedule will be increased accordingly, and additional charges will be billed.

3.11 The installation price does not include work such as clearing or grading of tower site; installing, re-locating or repairing utility services; obtaining profiles or surveys; installing grounding systems unless specified; blasting; rock removal; water evacuation; cribbing; installing fill; removal of obstructions; snow removal, installation of planking; road building; clearance for site access; clearing of guy anchor paths; or any other kind of site preparation or site maintenance work.

3.12 If necessity dictates non-included labor or materials to be expended resulting from but not limited to, compliance to OSHA or local safety standards, inadequate site accessibility, non-included specified soil conditions, non-included labor or material requirements, then ERI shall be allowed to increase the installation and materials price to include any additional cost incurred, plus a reasonable profit.

3.13 ERI has the right to complete installation work early and be compensated for delay damages if other segments of the project, not in ERI control, affect an early completion of any part of ERI's work if ERI submits a reasonable plan to place the Buyer on notice of the intent to finish early and submits documentation of delays.

3.14 If requested or approved by the Buyer, ERI may provide accelerated services including overtime and/or multiple crews, as required to maintain the schedule or provide other services, and Buyer agrees to compensate ERI for such services.

Revised July 23, 2020

ERI Product Information for

Nebraska Educational Telecommunications Commission

FM Antenna and Transmission Line for KXNE-FM

State of Nebraska Purchasing Solicitation Number 6781OF

SHPX Series ROTOTILLER®[1] FM Antenna

Features

- Low VSWR
- Internal feed
- Fully pressurized
- Series fed radiating elements
- Circular polarization
- Welded feed connections
- Superior VSWR band width
- High input power capacity
- Custom modifications are available
- Corrosion resistant construction
- Modular construction facilitates easy installation and repair
- Minimal weather related VSWR problems
- Beam tilt and/or null fill available
- Half-wave spacing between elements available
- Rugged brass construction
- Stainless steel support brackets and hardware
- Radomes or deicing heaters not normally required for radial ice less than ½-inch
- Radomes or deicing heaters are available
- Custom designed antenna supports; poles or LAMBDA® tower sections are also available from ERI

ERI's original and distinctive design combines the exceptional engineering features of an internally fed, fully pressurized system with superior fabrication characterized by totally welded feed connections, rugged brass material and TIG welding. ERI antennas are unchallenged in quality and dependability. ERI is the only manufacturer to use large diameter outer conductors and a completely enclosed, pressurized, internal series feed system. The result is a simple and reliable method of coupling power to the elements. Unlike competing designs, ERI series fed antennas do not require a troublesome secondary current loop for element excitation with all the resulting disadvantages. All ERI antennas include brackets for mounting on leg, pole, or face mounting (up to 42-inch uniform cross section tower); brackets for other mounting configurations are optionally available. The ROTOTILLER series FM antenna's unique design consists of two series fed, bent dipole elements which form a space phased, circularly polarized radiator. The antenna's configuration and the large diameter of the radiating elements contribute to the excellent bandwidth of the antenna system, and also inhibits corona discharge.

The horizontally polarized horizontal plane azimuth pattern of the SHPX series antenna is omnidirectional within ±2 dB when the antenna is pole or Lambda mounted atop a tower. Side mounting the antenna on a typical tower structure will affect the azimuth pattern. ERI offers a pattern measurement service to assist in determining the effect of the mounting structure on the antenna's pattern. Using ERI's pattern optimization service the pattern's circularity may be improved through the addition of parasitically excited elements.

NOTE: The VSWR specifications apply over a frequency ±200 kHz from the tuning point of the antenna. Where radomes or deicing heaters are not used, this tuning point is customarily set 200 kHz above the

[1] ROTOTILLER is a registered trademark of Electronics Research, Inc.

station operating frequency to provide improved performance under icing conditions. Parasitic elements tend to reduce the VSWR bandwidth of the antenna.

Utilize the ERI advantage. Combine an ERI antenna with an ERI LAMBDA® Mounting Structure, Pattern Measurement. Assure yourself of the best antenna/tower interaction. ERI's Pattern Measurement service will provide the crucial answers concerning the relationship between the antenna mounting orientation and antenna pattern. Lambda Sections are designed to achieve optimum antenna performance while reducing weight and wind loads. Only ERI can offer you an antenna/tower/installation package that will achieve your highest expectations in a demanding FM market.

Preliminary FM Antenna Specifications

Electrical Specifications

Model Number:	SHPX-10AC	
Bay to Bay Spacing:	1.0 Lambda	
Number of Bays:	Ten (10)	
Input Feed:	Center Fed	
Operating Frequency:	89.3 MHz	Channel 207
Polarization:	Clockwise Circular	
Interbay Transmission Line:	3-1/8-inch	
Element Stem:	3-1/8-inch	
RF Input:	3-1/8-inch EIA Flanged, female	
Input Power Rating:	39 kW	
Element Type:	SHPX A Series ROTOTILLER®	
Azimuth Pattern Circularity:	±2.0 dB in free space	
Power Gain, Maximum:	5.544 numeric	(7.438 dBd)
Power Gain in the Horizontal Plane:	5.247 numeric	(7.199 dBd)
VSWR at Antenna Input:	1.07:1 or less, with field matching 1.25:1 or less, pole or LAMBDA® Mounting Section 1.50:1 or less, side mounted without field matching	
Electrical Beam Tilt:	0.75 degrees	
First Null Fill:	0%	
Second Null Fill:	0%	
Icing Protection:	Optional radomes available Optional electrical deicers available	

Mechanical Specifications

Antenna Length:	101.35 feet	(30.89 meters)
Antenna Aperture:	98.77 feet	(30.10 meters)
Vertical Tower Aperture Recommended:	111.35 feet	(33.94 meters)
Antenna Weight:		
Antenna only:	1161 pounds	(526.40 kilograms)
Antenna with ½-inch radial ice:	1904 pounds	(863.53 kilograms)
Antenna with radomes:	1822 pounds	(826.23 kilograms)
Antenna with radomes and ½-inch radial ice:	3274 pounds	(1485.16 kilograms)
Antenna EPA Normal Exposure:		
Antenna only:	45.2 square feet	(4.20 square meters)
Antenna with ½-inch radial ice:	57.9 square feet	(5.38 square meters)
Antenna with radomes:	96.1 square feet	(8.93 square meters)
Antenna with radomes and ½-inch radial ice:	110.3 square feet	(10.25 square meters)
Antenna EPA Transverse Exposure:		
Antenna only:	47.5 square feet	(4.41 square meters)
Antenna with ½-inch radial ice:	61.2 square feet	(5.69 square meters)
Antenna with radomes:	80.5 square feet	(7.48 square meters)
Antenna with radomes and ½-inch radial ice:	95.6 square feet	(8.88 square meters)

Mechanical Specification Notes:

(1) All loads calculated in accordance with the ANSI/TIA-222 standard. (2) Provided effective projected areas, EPA, do NOT include potential wind shielding/interference due to the interaction with the supporting structure (i.e. does not include Ka factor). (3) Listed antenna weights and effective wind areas include the antenna radiating elements, feed harnessing, and standard leg mounting brackets. Special mounting bracket loads for face-mounted and/or pole standoff mounted systems are NOT included. Final design loads will vary for specific projects and should be verified by an ERI representative when precise loading is required.

Electronics Research, Inc.
7777 Gardner Road
Chandler, In. 47610

Figure 1

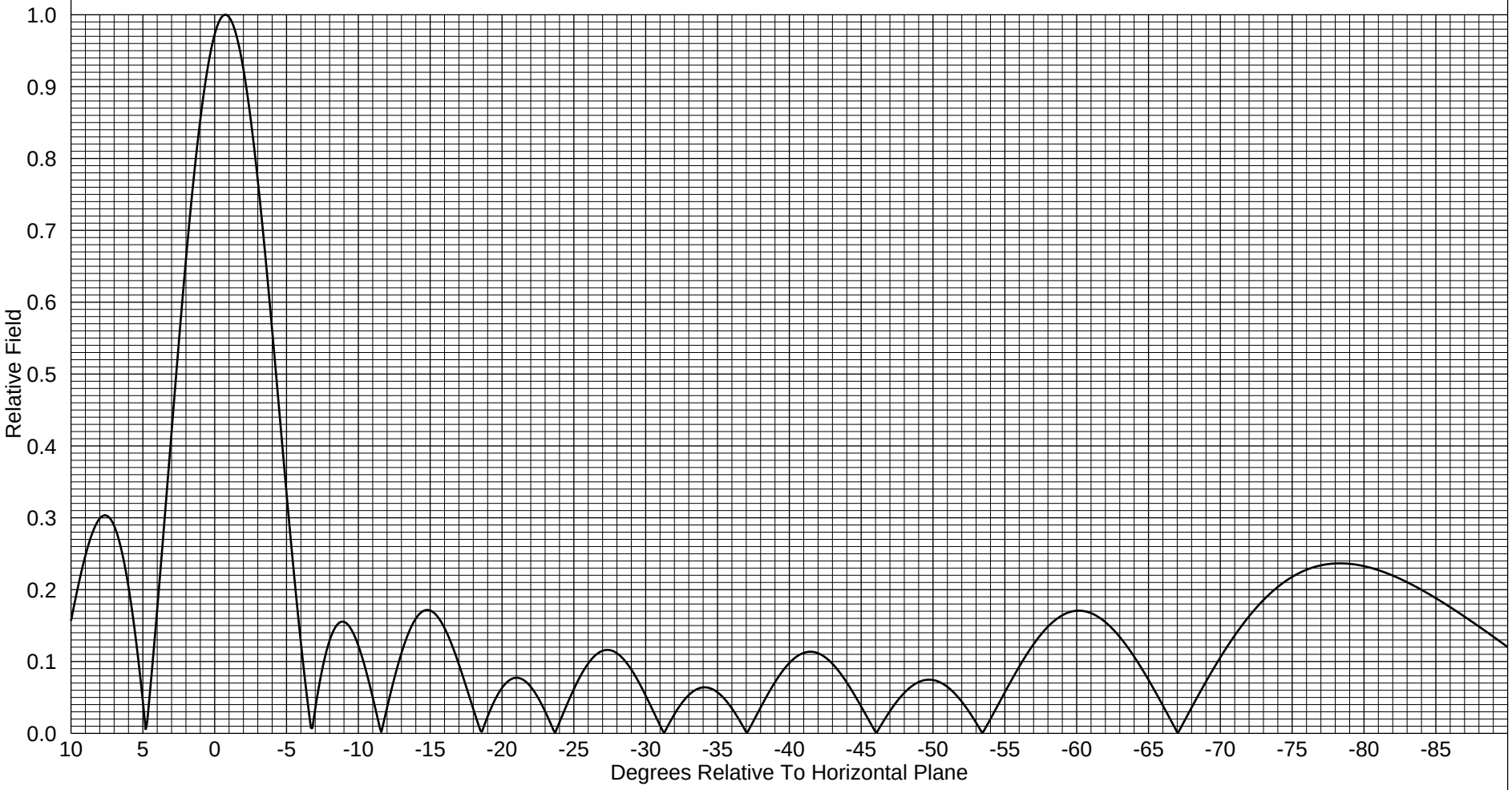
----Theoretical----

Vertical Plane Relative Field
10 ERI Type SHPX Elements
-0.75 Degree(s) Electrical Beam Tilt
0.0 Percent First Null Fill
0.0 Percent Second Null Fill
Power Gain is 5.247 In The Horizontal Plane(5.544 In The Max.)

5/14/2023 10:14:34 AM

89.3 MHz

Element Spacing:
131.69 Inches



ELEVATION TABULATED DATA

Type: SHPX-10AC with 0.75 Degrees Beam Tilt

Polarization: Circular

Angle	Field	dB	Angle	Field	dB	Angle	Field	dB	Angle	Field	dB
10.00	0.157	-16.09	-13.00	0.112	-19.03	-36.00	0.035	-29.18	-59.00	0.164	-15.69
9.50	0.205	-13.75	-13.50	0.140	-17.07	-36.50	0.019	-34.36	-59.50	0.169	-15.46
9.00	0.247	-12.13	-14.00	0.160	-15.93	-37.00	0.002	-56.12	-60.00	0.171	-15.36
8.50	0.280	-11.07	-14.50	0.170	-15.39	-37.50	0.017	-35.33	-60.50	0.170	-15.38
8.00	0.299	-10.48	-15.00	0.171	-15.34	-38.00	0.036	-28.87	-61.00	0.167	-15.53
7.50	0.303	-10.38	-15.50	0.163	-15.77	-38.50	0.054	-25.30	-61.50	0.162	-15.80
7.00	0.289	-10.78	-16.00	0.147	-16.68	-39.00	0.071	-22.95	-62.00	0.155	-16.21
6.50	0.256	-11.83	-16.50	0.124	-18.16	-39.50	0.086	-21.31	-62.50	0.145	-16.75
6.00	0.204	-13.81	-17.00	0.096	-20.36	-40.00	0.098	-20.18	-63.00	0.134	-17.45
5.50	0.133	-17.53	-17.50	0.065	-23.70	-40.50	0.107	-19.43	-63.50	0.121	-18.33
5.00	0.045	-27.01	-18.00	0.034	-29.39	-41.00	0.112	-19.01	-64.00	0.107	-19.43
4.50	0.058	-24.68	-18.50	0.004	-48.71	-41.50	0.114	-18.89	-64.50	0.091	-20.81
4.00	0.173	-15.25	-19.00	0.024	-32.55	-42.00	0.111	-19.06	-65.00	0.074	-22.57
3.50	0.295	-10.61	-19.50	0.046	-26.69	-42.50	0.106	-19.51	-65.50	0.057	-24.90
3.00	0.420	-7.54	-20.00	0.063	-23.97	-43.00	0.097	-20.28	-66.00	0.039	-28.24
2.50	0.543	-5.30	-20.50	0.074	-22.64	-43.50	0.085	-21.41	-66.50	0.020	-33.89
2.00	0.660	-3.62	-21.00	0.077	-22.22	-44.00	0.071	-23.01	-67.00	0.001	-56.78
1.50	0.765	-2.33	-21.50	0.074	-22.59	-44.50	0.055	-25.25	-67.50	0.017	-35.23
1.00	0.854	-1.37	-22.00	0.065	-23.77	-45.00	0.037	-28.55	-68.00	0.036	-28.89
0.50	0.925	-0.68	-22.50	0.050	-26.04	-45.50	0.020	-34.19	-68.50	0.054	-25.32
0.00	0.973	-0.24	-23.00	0.031	-30.28	-46.00	0.002	-54.91	-69.00	0.072	-22.85
-0.50	0.997	-0.02	-23.50	0.008	-41.52	-46.50	0.015	-36.35	-69.50	0.089	-20.99
-1.00	0.997	-0.03	-24.00	0.015	-36.27	-47.00	0.031	-30.20	-70.00	0.106	-19.52
-1.50	0.972	-0.25	-24.50	0.039	-28.14	-47.50	0.045	-26.98	-70.50	0.121	-18.31
-2.00	0.924	-0.69	-25.00	0.062	-24.21	-48.00	0.056	-24.98	-71.00	0.136	-17.31
-2.50	0.856	-1.35	-25.50	0.081	-21.79	-48.50	0.065	-23.69	-71.50	0.150	-16.47
-3.00	0.770	-2.28	-26.00	0.097	-20.24	-49.00	0.071	-22.92	-72.00	0.163	-15.76
-3.50	0.670	-3.48	-26.50	0.109	-19.28	-49.50	0.074	-22.57	-72.50	0.175	-15.15
-4.00	0.561	-5.02	-27.00	0.115	-18.79	-50.00	0.074	-22.59	-73.00	0.186	-14.63
-4.50	0.448	-6.98	-27.50	0.116	-18.72	-50.50	0.071	-22.98	-73.50	0.195	-14.19
-5.00	0.335	-9.51	-28.00	0.112	-19.05	-51.00	0.065	-23.78	-74.00	0.204	-13.82
-5.50	0.226	-12.92	-28.50	0.102	-19.80	-51.50	0.056	-25.08	-74.50	0.211	-13.50
-6.00	0.126	-17.98	-29.00	0.089	-21.03	-52.00	0.044	-27.10	-75.00	0.218	-13.24
-6.50	0.039	-28.28	-29.50	0.072	-22.87	-52.50	0.030	-30.35	-75.50	0.223	-13.02
-7.00	0.034	-29.29	-30.00	0.053	-25.58	-53.00	0.015	-36.59	-76.00	0.228	-12.85
-7.50	0.091	-20.86	-30.50	0.032	-29.91	-53.50	0.002	-53.29	-76.50	0.231	-12.72
-8.00	0.129	-17.77	-31.00	0.011	-39.05	-54.00	0.020	-33.93	-77.00	0.234	-12.62
-8.50	0.151	-16.45	-31.50	0.009	-41.18	-54.50	0.039	-28.27	-77.50	0.236	-12.56
-9.00	0.155	-16.18	-32.00	0.027	-31.48	-55.00	0.057	-24.86	-78.00	0.236	-12.53
-9.50	0.145	-16.78	-32.50	0.042	-27.58	-55.50	0.075	-22.46	-78.50	0.237	-12.52
-10.00	0.122	-18.27	-33.00	0.053	-25.46	-56.00	0.093	-20.65	-79.00	0.236	-12.54
-10.50	0.089	-20.97	-33.50	0.061	-24.32	-56.50	0.109	-19.24	-79.50	0.235	-12.59
-11.00	0.050	-26.00	-34.00	0.064	-23.88	-57.00	0.124	-18.12	-80.00	0.233	-12.66
-11.50	0.007	-42.73	-34.50	0.063	-24.06	-57.50	0.137	-17.25	-80.50	0.230	-12.76
-12.00	0.036	-28.92	-35.00	0.057	-24.86	-58.00	0.149	-16.56	-81.00	0.227	-12.87
-12.50	0.076	-22.34	-35.50	0.048	-26.44	-58.50	0.158	-16.05	-81.50	0.224	-13.01

Electronics Research, Inc.
7777 Gardner Road
Chandler, In. 47610

89.3 MHz

5/14/2023 10:23:10 AM

ELEVATION TABULATED DATA

Type: SHPX-10AC with 0.75 Degrees Beam Tilt

Polarization: Circular

Angle	Field	dB	Angle	Field	dB	Angle	Field	dB	Angle	Field	dB
-82.00	0.220	-13.17									
-82.50	0.215	-13.34									
-83.00	0.210	-13.54									
-83.50	0.205	-13.75									
-84.00	0.200	-13.99									
-84.50	0.194	-14.24									
-85.00	0.188	-14.51									
-85.50	0.182	-14.80									
-86.00	0.176	-15.11									
-86.50	0.169	-15.44									
-87.00	0.162	-15.79									
-87.50	0.156	-16.16									
-88.00	0.149	-16.55									
-88.50	0.142	-16.97									
-89.00	0.135	-17.42									
-89.50	0.127	-17.90									
-90.00	0.120	-18.41									

Electronics Research, Inc.
7777 Gardner Road
Chandler, In. 47610

89.3 MHz

5/14/2023 10:23:13 AM

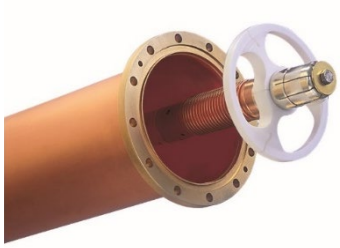
KXNE-FM Preliminary Power Analysis

Antenna Model:	SHPX-10AC			
	Analog		*Digital (-10 dBc)*	
Call Letters:	KXNE-FM Norfolk, Nebraska			
Frequency:	89.3 MHz	Channel 207		
ERP Peak of Beam:	45.000 kW	16.532 dBk	4.500 kW	6.532 dBk
ERP Horizontal Plane:	42.603 kW			
Polarization:	Circular		Circular	
Antenna RMS Gain:	5.544 Numeric	7.438 dB	5.544 Numeric	7.438 dB
Antenna Input Power:	8.117 kW	9.094 dBk	0.812 kW	-0.906 dBk
Peak Voltage:	901 volts		570 volts	
Transmission Line Type - Vertical Run:	MACX350A 3-1/8-inch MACXLine®		MACX350A 3-1/8-inch MACXLine®	
Vertical Run Length:	881 feet	268.5 meters	881 feet	268.5 meters
Vertical Run Attenuation:	0.090 dB/100-feet	0.297 dB/100-meters	0.090 dB/100-feet	0.297 dB/100-meters
Transmission Line Type - Horizontal Run:	MACX350A 3-1/8-inch MACXLine®		MACX350A 3-1/8-inch MACXLine®	
Horizontal Run Length:	49 feet	14.9 meters	49 feet	14.9 meters
Horizontal Run Attenuation:	0.090 dB/100-feet	0.297 dB/100-meters	0.090 dB/100-feet	0.297 dB/100-meters
Line Loss:	-1.736 kW	0.842 dB	-0.174 kW	0.842 dB
Line Efficiency:	82.385%		82.385%	
Transmitter Power Output:	9.852 kW	9.935 dBk	0.985 kW	-0.065 dBk
Peak Voltage:	993 volts		628 volts	
Analog and Digital into transmission line:	10.838 kW	1,620 volts		
Analog and Digital into antenna:	8.929 kW	1,471 volts		

ERI Rigid Transmission Product Overview

ERI manufactures a wide range of rigid transmission line products and components for broadcast applications. These products are manufactured at ERI's main facility in Chandler, Indiana, USA from the highest quality materials and with the latest fabrication technologies.

MACXLine® Rigid Line with Bellows Inner Connector



Made with heavy wall extruded copper inner and outer conductors, MACXLine® Rigid Line with Bellows Inner Connector is designed for exceptional reliability and long life. Six sizes, ranging from 3-1/8-inch through 8-3/16-inch, are available in original MACXLine®. ERI offers solutions optimized to meet your needs. ERI's field proven bellows expansion compensator accommodates the differential expansion between the inner and outer conductor and vertical and horizontal spring hangers are designed to support the system and compensate for differential expansion between the tower and vertical and horizontal runs. All the required system components and installation accessories can also be purchased from ERI.

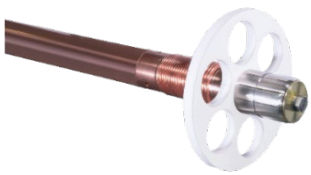
StandardLine Rigid Transmission Line

ERI StandardLine rigid coaxial transmission line is available in sizes from 7/8-inch to 8-3/16-inch. All required system components and installation accessories can be purchased from ERI. These components are fabricated from the same high-quality materials as MACXLine, but they do not include a bellows section for differential expansion compensation. This product is recommended only for very short runs and for indoor application only. This product family also includes unflanged rigid transmission line components in sizes from 7/8-inch to 6-1/8-inch, 50-ohm, for indoor use.

1329Line™ Rigid Transmission Line

ERI offers complete aluminum outer/copper inner conductor rigid transmission line systems in 3-1/8 inch, 4 1/16-inch and 6 1/8-inch (both 50 and 75-ohm) sizes. Not only does the elimination of the copper outer conductor reduce component prices, but the reduced weight decreases the support component complexity, cost and effort required to install the transmission line system. ERI's field proven bellows expansion compensator accommodates the differential expansion between the inner and outer conductor and vertical and horizontal spring hangers support the system and compensate for differential expansion between the tower and vertical and horizontal runs. This product family also includes unflanged rigid transmission line components in sizes from 1-5/8-inch to 6-1/8-inch, 50-ohm, for indoor use.

Inners Only™ Inner Conductors Replacement System

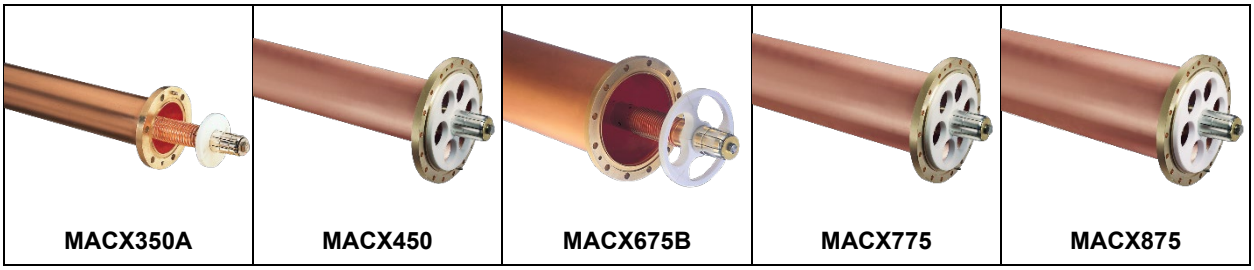


MACXLine® transmission lines are available as Inners Only™ replacements. Since MACXLine® lengths are identical to those of standard rigid line, it is an excellent choice for any application. Conventional rigid transmission line systems require maintenance after just ten years to avoid premature burnout of bullet-style connectors. MACXLine® Inners Only™ replacements provide the ultimate in operational dependability at about half the cost of a new installation. You swap your worn-out, failure-prone bullets and inner conductors for the

most dependable components in the industry while reusing your expensive outer conductors, which are normally good for many more years of service.

General Product Information

MACXLine® Rigid Coaxial Transmission Line



MACX350A	MACX450	MACX675B	MACX775	MACX875

MACX650 not shown

During broadcasting, RF heating of the inner and outer connectors causes differential expansion between them. With original design rigid transmission line, this expansion is compensated for with sliding metal bullets. Eventually this produces wear, hot spots—and burnout. Experienced broadcast consultants recommend replacing these bullets every seven years to avoid sudden failure.

The solution to eliminating sliding-contact wear is to eliminate the sliding. All expansion of the ERI, patented, MACXLine® inner connector is taken up with a flexible, built-in bellows; once put into service. Burnout and bullet replacement are eliminated. This advantage comes with no VSWR penalty or significant cost premium.

MACXLine® is manufactured by ERI from high conductivity copper tubing, outer conductors. Extra strength, custom PTFE dielectric disk insulators maintain precise mechanical alignment. Each section comes complete with a bullet/bellows assembly, stainless steel flange hardware and pressure sealing O ring gasket.

WIDELine™ Broadband Rigid Coaxial Transmission Line

ERI's MACXLine® is also available configured as a WIDELine™ that allows multiplex DTV television signals and minimize VSWR spikes, while extending the life of their transmission line. WIDELine™ wideband transmission line is made up of different length sections to minimize the addition of reflections. The result is excellent VSWR performance of a maximum of 1.1:1 over all UHF-TV channels in the U.S. FCC core spectrum.

For example, a 1,480-foot run of WIDELine™ transmission line (8-3/16-inch, 75-ohm) was calculated to have a maximum VSWR of slightly more than 1.08. Actual field results may vary, but VSWR will not exceed 1.1:1 for any UHF-TV channel 14 through 51.

ERI WIDELine™ transmission line also protects your investment by eliminating problems caused by sliding bullet-type connections found in conventional rigid transmission line. Conventional rigid line is capable of accepting future changes in frequency assignments, with acceptable VSWR performance, however, its service life is limited by the rubbing of its connection points, which can ultimately lead to bullet burnout or arc-over. WIDELine™ transmission line incorporates a unique, patented bellows section into each inner conductor that compensates for differential expansion between the inner and outer conductors. Mechanical wear from sliding contacts is thus eliminated. The result is extremely long life. Since 1984, more than 200 broadcasters have selected transmission line using this technology, without a

single failure due to bullet burnout. WIDELine™ is available in 3-1/8-inch,4-1/16-inch, 6-1/8-inch, 7-3/16-inch and 8-3/16-inch sizes.

DUALine™ Custom-Length, Dual-Channel, Rigid Transmission Line

If full wideband performance is not required, ERI will calculate the optimum rigid line section length to minimize VSWR, by using a proprietary computer program. Sections would normally be 20 feet long, or somewhat shorter and would all be the same length to simplify installation. This solution is ideal for applications where the DTV and NTSC signals are combined in a single line, as it typically results in outstanding VSWR performance (depending on which channels are combined).

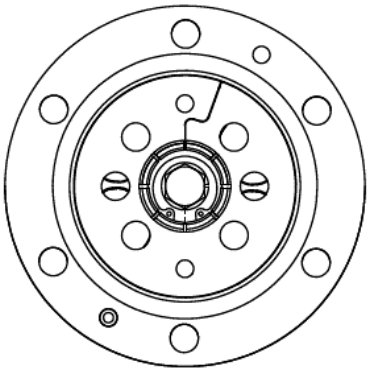
Inners Only™ Inner Conductors Replacement System

MACXLine® transmission lines are available as Inners Only™ replacements. Since MACXLine® lengths are identical to those of standard rigid line, it is an excellent choice for any application.
Conventional rigid transmission line systems require maintenance after just ten years to avoid premature burnout of bullet-style connectors. By upgrading with ERI Inners Only™ before your existing transmission line fails, you avoid the disaster of dead air.

MACXLine® Inners Only™ replacements provide the ultimate in operational dependability at about half the cost of a new installation. You swap your worn-out, failure-prone bullets and inner conductors for the most dependable components in the industry while reusing your expensive outer conductors, which are normally good for many more years of service.

3-1/8-inch Rigid Transmission Line Common Specifications

Line Size, Impedance	3-1/8-inch, 50-ohm	
Outer Material	Copper	
Velocity Factor	99.8%	
Cutoff Frequency	1600 MHz	
Peak Power Rating	440 kW	
Product Test Voltage	19 kV D.C.	
Outer Conductor		
Outer Diameter	3.125-in	(79-mm)
Inner Diameter	3.027-in	(77-mm)
Inner Conductor		
Outer Diameter	1.315-in	(33-mm)
Inner Diameter	1.231-in	(31-mm)
Flange Information		
Overall Diameter	5.188-in	(132-mm)
Bolt Circle	4.375-in	(111-mm)
No. of Bolts	Six (6)	
Bolt Size	3/8 in	



3-1/8-inch, 50-ohm

Recommended Transmission Line Section Lengths

Rigid transmission line is manufactured in flanged sections of a fixed length. At each flange section all, rigid coaxial inner connectors exhibit a minor deviation from the characteristic impedance of the transmission line. This deviation causes a small amount of power to be reflected back to the RF source (VSWR). By using the correct fixed line length, the VSWR buildup occurs outside the system's designed operating frequency. This needs to be considered for both digital television and FM service.

US Television Channels

20.00-foot (6.096 m) Section Length
Channels: 2, 3, 5, 6, 7, 8, 9, 11, 12, 14, 15, 18, 19, 22, 23, 27, 31, 32, 35, 36

19.75-foot (6.020 m) Section Length
Channels: 16, 20, 24, 28, 33

19.5-foot (5.944 m) Section Length
Channels: 4, 10, 13, 17, 21, 25, 26, 29, 30, 34

FM Radio Frequencies

Foot (Meter)	MHz
20.00 (6.096) Sections	88.1 - 95.9
	100.3 - 107.9
19.50 (5.944) Sections	96.1 - 98.3
19.00 (5.791) Sections	98.5 - 100.1
17.50 (5.342) Sections	88.1 – 107.9

Television channels listed are preferred, others may also be acceptable. Contact ERI for more information.

3-1/8-inch Rigid Line Attenuation and Power Handling

Channel	Freq. (MHz)	Attn. (dB/100 feet)	Attn. (dB/100 meters)	Average Power (kW)	Channel	Freq. (MHz)	Attn. (dB/100 feet)	Attn. (dB/100 meters)	Average Power (kW)
FM Frequencies									
201	88.1	0.090	0.295	53.2	251	98.1	0.095	0.311	50.4
202	88.3	0.090	0.295	53.1	252	98.3	0.095	0.312	50.3
203	88.5	0.090	0.296	53.0	253	98.5	0.095	0.312	50.3
204	88.7	0.090	0.296	53.0	254	98.7	0.095	0.312	50.2
205	88.9	0.090	0.296	52.9	255	98.9	0.095	0.313	50.2
206	89.1	0.090	0.297	52.9	256	99.1	0.095	0.313	50.1
207	89.3	0.090	0.297	52.8	257	99.3	0.095	0.313	50.1
208	89.5	0.091	0.297	52.7	258	99.5	0.096	0.314	50.0
209	89.7	0.091	0.298	52.7	259	99.7	0.096	0.314	49.9
210	89.9	0.091	0.298	52.6	260	99.9	0.096	0.314	49.9
211	90.1	0.091	0.298	52.6	261	100.1	0.096	0.315	49.8
212	90.3	0.091	0.299	52.5	262	100.3	0.096	0.315	49.8
213	90.5	0.091	0.299	52.5	263	100.5	0.096	0.315	49.7
214	90.7	0.091	0.299	52.4	264	100.7	0.096	0.315	49.7
215	90.9	0.091	0.300	52.3	265	100.9	0.096	0.316	49.6
216	91.1	0.091	0.300	52.3	266	101.1	0.096	0.316	49.6
217	91.3	0.092	0.300	52.2	267	101.3	0.096	0.316	49.5
218	91.5	0.092	0.301	52.2	268	101.5	0.097	0.317	49.5
219	91.7	0.092	0.301	52.1	269	101.7	0.097	0.317	49.5
220	91.9	0.092	0.301	52.0	270	101.9	0.097	0.317	49.4
221	92.1	0.092	0.302	52.0	271	102.1	0.097	0.318	49.4
222	92.3	0.092	0.302	51.9	272	102.3	0.097	0.318	49.3
223	92.5	0.092	0.302	51.9	273	102.5	0.097	0.318	49.3
224	92.7	0.092	0.303	51.8	274	102.7	0.097	0.319	49.2
225	92.9	0.092	0.303	51.8	275	102.9	0.097	0.319	49.2
226	93.1	0.092	0.303	51.7	276	103.1	0.097	0.319	49.1

Channel	Freq. (MHz)	Attn. (dB/100 feet)	Attn. (dB/100 meters)	Average Power (kW)	Channel	Freq. (MHz)	Attn. (dB/100 feet)	Attn. (dB/100 meters)	Average Power (kW)
FM Frequencies									
227	93.3	0.093	0.304	51.7	277	103.3	0.097	0.320	49.1
228	93.5	0.093	0.304	51.6	278	103.5	0.097	0.320	49.0
229	93.7	0.093	0.304	51.5	279	103.7	0.098	0.320	49.0
230	93.9	0.093	0.305	51.5	280	103.9	0.098	0.320	48.9
231	94.1	0.093	0.305	51.4	281	104.1	0.098	0.321	48.9
232	94.3	0.093	0.305	51.4	282	104.3	0.098	0.321	48.8
233	94.5	0.093	0.305	51.3	283	104.5	0.098	0.321	48.8
234	94.7	0.093	0.306	51.3	284	104.7	0.098	0.322	48.7
235	94.9	0.093	0.306	51.2	285	104.9	0.098	0.322	48.7
236	95.1	0.093	0.306	51.2	286	105.1	0.098	0.322	48.6
237	95.3	0.094	0.307	51.1	287	105.3	0.098	0.323	48.6
238	95.5	0.094	0.307	51.0	288	105.5	0.098	0.323	48.5
239	95.7	0.094	0.307	51.0	289	105.7	0.099	0.323	48.5
240	95.9	0.094	0.308	50.9	290	105.9	0.099	0.324	48.4
241	96.1	0.094	0.308	50.9	291	106.1	0.099	0.324	48.4
242	96.3	0.094	0.308	50.8	292	106.3	0.099	0.324	48.4
243	96.5	0.094	0.309	50.8	293	106.5	0.099	0.325	48.3
244	96.7	0.094	0.309	50.7	294	106.7	0.099	0.325	48.3
245	96.9	0.094	0.309	50.7	295	106.9	0.099	0.325	48.2
246	97.1	0.094	0.310	50.6	296	107.1	0.099	0.325	48.2
247	97.3	0.094	0.310	50.6	297	107.3	0.099	0.326	48.1
248	97.5	0.095	0.310	50.5	298	107.5	0.099	0.326	48.1
249	97.7	0.095	0.311	50.5	299	107.7	0.099	0.326	48.0
250	97.9	0.095	0.311	50.4	300	107.9	0.100	0.327	48.0
TV Frequencies									
2	57	0.072	0.237	66.2	20	509	0.219	0.719	21.8
3	63	0.076	0.249	63.0	21	515	0.220	0.723	21.7
4	69	0.079	0.261	60.1	22	521	0.222	0.727	21.6
5	79	0.085	0.279	56.2	23	527	0.223	0.731	21.4
6	85	0.088	0.290	54.1	24	533	0.224	0.736	21.3
7	177	0.128	0.420	37.4	25	539	0.226	0.740	21.2
8	183	0.130	0.427	36.7	26	545	0.227	0.744	21.1
9	189	0.132	0.434	36.1	27	551	0.228	0.748	21.0
10	195	0.134	0.441	35.6	28	557	0.229	0.752	20.8
11	201	0.136	0.448	35.0	29	563	0.231	0.757	20.7
12	207	0.138	0.454	34.5	30	569	0.232	0.761	20.6
13	213	0.141	0.461	34.0	31	575	0.233	0.765	20.5
14	473	0.211	0.692	22.7	32	581	0.234	0.769	20.4
15	479	0.212	0.697	22.5	33	587	0.236	0.773	20.3
16	485	0.214	0.701	22.4	34	593	0.237	0.777	20.2
17	491	0.215	0.705	22.2	35	599	0.238	0.781	20.1
18	497	0.216	0.710	22.1	36	605	0.239	0.785	20.0
19	503	0.218	0.714	22.0					
TV Frequencies (Europe)									
2	48.25	0.066	0.218	72.0	40E	626	0.243	0.799	19.6
2A	49.75	0.067	0.221	70.9	41E	634	0.245	0.804	19.5
3	55.25	0.071	0.233	67.3	42E	642	0.247	0.809	19.4
4	66.25	0.078	0.255	61.4	43E	650	0.248	0.814	19.3
5	175.25	0.127	0.418	37.5	44E	658	0.250	0.820	19.1
6	182.25	0.130	0.426	36.8	45E	666	0.251	0.825	19.0
7	189.25	0.132	0.434	36.1	46E	674	0.253	0.830	18.9
8	196.25	0.135	0.442	35.5	47E	682	0.254	0.835	18.8
9	203.25	0.137	0.450	34.8	48E	690	0.256	0.840	18.7
10	210.25	0.140	0.458	34.2	49E	698	0.257	0.845	18.6
11	217.25	0.142	0.466	33.7	50E	706	0.259	0.850	18.5

Channel	Freq. (MHz)	Attn. (dB/100 feet)	Attn. (dB/100 meters)	Average Power (kW)	Channel	Freq. (MHz)	Attn. (dB/100 feet)	Attn. (dB/100 meters)	Average Power (kW)
FM Frequencies									
12	224.25	0.144	0.473	33.1	51E	714	0.260	0.855	18.3
21E	474	0.211	0.693	22.6	52E	722	0.262	0.860	18.2
22E	482	0.213	0.699	22.4	53E	730	0.263	0.864	18.1
23E	490	0.215	0.705	22.2	54E	738	0.265	0.869	18.0
24E	498	0.217	0.711	22.1	55E	746	0.266	0.874	17.9
25E	506	0.218	0.716	21.9	56E	754	0.268	0.879	17.8
26E	514	0.220	0.722	21.7	57E	762	0.269	0.884	17.7
27E	522	0.222	0.728	21.5	58E	770	0.271	0.888	17.6
28E	530	0.224	0.734	21.4	59E	778	0.272	0.893	17.6
29E	538	0.225	0.739	21.2	60E	786	0.274	0.898	17.5
30E	546	0.227	0.745	21.1	61E	794	0.275	0.903	17.4
31E	554	0.229	0.750	20.9	62E	802	0.277	0.907	17.3
32E	562	0.230	0.756	20.7	63E	810	0.278	0.912	17.2
33E	570	0.232	0.761	20.6	64E	818	0.279	0.917	17.1
34E	578	0.234	0.767	20.4	65E	826	0.281	0.921	17.0
35E	586	0.235	0.772	20.3	66E	834	0.282	0.926	16.9
36E	594	0.237	0.778	20.2	67E	842	0.284	0.930	16.9
37E	602	0.239	0.783	20.0	68E	850	0.285	0.935	16.8
38E	610	0.240	0.788	19.9	69E	858	0.286	0.939	16.7
39E	618	0.242	0.794	19.8					
40E	626	0.243	0.799	19.6					
41E	634	0.245	0.804	19.5					
42E	642	0.247	0.809	19.4					

Specification and Design Notes:

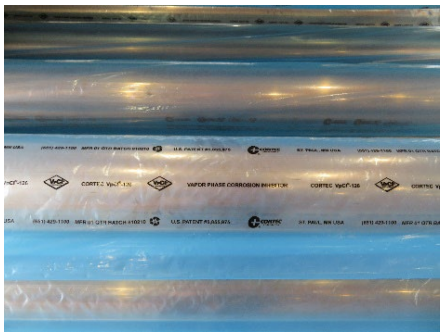
Standard conditions for rating rigid lines are as follows. Attenuation: VSWR 1:1.0, ambient temperature 20°C (68°), atmospheric pressure, dry air. Average Power: VSWR 1:1.0, ambient temperature 40°C (104°F), inner conductor temperature 100°C (212°F), atmospheric pressure, dry air and no solar loading. The safety factor on peak power ratings is 400% (safety factor of 2.0 on voltage) to allow for the possible effects of fine matchers, tuning slugs, etc. Also, the theoretical peak breakdown voltage is derated by 35% for production testing purposes, as done across the broadcast industry. Due to the difficulty of measuring the attenuation of large diameter rigid lines precisely, attenuation, (and consequently average power), ratings are calculated based on line geometry, copper losses and dielectric losses.

ERI rigid coaxial transmission lines are EIA compliant. To ensure high conductivity, they are made from ASTM B188 Alloy 102, Alloy 103 and Alloy 110 seamless copper tubes, which have an I.A.C.S rated conductivity at or above 99%. Temper is Hard Drawn, H80, for line sizes 3-1/8 inch and is rated Hard, H75, for sizes > 3-1/8 inch. The coefficient of thermal expansion is 9.4 x 10^{-6} in/(in/ºF) over 68°F – 212°F. Copper tube straightness is maintained at ≤ ½ inch per 20-foot length. This choice of copper material has been optimized in balancing the effects of both temperature and alloying elements on conductivity, as well as the need for strength, corrosion resistance and formability.

While typical RF broadcast transmission line systems are pressurized to 2-5 psig, ERI components are designed to handle 20 psig minimum. In RF applications, attenuation is affected by the nature of the signal to concentrate on the surface of the conductor due to skin effect, by some surface oxidation which is always present and also by small additional losses occurring at the flange interface. In order to ensure that attenuation ratings are conservative and agree closely with field-measured data, they include a derating factor on conductivity of 4 percentage points.

Transmission Line Shipment Packaging

Heat Shrink Skid Tarps Provide Long Term Weather Protection



CORTEC Corrosion Inhibitor Impregnated Packing Sleeves

Styrofoam Stacking Cradles for Shipment and Storage

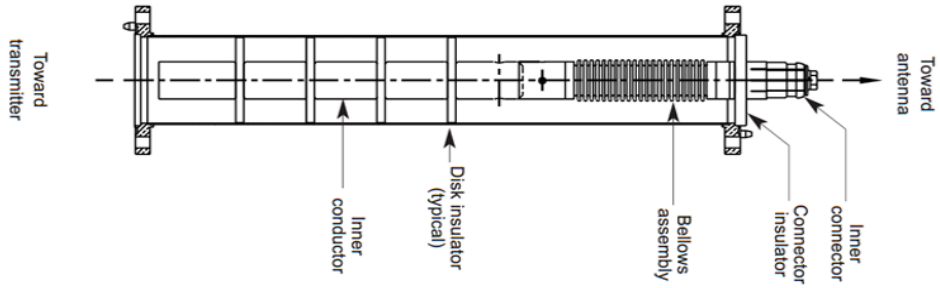
Rigid transmission line components are usually shipped to site and outdoor storage is often required. All transmission line systems shipped from ERI are suitably packaged for outdoor storage. This includes bagging the individual line sections in CORTEC bags that are impregnated with a corrosion inhibitor and stacking the line sections in Styrofoam cradles that are strapped to a shipping skid and then fully enclosed in a weatherproof heat shrink cover. This process has been used by ERI for several years and it has been demonstrated to be an excellent way to store rigid line components outdoors, for long periods, without tarnishing.

3-1/8-inch Rigid Line Sections

MACXLine® Rigid Line Sections

MACXLine® Standard Length Rigid Line Sections

MACXLine® standard length rigid line section come in standard section lengths of 20.00-foot (6.096-meter) detail “-1”, 19.75-foot (6.020 meter) detail “-2”, 19.50-foot (5.944 meter) detail “-3”, 19.00-foot (5.791 meter) detail “-6”and 17.50-foot (5.342 meter) detail “-11”. The detail “-D” line sections are for DUALine™ systems which use a specially engineered section length, that is the same for the entire system, to accommodate two (2) or three (3) television RF channels which are not able to use a standard line section length. The detail “W” line section are variable length line sections which are designed to provide a system which has a maximum VSWR of 1.1:1 or less for the entire UHF television band. Each line section includes the copper inner and outer conductor. The inner conductor includes the MACXLine fixed bullet/bellows expansion compensator. One flange hardware kit, with O ring is also included with each rigid line section.



MACXLine® Standard Rigid Line Section Specifications

Part No.	Line Size	Impedance	Length		Section Weight	
MACX350A-1	3-1/8-inch	50 ohm	20.00-ft	(6.10-m)	56-lbm	(25.4-kg)
MACX350A-2	3-1/8-inch	50 ohm	19.75-ft	(6.02-m)	55-lbm	(24.9-kg)
MACX350A-3	3-1/8-inch	50 ohm	19.50-ft	(5.94-m)	54-lbm	(24.5-kg)
MACX350A-6	3-1/8-inch	50 ohm	19.00-ft	(5.79-m)	52-lbm	(23.6-kg)
MACX350A-11	3-1/8-inch	50 ohm	17.50-ft	(5.33-m)	49-lbm	(22.2-kg)
MACX350A-D	3-1/8-inch	50 ohm	Custom	--	TBD	
MACX350A-W	3-1/8-inch	50 ohm	Varies	--	Varies	

MACXLine® Variable Length Rigid Line Sections

Special length MACXLine rigid line sections are available in any length and are a fixed price offering with detail numbers for variable length line sections up to 60.00-inches (1524-mm), 60.00-inches to 120.00-inches (1524-mm to 3048-mm) and 120.00-inches to 240.00-inches (3048-mm to 6096-mm). Each line section includes the copper inner and outer conductor. The inner conductor includes the MACXLine fixed bullet/bellows expansion compensator in variable length line sections greater than 60.00-inches (1524 mm). Variable length rigid line sections less than 60-inches (1524 mm), where the bellows compensator is not required, include a standard copper inner conductor with a captivated inner connector. One flange hardware kit, with O ring, is also included with each variable length rigid line section.

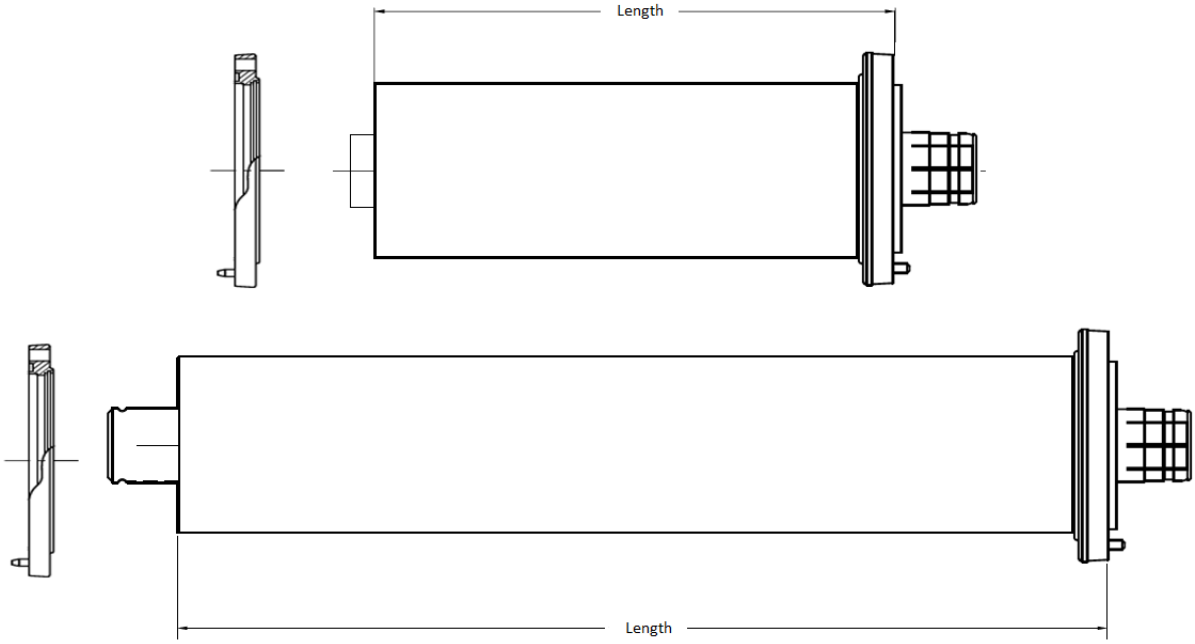
MACXLine® Variable Length Rigid Line Section Specifications

Part No.	Line Size	Impedance	Length			
MACX350A-5	3-1/8-inch	50 ohm	5.00-in to	60.00-in	(127-mm to	1524-mm)
MACX350A-10	3-1/8-inch	50 ohm	60.00-in to	120.00-in	(1524-mm to	3048-mm)
MACX350A-20	3-1/8-inch	50 ohm	120.00-in to	240.00-in	(3048-mm to	6096-mm)

MACXLine® Field Cut Rigid Line Sections

MACXLine Field Cut rigid line sections are available as an alternative to factory fabricated variable length line section. The detail -39 field cut MACXLine sections are for any length from 60.00-inches (1524-mm) to 240.00-inches (6096-mm). Each line section includes the copper inner and outer conductor. The inner conductor includes the MACXLine fixed bullet/bellows expansion compensator. Includes bellows attachment bushing (stub adapter) at both ends of the inner conductor. This accommodates any cut length required while maintaining sufficient separation from the inner conductor support insulators.

The detail -41 field cut line section is for section lengths less than 60-inches (1524 mm), where the bellows compensator is not required, include a standard copper inner conductor with a captivated inner connector.Both kits include a silver solder fixed field flange kit and one flange hardware kit, with O ring, is also included with each rigid line section.



MACXLine® Field Cut Rigid Line Sections Specifications

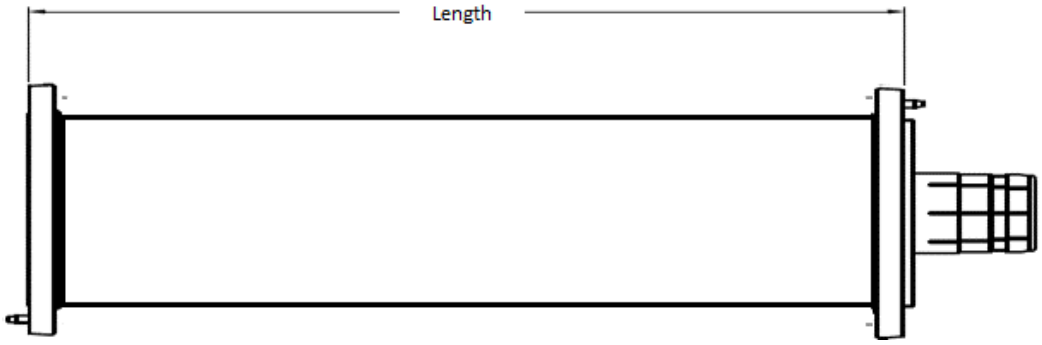
Part No.	Line Size	Impedance	Length			
MACX350A-39	3-1/8-inch	50-ohm	60.00-in to	120.00-in	(1524-mm to	3048-mm)
MACX350A-41	3-1/8-inch	50-ohm	0.00-in to	60.00-in	(0-mm to	1524-mm)

3-1/8-inch StandardLine Rigid Line Sections

STDLine Standard Length Rigid Line Sections

ERI StandardLine rigid coaxial transmission line is available in sizes from 7/8-inch to 8-3/16-inch. All required system components and installation accessories can be purchased from ERI. These components are fabricated from the same high-quality materials as MACXLine, but they do not include a bellows section for differential expansion compensation. This product is recommended only for very short runs and for indoor application only. This product family also includes unflanged rigid transmission line components in sizes from 7/8-inch to 6-1/8-inch, 50-ohm, for indoor use.

STDLine standard length rigid line sections come in standard section lengths of 20.00-foot (6.096-meter), 19.75-foot (6.020 meter), 19.50-foot (5.944 meter), 19.00-foot (5.791 meter) and 17.50-foot (5.342 meter). Each line section includes the copper outer conductor, a standard copper inner conductor with a captivated inner connector. One flange hardware kit, with O ring, is also included with each rigid line section.



STDLine Standard Length Rigid Line Sections Specifications

Part No.	Line Size	Impedance	Length		Section Weight	
STD350-1	3-1/8-inch	50-ohm	20.00-ft	(6.10-m)	55-lbm	(24.9-kg)
STD350-2	3-1/8-inch	50-ohm	19.75-ft	(6.02-m)	55-lbm	(24.9-kg)
STD350-3	3-1/8-inch	50-ohm	19.50-ft	(5.94-m)	54-lbm	(24.5-kg)
STD350-6	3-1/8-inch	50-ohm	19.00-ft	(5.79-m)	53-lbm	(24.0-kg)
STD350-11	3-1/8-inch	50-ohm	17.50-ft	(5.33-m)	49-lbm	(22.2-kg)

STDLine Variable Length Rigid Line Sections

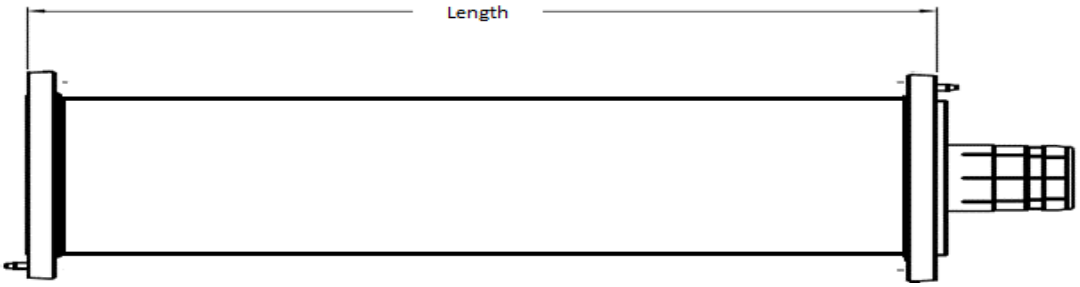
Special length STDLine rigid line sections are available in any length and are a fixed price offering with detail numbers for variable length line sections up to 60.00-inches (1524-mm), 60.00-inches to 120.00-inches (1524-mm to 3048-mm) and 120.00-inches to 240.00-inches (3048-mm to 6096-mm). Each line section includes the copper inner and outer conductor. one captivated inner connector and one flange hardware kit, with O ring, is also included with each variable length rigid line section.

STDLine Variable Length Rigid Line Section Specifications

Part No.	Line Size	Impedance	Length			
STD350A-10	3-1/8-inch	50 ohm	60.00-in to	120.00-in	(1524-mm to	3048-mm)
STD350A-20	3-1/8-inch	50 ohm	120.00-in to	240.00-in	(3048-mm to	6096-mm)

STDLine Field Cut Rigid Line Sections

STDLine Field Cut rigid line sections are available as an alternative to factory fabricated variable length line section. The detail -39 field cut STDLine sections are for any length from 60.00-inches (1524-mm) to 240.00-inches (6096-mm). Each line section includes the copper inner and outer conductor. Each line section includes the copper inner and outer conductor. one captivated inner connector, silver solder fixed field flange kit and one flange hardware kit, with O ring, is also included with each variable length rigid line section. For field cut line sections of 60.00-inches (1524 mm) or less use MACXLine detail -41 field cut line sections.



STDLine Field Cut Rigid Line Sections Specifications

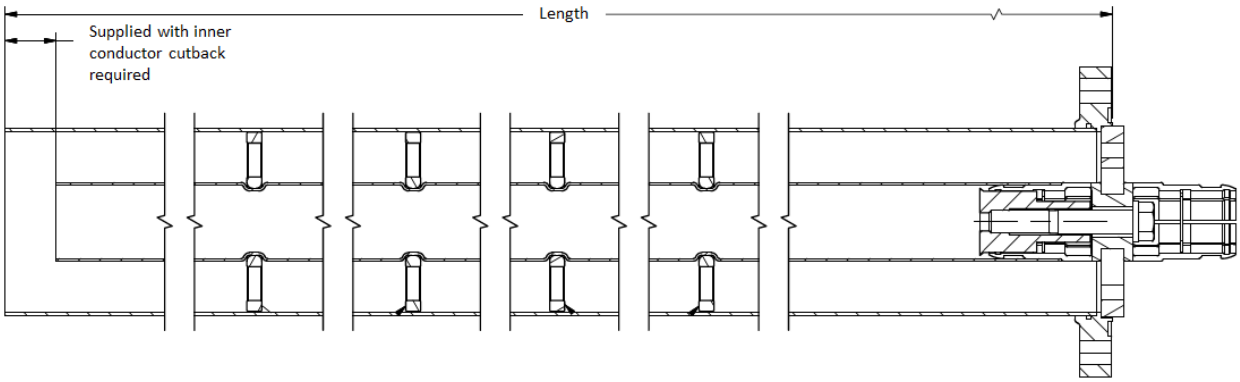
Part No.	Line Size	Impedance	Length			
STD350-39	3-1/8-inch	50-ohm	60.00-in to	120.00-in	(1524-mm to	3048-mm)

NOTE: Use MACX detail -41 for field cut sections up to 60-inches (1524-mm).

STDLine Variable Length Flanged One End Rigid Line Sections

Special length flanged one end, STDLine rigid line sections are available in any length and are a fixed price offering with detail numbers for variable length line sections up to 60.00-inches (1524-mm), 60.00-inches to 120.00-inches (1524-mm to 3048-mm) and 120.00-inches to 240.00-inches (3048-mm to 6096-mm). Each line section includes the copper inner and outer conductor. one captivated inner connector and one flange hardware kit, with O ring, is also included with each variable length rigid line section. Field

flange kits, unflanged couplings or clamp on field flanges are not included and should be ordered separately, if required.

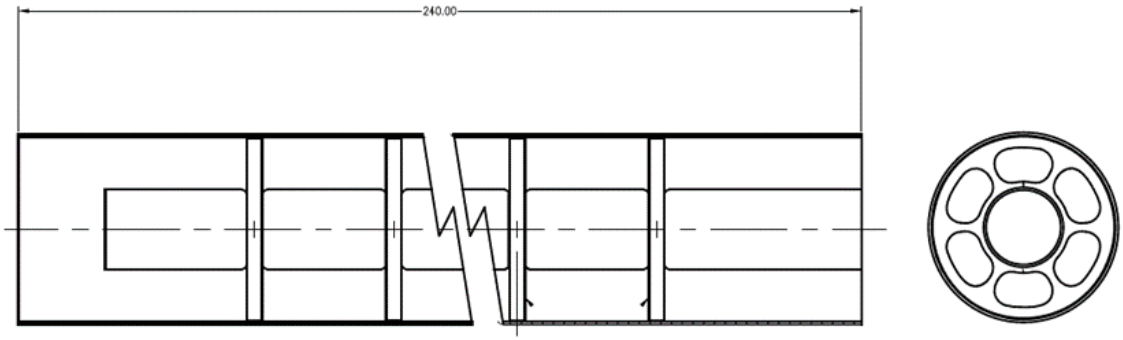


STDLine Variable Length Flanged One End Rigid Line Sections Specifications

Part No.	Line Size	Impedance	Length			
STD350-45-5	3-1/8-inch	50-ohm	0.00-in to	60.00-in	(0-mm to	1524-mm)
STD350-45-10	3-1/8-inch	50-ohm	60.00-in to	120.00-in	(1524-mm to	3048-mm)
STD350-45-20	3-1/8-inch	50-ohm	120.00-in to	240.00-in	(3048-mm to	6096-mm)

STDLine Unflanged Rigid Line Sections

ERI StandardLine unflanged rigid coaxial transmission line is available in sizes from 7/8-inch to 6-1/8-inch. All required system components and installation accessories can be purchased from ERI. These components are fabricated from the same high-quality materials as MACXLine, but they do not include a bellows section for differential expansion compensation. The line sections are supplied in 20.00-foot (6096 mm) and include the inner and outer conductor fully assembled. Line sections are joined with unflanged couplings, which include the inner connector, or with clamp-on flanges, inner connectors and flange hardware kits that are purchased separately. This product cannot be pressurized and is recommended only for indoor application only.



STDLine Unflanged Standard Length Rigid Line Sections Specifications

Part No.	Line Size	Impedance	Length		Section Weight	
STD350-31	3-1/8-inch	50-ohm	20.00-ft	(6.10-m)	50-lbm	(22.7-kg)

STDLine Variable Length Unflanged Rigid Line Sections

Special length STDLine rigid line sections are available in any length and are a fixed price offering with detail numbers for variable length line sections up to 60.00-inches (1524-mm), 60.00-inches to 120.00-inches (1524-mm to 3048-mm) and 120.00-inches to 240.00-inches (3048-mm to 6096-mm). Each line section includes the copper inner and outer conductor fully assembled. Line sections are joined with

unflanged couplings, which include the inner connector, or with clamp-on flanges, inner connectors and flange hardware kits that are purchased separately. This product cannot be pressurized and is recommended only for indoor application only.

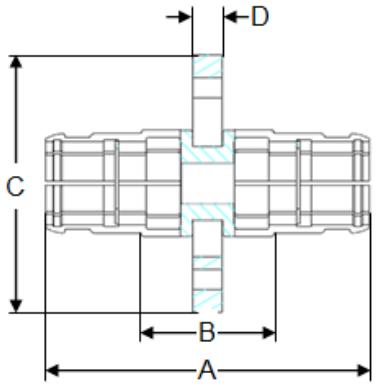
STDLine Unflanged Variable Length Rigid Line Sections Specifications

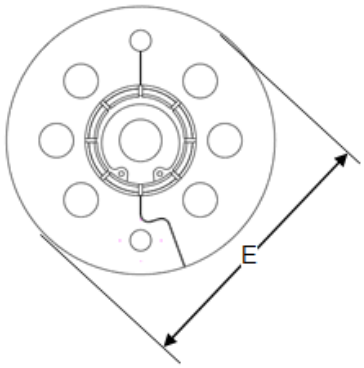
Part No.	Line Size	Impedance	Length			
STD350-29-5	3-1/8-inch	50-ohm	0.00-in to	60.00-in	(0-mm to	1524-mm)
STD350-29-10	3-1/8-inch	50-ohm	60.00-in to	120.00-in	(1524-mm to	3048-mm)
STD350-29-20	3-1/8-inch	50-ohm	120.00-in to	240.00-in	(3048-mm to	6096-mm)

3-1/8-inch Rigid Line Components

ACX350-20 3-1/8-inch Inner Connector

Standard inner connectors are used in most field applications to join coaxial rigid line inner conductors. They should not be used if the inner connector is to support a line section inner conductor when being hoisted during installation.

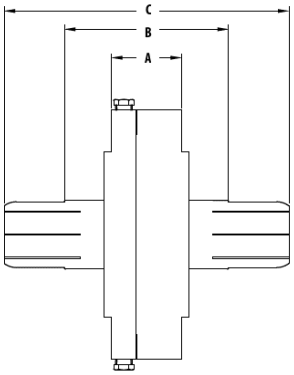




ACX350-20 Specifications

Part Number	ACX350-20	
Size	3-1/8-inch	
Impedance	50 ohm	
Dim A	4.133-in	(105-mm)
Dim B	1.697-in	(43-mm)
Dim C	3.187-in	(81-mm)
Dim D	0.375-in	(10-mm)
Dim E	3.187-in	(81-mm)
Weight	0.63-lbm	(0.29-kg)
Velocity	99.8%	
3-1/8-inch Coax Cutoff Frequency	1600 MHz	
3-1/8-inch Coax Peak Power Rating	440 kW	
3-1/8-inch Coax Production Test Voltage	19 kV D.C.	

Gas Barriers



Gas barrier, both sides have at least one pressure port, except the RLA150-16 which has a single pressure port. The assembly has fixed male inner connectors both ends. Includes flange hardware kit.

Gas Barrier Specifications

Part Number	RLA350-16	
Line Size	3-1/8-inch	
Impedance	50 ohm	
Outer	Copper/Brass	
Dim A	1.000-in	(25-mm)
Dim B	2.725-in	(69-mm)
Dim C	5.160-in	(131-mm)
Dim D	5.187-in	(132-mm)
No of Ports	Two (2)	
Weight	4.8-lbm	(2.2-kg)

Part Number	RLA150-16	
Line Size	1-5/8-inch	
Impedance	50 ohm	
Outer	Copper/Brass	
Dim A	1.375-in	(35-mm)
Dim B	2.575-in	(65-mm)
Dim C	3.701-in	(94-mm)
Dim D	3.505-in	(89-mm)
No of Ports	One (1)	
Weight	3.7-lbm	(1.7-kg)

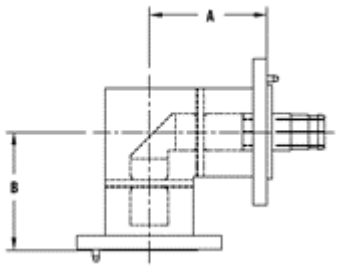
3-1/8-inch Miter Elbows

90-Degree Flanged Elbows

90-degree flanged miter elbows have supported inner conductors and swivel flanges. Each elbow includes one inner connector, O-ring, silicone grease and one flange hardware kit. They are pressure tight and suitable for indoor and outdoor applications.

90-Degree Flanged Elbow Specifications

Part Number	Line Size	Impedance	Outer	Leg A		Leg B		Weight	
ACX350-10SE	3-1/8-inch	50-ohm	Copper	4.189-in	(106-mm)	4.189-in	(106-mm)	4.2-lbm	(1.9-kg)
ACX350-10SE-2	3-1/8-inch	50-ohm	Copper	4.189-in	(106-mm)	4.189-in	(106-mm)	3.8-lbm	(1.7-kg)
ACX350-10SU-5	3-1/8-inch	50-ohm	Copper	17.179-in	(436-mm)	4.189-in	(106-mm)	10.0-lbm	(4.5-kg)
ACX350-10SU-9	3-1/8-inch	50-ohm	Copper	9.000-in	(229-mm)	6.000-in	(152-mm)	7.0-lbm	(3.2-kg)

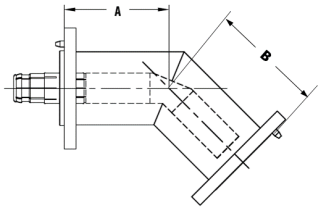


45-Degree Flanged Elbows

45-degree flanged miter elbows have supported inner conductors and swivel flanges. Each elbow includes one inner connector, O-ring, silicone grease and one flange hardware kit. They are pressure tight and suitable for indoor and outdoor applications.

45-Degree Flanged Elbow Specifications

Part Number	Line Size	Impedance	Outer	Leg A		Leg B		Weight	
ACX350-9SE	3-1/8-inch	50-ohm	Copper	4.500-in	(114-mm)	4.500-in	(114-mm)	4.5-lbm	(2.0-kg)

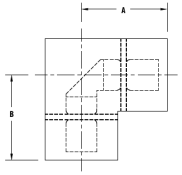


90-Degree Unflanged Elbows

90-degree unflanged miter elbows have supported inner conductors. Elbows are joined to other components with unflanged couplings, which include the inner connector, or with clamp-on flanges, inner connectors and flange hardware kits that are purchased separately. This product cannot be pressurized and is recommended only for indoor application only. All elbow sizes listed are broadband and do not require tuning to channel.

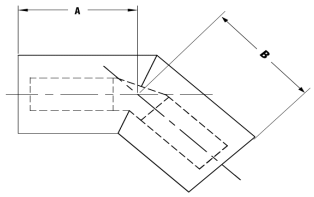
90-Degree Unflanged Elbow Specifications

Part Number	Line Size	Impedance	Outer	Leg A		Leg B		Weight	
ACX350-10SE-3	3-1/8-inch	50-ohm	Copper	4.000-in	(102-mm)	4.000-in	(102-mm)	1.8-lbm	(0.8-kg)



45-Degree Unflanged Elbows

45-degree unflanged miter elbows have supported inner conductors. Elbows are joined to other components with unflanged couplings, which include the inner connector, or with clamp-on flanges, inner connectors and flange hardware kits that are purchased separately. This product cannot be pressurized and is recommended only for indoor application only. All elbow sizes listed are broadband and do not require tuning to channel.

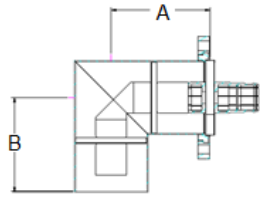


45-Degree Unflanged Elbow Specifications

Part Number	Line Size	Impedance	Outer	Leg A		Leg B		Weight	
ACX350-9SE-3	3-1/8-inch	50-ohm	Copper	4.312-in	(110-mm)	4.312-in	(110-mm)	2.1-lbm	(1.0-kg)

90-Degree Flanged/Unflanged Elbows

90-degree unflanged miter elbows have supported inner conductors and have a swivel flange on one leg and are unflanged, female on the other leg. The elbows include one inner connector, O-ring, silicone grease and one flange hardware kit. The unflanged leg is joined to other components with an unflanged coupling, which includes the inner connector, or with clamp-on flanges, inner connectors and flange hardware kits that are purchased separately. This product cannot be pressurized and is recommended only for indoor application only. All elbow sizes listed are broadband and do not require tuning to channel.

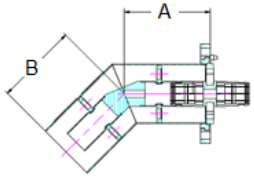


90-Degree Flanged/Unflanged Elbow Specifications

Part Number	Line Size	Impedance	Outer	Leg A		Leg B		Weight	
ACX350-10SE-4	3-1/8-inch	50-ohm	Copper	4.188-in	(106-mm)	4.000-in	(102-mm)	3.8-lbm	(1.7-kg)

45-Degree Flanged/Unflanged Elbows

45-degree unflanged miter elbows have supported inner conductors and have a swivel flange on one leg and are unflanged, female on the other leg. The elbows include one inner connector, O-ring, silicone grease and one flange hardware kit. The unflanged leg is joined to other components with an unflanged coupling, which includes the inner connector, or with clamp-on flanges, inner connectors and flange hardware kits that are purchased separately. This product cannot be pressurized and is recommended only for indoor application only.



45-Degree Flanged/Unflanged Elbow Specifications

Part Number	Line Size	Impedance	Outer	Leg A		Leg B		Weight	
ACX350-9SE-4	3-1/8-inch	50-ohm	Copper	4.500-in	(114-mm)	4.312-in	(110-mm)	4.1-lbm	(1.9-kg)

3-1/8-inch Field Flanges and Unflanged Couplings

Swivel Field Flange Kits

Silver solder swivel flange, includes silver solder, flux, sliding ring and fixed ring. Order flange hardware kit and inner connector separately.

Fixed Field Flange Kits

Silver solder fixed field flange, includes silver solder and flux. Order flange hardware kit and inner connector separately.

Soft Solder Field Flange Kits

Soft solder fixed field flange for interior runs, includes soft solder and sleeve with fixed flange. Order flange hardware kit and inner connector separately.

Field Flange Specifications

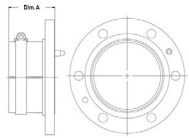
		Swivel Field Flange, Silver Solder			Fixed Field Flange, Silver Solder			Fixed Field Flange, Soft Solder		
Line Size	Outer	Part Number	Weight		Part Number	Weight		Part Number	Weight	
3-1/8-inch	Copper/Brass	RLA300-27	2.0-lbm	(0.9-kg)	RLA300-28	1.9-lbm	(0.9-kg)	RLA300-37	2.1-lbm	(0.9-kg)

Clamp-On Flanges

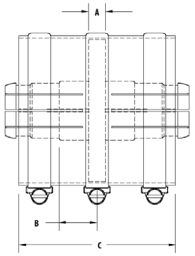
Flange adapter, clamp type. Available for both copper and aluminum outer conductor transmission line. Includes hose clamp. Order flange hardware kit and inner connector separately.

Clamp-On Flange Adapter Specifications

Part Number	Line Size	Outer	Dim A		Weight	
RLA300-38	3-1/8-inch	Copper/Brass	1.645-in	(42-mm)	2.1-lbm	(0.9-kg)



Unflanged Couplings



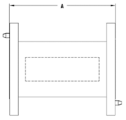
Unpressurized coupling, connects unflanged line and fittings. Includes supported inner connector and sleeve outer connector with clamps. Available for both copper and aluminum outer conductor transmission line.

Unflanged Coupling Specifications

Part Number	Line Size	Impedance	Outer	Dim A		Dim B		Dim C		Weight		No of Clamps
RLA350-39A	3-1/8-inch	50 ohm	Copper/Brass	0.375-in	(10-mm)	0.849-in	(22-mm)	3.500-in	(89-mm)	1.4-lbm	(0.7-kg)	3

Male-to-Male Adapters

A male-to-male adapter is used to connector two fixed male connectors together they include a copper inner and outer conductor and one flange hardware kit, with O ring gasket, no inner connector is included. This item can be pressurized.



Male-to-Male Adapter Specifications

Part No.	Line Size	Impedance	Length		Weight	
STD350-52	3-1/8-inch	50-ohms	6.00-in	(152-mm)	6-lbm	(2.7-kg)

Flange Hardware Kits and Replacement O-Rings

Hardware kits include one (1) O-ring, silicone lubricant, nuts, bolts and lock washers for one flange joint connection. Replacement O-Rings include the O-Ring and Silicon Lubricant.

Flange Hardware Kit Specifications

Part Number	Line Size	Number of Bolts	Bolt Size	Weight	
RLA300-21	3-1/8-inch	6	3/8 in	0.5-lbm	(0.2-kg)

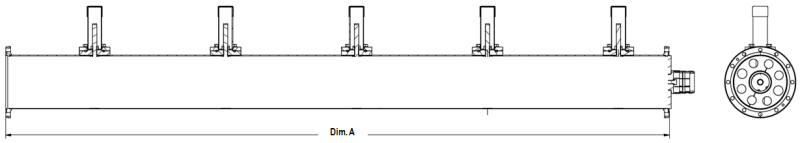
Replacement O-Ring Specifications

Part Number	Line Size	Inside Diameter		Thickness	
RLA300-51	3-1/8-inch	3.350-in	(85-mm)	0.210-in	(5-mm)

3-1/8-inch Coaxial Fine Matchers

FM Fine Matchers

ERI FM Coaxial fine matcher, fixed flanged both ends for the FM broadcast band (88 to 108 MHz). Includes one captive inner connector, O ring and one flange hardware kit. Five (5) tuners. Can be pressurized for outside use. 76-inches flange to flange (STD150-FTF is 77.73-inches flange to flange). Tuners including locking nuts and pressure tight caps. Does not include mounting brackets or hardware. These are available from ERI at additional cost. Maximum matching capability 1.23. Maximum input power handling capability is 90% of transmission line rating.

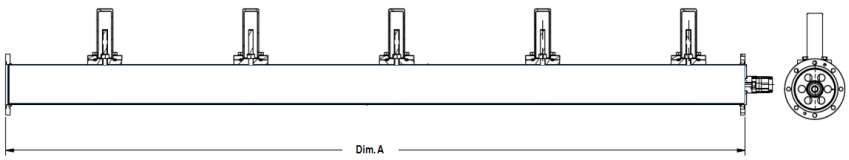


FM Fine Matcher Specifications

Part Number	Line Size	Impedance	Outer	Tuners	Dim A		Weight	
STD350-FTF	3-1/8-inch	50-ohm	Copper/Brass	Five (5)	76.000-in	(1930-mm)	38-lbm	(17.3-kg)

High Band VHF Fine Matchers

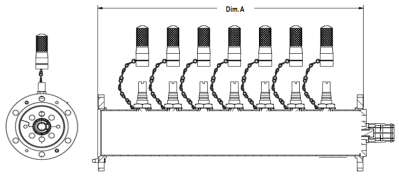
Coaxial fine matcher, fixed flanged both ends for the high band VHF television broadcast band (174 to 216 MHz). Includes one captive inner connector, O ring and one flange hardware kit. Five (5) tuners. Can be pressurized for outside use. 48-inches flange to flange. Tuners including locking nuts and pressure tight caps. Does not include mounting brackets or hardware. These are available from ERI at additional cost. Maximum input power handling capability is 90% of transmission line rating.



High Band VHF Fine Matcher Specifications

Part Number	Line Size	Impedance	Outer	Tuners	Dim A		Weight	
STD350-FTV	3-1/8-inch	50-ohm	Copper/Brass	Five (5)	48.000-in	(1219-mm)	34-lbm	(15.3-kg)

UHF Fine Matchers



Coaxial fine matcher, fixed flanged both ends for the UHF television broadcast band (470 to 800 MHz). Includes one captivated inner connector and one flange hardware kit. 7 tuners. 18-inches flange to flange. Tuners including locking nuts and pressure tight caps. Does not include mounting brackets or hardware. These are available from ERI at additional cost. Maximum input power handling capability is 90% of transmission line rating.

UHF Fine Matcher Specifications

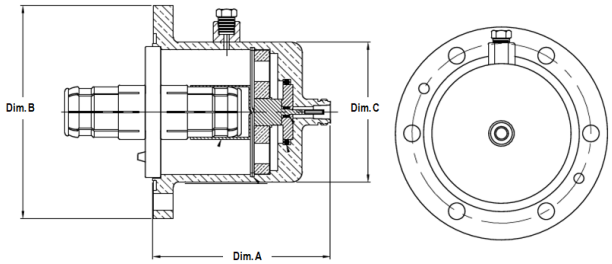
Part Number	Line Size	Impedance	Outer	Tuners	Dim A		Weight	
STD350A-FT	3-1/8-inch	50-ohm	Copper/Brass	Seven (7)	18.000-in	(457-mm)	11-lbm	(5.1-kg)

Coaxial Reducers

3-1/8-inch Reducers

RLA350-NF 3-1/8-inch to Type N Reducers

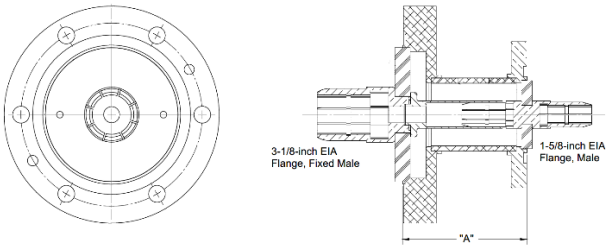
Step reducer from 3-1/8-inch EIA flange to Type N, female. 3-1/8-inch fixed flange available with copper/brass construction (RLA350-NF) or with an aluminum outer conductor (RLA350-NF-AL), gas tight, with a 1/8-inch NPT gas inlet port. Includes removable 3-1/8-inch inner connector and one flange hardware kit, with O ring.



Part Number	RLA350-NF		RLA350-NF-AL	
Outer Material	Copper/Brass		Aluminum	
Dim. "A"	4.338-in	(110-mm)		
Dim. "B"	5.187-in	(132-mm)		
Dim. "C"	3.402-in	(86-mm)		
Weight	5.6-lbm	(2.5-kg)	2.5-lbm	(1.1-kg)

CR312 3-1/8-inch to 1-5/8-inch Reducer

Step reducer from 3-1/8-inch EIA flange to 1-5/8-inch EIA Flange. Fixed flanges aluminum outer conductor construction, gas tight. Includes removable 1-5/8-inch and fixed 3-1/8-inch inner connectors. Flange hardware is not included, order, separately. Mixing copper/brass and aluminum components, outdoors, without galvanic protection is not recommended.

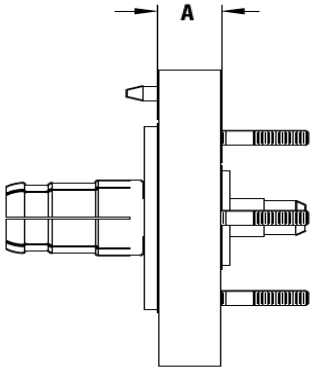


Dim. "A"	0.867-in	(22-mm)
Weight	7.0-lbm	(3.2-kg)

RLA350-150 3-1/8-inch to 1-5/8-inch Reducer

Plate reducer, 50-ohm, 3-1/8-inch EIA flange to 1-5/8-inch EIA flange includes two inner connectors. 1-5/8-inch inner connector is removable and mates with captivated 1-5/8-inch inner connectors. Includes 3-1/8-inch and 1-5/8-inch O rings, 3-1/8-inch hardware kit

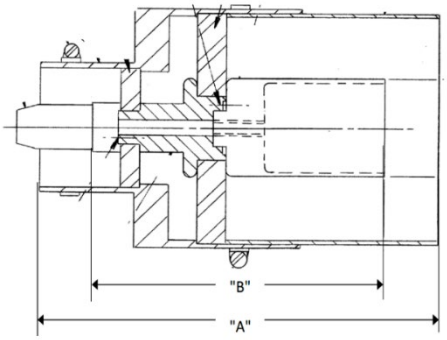
and studs for 1-5/8-inch flange connection. When a 1-5/8 inch 50-ohm Gas Barrier needs to be connected to this adapter, first remove all four 5/16-18 threaded studs from adapter. Secure with four 5/16-18UNC-2A cap screws which are 2-inches long (not included) and four 5/16-inch lock washers (included).



Dim. "A"	0.867-in	(22-mm)
Weight	7.0-lbm	(3.2-kg)

CR304 3-1/8 to 1-5/8-inch NF Reducer

Step reducer from 3-1/8-inch unflanged, female, to 1-5/8-inch unflanged, fixed male. Aluminum outer conductor construction, unpressurized. Indoor use only. Includes removable 1-5/8-inch and fixed 3-1/8-inch inner connectors. Flange hardware is not included, order separately.

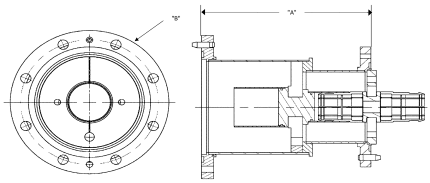


Dim. "A"	5.220-in	(133-mm)
Dim. "B"	4.120-in	(105-mm)
Weight	3.0-lbm	(1.4-kg)

4-1/16-inch Reducers

RLA450-350 / 1329450-350 Reducers

Step reducer from 4-1/16-inch flange to 3-1/8-inch EIA flange. Fixed flanges available with copper/brass construction (RLA450-350) or with an aluminum outer conductor (1329450-350), gas tight. Includes removable 3-1/8-inch inner connector and one 3-1/8-inch flange hardware kit, with O ring. Mixing copper/brass and aluminum components, outdoors, without galvanic protection is not recommended.

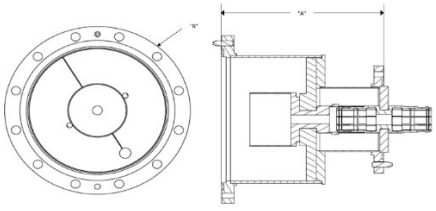


Part Number	**RLA450-350**		**1329450-350**	
Outer Material	Copper/Brass		Aluminum	
Dim. "A"	6.625-in	(168-mm)		
Dim. "B"	6.188-in	(157-mm)		
Weight	8.2-lbm	(3.7-kg)	3.8-lbm	(1.7-kg)

6-1/8-inch Reducers

RL650B-350 / 1329650-350 Reducers

Step reducer from 6-1/8-inch, 50-ohm, EIA flange to 3-1/8-inch EIA flange. Fixed flanges available with copper/brass construction (RLA650B-350) or with an aluminum outer conductor (1329650-350), gas tight. Includes removable 3-1/8-inch inner connector and one 3-1/8-inch flange hardware kit, with O ring.



Part Number	**RLA650B-350**		**1329650-350**	
Outer Material	Copper/Brass		Aluminum	
Dim. "A"	7.125-in	(181-mm)		
Dim. "B"	8.120-in	(206-mm)		
Weight	8.2-lbm	(3.7-kg)	6.5-lbm	(2.9-kg)

3-1/8-inch Hangers and Support Accessories

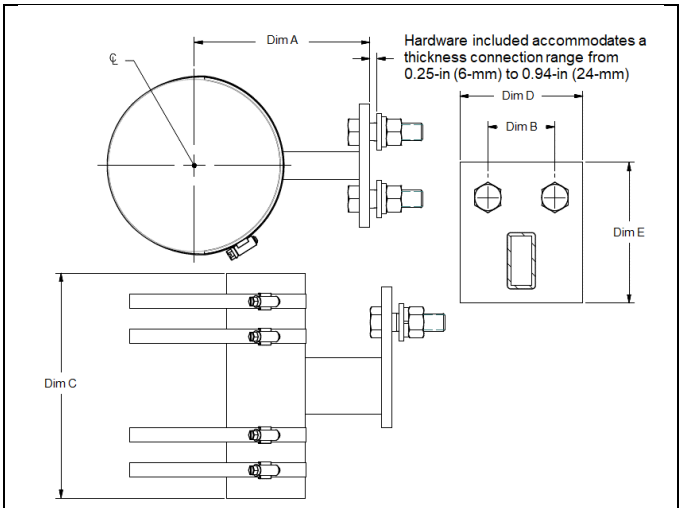
Rigid Line Vertical Hangers

Vertical Fixed Hangers

Rigid Line Fixed Hangers support the weight of the transmission line vertical run. Use two (2) at the tower top for up to 500-feet of vertical line. Add one additional fixed hanger at the tower top for each additional 500-feet of vertical run length.

All ERI rigid transmission line vertical fixed hangers are made with stainless steel.

Mounting hardware included: 1/2-inch diameter hardware requires mounting to 9/16-inch diameter holes. 5/8-inch diameter hardware requires 11/16-inch diameter mounting holes.

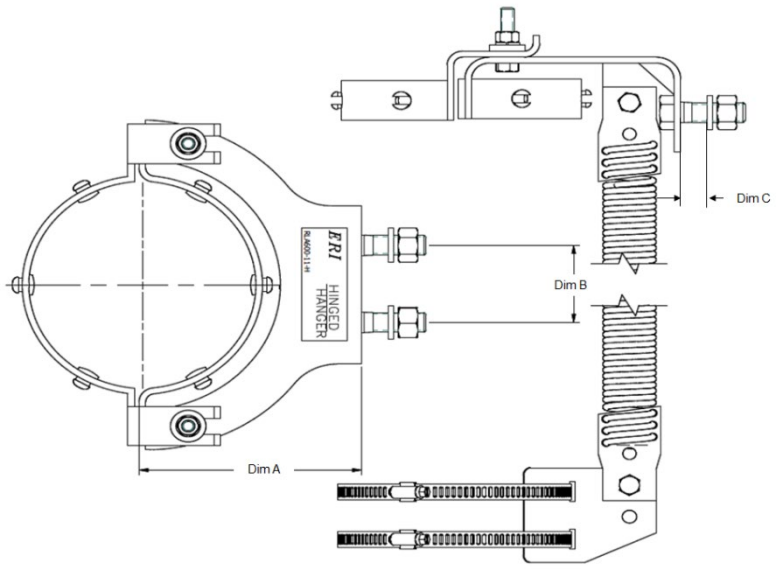


RLA300-13-2

Vertical Fixed Hanger Specifications

Part Number	Line Size	Dim A	Dim B	Dim C	Dim D	Dim E	Weight	Attachment Hardware
RLA300-13-2	3-1/8-inch	4.125-in (105-mm)	2.250-in (57-mm)	8.000-in (203-mm)	4.250-in (108-mm)	5.000-in (127-mm)	4.8-lbm (2.2-kg)	1/2-inch

Vertical Spring Hangers

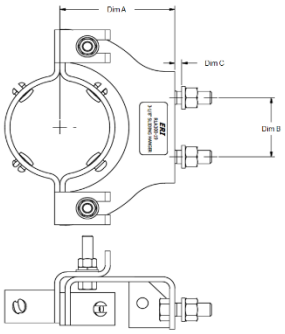


For all rigid coaxial line sizes3-1/8-inch and larger ERI offers its unique Hinged Vertical Spring Hanger, they support the transmission line vertical run while preventing lateral motion and accommodating differential expansion and contraction. For 3-1/8-inch and 4-1/16-inch rigid line one hanger and one vertical sliding ring is used on each line section. All vertical spring hangers and vertical sliding ring hangers are hinged to open from left or right side to save installation labor. Each hanger includes mounting hardware shown in the table below.

Vertical Spring Hanger Specifications

Part Number	Line Size	Dim A	Dim B	Dim C	Weight	Attachment Hardware
RLA300A-11-H	3-1/8-inch	4.125-in (105-mm)	2.250-in (57-mm)	0.130 - 0.690-in (3 - 18-mm)	6.4-lbm (2.9-kg)	1/2-inch

Vertical Sliding Hangers



Smaller sizes of ERI rigid transmission line, including 3-1/18-inch and 4-1/16-inch use a combination of vertical spring hangers and vertical sliding rings to support their vertical runs. For 3-1/8-inch and 4-1/16-inch rigid transmission lines the vertical sliding hangers should be used at 10-foot intervals along the vertical run between vertical spring hangers. ERI's vertical sliding hangers use the same hinged closure used in ERI's vertical spring hangers. These hangers are hinged to open from the left or right side to save installation labor and time. These sliding hangers prevent lateral motion and accommodate differential expansion and contraction. Each hanger includes mounting hardware shown in the table below.

Vertical Sliding Hanger Specifications

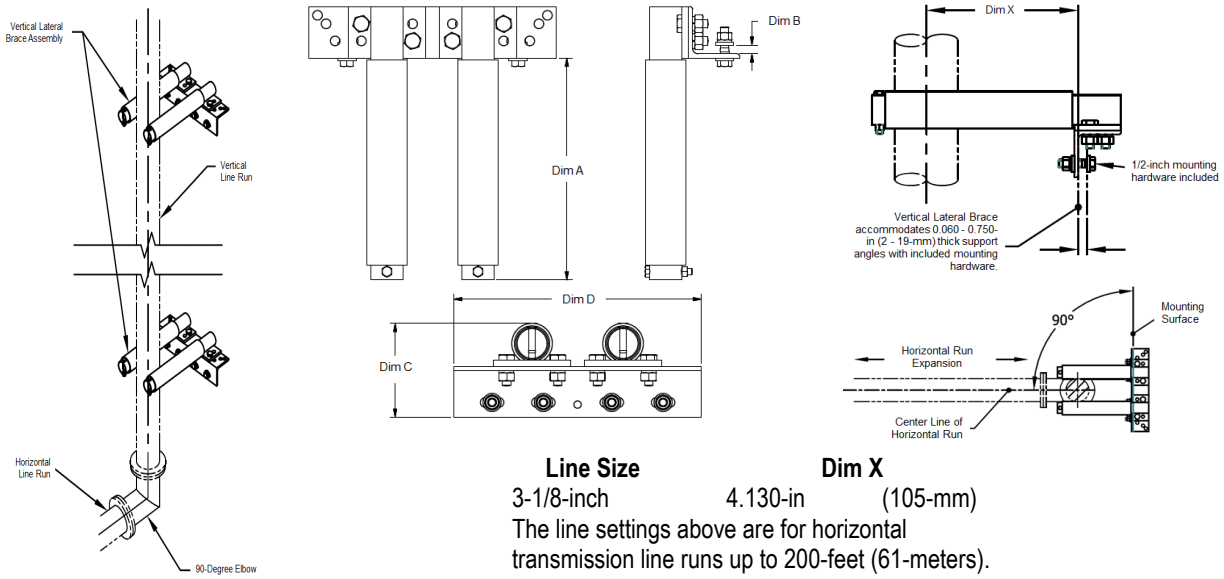
Part Number	Line Size	Dim A	Dim B	Dim C	Dim D	Weight	Attachment Hardware
RLA300-19	3-1/8-inch	4.125-in (105-mm)	2.250-in (57-mm)	0.130 - 0.690-in (3 - 18-mm)	---	2.7-lbm (1.2-kg)	1/2-inch

Minimum Distance to the Lowest Vertical Spring Hanger or Vertical Sliding Hanger

Horizontal Run Length	Copper Outer Conductor Rigid Line		Aluminum Outer Conductor Rigid Line	
Up to 100-feet (30.5-meters)	16.0-feet	(4.9-meters)	24.0-feet	(7.3-meters)
101-feet to 200-feet (30.6-meters to 61.0-meters)	32.0-feet	(9.8-meters)	48.0-feet	(14.6-meters)

Vertical Lateral Braces

The Vertical Lateral Brace is an innovative unique product manufactured by ERI. These braces are used at the base of vertical run to prevent lateral motion and are universal with adjustments to accommodate all rigid transmission line sizes from 3-1/8-inch through 8-3/16-inch. Use two (2) vertical lateral guides equally spaced between the lowest vertical spring or sliding hanger and elbow at the base of the vertical run. Includes 1/2-inch mounting hardware.



Line Size	Dim X	
3-1/8-inch	4.130-in	(105-mm)

The line settings above are for horizontal transmission line runs up to 200-feet (61-meters).

Vertical Lateral Brace Specifications

Part Number	Dim A	Dim B	Dim C	Dim D	Weight	Attachment Hardware
RLA000-01VLB	13.000-in (330-mm)	0.060 - 0.750-in (2 - 19-mm)	5.510-in (140-mm)	14.500-in (368-mm)	11.2-lbm (5.1-kg)	1/2-inch

3-1/8-inch Rigid Line Horizontal Hangers

ERI provides a unique Horizontal Hanger System which uses components that are compatible with all rigid transmission line sizes from 3-1/8-inch through 8-3/16-inch. The system uses a Universal Horizontal Hanger Bracket and interchangeable Hanger Springs, Fixed Hanger Rods and a Universal Horizontal Lateral Brace. The system is engineered to allow many different support configurations and is particularly useful when adding new transmission lines to towers with multiple existing transmission line already installed under the transmission line bridge.

Minimum Horizontal Run Length

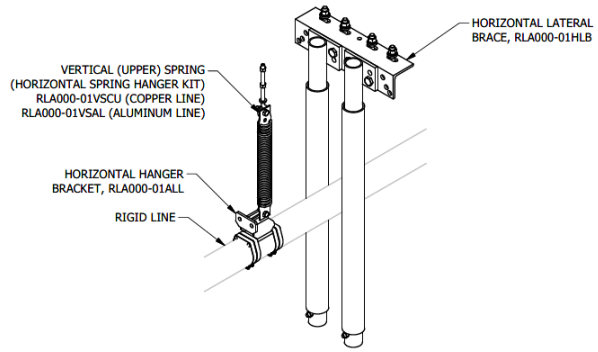
The entire length of the Minimum Horizontal Run length should be supported be horizontal spring hanger to accommodate differential expansion, beyond that length fixed hangers may be used. The Minimum Horizontal Run length should be the greater of 20-feet (6.1-meters) or:

Line Size	Copper Outer Conductor Rigid Line	Aluminum Outer Conductor Rigid Line
3-1/8-inch and 4-1/16-inch	4% of Vertical Run Height	7% of Vertical Run Height
6-1/8-inch	6% of Vertical Run Height	10% of Vertical Run Height
7-3/16-inch and 8-3/16-inch	6% of Vertical Run Height	---

Universal Horizontal Hanger System

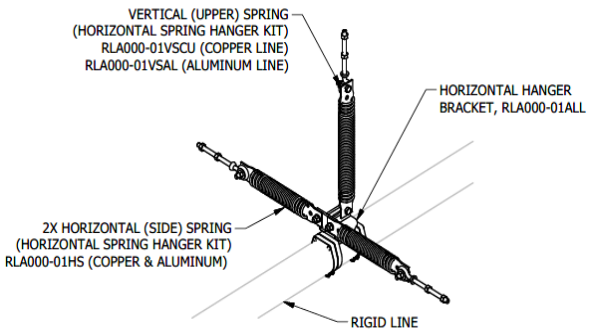
The ERI horizontal transmission line support system is made up of four (4) components that can be used to accommodate many different installation configurations. This system is particularly useful when adding new transmission line to an already crowded structure and in systems that use more than one transmission line to feed dual input FM and television master antennas. The components include the Universal Horizontal Hanger Bracket is compatible with all rigid transmission line sizes from 3-1/8-inch through 8-3/16-inch. It includes a stainless steel bracket and stainless steel hose clamps for all these transmission line sizes. The brackets accept a variety of accessory supports including Horizontal Vertical Support Springs, Horizontal Side Springs, Horizontal Fixed Supports. The separate Horizontal Lateral Brace assembly provides support to prevent lateral motion of the transmission line when the Universal Horizontal Hanger Bracket is used in single point mounting configurations.

Single Point Horizontal Spring Hanger



This configuration requires one (1) RLA000-01ALL Universal Horizontal Hanger Bracket and one (1) RLA000-01VSxx (xx="CU" for Copper Outer Conductor Line or xx="AL" for Aluminum Outer Conductor Line) Horizontal Vertical Spring. The horizontal hanger spacing should be an average of 480-inches (12,192-mm) for 3-1/8 and 4-1/16-inch Aluminum Outer Conductor Rigid Line, 240-inches (6,096-mm) for 3-1/8 and 4-1/16-inch Copper Outer Conductor or 6-1/8-inch Aluminum Outer Conductor Rigid Line and 120-inches (3,048-mm) 6-1/8, 7-3/16 and 8-3/17-inch Copper outer Conductor Rigid Line. In addition, an RLA000-01HLB Horizontal Lateral Brace to prevent lateral motion should be

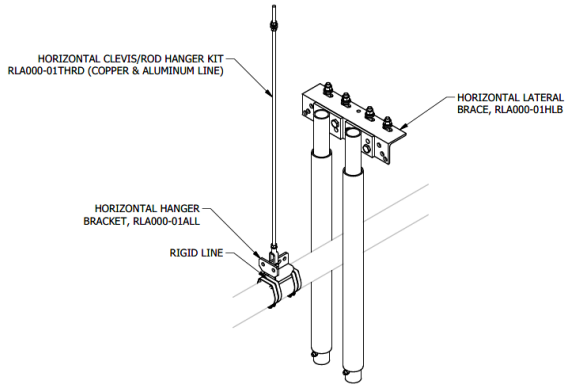
Three Point Horizontal Spring Hanger



This configuration requires one (1) RLA000-01ALL Universal Horizontal Hanger Bracket, one (1) RLA000-01VSxx (xx="CU" for Copper Outer Conductor Line or xx="AL" for Aluminum Outer Conductor Line) Horizontal Vertical Spring and two (2) RLA000-1HS Horizontal Side Springs. The horizontal hanger spacing should be an average of 480-inches (12,192-mm) for 3-1/8 and 4-1/16-inch Aluminum Outer Conductor Rigid Line, 240-inches (6,096-mm) for 3-1/8 and 4-1/16-inch Copper Outer Conductor or 6-1/8-inch Aluminum Outer Conductor Rigid Line and 120-inches (3,048-mm) 6-1/8, 7-3/16 and 8-3/17-inch Copper outer Conductor Rigid Line. When this configuration is used the

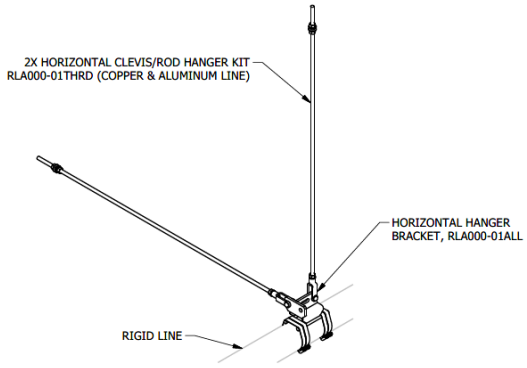
installed every 240-inches (6,096-mm) for the entire length of the horizontal run.	RLA000-01HLB Horizontal Lateral Brace to prevent lateral motion is not required.

Single Point Horizontal Fixed Hanger



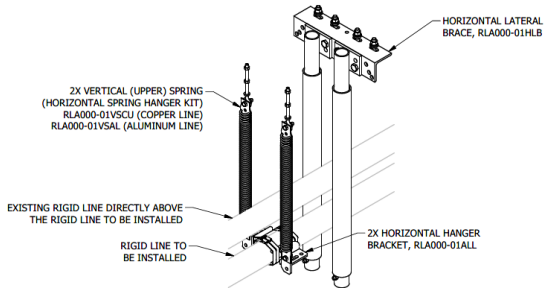
This configuration requires one (1) RLA000-01ALL Universal Horizontal Hanger Bracket and one (1) RLA000-01THRD Horizontal Clevis/Rod Hanger Kit. The horizontal hanger spacing should be an average of every 120-inches (3,048-mm) for all rigid line sizes and types. In addition, an RLA000-01HLB Horizontal Lateral Brace to prevent lateral motion should be installed every 240-inches (6,096-mm) for the entire length of the horizontal run. NOTE: Horizontal fixed hangers should only be installed beyond the minimum horizontal run length (see table page 44).

Two Point Horizontal Fixed Hanger



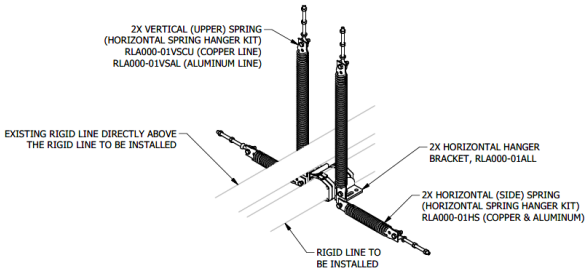
This configuration requires one (1) RLA000-01ALL Universal Horizontal Hanger Bracket and two (2) RLA000-01THRD Horizontal Clevis/Rod Hanger Kit. The horizontal hanger spacing should be an average of every 120-inches (3,048-mm) for all rigid line sizes and types. When this configuration is used the RLA000-01HLB Horizontal Lateral Brace to prevent lateral motion is not required. NOTE: Horizontal fixed hangers should only be installed beyond the minimum horizontal run length (see table page 44).

Two Point Horizontal Spring Hanger



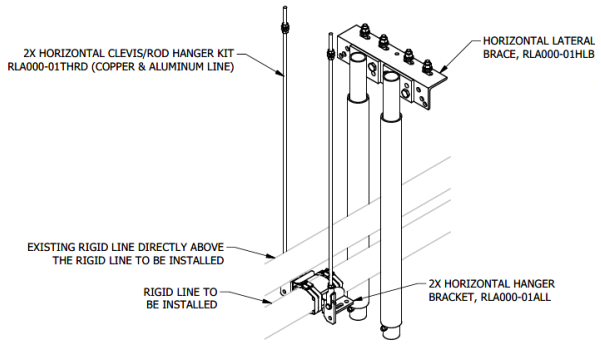
This configuration requires two (2) RLA000-01ALL Universal Horizontal Hanger Bracket and two (2) RLA000-01VSxx (xx="CU" for Copper Outer Conductor Rigid Line or xx="AL" for Aluminum Outer Conductor Rigid Line) Horizontal Vertical Spring. The horizontal hanger spacing should be an average of 480-inches (12,192-mm) for 3-1/8 and 4-1/16-inch Aluminum Outer Conductor Rigid Line, 240-inches (6,096-mm) for 3-1/8 and 4-1/16-inch Copper Outer Conductor or 6-1/8-inch Aluminum Outer Conductor Rigid Line and 120-inches (3,048-mm) 6-1/8, 7-3/16 and 8-3/17-inch Copper outer Conductor Rigid Line. In addition, an RLA000-01HLB Horizontal Lateral Brace to prevent lateral motion should be installed every 240-inches (6,096-mm) for the entire length of the horizontal run.

Two Point Horizontal Spring Hanger



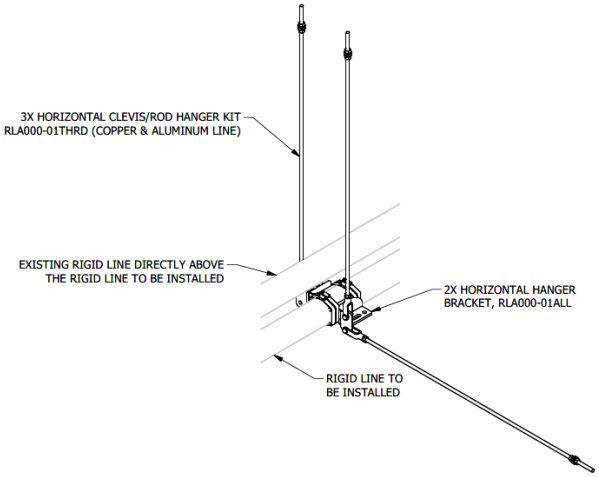
This configuration requires two (2) RLA000-01ALL Universal Horizontal Hanger Bracket, two (2) RLA000-01VSxx (xx="CU" for Copper Outer Conductor Rigid Line or xx="AL" for Aluminum Outer Conductor Rigid Line) Horizontal Vertical Spring and two (2) RLA000-1HS Horizontal Side Springs. The horizontal hanger spacing should be an average of 480-inches (12,192-mm) for 3-1/8 and 4-1/16-inch Aluminum Outer Conductor Rigid Line, 240-inches (6,096-mm) for 3-1/8 and 4-1/16-inch Copper Outer Conductor or 6-1/8-inch Aluminum Outer Conductor Rigid Line and 120-inches (3,048-mm) 6-1/8, 7-3/16 and 8-3/17-inch Copper outer Conductor Rigid Line.

Two Point Horizontal Fixed Hanger

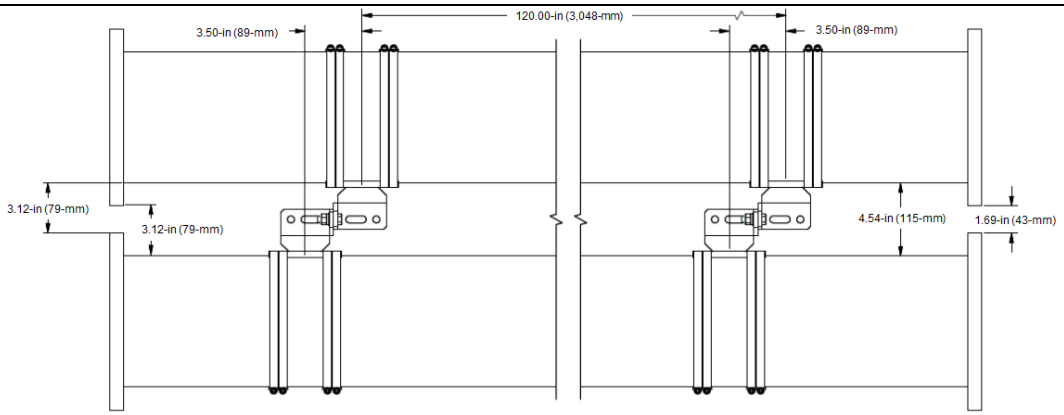


This configuration requires two (2) RLA000-01ALL Universal Horizontal Hanger Bracket and two (2) RLA000-01THRD Horizontal Clevis/Rod Hanger Kit. The horizontal hanger spacing should be an average of every 120-inches (3,048-mm) for all rigid line sizes and types. In addition, an RLA000-01HLB Horizontal Lateral Brace to prevent lateral motion should be installed every 240-inches (6,096-mm) for the entire length of the horizontal run. NOTE: Horizontal fixed hangers should only be installed beyond the minimum horizontal run length (see table page 44).

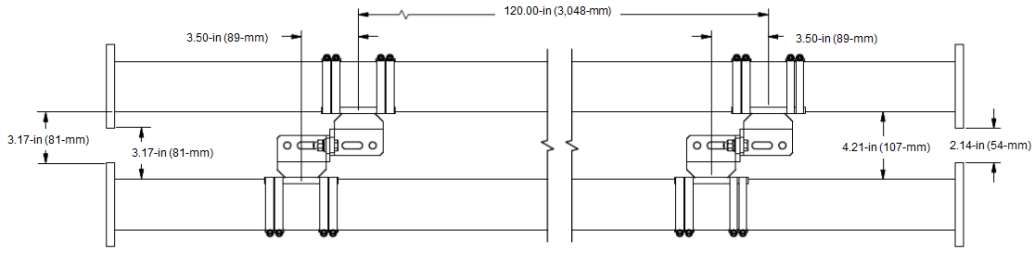
Three Point Horizontal Fixed Hanger



This configuration requires two (2) RLA000-01ALL Universal Horizontal Hanger Bracket and three (3) RLA000-01THRD Horizontal Clevis/Rod Hanger Kit. The horizontal hanger spacing should be an average of every 120-inches (3,048-mm) for all rigid line sizes and types. When this configuration is used the RLA000-01HLB Horizontal Lateral Brace to prevent lateral motion is not required. NOTE: Horizontal fixed hangers should only be installed beyond the minimum horizontal run length (see table page 44).



8-3/16-inch Rigid Line

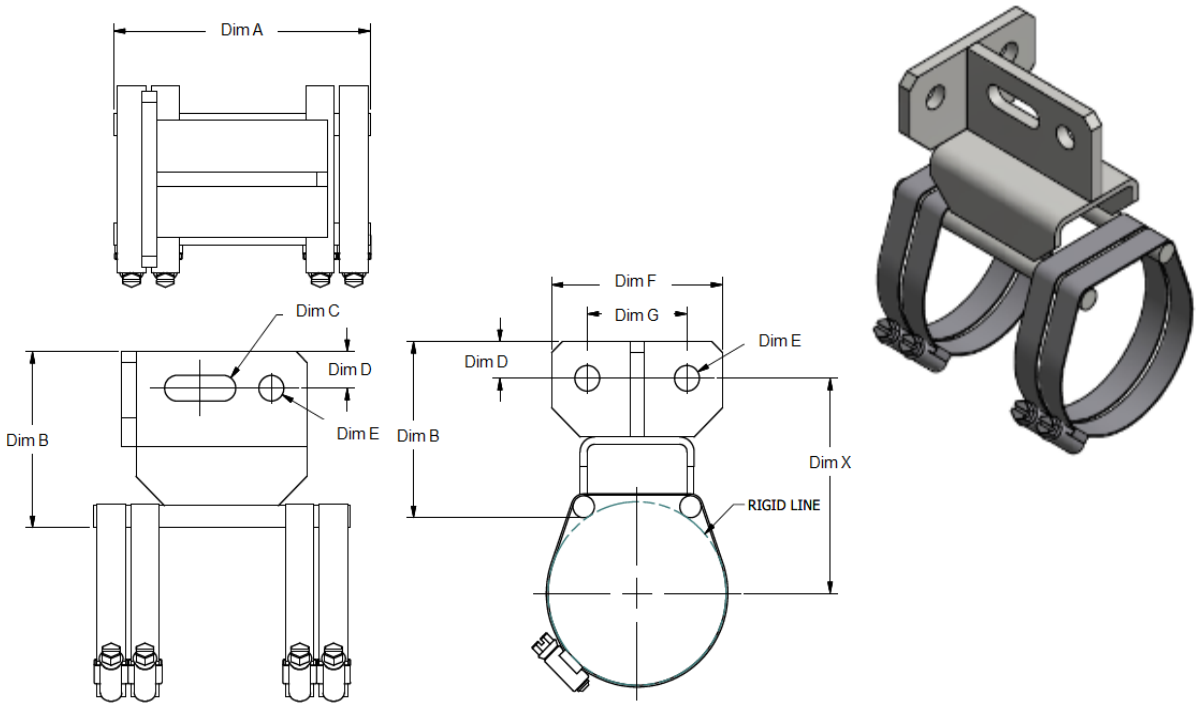


3-1/8-inch Rigid Line

RLA000-01ALL Horizontal Hanger Brackets configured to support two transmission lines side by side.

Universal Horizontal Hanger Brackets

The Universal Horizontal Hanger Bracket includes the bracket assembly and a quantity of four (4) HC0062 Stainless Steel Hose Clamps (2.500-in (64-mm) to 4.500-in (114-mm)) for 3-1/8-inch and 4-1/16 rigid transmission lines and four (4) HC0128 Stainless Steel Hose Clamps (2.500-in (64-mm) to 8.500-in (216-mm)) for 6-1/8-inch, 7-3/16-inch and 8-3/16-inch rigid lines. This bracket is used in combination with the RLA000-01VSCU Horizontal Vertical Spring for Copper Outer Conductor Rigid Line or the RLA000-01VSAL Horizontal Vertical Spring for Aluminum Outer Conductor Rigid Line to provide vertical support for the weight of the horizontal run while allowing the differential expansion of the vertical transmission line run. lateral support is provided by adding two (2) RLA000-1HS Horizontal Side Springs or using the RLA000-01HLB Horizontal Lateral Brace. The horizontal hanger spacing should be an average of 480-inches (12,192-mm) for 3-1/8 and 4-1/16-inch Aluminum Outer Conductor Rigid Line, 240-inches (6,096-mm) for 3-1/8 and 4-1/16-inch Copper Outer Conductor or 6-1/8-inch Aluminum Outer Conductor Rigid Line and 120-inches (3,048-mm) 6-1/8, 7-3/16 and 8-3/17-inch Copper outer Conductor Rigid Line. In addition, an RLA000-01HLB Horizontal Lateral Brace to prevent lateral motion should be installed every 240-inches (6,096-mm) for the entire length of the horizontal run. Beyond the length of Minimum Horizontal Run (see Table on Page 44) the Universal Horizontal Hanger Bracket can be used with the RLA000-01THRD Horizontal Clevis/Rod Hanger Kit. The horizontal hanger spacing should average of every 120-inches (3,048-mm) for all rigid line sizes and types. In addition, an RLA000-01HLB Horizontal Lateral Brace to prevent lateral motion should be installed every 240-inches (6,096-mm) for the entire length of the horizontal run if no other lateral support is provided by Horizontal Side Springs or Horizontal Clevis/Rod Kits.

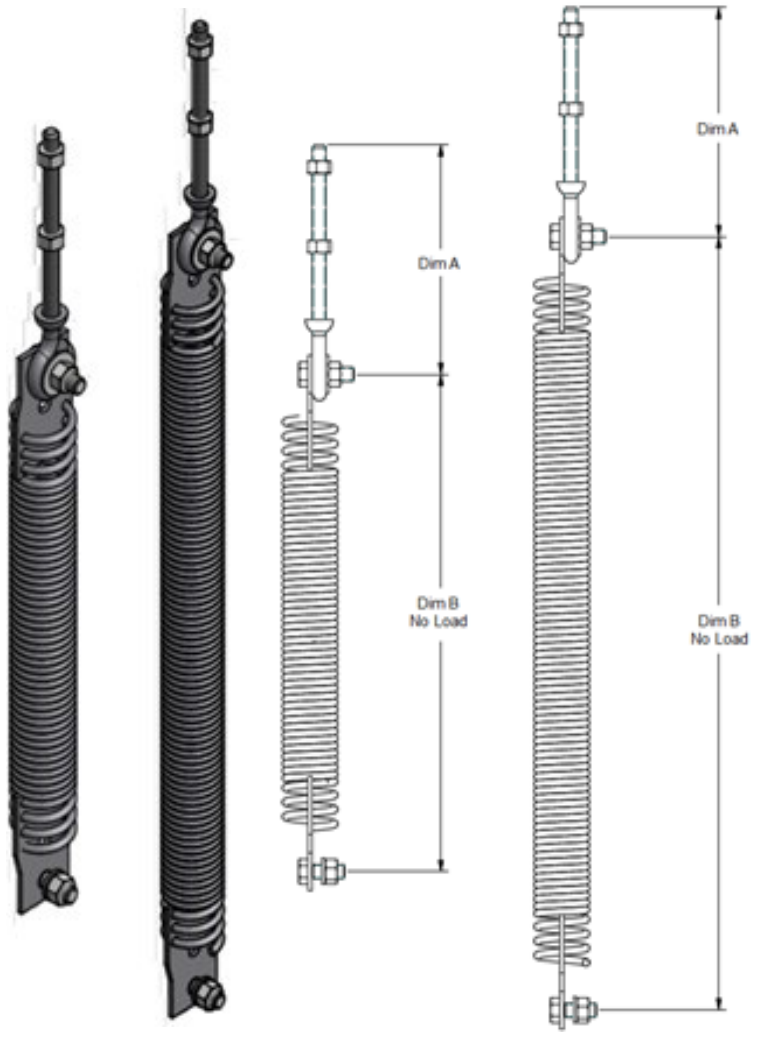


Universal Horizontal Hanger Bracket Specifications

Part Number		RLA000-01ALL			
Dim A	4.500-in	(114-mm)	**Line Size**	**Dim X**	
Dim B	3.000-in	(76-mm)	3-1/8-inch	3.670-in	(93-mm)
Dim C	0.44 x 1.25-in	11 x 32-mm	4-1/16-inch	4.200-in	(107-mm)
Dim D	0.625-in	(16-mm)	6-1/8-inch	5.300-in	(135-mm)
Dim E	0.440-in	(11-mm)	7-3/16-inch	5.830-in	(148-mm)
Dim F	3.000-in	(76-mm)	8-3/16-inch	6.350-in	(161-mm)
Dim G	1.750-in	(44-mm)			
Weight	1.6-lbm	(0.7-kg)			

Horizontal Vertical Springs

The Horizontal Vertical Spring comes in two (2) versions the RLA000-01VSCU for Copper Outer Conductor Rigid Line and the RLA000-01VSAL for Aluminum Outer Conductor Rigid Line. These are used in combination with the RLA000-01ALL Universal Horizontal Hanger Bracket to provide vertical support for the weight of the horizontal run while allowing the differential expansion of the vertical transmission line run, lateral support is provided by adding two (2) RLA000-1HS Horizontal Side Springs or using the RLA000-01HLB Horizontal Lateral Brace. The horizontal hanger spacing should be an average of 480-inches (12,192-mm) for 3-1/8 and 4-1/16-inch Aluminum Outer Conductor Rigid Line, 240-inches (6,096-mm) for 3-1/8 and 4-1/16-inch Copper Outer Conductor or 6-1/8-inch Aluminum Outer Conductor Rigid Line and 120-inches (3,048-mm) 6-1/8, 7-3/16 and 8-3/16-inch Copper outer Conductor Rigid Line. In addition, an RLA000-01HLB Horizontal Lateral Brace to prevent lateral motion should be installed every 240-inches (6,096-mm) for the entire length of the horizontal run.



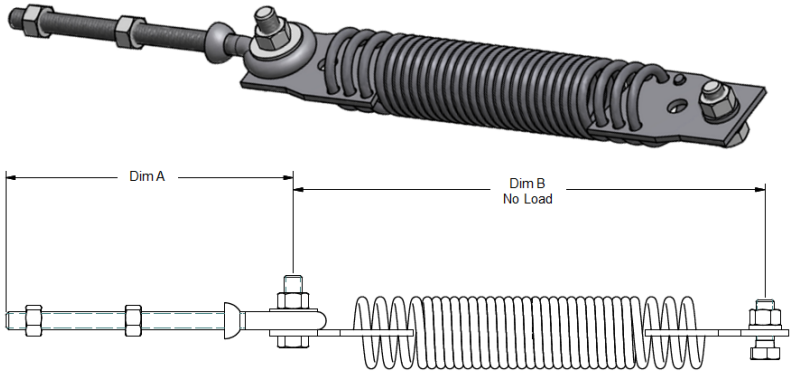
Horizontal Vertical Spring Specifications

Part Number	RLA000-01VSCU
Line Type	Copper Outer
Dim A	6.000-in (152-mm)
Dim B	13.400-in (340-mm)
Weight	2.4-lbm (1.1-kg)
Attachment Hardware	3/8-inch
Part Number	**RLA000-01VSAL**
Line Type	Aluminum Outer
Dim A	6.000-in (152-mm)
Dim B	20.500-in (521-mm)
Weight	3.6-lbm (1.6-kg)
Attachment Hardware	3/8-inch

Horizontal Side Springs

The Horizontal Side Spring, Part Number RLA000-01HS are used in pairs (two (2)) in combination with the RLA000-01ALL Universal Horizontal Hanger Bracket and the RLA000-01VSCU Horizontal Vertical Spring for Copper Outer Conductor Rigid Line or the RLA000-01VSAL Horizontal Vertical Spring for Aluminum Outer Conductor Rigid Line to provide lateral support to the horizontal transmission line run while allowing the differential expansion of the vertical transmission line run. The horizontal hanger spacing should be an average of 480-inches (12,192-mm) for 3-1/8 and 4-1/16-inch Aluminum Outer Conductor Rigid Line, 240-inches (6,096-mm) for 3-1/8 and 4-1/16-inch Copper Outer Conductor or 6-1/8-

inch Aluminum Outer Conductor Rigid Line and 120-inches (3,048-mm) 6-1/8, 7-3/16 and 8-3/17-inch Copper outer Conductor Rigid Line. When this configuration is used the RLA000-01HLB Horizontal Lateral Brace to prevent lateral motion is not required.

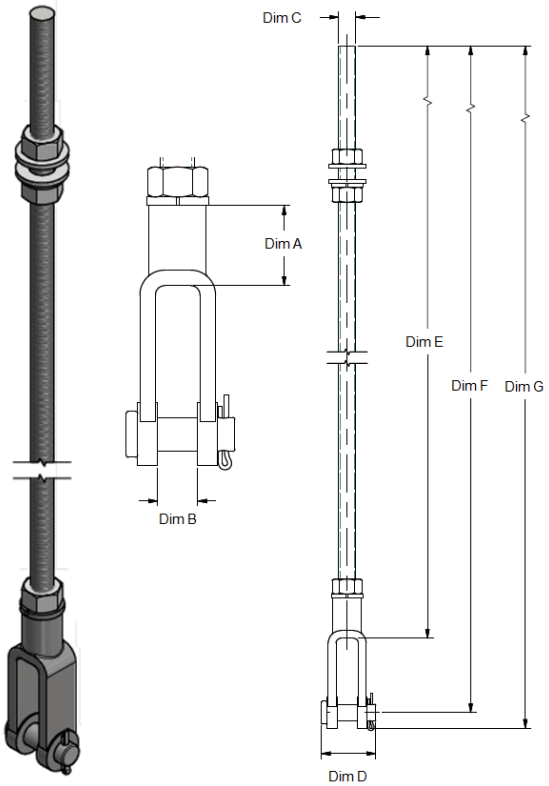


Horizontal Side Spring Specifications

Part Number	RLA000-01HS
Dim A	6.000-in (152-mm)
Dim B	9.600-in (244-mm)
Weight	1.8-lbm (0.8-kg)
Attachment Hardware	3/8-inch

Horizontal Clevis Rod Kits

The Horizontal Clevis Rod Kit, Part Number RLA000-01THRD are used in combination with the RLA000-01ALL Universal Horizontal Hanger Bracket to provide vertical support for the weight of the horizontal run while allowing expansion and contraction of the horizontal run. They are to be used beyond the length of Minimum Horizontal Run (see Table on Page 44). A second Horizontal Clevis Rod Kit can be installed horizontally to provide the required lateral support to the horizontal transmission line run while allowing the differential expansion of the horizontal transmission line run. When this configuration is used the RLA000-01HLB Horizontal Lateral Brace to prevent lateral motion is not required. The horizontal hanger spacing should be an average of every 120-inches (3,048-mm) for all copper outer conductor rigid line sizes and 240-inches (6,096-mm) for all aluminum outer conductor rigid line. In cases were a horizontal rod cannot be installed an RLA000-01HLB Horizontal Lateral Brace can be used to prevent lateral motion and should be installed every 240-inches (6,096-mm) for the entire length of the horizontal run if no other lateral support is provided by Horizontal Side Springs or Horizontal Clevis Rod Kits.

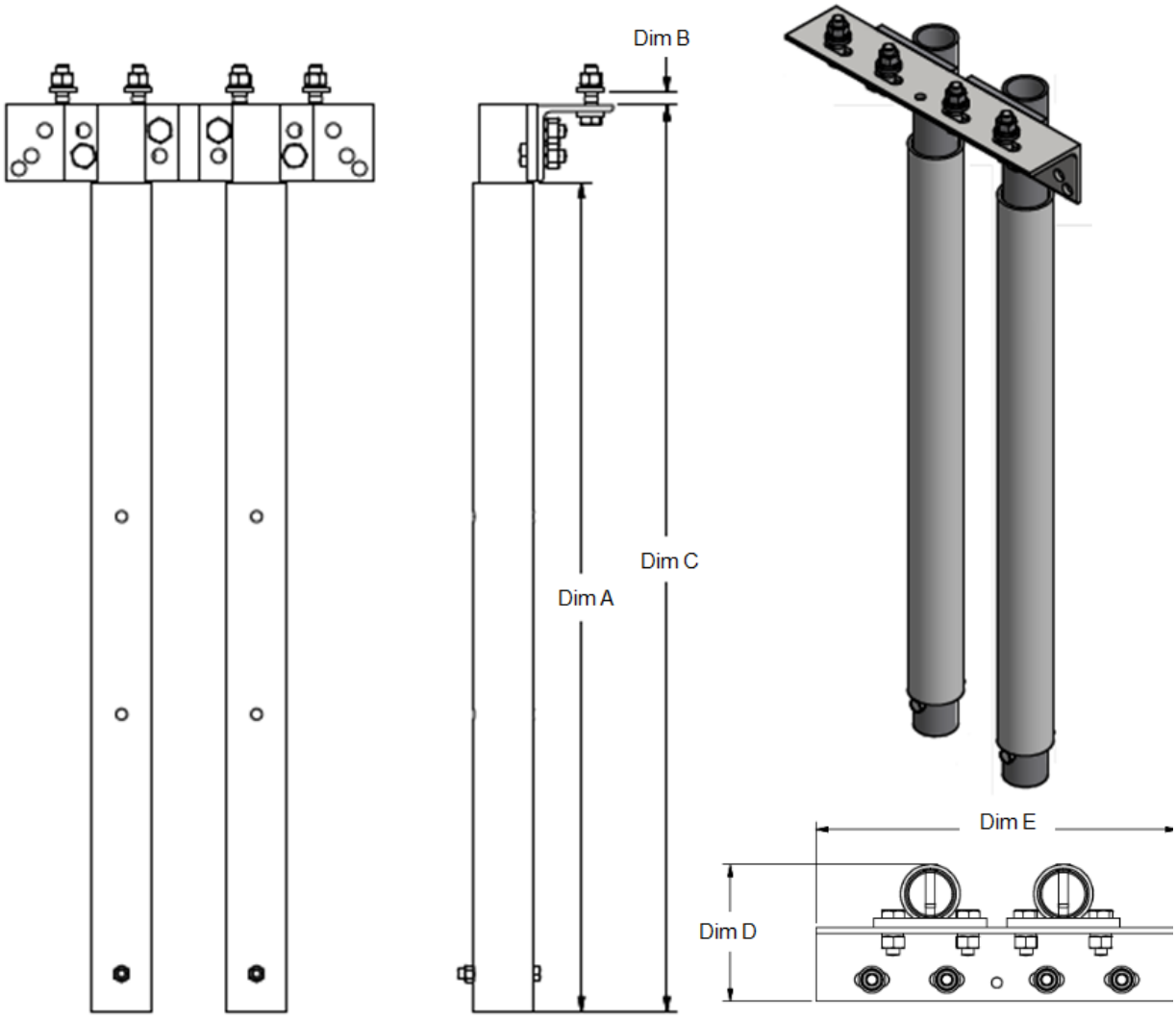


Horizontal Clevis/Rod Kit Specifications

Part Number	RLA000-01THRD	
Dim A	0.880-in	(22-mm)
Dim B	0.440-in	(11-mm)
Dim C	0.380-in	(10-mm)
Dim D	1.190-in	(30-mm)
Dim E	36.000-in	(914-mm)
Dim F	37.630-in	(956-mm)
Dim G	37.970-in	(964-mm)
Weight	1.4-lbm	(0.6-kg)
Attachment Hardware	3/8-inch	

Horizontal Lateral Braces

The Horizontal Lateral Brace, Part Number RLA000-01HLB are used in combination with the RLA000-01ALL Universal Horizontal Hanger Bracket to provide lateral support to the horizontal run of transmission line run while allowing expansion and contraction of both the vertical and horizontal run. They can be used with both Horizontal Vertical Spring Hanger and Horizontal Fixed Hangers and provide lateral support for the single point attachment configurations of both types. The Horizontal Lateral Brace spacing should be an average of every 240-inches (6,096-mm) for all rigid line sizes and types. If other lateral support is provided in the horizontal run by Horizontal Side Springs or Horizontal Clevis/Rod Kits, then a Horizontal Lateral Brace is not required.

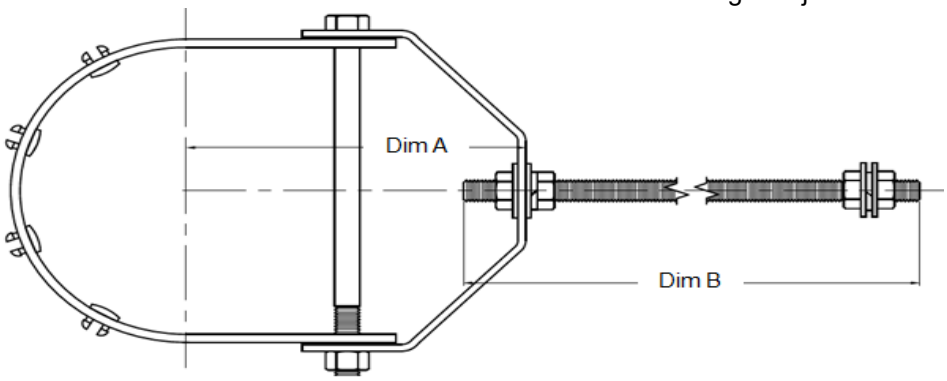


Horizontal Lateral Brace Specifications

Part Number	Dim A	Dim B	Dim C	Dim D	Dim E	Weight	Attachment Hardware
RLA000-01HLB	32.750-in (832-mm)	0.060 - 0.750-in (2 - 19-mm)	35.810-in (910-mm)	5.510-in (140-mm)	14.500-in (368-mm)	17.8-lbm (8.1-kg)	1/2-inch

Horizontal Slip Hangers

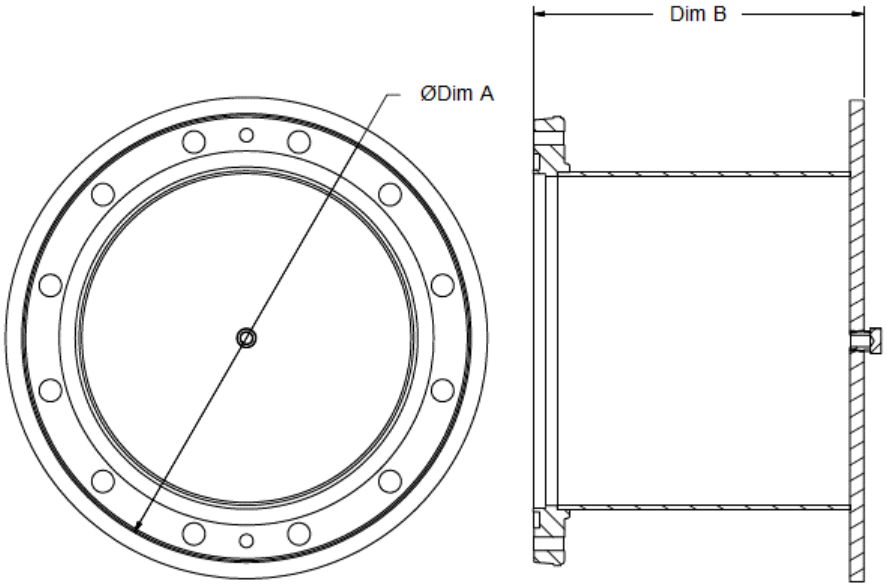
For indoor use only. Supports horizontal transmission line runs accommodates lateral motion due to expansion and contraction. Includes threaded rod and hardware to allow height adjustment.



RLAx00-22A Horizontal Sliding Hanger

Horizontal Sliding Hanger Specifications

Part Number	Line Size	Dim A		Dim B		Weight		Attachment Hardware
RLA300-22A	3-1/8-inch	4.880-in	(124-mm)	36.000-in	(914-mm)	2.0-lbm	(0.9-kg)	1/2-inch



End Caps

End caps are used during installation to allow pressurizing transmission line runs during installation, when installation is interrupted by weather or to allow pressurization of rigid line runs that are temporarily not in use. End caps include a 1/8-inch NPFT pipe plug which can be replaced with a gas inlet valve to allow connection to a dry air or nitrogen source.

End Cap Specifications

Part Number	Line Size	Dim A		Dim B		Weight	
RLA300A-50	3-1/8-inch	5.180-in	(132-mm)	3.750-in	(95-mm)	4.0-lbm	(1.8-kg)

Rigid Transmission Line Installation Tool Kit

The MACX-TK MACXLine Installation Tool Kit contains all of the specialty tools required to install copper outer conductor rigid transmission line.

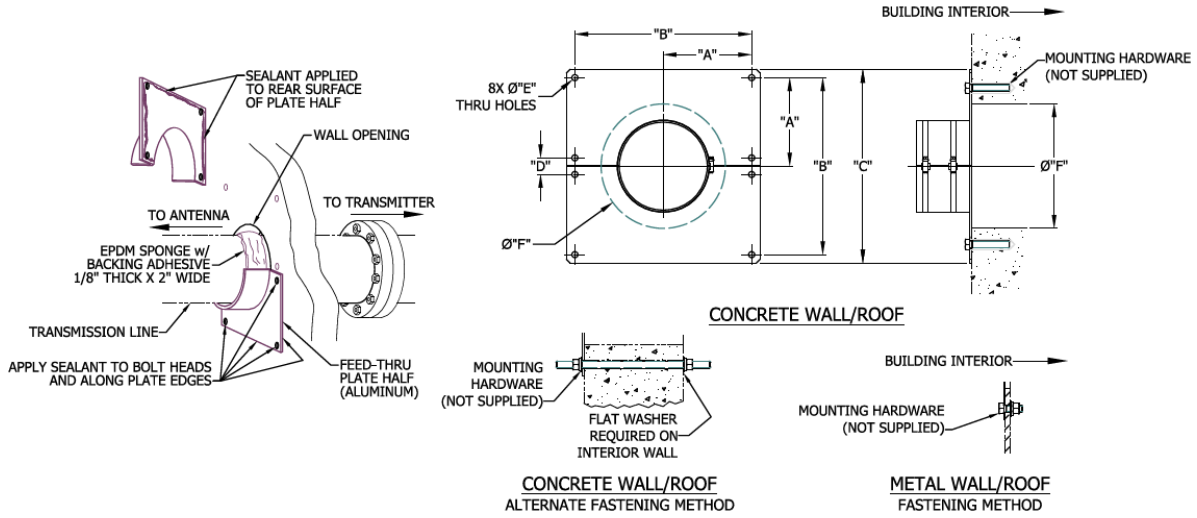
Part Number	Description
MACX-TK	MACXLine Installation Tool Kit. Contains all unique tools necessary to assemble MACXLine and 1329Line transmission line systems. Includes: 5 Packages of assorted grit garnet paper. 3/8-inch drive torque wrench 2-Piece strap wrench set 5/16-inch Hex bit socket

5/32-inch hex bit socket
Tool box

Wall Roof Feed Thru Plates

Wall/Roof Feed Thru Plates are split aluminum plates that accommodate passage of a section of copper or aluminum rigid transmission line through the metal or concrete wall or roof of the transmitter equipment building. The two piece plate is supplied with EPDM weatherproofing sponge with backing and provides for proper weather sealing of the line to the building. Eight (8) (Four (4) in the RLA100-15) mounting holes are sized, refer to dimension "E" in table, for 3/8-inch or ½-inch mounting hardware (customer supplied).

Accurately determine the entry point where the rigid line penetrates the structure. Cut out the designated area at the point of entry, refer to dimension “F” in table. Insert a single rigid line section through the entry opening. Complete both the exterior and interior installation of horizontal rigid line run. Ensure that the rigid line is suspended at the point of entry and not resting on either the top or bottom of the entry opening.



Wall/Roof Feed Thru Plate Specifications

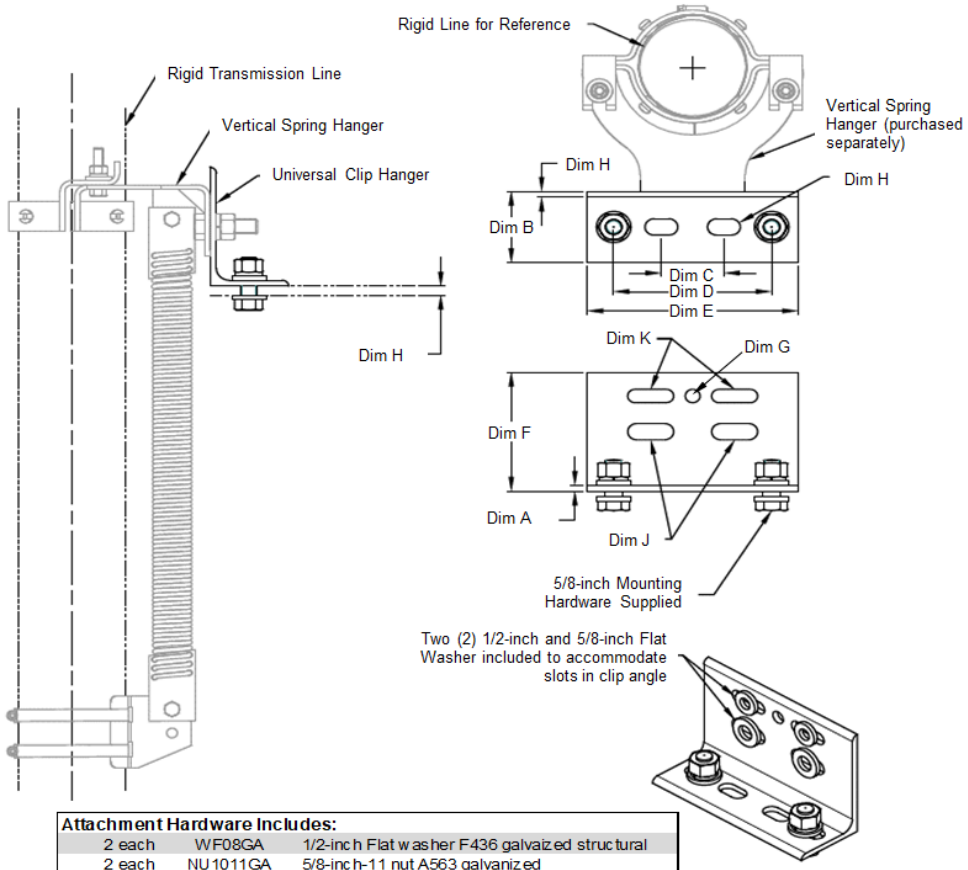
Part Number	Line Size	Dim A	Dim B	Dim C	Dim D	Dim E	Dim F	Weight
RLA300-15A	3-1/8-inch	3.400-in (86-mm)	6.800-in (173-mm)	8.000-in (203-mm)	1.200-in (30-mm)	0.438-in (11-mm)	6.000-in (152-mm)	1.1-lbm (0.5-kg)

Additional Installation Accessories

Rigid Transmission Line Attachment Brackets

Horizontal Angle Member Rigid Line Hanger Attachment Bracket

ERI's Horizontal Angle Member Rigid Line Hanger Attachment Bracket for 1-5/8-inch, 3-1/8-inch, 4-1/16-inch, 6-1/8-inch, 7-3/16-inch, and 8-3/16-inch rigid transmission lines. Supports vertical fixed, spring, and sliding ring hangers manufactured by all major rigid transmission suppliers. Includes 5/8-inch hardware to attach to drilled or punched horizontal angle members. The mounting hardware supplied can accommodate thickness connection range from 0.06-inches to 0.50-inches. Spring hanger is shown for reference only and is not included; order separately.



Attachment Hardware Includes:		
2 each	WF08GA	1/2-inch Flat washer F436 galvaized structural
2 each	NU1011GA	5/8-inch-11 nut A563 galvanized
2 each	WL10GA	5/8-inch galvanized lock washer
6 each	WF10GA	5/8-inch galvanized flat washer
2 each	SC1011H0175GA	5/8-inch-11 x 1.75-inch A325 galvanized hex bolt

Horizontal Angle Member Rigid Line Hanger Attachment Bracket Specifications

Part Number	RLA001-00KIT	
Dim A	0.250-in	(6-mm)
Dim B	3.000-in	(76-mm)
Dim C	2.380-in	(60-mm)
Dim D	6.000-in	(152-mm)
Dim E	8.000-in	(203-mm)
Dim F	5.000-in	(127-mm)
Dim G	0.563-in	(14-mm)
	hole for 1/2-inch mounting hardware	
Weight	5.0-lbm	(2.3-kg)

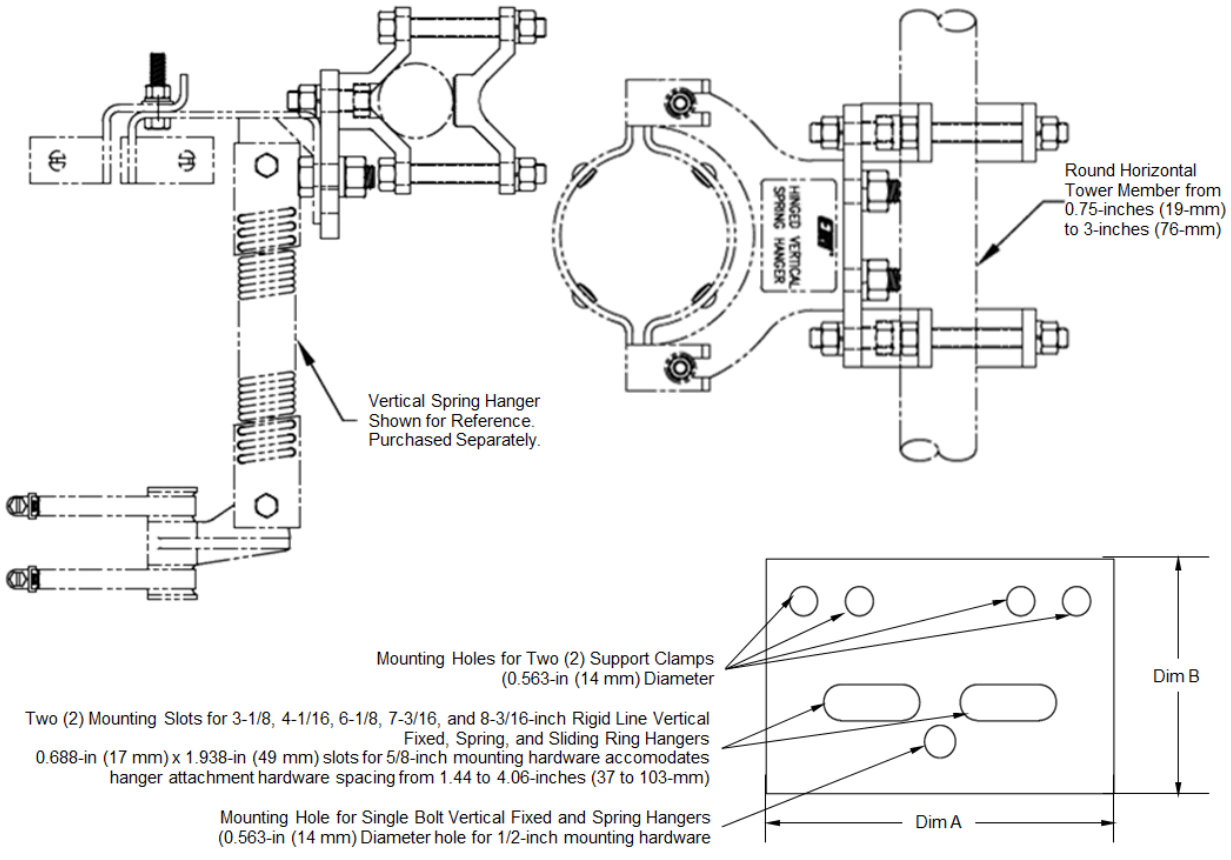
Dim H	0.06 to 0.5-in	(2 to 13-mm)
	With One (1) Flat Washer	
	0.06 to 0.31-in	(2 to 8-mm)
	With Two (2) Flat Washers	
Dim J	0.688 x 1.75-in	(17 x 44-mm)
	two (2) slots for 5/8-inch mounting hardware	
	5/8-inch Hardware Spacing	
	2.13 to 4.25-in	(54 to 108-mm)
Dim K	0.563 x 1.75-in	(14 x 44-mm)
	two (2) slots for 1/2-inch mounting hardware	
	1/2-inch Hardware Spacing	
	2.00 to 4.38-in	(51 to 111-mm)

Horizontal Round Member Rigid Line Hanger Attachment Bracket

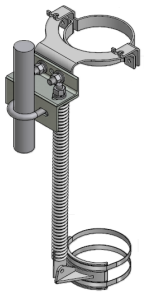
ERI's Horizontal Round Member Rigid Line Hanger Attachment Bracket for 1-5/8-inch, 3-1/8-inch, 4-1/16-inch, 6-1/8-inch, 7-3/16-inch, and 8-3/16-inch rigid transmission lines rigid transmission vertical fixed, spring, and sliding ring rigid line hangers manufactured by all major rigid transmission line suppliers. The universal hanger attachment bracket provides an interface to adapt lightweight vertical fixed hangers and vertical spring hangers to round horizontal tower members from 0.75-inches (19 mm) to 3-inches (76mm) in diameter. The bracket provides an off-the-shelf solution eliminating the need to have custom brackets fabricated before commencing installation.

Horizontal Round Member Rigid Line Hanger Attachment Bracket Specifications

Part Number	RLA001-02	
Dim A	7.000-in	(178-mm)
Dim B	4.500-in	(114-mm)
Weight	19.0-lbm	(8.6-kg)

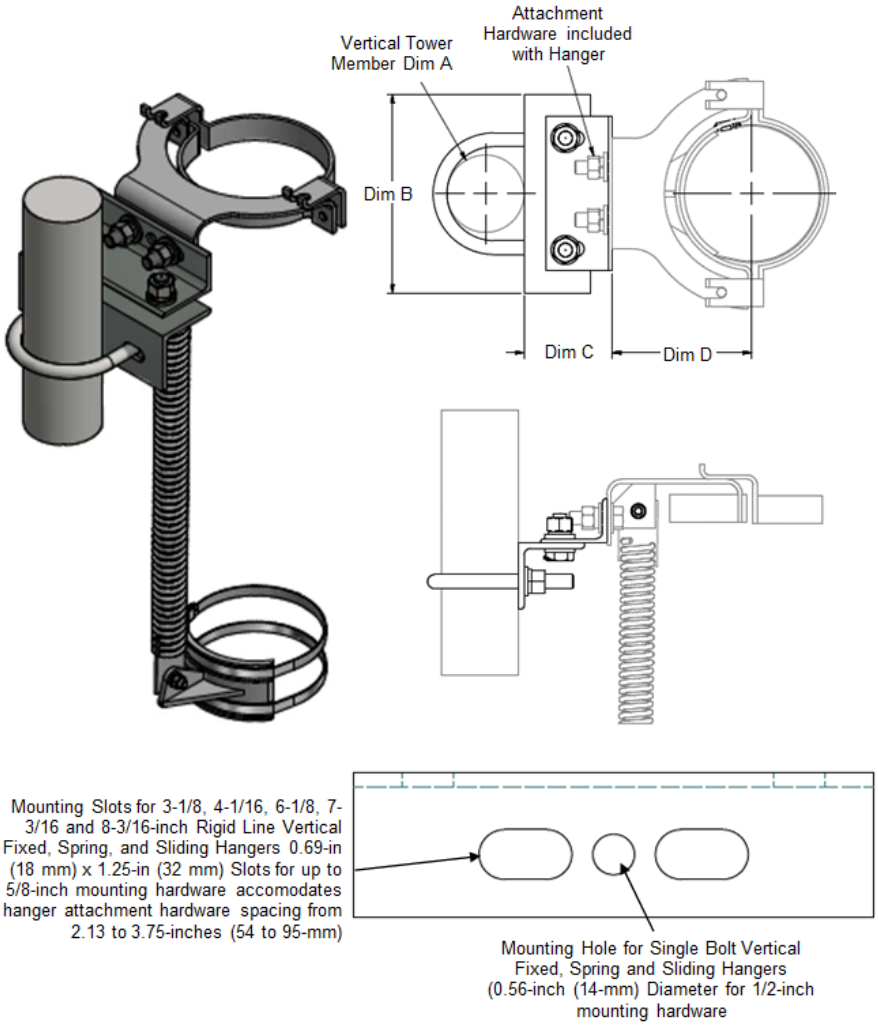


Vertical Round Member Rigid Line Hanger Attachment Bracket



Spring hanger is shown for reference only and is not included; order separately.

ERI's Vertical Round Member Rigid Line Hanger Attachment Bracket for 1-5/8-inch, 3-1/8-inch, 4-1/16-inch, 6-1/8-inch, 7-3/16-inch, and 8-3/16-inch rigid transmission line vertical fixed, spring, and sliding ruing hangers. The universal hanger attachment bracket provides an interface to adapt lightweight vertical fixed hangers and vertical spring hangers to round vertical tower members from 1.25-inches (19 mm) to 6.13-inches (156mm) in diameter. The bracket provides an off-the-shelf solution eliminating the need to have custom brackets fabricated before commencing installation.



RLA002 Universal Rigid Line Hanger Attachment Bracket Specifications

Part Number	Dim A		Dim B		Dim C		Weight	
RLA002-187K	0.75 to 1.25-in	(19 to 32-mm)					10.1-lbm	(4.6-kg)
RLA002-287K	1.25 to 2.13-in	(32 to 54-mm)	7.00-in	(178-mm)			13.0-lbm	(5.9-kg)
RLA002-387K	2.13 to 3.13-in	(54 to 79-mm)					21.2-lbm	(9.6-kg)
RLA002-487K	3.13 to 4.13-in	(79 to 105-mm)			3.00 to 4.13-in	(76 to 105-mm)	42.9-lbm	(19.5-kg)
RLA002-587K	4.13 to 5.13-in	(105 to 130-mm)	9.00-in	(229-mm)			58.7-lbm	(26.6-kg)
RLA002-687K	5.13 to 6.13-in	(130 to 156-mm)					80.8-lbm	(36.7-kg)

Transmission Line System Planning

Rigid transmission line systems provide a connection path, with high power handling capability and low loss, to deliver transmitter power to the antenna. The section provides the information to select the proper rigid transmission line size and type for the vast majority of terrestrial radio and television broadcast applications but there are many factors that can impact proper transmission line selection. It is recommended that other resources such as the transmission line chapters of the SBE Engineering Handbook (ISBN-13: 978-0071826266) or the NAB Engineering Handbook (11th Edition ISBN-13: 978-1138930513) be consulted as these resources include detailed information on all of the derating factors that may apply to special situations. You can also contact ERI for assistance in selecting the proper transmission line ty0pe and size for your specific requirements. This section of the catalog discusses the specifics of transmission line selection and installation requirements. For information on the detailed electrical and mechanical specifications, dimensional information, included hardware and other information please refer to the individual component information provided in this catalog.

Selecting the Proper Transmission Line

In general, the selection of transmission lines is based on:

1. Operating Frequency
2. Type of Service (Modulation Scheme)
3. Power Rating
4. Characteristic impedance
5. Efficiency (attenuation)
6. Tower loading (size and weight)

Special consideration is required if the broadcast service using the system is digital, due to the higher peak to average ratios of digital signals versus analog transmission formats or for systems that combine several digital television or FM channels into a single transmission line and antenna.

Operational and Electrical Parameters

When a system designer is selecting transmission lines for specific applications a number of performance and operational factors need to be considered. As seen in the table of typical specifications in general the larger the transmission line diameter the lower its attenuation (insertion loss) and the higher its power handling capability. If the transmission system includes an antenna that requires pressurization and/or the transmitter power output is greater than two kilowatts, for digital television or FM services, then semi-flexible air cable or rigid transmission line is used. For those applications utilizing an antenna that does not require pressurization small diameter (1-5/8 inch or less) foam dielectric semi-flexible cables are usually employed.

Characteristic Impedance

The characteristic impedance of a transmission line is determined by the relative diameters of the inner and outer conductors and is expressed with the following equation:

$$Z_0 = \frac{60}{\sqrt{\varepsilon_r}} \times log_{10}\left(\frac{ID}{OD}\right)$$

where:
Z_0 = characteristic impedance
ε_r = dielectric constant or relative permittivity of dielectric to air
ID = inside electrical diameter of the outer conductor (inches)
OD = outside electrical diameter of the inner conductor (inches)

When this formula is applied one finds mathematically that for maximum peak power handling, characteristic impedance should be 30 ohms. If the desire is for maximum average power handling, the characteristic impedance should be about 60 ohms and for minimum attenuation, the characteristic

impedance should be 77 ohms. As a compromise and to provide the greatest utility the characteristic impedance of commercially available coaxial transmission line is either 50 or 75 ohms.

The vast majority of semi-flexible and rigid transmission lines have a characteristic impedance of 50 ohms. In general, 50-ohm transmission lines are used in VHF digital television and FM broadcast services as attenuation losses are lower at these channels and they provide high average power handling capability relative to their physical size. Rigid transmission lines in larger sizes are usually 75-ohm for UHF digital television service as the attenuation losses are less than 50-ohm transmission lines of the same size.

Cut-Off Frequency

Coaxial transmission lines are wideband and they can generate undesirable modes of propagation above a certain frequency. This is called the cut-off frequency, (f_c). The cut-off frequency is inversely proportional to the inner and outer conductor dimensions (and dielectric constant). Larger diameter lines have cut-off frequencies below 700 MHz, which can make some line sizes unsuitable for operation at higher UHF television channels or in microwave applications. Different transmission line manufacturers use different factors of safety in specifying maximum operating frequency and so this should be considered when making a specific product selection.

Line Size	Calculated Cut-Off (MHz)	Useful Cut-Off (MHz)	Outer I.D. (in)	Inner O.D. (in)
7/8-inch 50 ohm	6659	6000	0.785	0.341
1 5/8-inch 50 ohm	3422	3000	1.527	0.664
3 1/8-inch 50 ohm	1727	1600	3.027	1.315
4 1/16-inch 50 ohm	1328	1262	3.935	1.711
6 1/8-inch 50 ohm	874	806	5.981	2.600
6 1/8-inch 75 ohm	975	830	5.981	1.711
7 3/16-inch 75 ohm	833	752	7.000	2.000
8 3/16-inch 75 ohm	729	704	8.000	2.290

Table 1 Rigid Transmission Line Cut Off Frequencies.

Attenuation

The attenuation of a given size and type of transmission is expressed as loss per unit length as either dB per 100 feet (dB per 100 meters). In this catalog attenuation values for ERI rigid transmission lines can be found under Rigid Line Attenuation and Power Handling, beginning on Page 26 As noted previously, as the transmission line size increases the loss value falls. In all coaxial transmission lines as the frequency increases the attenuation losses also increases as the conductor losses increase in direct proportion Attenuation results from dielectric losses and conductor losses. In commercially available transmission line designs air occupies most of the space between the inner and outer conductor. The PTFE and PE materials selected to provide support to the inner conductor in rigid transmission line sections, air dielectric semi-flexible transmission lines, or as the dielectric material in foam dielectric semi-flexible cables have extremely low dielectric losses. The primary source of attenuation losses in transmission lines is the conductor losses which are related to the material dimensions, conductivity and permeability of copper inner conductors used. The attenuation constant for rigid and air dielectric transmission line, with copper inner conductors can be calculated as shown below:

$$\alpha = \frac{0.433}{Z_o} \times \left(\frac{1}{D} + \frac{1}{d} \right) \times \sqrt{f}$$

where:
α = attenuation
Z_0 = characteristic impedance
ID = inside electrical diameter of the outer conductor (inches)
OD = outside electrical diameter of the inner conductor (inches)
f = frequency

Note that ERI derates the transmission line attenuation specifications to 95% to account for conductor surface conditions and connection losses. Also, attenuation increases with temperature and the generally accepted practice is to calculate published specifications based on an ambient temperature of 20 degrees C. (68 degrees F) with no differential for the higher inner conductor temperature during operation. The attenuation correction factor for higher operating temperatures can be calculated with the formula shown below:

$$M_\alpha = \sqrt{1 + \sigma_o (T_t - T_o)}$$

where:
M_α = Attenuation adjustment factor
σ_o = temperature coefficient of resistance at standard rating (for copper conductors at 20 degrees C. σ_o = 0.00393/degrees C.)
T_t = inner conductor temperature, °C
T_t = inner conductor temperature, °C

Once the attenuation constant and any correction factors have been applied then the transfer efficiency of the system can be determined. The total attenuation (α_{total}, dB) is found by multiplying the attenuation constant by total length of the transmission line system. The total attenuation is converted to efficiency with the formula shown below:

$$Efficiency\% = \frac{100}{10^{\left(\frac{\alpha_{total}}{10}\right)}}$$

One final note regarding attenuation, semi-flexible coaxial transmission lines used for broadcast service usually always have corrugated outer conductors and often have corrugated inner conductors. The corrugations actually increase the distance the signal needs to travel, when compared to rigid transmission line which incorporates smooth walled inner and outer conductors.

Power Handling

The power rating specifications for coaxial transmission line is expressed as two separate operating specifications:

- Average power handling capability is determined by the amount of heat created by loss. This operational parameter is limited by the performance of the dielectric material. ERI rigid transmission lines it is based inner conductor operating temperature of 102 degrees C. (216 degrees F.).
- Peak power handling capability represents the maximum peak power which is determined by the maximum voltage gradient that can be safely present, based on the calculated DC breakdown voltage with a safety factor applied.

Average Power

For a given size and type of transmission line the average power handling capability is determined by the amount of heat created by loss. This is limited by the long term performance of the dielectric material when exposed to the elevated. For rigid transmission line inner conductor operating temperature is normally 102 degrees C. (216 degrees F.) while semi-flexible transmission lines are rated to operate with inner conductor temperatures of 100 degrees C. (212 degrees F.) or 121 degrees C. (250 degrees F.), depending on line size.

Transmission line components are usually designed to provide a useful life of twenty (20) years or more. If the system is operated at power levels or in ambient temperatures that exceed those ratings useful life will be significantly reduced. In systems with multiple users combined into a single run of transmission line power planning is straightforward, since average power rating are based on temperature rise of coaxial components, the sum of the transmitter outputs is used to check average power safety factor.

Peak Power

The transmission line Peak Power rating is essentially the voltage at which the line will arc from the inner to the outer conductor. The Peak Power rating is derived from the DC production test voltage. Transmission lines and components are tested at the factory using a DC Hi-Pot test. This test is performed by connecting electrodes to the inner conductor and the outer conductor and applying a DC production test voltage for one minute to confirm the component will not arc over.

General industry practice is to set the DC production test voltage at 35% of the calculated value of air breakdown (≈30 kV/cm). The peak power rating of a particular transmission line is derived by converting the DC voltage breakdown of two cylinders placed coaxially is shown below:

$$P_{PK} = \frac{\left(\frac{E_P \times 0.707 \times 0.7}{SF}\right)^2}{Z_c}$$

where:
P_{PK} = Cable power rating, standard conditions
E_P = dc production test voltage
0.707 = RMS factor
0.7 = dc to RF factor (empirically verified)
SF = Safety factor on voltage
= 1.4 for semi-flexible cables
= 2.0 for rigid coaxial lines
Z_C = Characteristic impedance

The term, Peak Power, is misleading. It is a power term in watts based on a root mean square voltage, not a peak voltage. The peak voltage rating of the components in a multiplex facility is critical. Just like in average power considerations, peak voltages add up, but the modulation of the carrier must be also be considered. The Average power rating of the transmission line system is critical for systems with only one or two channels. In combined system the equivalent peak power rises as the square of the number of carriers. The peak power capability is often the limiting factor for multiplexing several signals. The peak voltage for a system is calculated with the following formula:

$$E_{pk} = (\sqrt{2}) \times \sqrt{F_{env} \times Z_c \times P_t}$$

where:
E_{pk} = Peak RF Voltage
P_t = Transmitter Power Output
Z_C = Characteristic impedance
F_{env} = From Table below:

		F_{env}
Single Station		
FM Analog	0 dB	1
FM IBOC (OFDM)	10 dB	10
8VSB TV	7 dB	5
Multiplexed Stations		
FM Analog	0 dB	1
FM IBOC (OFDM)	6 dB	4
8VSB TV	7 dB	5

Table 2 Peak to Average Power Factors

For combined systems simply perform the Peak RF Voltage calculation for each station and sum them. The maximum allowable peak voltage recommended for various transmission line sizes is shown in Table 2.

Size	Impedance	Peak Power Rating	DC Production Test Voltage	Max Peak Voltage
7/8-inch	50 ohms	41 kW	6 kV	2.100 kV
1-5/8-inch	50 ohms	132 kW	11 kV	3.643 kV
3-1/8-inch	50 ohms	440 kW	19 kV	6.640 kV
4-1/16-inch	50 ohms	710 kW	24 kV	8.427 kV
6-1/8-inch	50 ohms	1500 kW	35 kV	12.394 kV
6-1/8-inch	75 ohms	1069 kW	36 kV	12.600 kV
7-3/16-inch	75 ohms	1426 kW	42 kV	14.700 kV

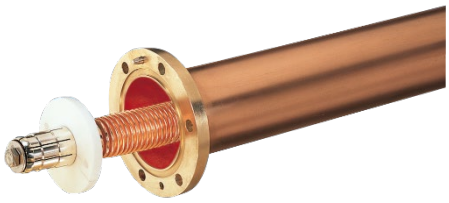
Table 3 Rigid Transmission Line Peak Power Ratings, DC Production Test Voltages and Recommended Maximum Peak Voltage Ratings by Transmission Line Size and Type for ERI Rigid Transmission Lines

Voltage Standing Wave Ratio (VSWR)

The voltage standing wave ratio is defined as the maximum to the minimum standing wave voltage. In any transmission line system some energy transmitted through a coaxial line is reflected back and lost. The reflections are caused by variations in impedance along transmission line from corrugations, production variations, dents, flange reflections, inner connectors, or due to an impedance mismatch between line and the antenna. If the voltage distribution in the system is uneven, resulting in standing wave along the transmission line. A perfect VSWR would be 1:1 and no system can achieve this level of performance and so a system VSWR of 1.1:1 or less is generally considered to be good performance. Another way to express this performance parameter is Return Loss which is the ratio of the reflected wave to the incident wave expressed as a positive number of dB's. The Return Loss of a system with a VSWR of 1.1:1 would 27 dB.

Differential Expansion

The inner conductor of a transmission line runs substantially hotter than the outer conductor it will expand to a greater length. For a long useful service life the transmission line must incorporate some method to accommodate the differential expansion between the two coaxial conductors. In semi-flexible cables this is done by corrugating the inner and outer conductors. Rigid transmission lines the inner conductor of a 20-foot rigid line section will expand 0.166 inches at rated average power. In rigid transmission lines this movement causes degradation of the contact surfaces at each of the line section connections and over time the metal particles can lead to a catastrophic failure of the transmission line system. ERI MACXLine includes a compensation bellows in each rigid line section to accommodate differential expansion. This method eliminates any sliding of the contact point between line sections.



MACX350A 3-1/8-inch MACXLine® Rigid Line Section Captive Inner Connector with Bellows Compensator.

Velocity Factor

The addition of dielectric material causes the signal in transmission line to propagate more slowly and velocity factor is expressed as a percentage of the speed of light. Published specifications for transmission lines include a velocity factor and this needs to be considered when phase matching transmission lines of different types. In transmission line systems that use dual transmission lines to provide additional power handling capability the two transmission lines must be matched to have identical electrical lengths for the system to operate properly. Velocity factors for the transmission line products in this catalog can be found in the specification table titled "Rigid Line Common Specifications" on page **Error! Bookmark not defined.**.

Derating Factors

In planning transmission line systems it is important to understand the transmission line operating specifications and how they are derived. Most manufactures employ standard conditions for their power and operating specifications. In general, attenuation and average and peak power ratings are based on a VSWR 1.0 and at atmospheric pressure. As a part of the selection process derating factors must be applied to the published average and peak power specifications. Usually the transmission line system for AM broadcast service (530 to 1710 kHz) is limited by Peak Power Rating and multi-station combined FM and digital television transmission line systems are limited by Total Peak RF Voltage. For transmission line systems used by a single FM broadcast station or a single digital television station the Average Power Rating of the line is usually the limiting factor.

Derating Average Power for VSWR

The total average power in a given run of transmission line is the total of the forward and reflected power applied to the line. For systems that include more than signal the sums of the combined forward and reflected power of all the signals in the system must be less than the average power rating of the line employed. It is recommended that the expected worst case VSWR be applied when sizing the average power handling required for the transmission line. For most terrestrial broadcast applications a VSWR of 1.50 :1 is suggested as the minimum value applied. Table 4 provides the Reflection Coefficient that can be used to derive the Reflected Power in a transmission line from a given transmitter power output for a range of VSWR and Return Loss values.

Reflection Coefficient	Return Loss	VSWR
35%	-9.1-dB	2.077 : 1.00
30%	-10.5-dB	1.857 : 1.00
25%	-12.0-dB	1.667 : 1.00
20%	-14.0-dB	1.500 : 1.00
15%	-16.5-dB	1.353 : 1.00
10%	-20.0-dB	1.222 : 1.00
5%	-26.0-dB	1.105 : 1.00
1%	-40.0-dB	1.020 : 1.00

Table 4 Reflection, Return Loss and VSWR Conversion Table

Derating Peak Power for Modulation and VSWR

The peak power rating of transmission line must be derated for VSWR and the Modulation of the broadcast service it will carry and the transmitter power must be less that this calculated derated value. The table below shows the methods for derating peak power for broadcast service. For DTV, compare to +6 dB peak power levels for 8VSB, not the average signal power.

Modulation	Peak Power Derating Calculation
AM	$P_{MAX} = \frac{P_{PK}}{(1+M)^2 \times VSWR}$
FM and DTV	$P_{MAX} = \frac{P_{PK}}{VSWR}$

P_{MAX} = Derated peak power
P_{PK} = Peak power rating of cable
M = Amplitude modulation index (100% = 1.0)
$VSWR$ = Voltage standing wave ratio

Derating Average and Peak Power for Altitude

The transmission line average and peak power ratings must be derated for altitude because the lower atmospheric pressure reduces heat transfer from the inner and outer conductors and the dielectric strength of the air inside the transmission line. The recommended derating factors are shown in Table 5.

Altitude above Sea Level feet (meters)	P1/P Average Power	P1/P Peak Power
0 (0)	1.00	1.00
5000 (1524)	0.92	0.69
8000 (2438)	0.87	0.53
10,500 (3200)	0.84	0.44
15,000 (4572)	0.78	0.30

Table 5 Derating Factors for Peak and Average Power with Altitude

Selecting the Correct Line Section Length

The flanged connections between the individual rigid transmission line sections cause a small reflection as there is a small impedance mismatch at each connection. These reflections add up in a long transmission line run and cause a high VSWR spike in the system. These critical frequencies can be determined with the following formula:

$$F_c = \frac{492.15 \times V_p \times n}{L_{ft}}$$

where:
F_c = Critical frequency in MHz
V_p = Relative velocity
L_{ft} = Transmission section line length in feet
n = Any integer

Table 6 lists the recommended standard rigid transmission line section lengths for Region II television channels and the FM broadcast band. In cases where multiple television channels are combined in a single run of transmission a broadband rigid transmission line must be used. These systems are available from

ERI and use a proprietary technique to randomize individual transmission line section lengths to minimize the VSWR spikes caused by the flange reflections.

US Television Channels

20.00-foot (6.096 meter) Section Length
Channels: 2, 3, 5, 6, 7, 8, 9, 11, 12, 14, 15, 18, 19, 22, 23, 27, 31, 32, 35, 36

19.75-foot (6.020 meter) Section Length
Channels: 16, 20, 24, 28, 33

19.5-foot (5.944 meter) Section Length
Channels: 4, 10, 13, 17, 21, 25, 26, 29, 30, 34

FM Radio Frequencies

Foot (meter)	MHz
20.00 (6.096) Sections	88.1 - 95.9
	100.3 - 107.9
19.50 (5.944) Sections	96.1 - 98.3
19.00 (5.791) Sections	98.5 - 100.1
17.50 (5.342) Sections	88.1 – 107.9

Table 6 Recommended rigid transmission line section lengths for Region II Television and FM frequencies.

Rigid Transmission Line Support Selection

Proper installation and support of a rigid transmission line system is one of the key factors to the reliability and longevity of the system. Rigid transmission line is usually selected when the power handling required exceeds the power handling capability of semi-flexible transmission line. Since rigid transmission line is not corrugated it also has lower loss than equivalently sized semi-flexible transmission line. Also, rigid transmission line is supplied in sections it is often easier to ship and off load at site versus a large reel of semi-flexible cable.

The copper and aluminum outer conductors employed in rigid waveguide and coaxial transmission lines expand and contract at a different rate, with changes in ambient temperature, then the steel used to construct the tower. With a 100 degree change in temperature the differential expansion between the tower and a copper transmission line is 3 inches. So, this requires some method of supporting the transmission line while allowing these different expansion rates as the temperature varies between day and night and through the changes in seasons.

		Hardware Size	Torque Value
Steel	0.0000065 in/in/Degrees F	3/8-inch (10 mm)	21 lb-ft (28 Nm)
Copper	0.000009 in/in/Degrees F	1/2-inch (13mm)	46 lb-ft (62 Nm)

Aluminum	0.000013 in/in/Degrees F

Table 7 Coefficient of thermal expansion

5/8-inch (16 mm)	76 lb-ft (103 Nm)

Table 8 Hardware Torque Specifications

Rigid line hangers are designed to support a transmission line run based on the length of the Vertical Line Run (Antenna Input to Bottom Elbow) and the Horizontal Line Run (Bottom Elbow to the Gas Barrier). The hanger requirements for copper outer conductor and aluminum outer conductor transmission line are similar with some minor differences required due to the greater thermal expansion coefficient of aluminum versus steel. Table 8 lists the hardware torque specifications that apply to the installation of all of the rigid transmission line hanger components discussed in this section.

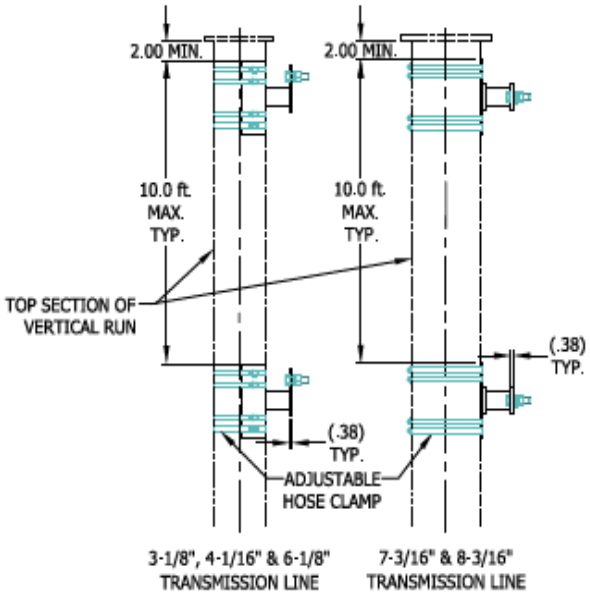
Vertical Run Installation Requirements

Vertical Fixed Hangers

A rigid transmission line system employs one or more fixed hangers at the top of the vertical run. These fixed hangers are installed near the antenna input. In most installations an elbow complex made up of four (4) 90-degree elbows is installed at the antenna input. This elbow complex provides expansion compensation between the fixed hanger(s) and the antenna input. The elbow complex can be disassembled without disturbing any part of the transmission line system or the antenna input section.

Minimum Quantity	Vertical Run Length	
Two (2)	500 feet	(152.4 meters)
Three (3)	1000 feet	(304.8 meters)
Four (4)	1500 feet	(457.2 meters)
Five (5)	2000 feet	(609.6 meters)

Table 9 Vertical Rigid Hanger Requirements for Rigid Transmission Line Systems

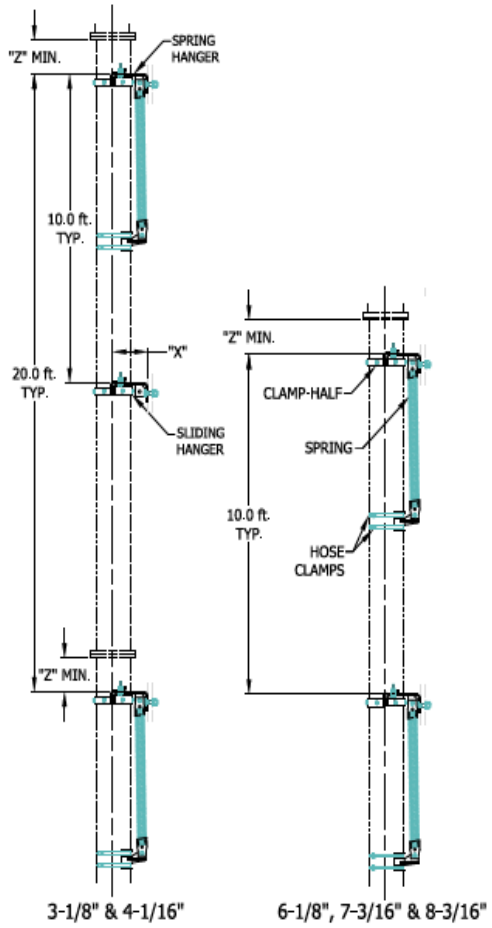


Vertical Rigid Hanger Installation

The weight of the vertical run is supported by Fixed Vertical Rigid Hangers that are installed at the top of the vertical run immediately below the elbow complex at the input to the antenna. A minimum of two (2) Vertical Rigid Hangers is required in any rigid transmission line run up to 500-feet (152.4-meters) in length. One additional Vertical Rigid Hanger is added for each additional 500-feet (152.4-meters) of vertical run length.

The first (highest) Vertical Rigid Hanger should be installed as close as possible, vertically, of the antenna input to prevent excessive differential expansion from putting stress on the antenna input but it should be below the antenna input elbow complex so that the vertical transmission line run is supported if the elbow complex should ever require disassembly. The additional required Vertical Rigid Hangers should be installed with an average vertical separation of 10-feet (3.0-meters) below the first Vertical Rigid Hanger. The Vertical Rigid Hangers include attachment hardware to connect to holes in tower members. In most cases additional brackets are required to attach the bracket to the tower. The most popular hanger support brackets available from ERI are detailed in this catalog in the section titled “Rigid Transmission Line Attachment Brackets” beginning on page 54.

Vertical Spring and Sliding Hangers



Vertical Spring and Sliding Hanger Installation

The balance of the vertical run below to Vertical Rigid Hanger installed on the top section(s) of rigid line are supported by a combination of Vertical Spring Hangers and Vertical Sliding Hangers for 1-5/8-inch, 3-1/8-inch and 4-1/16-inch rigid transmission lines. The larger 6-1/8-inch, 7-3/16-inch and 8-3/16-inch line sizes require the Vertical Spring Hangers be used for all of the vertical run below the Vertical Fixed Hangers installed on the top section(s).

For 1-5/8-inch rigid transmission line one Vertical Spring Hanger is required for every 50-feet (15.2-meters) of vertical run below the Vertical Fixed Hangers and Vertical Sliding Hangers should be installed with an average vertical separation of 10-feet (3.0-meters).

Rigid transmission line systems with 3-1/8-inch and 4-1/16-inch line require one (1) Vertical Spring Hanger installed an average of every 20-feet (6.1-meters) below the lowest Vertical Rigid Hangers. For 6-1/8-inch, 7-3/16-inch and 8-3/16-inch rigid line systems one (1) Vertical Spring Hanger should be installed an average of every 10-feet (3.0-meters) below the lowest Vertical Rigid Hangers.

	Dimension "Z"	
Vertical Run Height	**Copper Line**	**Aluminum Line**
Up to 1000-feet (304.8-meters)	4.0-inches(102-mm)	8.0-inches (203-mm)
Up to 2000-feet (609.6-meters)	8.0-inches(203-mm)	16.0-inches(406-mm)

Table 10 Minimum Flange to Hanger Distance for Vertical Spring and Vertical Sliding Hangers for all Rigid Transmission Line Sizes and Types

After the installation of the Vertical Spring Hangers (and Vertical Sliding Hangers for smaller lines) the vertical springs must be set according to the spring setting table included in the installation instructions. The spring setting are based on the overall vertical line run length and on the ambient air temperature during installation. It is important to avoid large variations in tension and so it is recommended that all spring hangers should be set within hours of each other.

Horizontal Run Length	**Copper Line**		**Aluminum Line**	
Up to 100-feet (30.5-meters)	16.0-feet	(4.9-meters)	24.0-feet	(7.3-meters)
101-feet (30.8-meters) to 200-feet (61.0-meters)	32.0-feet	(9.8-meters)	48.0-feet	(14.6-meters)

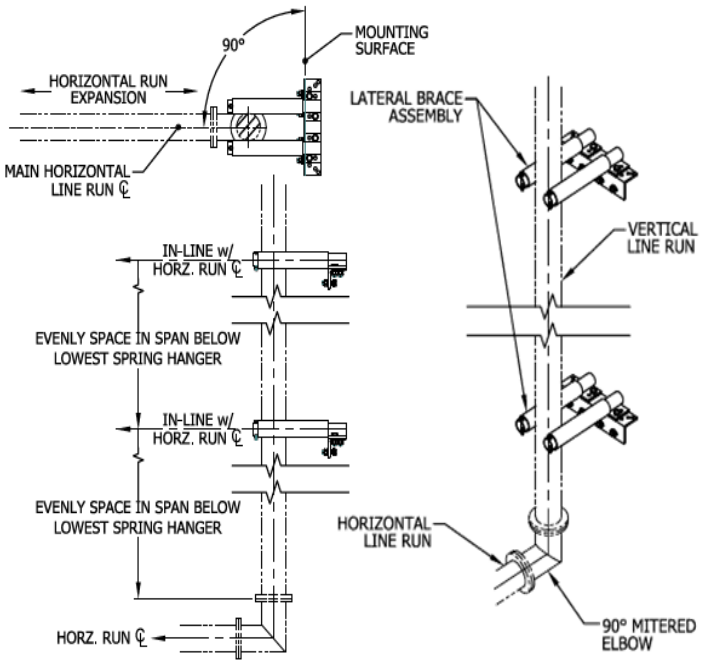
Table 11 Minimum Distance from Elbow at Base of Vertical Line Run to Lowest Vertical Spring/Sliding Hanger

At the base of the vertical line run the system must allow for the differential expansion and contraction of the horizontal line run. The distance from the elbow at the base of the vertical line run to the lowest Vertical Spring or Sliding Hanger should be the distance shown in Table 11.

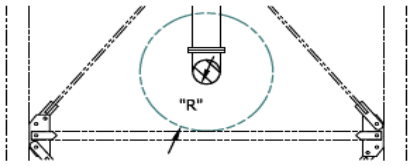
Vertical Lateral Braces

The base of the vertical line run must be allowed to move to accommodate the expansion and contraction of the horizontal line run as the temperature varies between day and night and through the changes of the seasons. At the same time, if lateral motion is not controlled it causes undesirable mechanical stresses and cause damage to the system. To prevent lateral motion ERI manufactures Vertical Lateral Braces that are adjustable to fit all available rigid transmission line sizes.

All systems require two (2) Vertical Lateral Brace Assemblies installed at the base of the vertical line run evenly spaced in the vertical span below the lowest Vertical Spring/Sliding Hanger and the elbow at the base of the vertical line run. They should be installed in-line with the horizontal run expansion, as shown, using the ½-inch mounting hardware supplied.



Vertical Lateral Brace Installation



Minimum Radial Clearance Required

In addition, it is important that there be sufficient radial clearance from all tower member, other transmission lines, conduits, ladders and other obstructions sop that the transmission line expansion and contraction is not impeded. The minimum radial clearance is determined by the transmission vertical run length and transmission line type, with greater clearance required for aluminum outer conductor rigid transmission line.

	Dimension "R"			
Vertical Run Height	**Copper Line**		**Aluminum Line**	
Up to 500-feet (152.4-meters)	1.5-inches	(38-mm)	3.9-inches	(99-mm)
501-feet (152.7-meters) to 1000-feet (304.8-meters)	3.0-inches	(76-mm)	7.8-inches	(198-mm)
1001-feet (305.1-meters) to 1500-feet (457.2-meters)	4.5-inches	(114-mm)	11.7-inches	(297-mm)
1501-feet (457.5-meters) to 2000-feet (609.6-meters)	6.0-inches	(152-mm)	15.6-inches	(396-mm)

Table 12 Minimum Radial Clearance Required at Bottom of Vertical Line Run

Horizontal Line Run Installation Requirements

The horizontal line run must be long enough to accommodate the expansion and contraction of the vertical line run without damage. The minimum horizontal line run lengths required for most system is listed in .

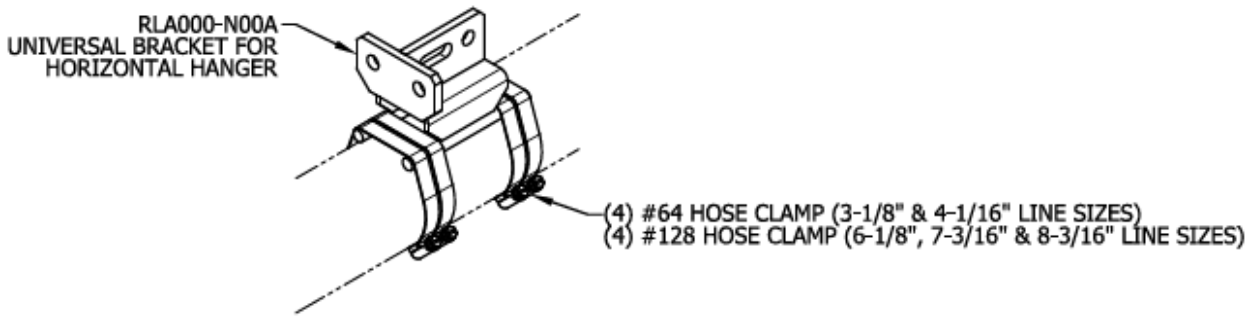
Minimum horizontal line run length is to be the greater of 20-feet (6.1-meters) or:

Line Size	**Copper Line**	**Aluminum Line**
3-1/8-inch and 4-1/16-inch	4% of Vertical Run Height	7% of Vertical Run Height
6-1/8-inch	6% of Vertical Run Height	10% of Vertical Run Height
7-3/16-inch and 8-3/16-inch	6% of Vertical Run Height	Not Applicable

Table 13 Minimum Horizontal Run Length

Horizontal Spring Hanger must be used over the entire length of the Minimum Horizontal Line Run to allow for the vertical movement of the run as the vertical line run expands and contracts and also to accommodate horizontal movement of the horizontal line run as it expands and contracts. In addition, lateral motion of the horizontal line run must be controlled by using Horizontal Lateral Braces and/or Horizontal Side Springs. Beyond the Minimum Horizontal Line Run length, Fixed Horizontal Hangers may be used and on very long horizontal line runs are recommended to prevent wind induced vertical motion, usually referred to as “galloping”.

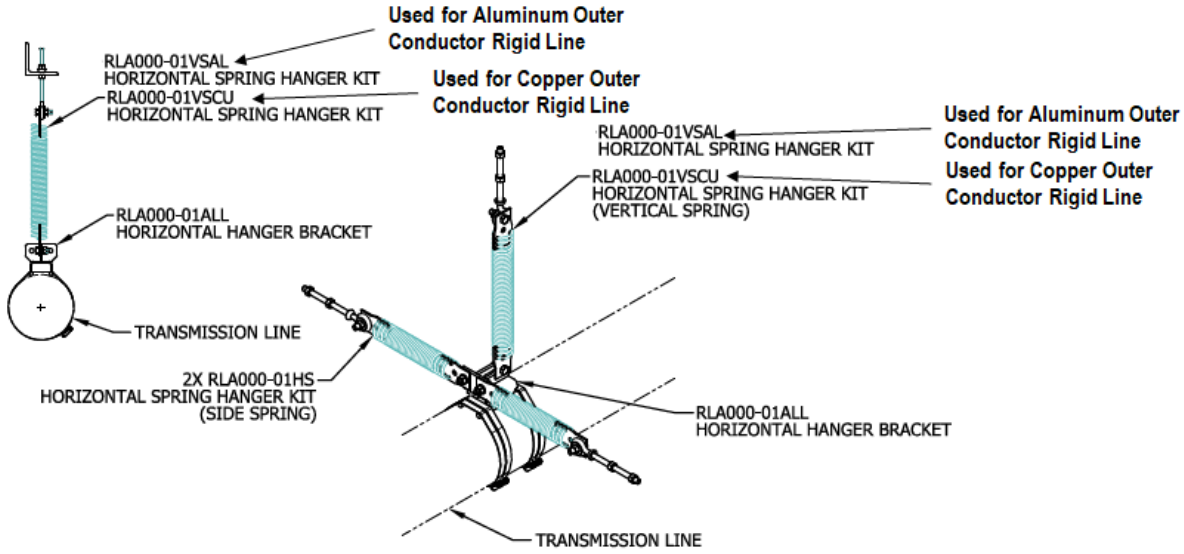
Universal Horizontal Bracket Assembly



ERI RLA000-01ALL Universal Horizontal Bracket Assembly

ERI’s Universal Horizontal Bracket Assembly (RLA000-01ALL) includes components to allow it to be used with all rigid transmission line sizes. The Bracket and hose clamps are fabricated from Stainless Steel so it may be used with copper or aluminum outer conductor transmission line without special galvanic barriers.

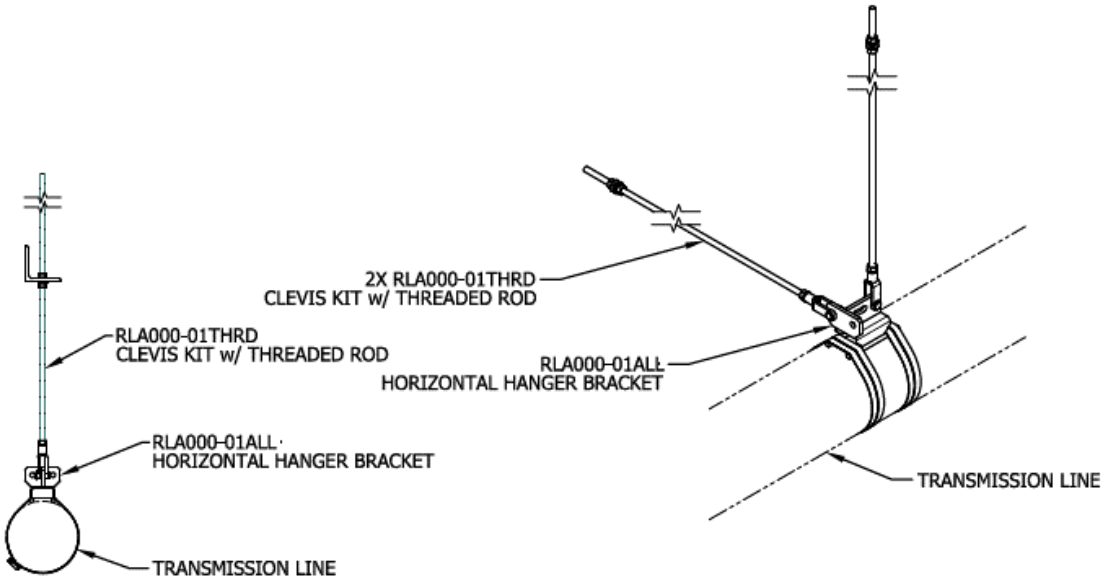
Horizontal Spring Hangers



Universal Horizontal Bracket Assembly with Horizontal Spring Hanger Kits in Single-Point and Three-Point Horizontal Spring Hanger Suspension Configurations

The Universal Horizontal Bracket Assembly when combined with a Horizontal Spring Hanger Kit (RLA000-01VSAL for Aluminum Line or RLA000-01VSCU of Copper Line) to make Single Point Horizontal Spring Hangers. Three-Point Horizontal Spring Hangers can be made by adding two (2) Horizontal Side Spring Hanger Kits (RLA000-01HS). Horizontal Spring Hangers are required for the entire length of the Minimum Horizontal Line Run. The horizontal spring hanger spacing should be an average of 40-feet (12.2-meters) for 3-1/8 and 4-1/16-inch Aluminum Outer Conductor Rigid Line, 20-feet (6.1-meters) for 3-1/8 and 4-1/16-inch Copper Outer Conductor or 6-1/8-inch Aluminum Outer Conductor Rigid Line and 10-feet (3-meters) 6-1/8, 7-3/16 and 8-3/16-inch Copper outer Conductor Rigid Line.

Horizontal Fixed Hangers



Universal Horizontal Bracket Assembly with Clevis with Threaded Rod Kits in Single-Point and Two-Point Fixed Horizontal Suspension Configurations

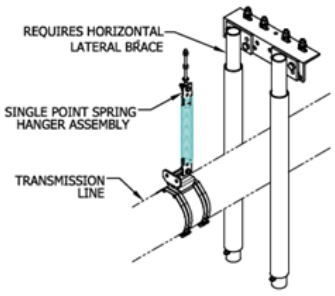
The Universal Horizontal Bracket Assembly when combined with a Horizontal Clevis/Rod Kit (RLA000-01THRD) to make Single Point Horizontal Fixed Hanger. Two-Point Horizontal Fixed Hangers can be made by adding two (2) Horizontal Clevis/Rod Kits (RLA000-01THRD). Horizontal Fixed Hangers can be used on the portion of the horizontal run that exceeds the Minimum Horizontal Line Run. The horizontal fixed hanger spacing should be an average of every 10-feet (3-meters) for all copper outer conductor rigid line sizes and 20-foot (6.1-meter) for all aluminum outer conductor rigid line.

Horizontal Lateral Braces

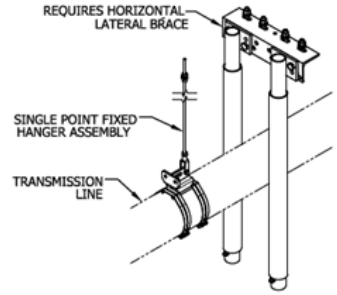
The Horizontal Lateral Brace is used at 20-foot (6.1-meter) intervals along the entire length of the horizontal line run when single-point spring hangers are used. This is the preferred configuration as it provides the best support and control of lateral movement for the horizontal run and is usually the easiest to install in crowded existing transmission line bridges. The Horizontal Lateral Brace is universal for all line sizes.

	Dimension "E"	
Line Size	**Copper Line**	**Aluminum Line**
3-1/8-inch	25.10-inches (638-mm)	33.02-inches (839-mm)
4-1/16-inch	27.49-inches (698-mm)	33.88-inches (861-mm)
6-1/8-inch	27.44-inches (697-mm)	36.77-inches (934-mm)
7-3/16-inch	29.04-inches (738-mm)	
8-3/16-inch	30.78-inches (782-mm)	

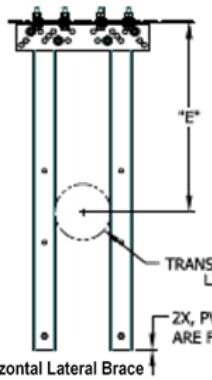
Horizontal Spring Hangers are required for the entire length of the Minimum Horizontal Line Run. The horizontal spring hanger spacing should average of 40-feet (12.2-meters) for 3-1/8 and 4-1/16-inch Aluminum Line, 20-feet (6.1-meters) for 3-1/8 and 4-1/16-inch Copper Line or 6-1/8-inch Aluminum Line and 10-feet (3-meters) 6-1/8, 7-3/16 and 8-3/16-inch Copper Line. Horizontal Fixed Hangers can be used on the portion of the horizontal run that exceeds the Minimum Horizontal Line Run. The horizontal fixed hanger spacing should be an average of every 10-feet (3-meters) for all copper line sizes and 20-foot (6.1-meter) for all aluminum line.



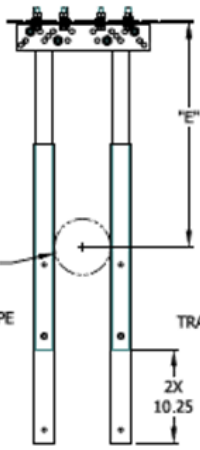
Horizontal Lateral Brace typical mounting configuration with Single-Point Horizontal Spring Hanger



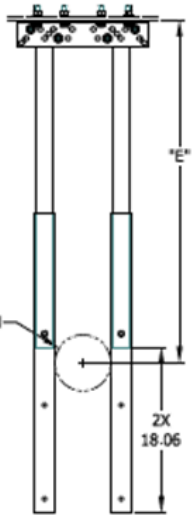
Horizontal Lateral Brace typical mounting configuration with Single-Point Horizontal Fixed Hanger



Horizontal Lateral Brace configuration for:
3-1/8-in, 4-1/16-in and 6-1/8-inch copper line vertical runs up to 2,000-feet (610-meters)
7-3/16-in and 8-3/16-inch copper line vertical runs up to 1,000-feet (305-meters)



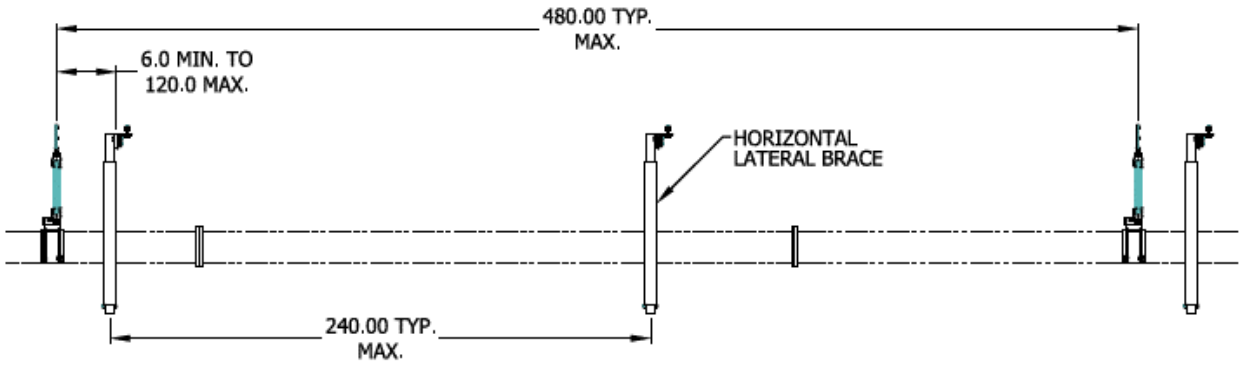
Horizontal Lateral Brace configuration for:
3-1/8-in, 4-1/16-in and 6-1/8-inch aluminum line vertical runs up to 1,000-feet (305-meters)
7-3/16-in and 8-3/16-inch copper line vertical runs up to 2,000-feet (610-meters)



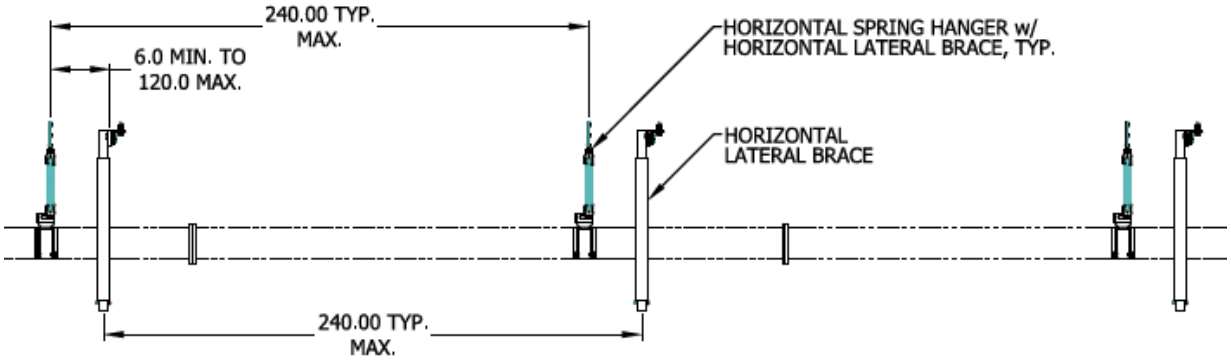
Horizontal Lateral Brace configuration for:
3-1/8-in, 4-1/16-in and 6-1/8-inch aluminum line vertical runs up to 2,000-feet (610-meters)

Horizontal Lateral Braces are configured to accommodate all of the configurations show above. The RLA000-01HLB includes PVC guides which can be adjusted to any of the lengths shown. When installed with no guide adjustments ("FLUSH") their length is 35.81-inches (910-mm). When extended to the first position ("2X 10.25") length is 46.06-inches (1170-mm) and when extended to the second position ("2X 18.06) they are 54.07-inches (1373-mm) in length.

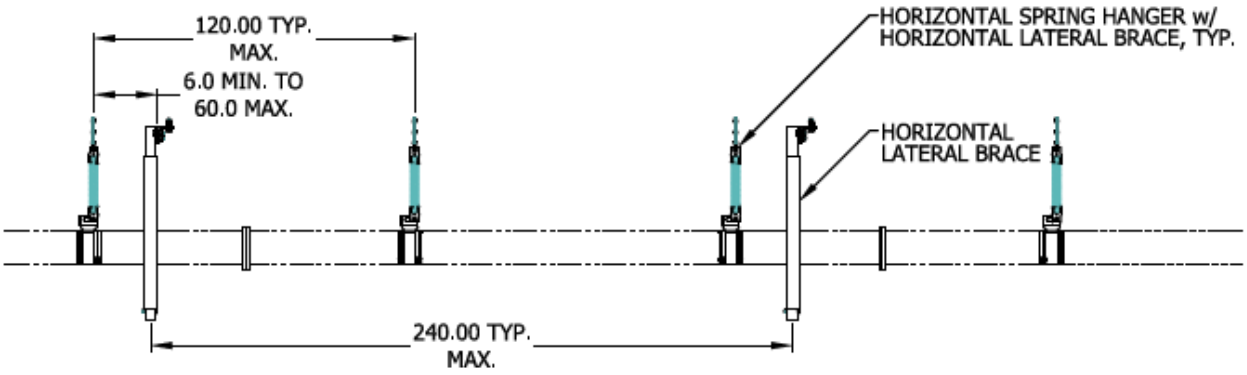
Horizontal Lateral Brace Typical Mounting Configurations and Length Adjustment for all Applications



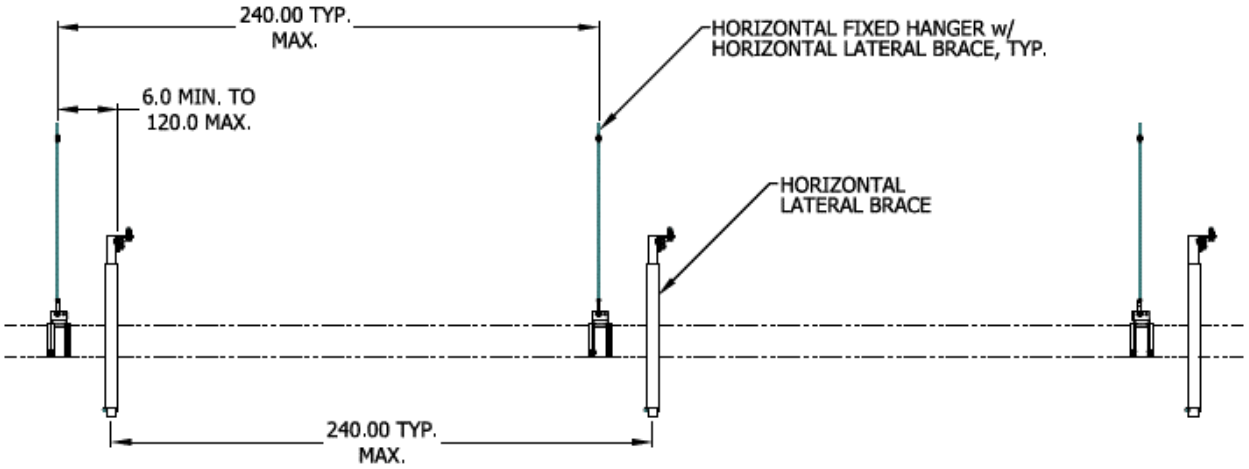
Horizontal Lateral Brace and Horizontal Spring Hanger Configuration for 3-1/8-inch and 4-1/16-inch Aluminum Outer Conductor Transmission Line Horizontal Line Runs



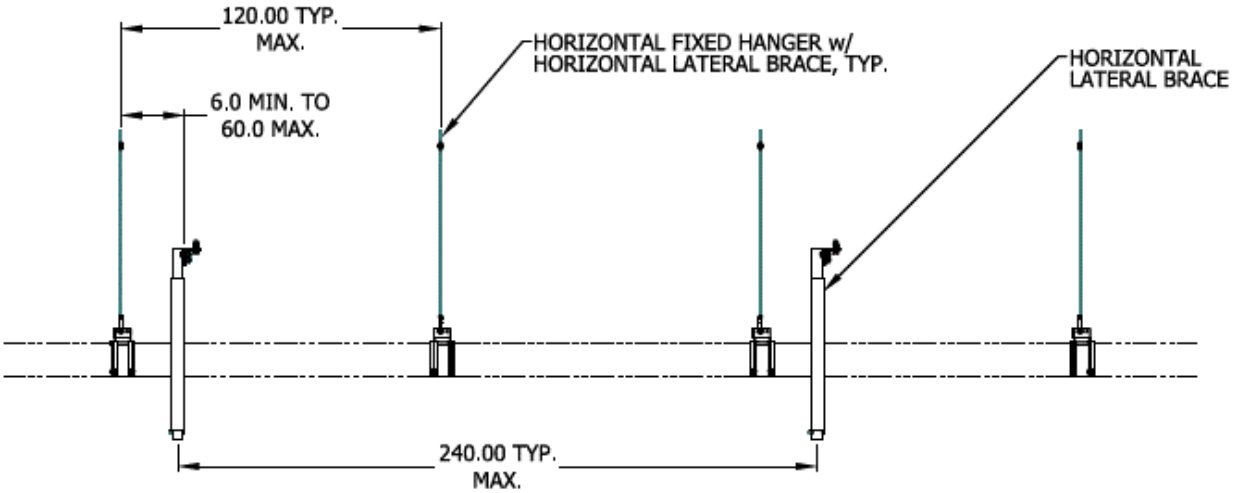
Horizontal Lateral Brace and Horizontal Spring Hanger Configuration for 3-1/8-inch and 4-1/16-inch Copper Outer Conductor and 6-1/8-inch Aluminum Outer Conductor Transmission Line Horizontal Line Runs



Horizontal Lateral Brace and Horizontal Spring Hanger Configuration for 6-1/8-inch, 7-3/16 and 8-3/16-inch Copper Outer Conductor Transmission Line Horizontal Line Runs



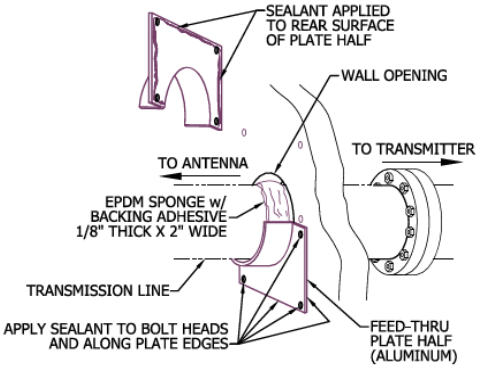
Horizontal Lateral Brace and Horizontal Fixed Hanger Configuration for 3-1/8-inch, 4-1/16-inch and 6-1/8-inch Aluminum Outer Conductor Transmission Line Horizontal Line Runs

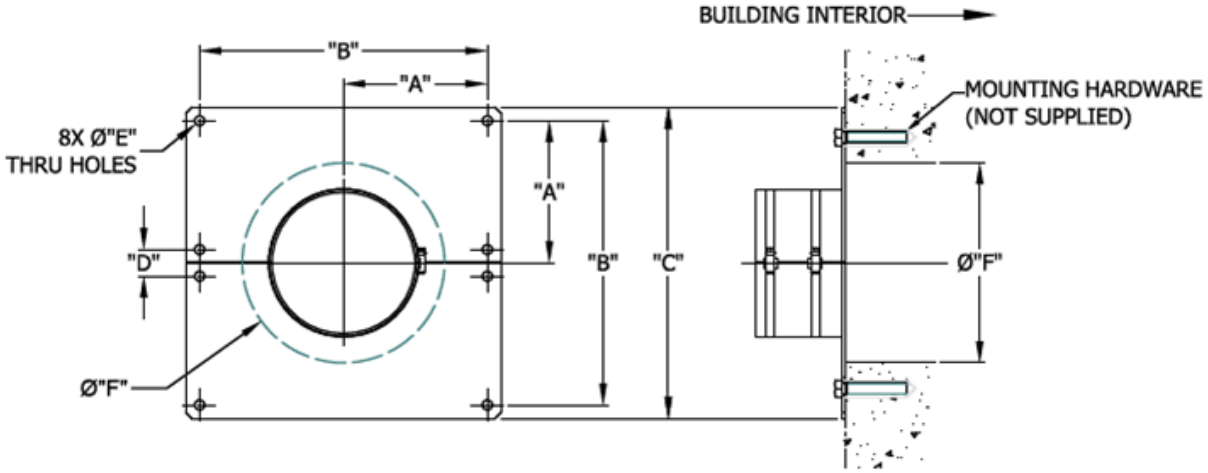


Horizontal Lateral Brace and Horizontal Fixed Hanger Configuration for 3-1/8-inch, 4-1/16-inch, 6-1/8-inch, 7-3/16-inch and 8-3/16-inch Copper Outer Conductor Transmission Line Horizontal Line Runs

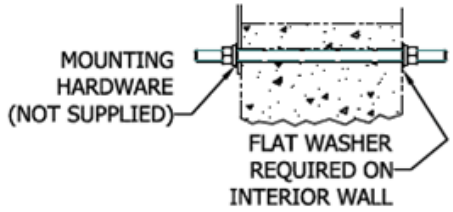
Wall/Roof Feed Thru Plates

Wall/Roof Feed Thru Plates accommodate passage of a rigid line section through a wood, metal or concrete wall or roof of the transmitter building. The plates are provided in two (2) pieces and provide proper weather sealing at the point where the transmission line enters the building. A single plate can be used on the building exterior and a second Wall/Roof Feed Thru Plate can be installed on the interior side of building, at the installer's option. Mounting holes for 3/8-inch or ½-inch (see Dim E) customer supplied hardware are provided to secure the Feed-Thru Plate at the egress point.

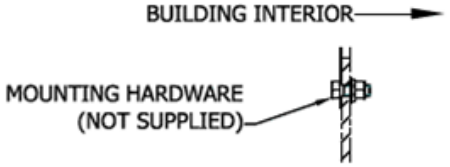




CONCRETE WALL/ROOF



CONCRETE WALL/ROOF
ALTERNATE FASTENING METHOD



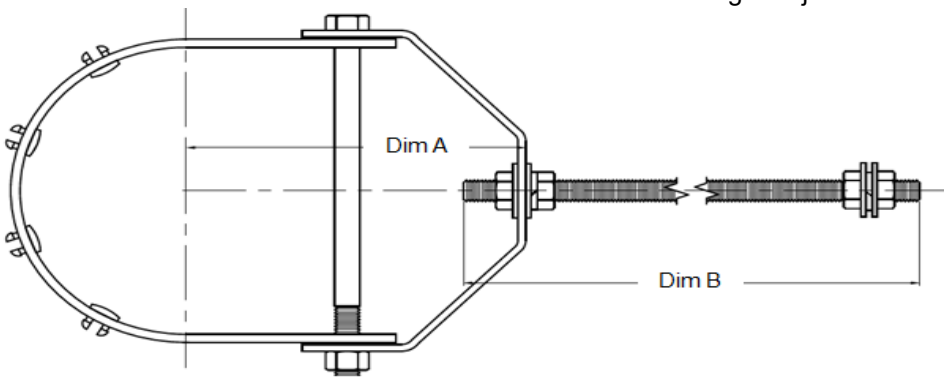
METAL WALL/ROOF
FASTENING METHOD

Wall/Roof Feed Thru Plate Specifications

Part Number	Line Size	Dim A	Dim B	Dim C	Dim D	Dim E	Dim F	Weight
RLA100-15	1-5/8-inch	2.250-in (57-mm)	4.750-in (121-mm)	6.000-in (152-mm)	-- --	0.438-in (11-mm)	3.000-in (76-mm)	0.9-lbm (0.4-kg)
RLA300-15A	3-1/8-inch	3.400-in (86-mm)	6.800-in (173-mm)	8.000-in (203-mm)	1.200-in (30-mm)	0.438-in (11-mm)	6.000-in (152-mm)	1.1-lbm (0.5-kg)
RLA400-15A	4-1/16-inch	3.400-in (86-mm)	6.800-in (173-mm)	8.000-in (203-mm)	1.200-in (30-mm)	0.438-in (11-mm)	7.000-in (178-mm)	1.2-lbm (0.5-kg)
RLA600-15A	6-1/8-inch	6.400-in (163-mm)	12.800-in (325-mm)	14.000-in (356-mm)	1.200-in (30-mm)	0.438-in (11-mm)	9.000-in (229-mm)	2.9-lbm (1.3-kg)
RLA700-15AL	7-3/16-inch	7.000-in (178-mm)	14.000-in (356-mm)	16.000-in (406-mm)	2.000-in (51-mm)	0.563-in (14-mm)	10.000-in (254-mm)	17.0-lbm (7.7-kg)
RLA800B-15	8-3/16-inch	7.000-in (178-mm)	14.000-in (356-mm)	16.000-in (406-mm)	2.000-in (51-mm)	0.563-in (14-mm)	12.000-in (305-mm)	17.0-lbm (7.7-kg)

Horizontal Slip Hangers

For indoor use only. Supports horizontal transmission line runs accommodates lateral motion due to expansion and contraction. Includes threaded rod and hardware to allow height adjustment.



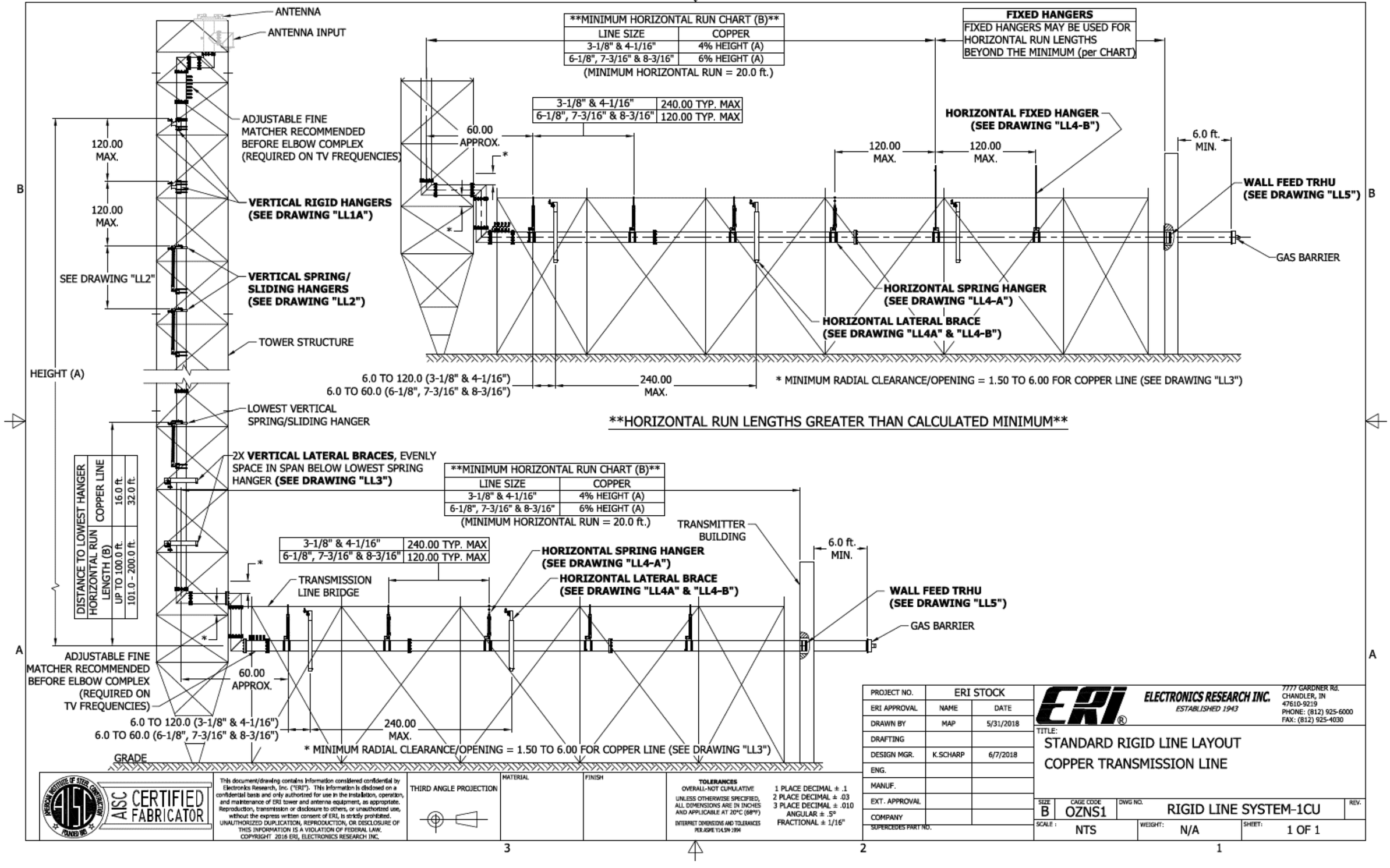
RLAx00-22A Horizontal Sliding Hanger

Horizontal Slip Hanger Specifications

Part Number	Line Size	Dim A		Dim B		Weight		Attachment Hardware
RLA100-22A	1-5/8-inch	3.000-in	(76-mm)	36.000-in	(914-mm)	1.8-lbm	(0.8-kg)	3/8-inch
RLA300-22A	3-1/8-inch	4.880-in	(124-mm)	36.000-in	(914-mm)	2.0-lbm	(0.9-kg)	1/2-inch
RLA400-22A	4-1/16-inch	5.500-in	(140-mm)	36.000-in	(914-mm)	2.2-lbm	(1.0-kg)	1/2-inch
RLA600B-22A	6-1/8-inch	6.940-in	(176-mm)	36.000-in	(914-mm)	3.8-lbm	(1.7-kg)	1/2-inch
RLA700-22A	7-3/16-inch	8.380-in	(213-mm)	36.000-in	(914-mm)	11.0-lbm	(5.0-kg)	1/2-inch
RLA800-22A	8-3/16-inch	8.380-in	(213-mm)	36.000-in	(914-mm)	11.0-lbm	(5.0-kg)	1/2-inch

Pressurization

When the installation of the any air dielectric transmission line is complete the gas barrier is installed inside the transmitter building. The transmission line during installation was exposed to the atmosphere and so it must be purged of moisture prior to the application of power. To purge the transmission line to determine the total system volume of the transmission line and the antenna, if it is pressurized, and divide this by the dehydrator flow rate. This figure will provide the number of hours the dehydrator must run to displace the total untreated air in the system. Open the farthest end of the transmission line/antenna system as possible. Run the dehydrator long enough to replace the complete volume of air in the complete system at least three (3) times. If it is not possible to open the far end of the transmission line connect the dehydrator to the system and pressurize to at least 5 psig. Wait 15 minutes for the dry air added to absorb moisture in the system and disconnect the dehydrator and allow the transmission line to vent. Repeat these two steps at least twelve (12) times. After the transmission line has been initially purged maintain a positive 3 to 5 psig dry gas pressure. An alternate to an air dehydrator is dry nitrogen, from a nitrogen generator or delivered in compressed gas cylinders and fitted with a pressure regulator, can also be used to purge and pressurize transmission lines.



AISC CERTIFIED FABRICATOR

THIRD ANGLE PROJECTION

MATERIAL

FINISH

TOLERANCES
OVERALL-NOT CUMULATIVE
UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES AND APPLICABLE AT 20°C (68°F)
INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994

1 PLACE DECIMAL ± .1
2 PLACE DECIMAL ± .03
3 PLACE DECIMAL ± .010
ANGULAR ± .5°
FRACTIONAL ± 1/16"

PROJECT NO.	ERI STOCK	
ERI APPROVAL	NAME	DATE
DRAWN BY	MAP	5/31/2018
DRAFTING		
DESIGN MGR.	K.SCHARP	6/7/2018
ENG.		
MANUF.		
EXT. APPROVAL		
COMPANY		
SUPERCEDES PART NO.		

ELECTRONICS RESEARCH INC.
ESTABLISHED 1943
7777 GARDNER Rd.
CHANDLER, IN
47610-9219
PHONE: (812) 925-6000
FAX: (812) 925-4030

TITLE:
STANDARD RIGID LINE LAYOUT
COPPER TRANSMISSION LINE

SIZE	CAGE CODE	DWG NO.	REV.
B	OZNS1	RIGID LINE SYSTEM-1CU	

SCALE :	WEIGHT:	SHEET:
NTS	N/A	1 OF 1