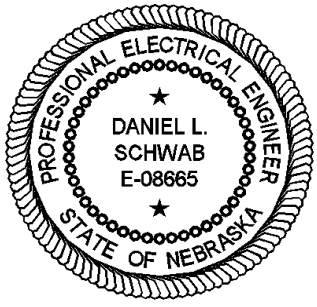
CITY OF GRAND ISLAND, NEBRASKA

CONTRACT # 11-PCC-01

SPECIFICATIONS AND CONTRACT DOCUMENTS
FOR
TRANSMISSION LINE WORK

August 2011



ADVANTAGE ENGINEERING, INC.
769 SPIRIT OF ST. LOUIS BLVD.
CHESTERFIELD, MO 63005
Tel: 636-530-0470 Fax: 636-530-0670

ADVERTISEMENT TO BIDDERS
CONTRACT # 11-PCC-01
Transmission Line Work

CITY OF GRAND ISLAND, NEBRASKA
ELECTRIC DEPARTMENT

Sealed bids will be **received at the office of the City Clerk**, 100 E. First St., Grand Island, NE 68801 or P.O. Box 1968, Grand Island, Nebraska, 68802 until 2:00 P.M. (local time), Thursday October 6, 2011, for furnishing Transmission Line Work to the City of Grand Island. Bids will be publicly opened at this time in the Conference Room #1 located on 1st floor of City Hall. Bids received after specified time will be returned unopened to sender.

Specifications are on file in the Utilities Department. Bids shall be submitted on forms which will be furnished by the City.

Each bidder shall submit with his bid a certified check, a cashiers check or bid bond payable to the City Treasurer in an amount no less than five percent (5%) of the bid price which shall guarantee good faith on the part of the bidder and the entering into a contract within 20 days, at the bid price, if accepted by the City. **Your certified check, cashiers check or bid bond must be submitted in a separate envelope attached to the envelope containing the bid. Each envelope must be clearly marked indicating its contents. Failure to submit the necessary qualifying information in clearly marked and separate envelopes will result in your bid not being opened or considered.** Bid bonds must be issued by surety companies authorized to do business in the State of Nebraska.

The successful bidder will be required to comply with fair labor standards as required by Nebraska R.R.S. 73-102 and comply with Nebraska R.R.S. 48-657 pertaining to contributions to the Unemployment Compensation Fund of the State of Nebraska.

Successful bidder shall comply with the City's insurance requirements and supply performance and payment bonds.

Bids will be evaluated by the Purchaser based on price, quality, adherence to schedule, plan and specification, economy and efficiency of operation, experience and reputation of bidder, ability, capacity, and skill of the bidder to perform contract required and adaptability of the particular items to the specific use intended.

The Purchaser reserves the right to reject any or all bids and to waive irregularities therein and to accept whichever bid that may be in the best interest of the City, at its sole discretion.

No bidder may withdraw his bid for a period of 60 days after date of opening bids.

RaNae Edwards, City Clerk

BID PACKAGE
TABLE OF CONTENTS

BID PACKAGE
TABLE OF CONTENTS

CITY OF GRAND ISLAND, NEBRASKA
INSTRUCTIONS TO BIDDERS

EXCEPTIONS TO SPECIFICATIONS: Each bidder shall carefully check all requirements herein set forth and shall offer items which fully comply with these requirements or shall plainly set forth all points, features, conditions, specifications, etc., wherein his items offered do not meet these specifications. Such exceptions as are made shall be listed by page number in the following blanks and shall be marked in ink on the pages of these specifications. If additional space is required for exception explanation, please reference and attach a letter to bid. Reference shall not be made to other attachments for exceptions and supplementary terms. Failure to outline such exceptions as specifically stated herein will require the successful bidder to comply with these specifications. In case of conflict between the bid and these specifications, these specifications shall govern unless specific exceptions are listed by the bidder.

Exceptions to specifications, pages _____
_____
_____

SUBMISSION OF BIDS: All bids shall be submitted using the City's bid form. Bids shall **be addressed to the City Clerk** and plainly marked, **"BID FOR TRANSMISSION LINE WORK"**. A site visit is required prior to bidding and shall be arranged through Travis W. Burdett, City of Grand Island, (308) 385-5466.

INSURANCE COVERAGE: The Contractor shall purchase and maintain at his expense as a minimum insurance coverage of such types and in such amounts as are specified herein to protect Contractor and the interest of Owner and others from claims which may arise out of or result from Contractor's operations under the Contract Documents, whether such operations be by Contractor or by any subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be legally liable. Failure of Contractor to maintain proper insurance coverage shall not relieve him of any contractual responsibility or obligation.

BASE BID: The bidder is expected to base his bids on materials and items complying fully with these specifications, and in the event he names in his bid materials or items which do not conform, he will be responsible for furnishing materials and items which fully conform at no change in his bid price.

ALTERNATE BIDS: It is the desire of the Owner that the bidder base his bid price for this project on the written specifications. If an alternate bid or bids are submitted by a bidder, it is desired that he first submit a bid price as above described and then describe his alternate bid. Failure to do so may be reason for not extending any consideration to alternate bids.

BIDDER QUALIFICATION: Bids will be received only from qualified bidders. A bidder will be considered qualified if he is a recognized electric utility contractor and has had experience in the construction of projects of equal or greater size than that specified herein. If requested, the Bidder shall supply experience data. Such data will be used to assist in determining the qualifications of the Bidder. Bidder must comply with all applicable Federal, State and Local rules and regulations.

CHECKS OR BID BONDS: Checks or bid bonds of the unsuccessful bidders will be returned when their bids have been rejected and not to exceed 60 days from the date bids are opened. All bids shall remain in force for this 60-day period. The check or bid bond of the successful bidder will be returned when the Contracts are signed by both parties and necessary bonds supplied. Should the Purchaser make an award to a Contractor who refuses to enter into Contract and furnish the required bonds within 20 days after notification of acceptance, then the bid security which has been deposited with the Purchaser will be forfeited to the Purchaser as liquidated damages.

PERFORMANCE BOND: On award of the Contract, the successful Contractor shall furnish a Performance Bond which shall be in an amount equal to the full Contract price, guaranteeing faithful compliance with all requirements of the Contract Documents and complete fulfillment of the Contract, and payment of all labor, material and other bills incurred in carrying out this Contract. According to Nebraska Law, the surety company executing the Performance Bond must be authorized to do business in the State of Nebraska.

PAYMENT BOND: On award of the Contract, the successful Contractor shall furnish a Payment Bond which shall be in an amount equal to the full Contract price, guaranteeing protection of all persons supplying labor and materials to the Contractor or its subcontractors for the performance of the work provided for in the Contract. In accordance

with Nebraska Law, the surety company executing the Payment Bond must be authorized to do business in the State of Nebraska.

TAXES: The City Utilities Department pays sales tax amounting to 5.5% State and 1.5% City; payment of 7% sales tax must be in the contractor's bid. Contractor must pay any other tax which might be applicable.

REQUESTS FOR PAYMENT: The City of Grand Island will make payments only after approval at regularly scheduled City Council meetings. These meetings typically occur the second and fourth Tuesday each month. Requests for payment must be received no less than ten working days prior to the designated meeting to allow proper review and consideration. Payments will only be made after final completion of the project to City's satisfaction unless otherwise stated in bidding documents.

REQUEST FOR INTERPRETATION: If any person contemplating submitting a bid for this Contract is in doubt as to the true meaning of any part of the specifications or other proposed Contract documents, he may submit to the Purchasing Department a written request for an interpretation thereof. The person submitting the request will be responsible for its prompt delivery. Any interpretation of the proposed documents will be made only by addendum duly issued and/or delivered to each person receiving a set of such documents. The addenda upon closing shall become a part of the Contract. The Purchasing Department will not be responsible for any other explanation or interpretation of the proposed documents.

ADDENDA: Any addendum to the specifications issued during the time allowed for preparation of bids shall be covered in the bid and shall become a part of the specifications. One copy of each addendum issued before the date of the letting will be sent to all bidders. One signed copy is to be returned immediately to the sender as acknowledgment of receipt.

TIME OF COMPLETION: Time of completion is the essence of this Contract, and all work shall be completed no later than December 1, 2012.

MODIFICATION OF BIDS: Bids may be modified or withdrawn by an appropriate document duly executed in the manner that a bid must be executed and delivered to the place where bids are to be submitted at any time prior to the final time set for receiving bids. Bidders may modify or withdraw bids by Fax communication at any time prior to the time set for receiving bids provided this instruction is positively identified. Any Fax modification should not reveal the amended bid price but should provide only the addition, subtraction or other modifications. A duly-executed document confirming the Fax modification shall be submitted within three days after bids are opened.

BID DATA: Bidders shall submit bid documents and data, in triplicate, by filling in the document and data sheets supplied by the Purchasing Department. The bid sheets shall be filled out legibly in ink to permit reproduction.

BIDDER SECURITY: Bidder security shall be enclosed in a special envelope marked, **"BIDDER SECURITY / BID FOR TRANSMISSION LINE WORK,"** the envelope shall contain only a cashier's check, certified check or bidder's bond.

This special envelope shall be attached to a sealed envelope containing the bid and any other bid materials. This second envelope shall be marked **"BID FOR TRANSMISSION LINE WORK" and be addressed to the "City Clerk**." Bids of an incomplete nature or subject to multiple interpretations may, at the option of the Purchaser, be rejected as being irregular.

FINANCIAL STATEMENT: The bidder shall furnish upon request a complete financial statement signed by the bidder, if an individual, by all partners if the bidder is a partnership and, by the President or Secretary, if the bidder is a corporation.

EQUAL EMPLOYMENT OPPORTUNITY: The Contractor agrees that during the performance of this Contract not to discriminate in hiring or any other employment practice on the basis of race, color, religion, sex, disability, age or national origin, and to comply with Executive Order 11,246 of September 24, 1965, and the rules, regulations and relevant orders of the Secretary of Labor, and Chapter 20 of the Reissue Revised Statutes of the State of Nebraska.

GRATUTITIES AND KICKBACKS: City Code states that it is unethical for any person to offer, give, or agree to give any City employee or former City employee, or for any City employee or former City employee to solicit, demand, accept, or agree to accept from another person, a gratuity or an offer of employment in connection with any decision, approval, disapproval, recommendation, or preparation of any part of a program requirement or a purchase

request, influencing the content of any specification or procurement standard, rendering of advice, investigation, auditing, or in any other advisory capacity in any proceeding or application, request for ruling, determination, claim or controversy, or other particular matter, pertaining to any program requirement or a contract or subcontract, or to any solicitation or proposal therefore. It shall be unethical for any payment, gratuity, or offer of employment to be made by or on behalf of a subcontractor under a contract to the prime contractor or higher tier subcontractor or any person associated there within, as an inducement for the award of a subcontract or order.

LOCAL CONDITIONS: Each bidder shall have an authorized representative visit the site of the work and thoroughly inform himself of all conditions and factors which would affect the work and the cost thereof, including the arrangement and conditions of existing or proposed structures affecting or affected by the proposed work; the procedure necessary for maintenance of uninterrupted operation; the availability and cost of labor and facilities for transportation, handling, and storage of materials and equipment.

It must be understood and agreed that all such factors have been investigated and considered in the preparation of every bid submitted. No claims for financial adjustment (to any Contract awarded for the work under these Specifications and documents) will be permitted by the City, which are based on lack of such prior information, or its effect on the cost of the work.

CORRESPONDENCE: Correspondence regarding drawings, instruction manuals, and other engineering data shall be sent to:

Attn: Travis W. Burdett P.E.
City of Grand Island
Utility Department
P.O. Box 1968
Grand Island, NE 68802-1968
(308) 385-5466

LOCAL BIDDER PREFERENCE: In case of tied low bids, all other things being equal, preference shall be given in the following order:

1. To those bidders who manufacture their products within the limits of the City of Grand Island.

2. To those bidders who manufacture their products within the limits of the County of Hall.

3. To those bidders who package, process, or through some other substantial operation have employees and facilities for these purposes in the City of Grand Island.

4. To those bidders who package, process, or through some other substantial operation have employees and facilities for these purposes in the County of Hall.

5. To those bidders who maintain a bona fide business office in the City of Grand Island, whose products may be made outside the confines of the City of Grand Island.

6. To those bidders who maintain a bona fide business office in the County of Hall, whose products may be made outside the confines of the County of Hall.

7. To those bidders whose commodities are manufactured, mined, produced, or grown within the state of Nebraska, and to all firms, corporations, or individuals doing business as Nebraska firms, corporations or individuals, when quality is equal or better, and delivered price is the same or less than the other bids received.

8. To those bidders whose commodities are manufactured, mined, produced, or grown within the United States of America, and to all firms, corporations, or individuals doing business as firms registered in states other than Nebraska, when quality is equal or better, and delivered price is the same or less than the other bids received.

TRANSMISSION LINE WORK
CITY OF GRAND ISLAND, NEBRASKA
CONTRACT # 11-PCC-01
CONTRACTOR'S BID

TO THE MEMBERS OF THE COUNCIL
CITY OF GRAND ISLAND
GRAND ISLAND, NEBRASKA

THE UNDERSIGNED BIDDER, having examined the plans, specifications, general and special conditions, and other proposed contract documents, and all addenda thereto and being acquainted with and fully understanding (a) the extent and character of the work covered by this Bid, (b) the location, arrangement, and specified requirements for the proposed work, (c) the location, character, and condition of existing streets, roads, highways, railroad, pavements, surfacing, walks, driveways, curbs, gutters, trees, sewers, utilities, drainage courses and structures, and other installations, both surface and underground which may affect or be affected by the proposed work, (d) the nature and extent of the excavations to be made and the handling and re-handling of excavated materials, (e) the location and extent of necessary or probable dewatering requirements, (f) the difficulties and hazards to the work which might be caused by storm and flood water, (g) local conditions relative to labor, transportation, hauling and rail delivery facilities, and (h) all other factors and conditions affecting or which may be affected by the work.

HEREBY PROPOSES to furnish all required materials, supplies, equipment, tools and plans, to perform all necessary labor and supervision, and to construct, install, erect, equip and complete all work stipulated in, required by and in accordance with the contract documents and the plans, specifications and other documents referred to therein (as altered, amended or modified by all addenda thereto) for and in consideration of the following prices:

1.1 BID PRICE: The bidder shall complete the work as stated in these specifications and as shown on the plans and drawings for the total lump sum firm contract price of:

_____Dollars

$_____

If bidder fails to include sales tax in their bid price or takes exception to including sales tax in their bid price, the City will add a 7% figure to the bid price for evaluation purposes; however, the City will only pay actual sales tax due.

According to Nebraska Sales and Use Tax Requirements, Section 1-017, Contractors, check which option you have selected to file with the Nebraska Department of Revenue:

____Option 1 (Section 1-017.05)
____Option 2 (Section 1-017.06)
____Option 3 (Section 1-017.07)

The choice of option is made by completing and mailing to the Department of Revenue, a Nebraska Sales and Use Tax Election for Contractors. This form must be filed within three months after beginning to operate as a contractor. If this form is not filed, the contractor will be treated as a retailer under Option 1 for sales and use tax purposes.

EXPERIENCE DATA:
Each bidder shall supply the following data on his experience:

Name of Bidder:

Project Owner Contact Phone No. Project Location Completion Date

_____

_____

_____

_____

_____

_____

_____

_____

Additional Data:_____

INSURANCE: Bidder acknowledges that bid includes compliance with the attached insurance requirements.

ADDENDA: Bidder acknowledges that Addenda Number(s)_____ were received and considered in Bid preparation.

SCHEDULE: Bidder acknowledges and accepts the delivery and installation schedule as outlined in the General Specification, Schedule, Section 5.

SITE VISIT: Individual's Name; _____
Company; _____
Date of visit; _____

The undersigned bidder agrees to furnish the certificate of insurance and bonds, and to enter into a contract within 20 days after acceptance of this Bid, and further agrees to complete all work covered by the foregoing bid in accordance with specified requirements. The proposed work will commence as soon as possible after the contract execution with completion of the total contract to be no later than December 1, 2012. **No work shall commence until the certificate of insurance and bonds are approved by the City and the contract is executed.**

Enclosed herewith is the bid security in the amount of:

_____Dollars

($_____)
which the undersigned bidder agrees is to be forfeited to and become the property of the City of Grand Island, Nebraska, as liquidated damages should this Bid be accepted and a contract be awarded to him and he fail to enter into a contract in the form prescribed and to furnish the required bond within 20 days, but otherwise the aforesaid bid guarantee will be returned upon his signing the contract and delivering the approved bond.

It is understood and agreed that time is the essence of the contract.

In submitting this bid it is understood that the right is reserved by the City to reject any and all bids; to waive irregularities therein and to accept whichever bid that may be in the best interest of the City, at its sole discretion. It is understood that this bid may not be withdrawn until after 60 days from bid opening.

In submitting this bid, the bidder states that bidder fully complies with, and will continue to comply with, applicable State fair labor standards as required by section 73-102 RRS, 1943 and also complies with, and will continue to comply with, section 48-657 RRS, 1943 pertaining to contributions to the Unemployment Compensation Fund of the State of Nebraska.

The undersigned bidder hereby certifies (a) that this bid is genuine and is not made in the interest of or in the behalf of any undisclosed person, firm or corporation, and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation, (b) that he has not directly or indirectly induced or solicited any person, firm or corporation to refrain from bidding, (c) that he has not sought, by collusion or otherwise, to obtain for himself an advantage over any other bidder or over the City of Grand Island, and (d) that he has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid.

DATED _____

SIGNATURE OF BIDDER:

If an Individual: _____ doing business

as _____

If a Partnership: _____

by _____, member of firm.

If a Corporation: _____

by _____(Seal)

Title _____

BUSINESS ADDRESS OF BIDDER _____

_____

TELEPHONE NUMBER OF BIDDER _____

FAX NUMBER OF BIDDER _____

LIST ALL SUBCONTRACTORS:

Company Name	Work Subcontracted	Business Address	Business Telephone Number

MINIMUM INSURANCE REQUIREMENTS

BIDS FOR CONSTRUCTION, DEMOLITION OR BOILER RELATED PROJECTS

CITY OF GRAND ISLAND, NEBRASKA

The Bidder shall take out, throughout the duration of the Contract, insurance of such types and in such amounts as may be necessary to protect himself and the interests of the City against all hazards or risks of loss as hereinafter specified. This insurance shall cover all aspects of the Bidder's operations to the fullest extent possible and provide no exclusions relative to any aspect of the work being performed for the City. The form and limits of such insurance, together with the underwriter thereof in each case, shall be approved by the City but regardless of such approval, it shall be the responsibility of the Bidder to maintain adequate insurance coverage at all times. Failure of the Bidder to maintain adequate coverage shall not relieve him of any contractual responsibility or obligation.

1. WORKERS' COMPENSATION AND EMPLOYER'S LIABILITY

This insurance shall protect the Bidder against all claims under applicable State worker's compensation laws. The Bidder shall also be protected against claims for injury, disease or death of employees which, for any reason, may not fall within the provisions of a workers' compensation law. This policy shall include an "all states" endorsement.

The liability limits shall not be less than the following:

Workers' Compensation	Statutory
Employer's Liability	$100,000 each person
	$100,000 per disease
	$500,000 policy limit

2. COMPREHENSIVE AUTOMOBILE LIABILITY

This insurance shall be written in comprehensive form and shall protect the Bidder against all claims for injuries to members of the public and damage to property of others arising out of any act or omission of the Bidder, his agents, employees or subcontractors.

The liability limits shall be not less than the following:

Bodily Injury & Property Damage	$ 500,000 combined single limit each occurrence

3. COMPREHENSIVE GENERAL LIABILITY

This insurance shall be written in comprehensive form and shall protect the Bidder against all claims arising from injuries to members of the public or damage to property of others arising out of any action or omission of the Bidder, his agents, employees or subcontractors.

If the Bidder's work involves construction of sanitary sewers, storm sewers or water mains, the comprehensive general liability coverage shall contain no exclusion relative to blasting, explosion, collapse of buildings or damage to underground property.

The liability limits shall be not less than the following:

Bodily Injury & Property Damage	$ 500,000 each occurrence
	$1,000,000 aggregate

4. OWNER'S PROTECTIVE LIABILITY AND PROPERTY DAMAGE

The Bidder shall purchase and maintain owner's protective liability and property damage insurance issued in the name of the City, which shall protect the latter against any and all claims which might arise as a result of the operations of the Bidder or his subcontractors or the City and its agents and employees in fulfilling this Contract during the life of the Contract. The minimum amounts and coverage of such insurance shall be the same as required for comprehensive general liability.

5. UMBRELLA LIABILITY INSURANCE

This insurance shall protect the Bidder against claims in excess of the limits provided under workers' compensation and employer's liability, comprehensive automobile liability, and commercial general liability policies. The umbrella policy shall follow the form of the primary insurance, including the application of the primary limits.

If the Bidder's work involves construction of sanitary sewers, storm sewers or water mains, the comprehensive general liability coverage shall contain no exclusion relative to blasting, explosion, collapse of buildings or damage to underground property.

The liability limits shall not be less than the following:

Bodily Injury & Property Damage	$1,000,000 each occurrence
	$1,000,000 general aggregate

6. RAILROAD PROTECTIVE LIABILITY INSURANCE

This Bidder shall purchase this insurance for each of the railroad companies where work will be done on or across railroad property. The limits and coverage shall be inaccordance with the requirements of the railroad company.

7. ADDITIONAL REQUIREMENTS

The City may require insurance covering a Bidder or subcontractor in character and more or less than the standard requirements set forth herein depending upon the character and extent of the work to be performed by such Bidder or subcontractor.

Insurance as herein required shall be maintained in force until the City releases the Bidder of all obligations under the Contract.

The Bidder shall provide and carry any additional insurance as may be required by special provisions of these specifications.

8. PROOF OF CARRIAGE OF INSURANCE

Satisfactory certificates of insurance shall be filed with the City prior to starting any construction work on this Contract. The certificates shall show the City as "Additionally Insured" for all coverages except Workers' Compensation. The certificate shall state that thirty (30) days written notice shall be given to the City before any policy covered thereby is changed or cancelled (strike the "endeavor to" wording often shown on certificate forms).

CONTRACT AGREEMENT

THIS AGREEMENT made and entered into by and between _____ hereinafter called the Contractor, and the City of Grand Island, Nebraska, hereinafter called the City.

WITNESSETH:

THAT, WHEREAS, in accordance with law, the City has caused contract documents to be prepared and an advertisement calling for bids to be published, for construction of TRANSMISSION LINE WORK; and

WHEREAS, the City, in the manner prescribed by law, has publicly opened, examined, and canvassed the bids submitted, and has determined the aforesaid Contractor to be the lowest responsive and responsible bidder, and has duly awarded to the said Contractor a contract therefore, for the sum or sums named in the Contractor's bid, a copy thereof being attached to and made a part of this contract;

NOW, THEREFORE, in consideration of the compensation to be paid to the Contractor and of the mutual agreements herein contained, the parties have agreed and hereby agree, the City for itself and its successors, and the Contractor for itself, himself, or themselves, and its, his, or their successors, as follows:

ARTICLE I. That the Contractor shall (a) furnish all tools, equipment, superintendence, transportation, and other construction materials, services and facilities; (b) furnish, as agent for the City, all materials, supplies and equipment specified and required to be incorporated in and form a permanent part of the completed work; (c) provide and perform all necessary labor; and (d) in a good substantial and workmanlike manner and in accordance with the requirements, stipulations, provisions, and conditions of the contract documents as listed in the attached General Specifications, said documents forming the contract and being as fully a part thereof as if repeated verbatim herein, perform, execute, construct and complete all work included in and covered by the City's official award of this contract to the said Contractor, such award being based on the acceptance by the City of the Contractor's bid;

ARTICLE II. That the City shall pay to the contractor for the performance of the work embraced in this contract and the contractor will accept as full compensation therefore the sum (subject to adjustment as provided by the contract) of _____ Dollars
$ _____
for all services, materials, and work covered by and included in the contract award and designated in the foregoing Article I; payments thereof to be made in cash or its equivalent in the manner provided in the General Specifications.

ARTICLE III. The contractor hereby agrees to act as agent for the City in purchasing materials and supplies for the City for this project. The City shall be obligated to the vendor of the materials and supplies for the purchase price, but the contractor shall handle all payments hereunder on behalf of the City. The vendor shall make demand or claim for payment of the purchase price from the City by submitting an invoice to the contractor. Title to all materials and supplies purchased hereunder shall vest in the City directly from the vendor. Regardless of the method of payment, title shall vest immediately in the City. The contractor shall not acquire title to any materials and supplies incorporated into the project. All invoices shall bear the contractor's name as agent for the City. This paragraph will apply only to these materials and supplies actually incorporated into and becoming a part of the finished product of TRANSMISSION LINE WORK.

ARTICLE IV. That the contractor shall start work as soon as possible after the contract is signed and the required bonds and insurance are approved, and that the Contractor shall complete the work on or before December 1, 2012. It is understood and agreed that time is the essence of the contract.

CONTRACT AGREEMENT (Continued)

ARTICLE V. The Contractor agrees to comply with all applicable State fair labor standards in the execution of this contract as required by Section 73-102, R.R.S. 1943. The Contractor further agrees to comply with the provisions of Section 48-657, R.R.S. 1943, pertaining to contributions to the Unemployment Compensation Fund of the State of Nebraska. During the performance of this contract, the contractor and all subcontractors agree not to discriminate in hiring or any other employment practice on the basis of race, color, religion, sex, national origin, age or disability. The Contractor agrees to comply with all applicable Local, State and Federal rules and regulations.

IN WITNESS WHEREOF, the parties hereto have executed this Contract Agreement.

Contractor _____

By _____ Date _____

Title _____

CITY OF GRAND ISLAND, NEBRASKA,
By _____ Date _____
Mayor

Attest: _____
City Clerk

The contract, insurance, and any required bonds are in due form according to law and are hereby approved.

_____ Date _____
Attorney for the City

SECTION 00004 - LIST OF DRAWINGS

TITLE	DRAWING NUMBER	REVISION
Line & Substation Location Map	CDI-1369	0
Plan & Profile Sub “F” to NPPD St. Libory - Line 1369	GI-PP-1369 Sheets 1 thru 13	0
Plan & Profile Sub “F” to Sub "C" Line 1063A	GI-PP-1063A Sheet 1	2
Steel Pole Type Braced Post Tangent	SBPT POLE	0
Steel Pole Type DBL. CKT Braced Post Tangent	SDBPT POLE	0
Steel Pole Type DBL. CKT. Braced Post Angle	SDBPA POLE	0
Concrete Pole Type Braced Post Tangent	CBPT POLE	0
Concrete Pole Type DBL. CKT Braced Post Tangent	CDBPT POLE	0
Concrete Pole Type DBL. CKT. Braced Post Angle	CDBPA POLE	0
Steel Pole Vertical Dead End	SVD POLE	0
Steel Pole Vertical Dead End With Jumper	SVDN POLE	0
Steel Pole Type Dbl. CKT. TAN. / Dead End	SDTD POLE	0
OFGW Support - Susp. (0° -20°) DBL. CKT STL Pole - 48 Fiber OPGW	1369-OF-1	0
OFGW Support - Susp. (0° -20°) SGL. CKT STL Pole - 48 Fiber OPGW	1369-OF-2	0
OFGW Dead End Assy. (60° -180°) Steel Pole - 48 Fiber OPGW	1369-OF-3	0
OFGW Support - Susp. (0° -20°) DBL. CKT STL Pole - 12 Fiber OPGW	1369-OF-4	0
OFGW Dead End Assy. (60° -180°) Steel Pole - 12 Fiber OPGW	1369-OF-5	0
Dead End Pole OFGW Pole Attachment / Splice Case	1369-OF-6	0
OFGW Attachment Details - Substation "F" Structures	1369-OF-7	0

SECTION 00004 - LIST OF DRAWINGS

TITLE	DRAWING NUMBER	REVISION
OFGW Support - Susp. (0° -20°) SGL. CKT STL Pole - 12 Fiber OFGW	1369-OF-8	0
OFGW Support - Deadend (180°) - 12 Fiber OFGW	1369-OF-9	0
OFGW Attachment Details - NPPD Substation Structure	1369-OF-10	0
Dead End Assembly - 7 No. 7 AW	1369-S1	0
Braced Post Assembly Single Circuit Pole	1369-C2-T2	0
Braced Post Assembly Double Circuit Pole	1369-C3-T2	0
Conductor Dead End Assembly T-2 336.4 ACSR	1369-C4-T2	0
Conductor Dead End Assembly 477 KCM 26/7 ACSR	1369-C5	0
Conductor Jumper Support Assembly T-2 336.4 ACSR	1369-C6-T2	0
Steel Pole Grounding Assembly	1369 - G1	0
Concrete Pole Grounding Assembly	1369 - G2	0
Steel Pole Details - Sheet 1	1369- SPD-1	0
Steel Pole Details - Sheet 2	1369 -SPD-2	0
List Of Steel Pole Structures	1369-STLPOLE Sheets 1 thru 4	0
Direct Embedded Steel Pole Foundation Details	1369 - ESPF-1 Sheets 1 & 2	0
Direct Embedded Concrete Pole Foundation Details	1369 - ESPF-2 Sheets 1 & 2	0
Concrete Pier Foundations	1369 - CPF-1	0
Sub "F" Line Terminations & T-2 Jumper Details	SUB "F" Terminations	0
NPPD St. Libory Jct. Line Termination Details	St. Libory Termination	0
Structure Loading Tree - Structure Type SVD	1369 -LT-1	0
Structure Loading Tree - Structure Type SVDN	1369 -LT-2	0

SECTION 00004 - LIST OF DRAWINGS

TITLE	DRAWING NUMBER	REVISION
Structure Loading Tree - Structure Type SDTD	1369 -LT-3	0
Distribution 3-Phase Underbuild - Tangent	1369-C9-5	0
Distribution 3-Phase Underbuild - Deadend	1369-C7-10	0

Line Maintenance Drawings For Existing 115 kV Lines

TITLE	DRAWING NUMBER	REVISION
Line 1093 Plan & Profile - Structures #41 to 47	GI-PP-1093 Sheet 6 of 6	5
Line 1060 Plan & Profile - Structures #D-1 to D-9	66-50-EW-66 Sheet 3 of 27	3
Line 1062 Plan & Profile - Structures #64 to 76	T0003	4
Line 1063A Plan & Profile - Structures #41 to 47	GI-PP-1063A Sheet 4 of 4	5
Line 1063B Plan & Profile - Structures #99 to111	T1001	3
Line 1064B Plan & Profile - Structures #62 to 75	GI-PP-1064A Sheet 2 of 10	2
Steel Pole Davit Arm Tangent Maintenance Structure	SSTM POLE	0
Concrete Pole Davit Arm Tangent Maintenance Structure	SCTM POLE	0
Conductor Suspension Assy - 477 ACSR "Hawk"	MAINT. - C1	0
Guy Stub Pole	MAINT. SP	0
Direct Embedded Steel Pole Foundation Details	MAINT. - ESPF-3	0
Direct Embedded Concrete Pole Foundation Details	MAINT. - ESPF-4	0
Single Pole Structure Details	P-60	0
115 kV H-Frame Tangent Structure	66-50-EW-11	3
115 kV H-Frame Tangent and Medium Angle Structures	66-50-EW-13	0
115 kV Double Circuit H-Frame Tangent and Dead End	P-84	0
Existing Structure Hardware Assembly Details	18638.02-BT-1J-1	0

SECTION 01010 - GENERAL SPECIFICATIONS
TRANSMISSION LINE WORK

PROJECT REQUIREMENTS

1.0 PROJECT OVERVIEW AND SCOPE

The City of Grand Island currently owns an electric system consisting of a 115 kV loop around the City. This transmission loop connects six existing distribution substations and two generation substations. The loop also has four 115 kV interconnections, at three substations, to the Nebraska Public Power District (NPPD).

This project will add a fifth 115 kV interconnection to NPPD. The scope of this project is to construct a new 6.95 mile 115 kV Line 1369 from Grand Island's Sub "F" to NPPD's St. Libory Junction Substation. The first 1.31 miles of Line 1369 will be constructed as a double circuit line with existing Line 1063A. The new line is to be constructed using either direct embedded steel poles or direct embedded spun concrete poles for the tangent and small angle structures. All direct embedded poles will be back filled with concrete. Self supported steel poles with concrete pier foundations and anchor bolt cages will be used for any in-line dead end and large angle structures. For new Line 1369, T-2 336.4 kcmil 26/7 ACSR "T-2 Linnet" conductor will be installed with a 48 fiber OFGW shield wire. For existing Line 1063A, the 1.31 miles of line to be reconstructed as double circuit with Line 1369 will have new T-2 336.4 kcmil 26/7 ACSR "T-2 Linnet" conductor installed and the existing 12 fiber OFGW shield wire will be transferred to the new double circuit structures.

Also included as part of this project is the replacement of defective poles and other line maintenance items for the existing 115 kV transmission loop.

Work Scope - Line 1369 Sub F to NPPD St. Libory Junction:

Install six (6) concrete pier foundations with anchor bolt cages at five (5) corner and one (1) inline locations and allow to cure prior to installation of the steel poles. Temporary lean twenty nine (29) existing wood pole structures of Line 1063A to allow for installation of new double circuit structures for the first 1.31 miles of line. The existing 12 fiber OPGW shield wire of 1063A is to remain in service and protected from damage as it will be transferred to the new structures and reused.

Twenty-nine (29) double circuit tangent and small angle structures are to be provided and installed. Ninety-six (96) single circuit tangent and small angle structures are to be provided and installed. These double and single circuit tangent and small angle structures provided shall be either direct embedded steel poles or direct embedded spun concrete poles, whichever is the most economical. All direct embedded poles are to include concrete backfill. Five (5) corner and one (1) inline self-supported steel poles are to be provided and installed.

A total of approximately 8.26 miles of three phase T-2 336.4 kcmil 26/7 ACSR "T-2 Linnet" conductor is to be provided and installed as part of the project. Six (6) new 115 kV polymer dead ends are to be provided and installed at Sub "F" to dead end Lines 1369 and 1063A. Three (3) new 115 kV polymer dead ends are to be provided and installed at the NPPD St. Libory Junction Substation to dead end Line 1369. The existing 477 kcmil ACSR 26/7 "Hawk" conductor for Line 1063A is to be transferred and deadended at the new double circuit corner pole #30.

SECTION 01010 - GENERAL SPECIFICATIONS
TRANSMISSION LINE WORK

As part of the project, approximately 7.0 miles of 48 fiber OFGW shield wire is to be provided and installed. The 48 fiber OFGW is to be installed in three (3) sections. The first section is from Sub "F" to the splice point at the corner structure #44 at Abbott Road. The second section is from the splice point at the corner structure #44 at Abbott Road to the splice point at the inline dead-end structure #97 at One R Road. The third section is from the splice point at the inline dead-end structure #97 at One R Road to the NPPD St. Libory Junction Substation. Between these splice locations, the 48 fiber OFGW is to be installed continuously without splices. A splice closure with cable storage rack is to be provided and installed on structures #44 and #97. A splice closure with cable storage rack is to be provided and installed on the line termination structures at both Sub "F" and the NPPD St. Libory Substation to splice the OFGW to the duct type cable into the control houses. The duct type cable at both substations will be provided and installed by others. Once the 48 fiber cable has been installed and spliced it shall be tested by the Contractor from substation control house to control house.

The existing 12 fiber OFGW cable of Line 1063A shall be transferred to the west side of the new double circuit structures from Sub "F" to structure #30. Some of the excess cable coiled at Sub "F" will be needed to increase the length of cable available to transfer the cable with having to install a splice point. At structure #1 of line 1063A, the first structure east of the new corner structure, will need to be modified to double dead end the OFGW without a splice to prevent uplift in the OFGW at structure #1.

Three spans of 7#7 Alumoweld shield wire are to be installed as additional shielding at Sub "F" and at the NPPD St. Libory Junction Substation.

Thirty (30) existing wood pole structures of Line 1063A are to be removed including 1.31 miles of three phase 477 kcmil 26/7 "Hawk" conductors as part of this project.

The Contractor shall include any temporary work to lean existing 12.5 kV distribution poles to provide clearances for the new construction, Material and installation of approximately 5,400 feet of three phase four wire 1/0 ACSR "Raven" 13.8 kV distribution underbuild on the new 115 kV transmission structures is to be included. The transfer of the existing distribution conductors and the removable of any existing distribution poles and circuits will be the responsibility of the Contractor as shown on the drawings. This work shall be coordinated with Southern Public Power District (SPPD).

The new and existing line between structures #15 and #16 crosses the BNSF Railway. The Contractor will be required to obtain as part of this contract a Railroad Protective Liability Insurance Policy to cover the work performed. The Contractor and crew will also be required to obtain BNSF Safety Training as required by the BNSF Railroad. BNSF flagmen will be required for the work and these expenses shall be included in the contract price provided by the Contactor.

Between structures #64 and #65, the transmission line will cross a Kinder Morgan High Pressure Gas Transmission Line. No heavy vehicles are allowed to cross the gas transmission line without providing protection to the gas pipelines. The Contractor shall coordinate with and submit to Kinder Morgan the Contractor's plans for working near and crossing the gas pipelines. The Contactor shall include the costs in his bid for providing, installing, and removing whatever steel

plates, crushed rock, and any additional soil that maybe required by Kinder Morgan to allow crossing of the pipelines. The Contractor may elect to avoid these costs by working from the north and the south of the pipeline right-of-way and not crossing the gas pipelines.

Work Scope - 115 kV Line Maintenance and Pole Replacements:

Also included as part of this project is the replacement of defective poles and other line maintenance items for the existing 115 kV transmission loop. This work includes the following work items:

1. Four existing 115 kV wood pole tangent structures are to be replaced with either direct embedded steel poles or direct embedded spun concrete poles.

2. One single pole wood guy stub structure is to be replaced with a wood guy stub structure.

3. Two existing 115 kV H-frame structures, a two pole tangent structure and a three pole deadend structure, are to have one pole replaced with wood poles.

4. Thirty-eight (38) structures are to be inspected and loose or missing hardware replaced or tightened.

5. Twenty-seven (27) structures that have missing or damaged guy guards are to have new guy markers installed.

6. Forty-seven (47) wood pole structures and twelve (12) steel pole structures that have broken or damaged ground wires are to have repairs made including the addition of ground rods to bring the grounding resistance at the structure to 10 ohms or less.

7. Four (4) structures are to have broken down guys or overhead guys replaced.

8. One (1) wood H-frame tangent structure has a defective cross arm that is to be replaced with a new arm.

9. One (1) single pole davit arm tangent structure with porcelain suspension insulators has a broken or damaged insulator that is to be replaced.

10. Fifteen (15) structures have possible above ground pole problems that are to have climbing inspections performed to determine the extent of repairs needed. The Contractor shall make the required repairs to correct the problems found.

2.0 DEFINITIONS

A. Owner - Shall refer to The City of Grand Island its engineer or engineering representative and all correspondence shall be sent to:

Attn: Travis W. Burdett
City of Grand Island
Utility Department
P.O. Box 1968
Grand Island, NE 68802-1968
Tel. (308) 385-5466
Fax (308) 385-5449
Email: TravisB@grand-island.com

B. Engineer - Shall refer to Advantage Engineering and all correspondence shall be sent to:

Advantage Engineering
769 Spirit of St. Louis Blvd.
Chesterfield, MO 63005
Attn: Barry A. Smith
Tel. (636) 530-0470 - Ext. 109
Fax (636) 530-0670
Email: bsmith@advanteng.com

C. Contractor - Shall refer to the party entering in to this contract or to any party that they have assigned any portion of the proposed construction or material provision.

3.0 EXTENT OF CONTRACT

A. 115 KV Line 1369 - SUB "F" to NPPD St. Libory Junction Substation. The Contractor is responsible for the furnishing all labor, supervision, and material, including steel or spun concrete direct embedded tangent and small angle structures, steel dead end structures including poured concrete pier foundations including anchor bolt cages, T-2 336.4 kcmil ACSR 26/7 "T-2 Linnet" conductor, conductor and shield wire hardware assemblies, 48 fiber OFGW cable, OFGW support and dead end assemblies, 48 fiber splice closures with cable storage racks for installation at Sub "F" and the NPPD substation, 1/0 ACSR conductor and crossarms and hardware for three phase four wire distribution undercircuit as shown on the drawings.

B. 115 KV Transmission Line Pole Replacement and Line Maintenance. The Contractor is responsible for the furnishing all labor, supervision, and material, including four steel or spun concrete direct embedded tangent structures, insulators, hardware, grounding and guying material as shown on the drawings. The City will provide the 50' wood pole for the guy stub, a 70' and a 80' wood pole for the H-frame pole replacements, a 115 kV H-frame tangent crossarm, and porcelain insulator bells. All other material for the line maintenance and pole replacement work is to be supplied by the Contractor.

C. The Contractor shall furnish all tools equipment, transportation, materials, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, permits, railroad protective liability insurance, railroad flagmen, other incidentals, and supervision necessary for the completion of the proposed construction project.

D. The Contractor shall accept and unload all materials and equipment. Each shipment shall be clearly identified, secured, and protected from the elements.

4.0 DRAWINGS

A. Anything appearing in either the specifications or the drawings and not the other shall be considered as appearing in both unless they appear conflicting. In case of conflict or of any questions concerning the drawings and specifications, the Contractor shall refer them to the Engineer for clarification. The contract shall be considered executed on the most expensive of conflictive alternatives.

B. Physical drawings for this project, as detailed in the drawing list, are included as a part of this specification.

C. The Contractor IS NOT TO PROCEED with the actual work until drawings stamped "Approved for Construction" are issued.

D. Contractor Supplied Equipment

1. Drawing Submittal:

a. Furnish to the Engineer for approval two (2) copies of all general and detail drawings for the design, installation and operation of the equipment being furnished under this contract, and any other supplemental drawings required in the prosecution of the work. Drawings shall be submitted according to the schedule specified. The Engineer shall review these drawings and one (1) copy returned to the Contractor marked approved or with corrections noted thereon. Also furnish one (1) copy of Approval Drawings to the Owner.
b. After the drawings have been approved, forward to the Engineer two (2) sets of Construction Drawings marked final. Also furnish one (1) copy of Final Drawings to the Owner.
c. After erection is complete, furnish the Owner one (1) copy of As-Built Drawings and the Engineer one (1) copy. So that field changes can be incorporated into record drawings.

2. Drawing Approval:

a. The Engineer will check submittal drawings to ensure compliance with the purpose and intent of the specifications and to assist the Contractor in interpreting the specifications so as to eliminate errors in the design or manufacture of the equipment shipped to the Owner.

b. The formal approval given to the Contractor is to be considered in conformance with these purposes and in no manner shall be construed so as to relieve the Contractor from any reliability or responsibility for proper design, fabrication or compliance with the specifications.
c. The approval of the shop drawings by the Engineer does not relieve the Contractor from any obligations set forth in the contract documents.
d. Obtain the Engineer's approval of drawings before equipment is fabricated or purchased. This requirement does not relieve the Contractor from meeting the required schedules. It is the Contractor's responsibility to schedule drawings to allow the normal exchange of drawings and to call it to the Engineer's attention if the required schedules are not being maintained.
e. It is to be understood by the Contractor that final distribution copies of a previously approved drawing are not rechecked. It is also to be understood that only those portions requiring change on "approved except as noted" and "returned for correction and resubmittal" drawings will be checked. It is the responsibility of the Contractor to ensure that any change made on resubmittal drawings are clearly indicated as a revision to the drawing, and called to the Engineer's attention in the transmittal letter.

5.0 SCHEDULE

A. The Contractor shall submit and update monthly, a bar chart type project schedule. The schedule shall indicate the following "milestones" on a per-line or per substation basis as a minimum:

* Start Construction
* Foundation Installation
* Structure Installation
* Conductor and Shield Wire Installation
* Line and Structure Removal and Cleanup
* Complete Construction

B. As part of the project, the Contractor will be coordinating his work with the City and the Engineer. Refer to the following document "Work by Substation and Line Section" for a list of work items which details what coordination, if any, will be required. The Contractor will be required to request a line outage, once the Contractor obtains the line outage the line can be out of service for the duration of the project, unless the City requests that the line be returned to service due to line loading conditions. The Contractor agrees that once work on the project has started, and the line outage has been given to the Contractor, that work is to continue uninterrupted with supervision until the work is completed.

C. As part of the work, the Contractor may be required by the City to temporarily halt the work due to line loading or other conditions that my occur. When the Contractor is requested by the City to temporarily halt the work, the Contractor is to be paid according

to the unit price for a demobilization and remobilization. The Contractor's Bid is to include the costs associated with a total of two (2) demobilizations and remobilizations.

D. Work may begin at anytime after award of the contract and all contact documents have been approved and executed by the City. The Contractor agrees that once work on the project has started, work is to continue uninterrupted with supervision until the work is completed. **All work must be completed by December 31, 2012**.

6.0 EXISTING UTILITIES

A. The Contractor shall avoid interference or damage to any utilities. If the Contractor causes damage to be done to utilities due to carelessness or neglect, the owner of the utility involved shall make the repairs, and all charges made for necessary repairs and replacements shall be borne by the Contractor.

The "One Call" locating service is Digger's Hotline of Nebraska" 1-800-331-5666

7.0 OPTICAL FIBER GROUND WIRE

A. As part of this contract, the existing 12 fiber optical ground wire on Line 1063A is to remain in service during the installation of the new structures. The existing cable shall be transferred one structure at a time to avoid any damage to the optical fibers contained in the cable. The cable shall not be cut or damaged in anyway.

B. The contractor shall be responsible for any damage to the optical fiber ground wire that occurs during the handling of the existing and new cables. The contractor shall use the proper tools and handling to ensure that the optical fibers contained in the cable are not crushed or damaged.

C. In the event that damage or suspected damage is done to the optical fibers or cable, the contractor shall be responsible for all repair including all material, fiber splicing, and testing required.

8.0 CHANGES IN CONTRACT PRICE

A. The contractor must include in his bid any item of material or labor that he feels is required in order to deliver a complete line project as outlined in the extent of contract section of this specification.

B. The individual items of material and work are identified in the Bid Units sections of the specification. The quantities listed are an estimate of the amount of material and the extent of work required for the project. Bid Units and quantities shall be used to adjust the contract price only for changes authorized in writing by the Owner. No adjustments will be made for lost or damaged material.

C. Where Owner furnished material is provided, the Contractor shall provide a price for labor to transport and install the material. Contractor furnished material shall indicate separately the material price and the labor price for installation, in the Bid Units.

D. **Prices for all material and labor furnished by the Contractor shall be firm. The prices shall include allowances for any and all increases in the prices of steel or aluminum that may occur. This shall include all prices quoted by the Contractor for the shield wire and conductor. No increases in the total price of the contact will be made as a result of material price increases.**

9.0 SAFETY

A. The Contractor shall comply with federal, state and local regulations regarding safety, health, and accident prevention. The Contractor will be advised of any unsafe practices and conditions observed by the Inspector, immediate action to correct the unsafe situation must be completed by the Contractor.

B. The Contractor shall take special note that the work will be near energized conductors and/or existing distribution lines.

C. The Contractor shall develop a medical assistance plan and procedure for any possible accident that could occur during the course of the project. At each work location the Contractor shall maintain a telephone. The bell on this telephone must be heard above construction activities.

10.0 PERMITS

A. The Contractor shall secure all permits for work included in this project.

11.0 WORK DELAY OR STOPPAGE DUE TO WHOOPING CRANES

The Whooping Crane is a federal and state listed endangered migratory species. There is the possibility that the birds may be spotted near the area where construction activity is taking place. The City has an agreement with the Nebraska Game and Parks Commission (NGPC) to do a survey of the construction area on a daily basis during the construction period of this project to determine if whooping cranes are present within ½ mile of construction activities on any given day.

Whooping crane surveys will be performed daily by the City according to the protocol on the following page. The "Linear Project" protocol will be used. As stated in the protocol, surveys will be conducted during the spring (March 23-May 10) and fall (September 16 – November 16) whooping crane migration periods if construction activities are taking place at these times. These migration periods may vary from year to year and surveys may need to begin earlier or run later than suggested. NGPC will let the City know if these dates need to be adjusted for any given year based on whooping crane movements and migration patterns for that year. The City will document all surveys and provide a complete records of surveys to NGPC upon completion of the project. In the event whooping cranes are sighted within ½ mile of the project, all construction activities shall cease in any areas within ½ mile from the sighting of the whooping cranes until the whooping cranes move greater than ½ mile from the construction area. The City will be responsible for contacting NGPC and the Contractor immediately if whooping cranes are sighted. The Contractor will be required to stop or not start any work in any area which is within ½ mile of where the whooping cranes have been spotted. If whooping cranes are spotted within ½ mile of the construction areas and the Contractor is notified by the City to stop work in an area, The City will monitor the activities of the whooping cranes and notify the Contractor when the whooping cranes have moved outside the ½ mile limit that would allow the Contractor's work to resume or start in that area.

SECTION 01010 - GENERAL SPECIFICATIONS
TRANSMISSION LINE WORK

THE DAILY SURVEY BELOW WILL BE PERFORMED BY THE CITY OF GRAND ISLAND

Whooping Crane Survey Protocol

Whooping Cranes can be disturbed by sight (human figures, equipment within sight) and sound (loud equipment, banging, etc.) that are abnormal (roadway traffic is normal), therefore surveys are needed to ensure disturbance is minimized.

Dates of Survey:

- Spring Migration – March 23 – May 10
- Fall Migration – September 16 – November 16
- Surveys should be conducted daily during these two time frames.

Bridge Projects (Roosting Survey)

Time of Survey:

- Prior to sunrise (published clock time) to make use of the beginning daylight hours, record start and stop time
- *Optional* evening survey (after 4:00 pm) to check for birds potentially coming into roost
- Do east side of bridge first to reduce glare from sun.

Method of Survey:

- Stand at the four corners of the bridge – look at all up and down stream channels as far as you can see
- Use binoculars or spotting scope
- Watch for at least 15 minutes overall
  - Look for bird movements – possibly moving within channel among vegetation
  - Look for Whooping Cranes among Sandhill Crane groups
- If cloudy, overcast or foggy and visibility is reduced to below 0.5 miles, allow time for clearing– take additional time to ensure the best survey possible

Linear Projects (Foraging Survey)-not crossing a major river

Time of Survey:

- Survey project within one hour of start of workday, with at least one survey done no later than 10 am. Record start and stop time.
- Survey using binoculars or spotting scope area within 0.5 miles of project.

For projects which are a combination of bridge and linear work use both methods.

If Whooping Cranes are not seen during the morning survey, work may begin after completion of the survey.

If Whooping Cranes are spotted within 0.5 miles of the active construction:

- Do not start work. Contact the Commission or the USFWS for further instruction.
- Stop work if seen at times other than the morning survey.
- Work can begin or resume if birds move off; record sighting, bird departure time, and work start time on survey form.

Whooping Crane Fact Sheet

Whooping Cranes in Flight

Foraging Whooping Cranes

Adult with juvenile

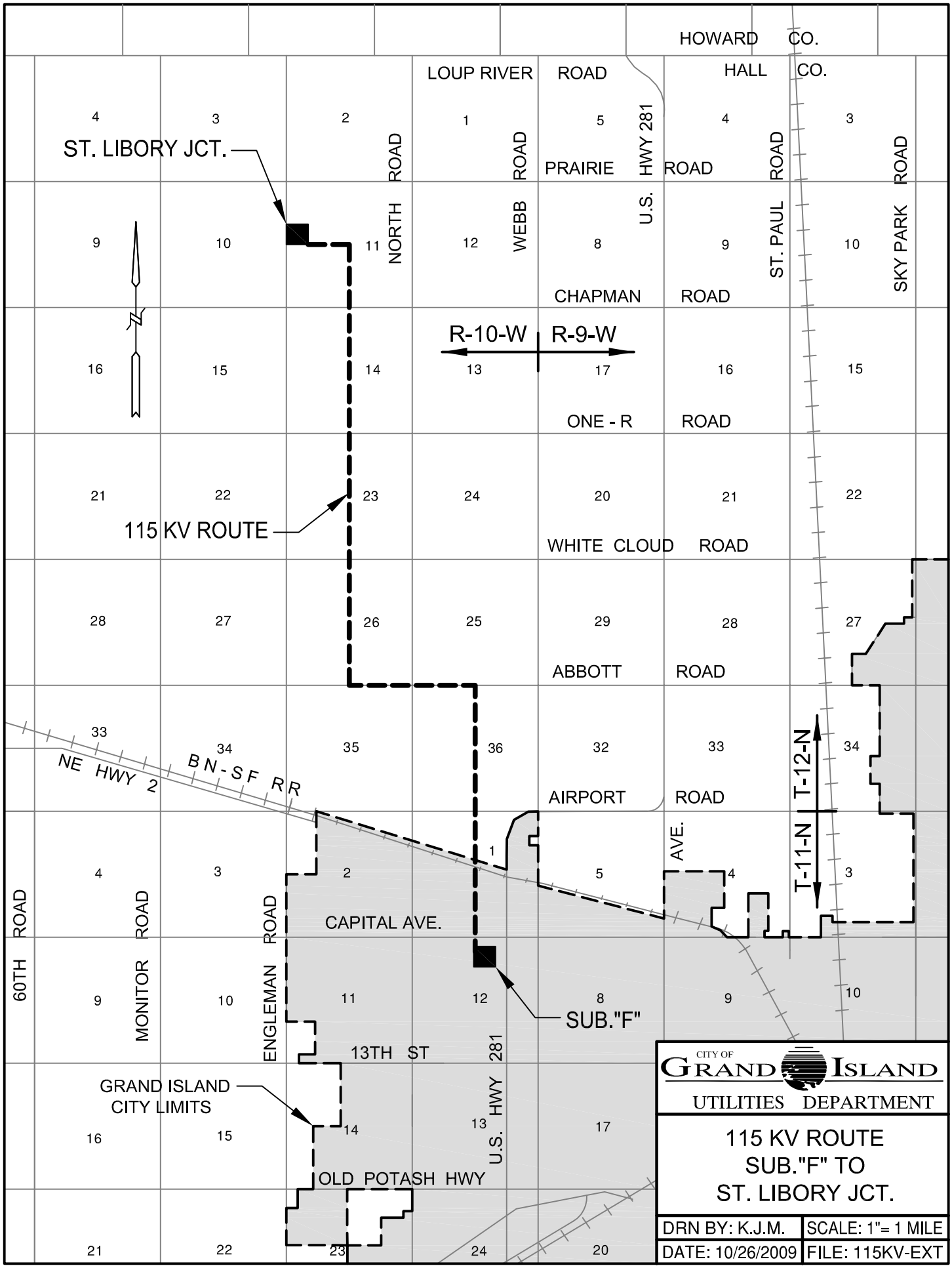
The Whooping Crane (*Grus americana*) is a federal and state listed endangered migratory species. The Whooping Crane was federally listed as endangered in 1967. Major river systems used by whooping cranes in Nebraska include the Platte, Loup, Republican, and Niobrara rivers. Additionally, a 3-mile-wide, 56-mile-long reach of the Platte River between Lexington and Denman, Nebraska, has been federally designated as critical habitat for whooping cranes. (Information from U.S. Fish and Wildlife Service)

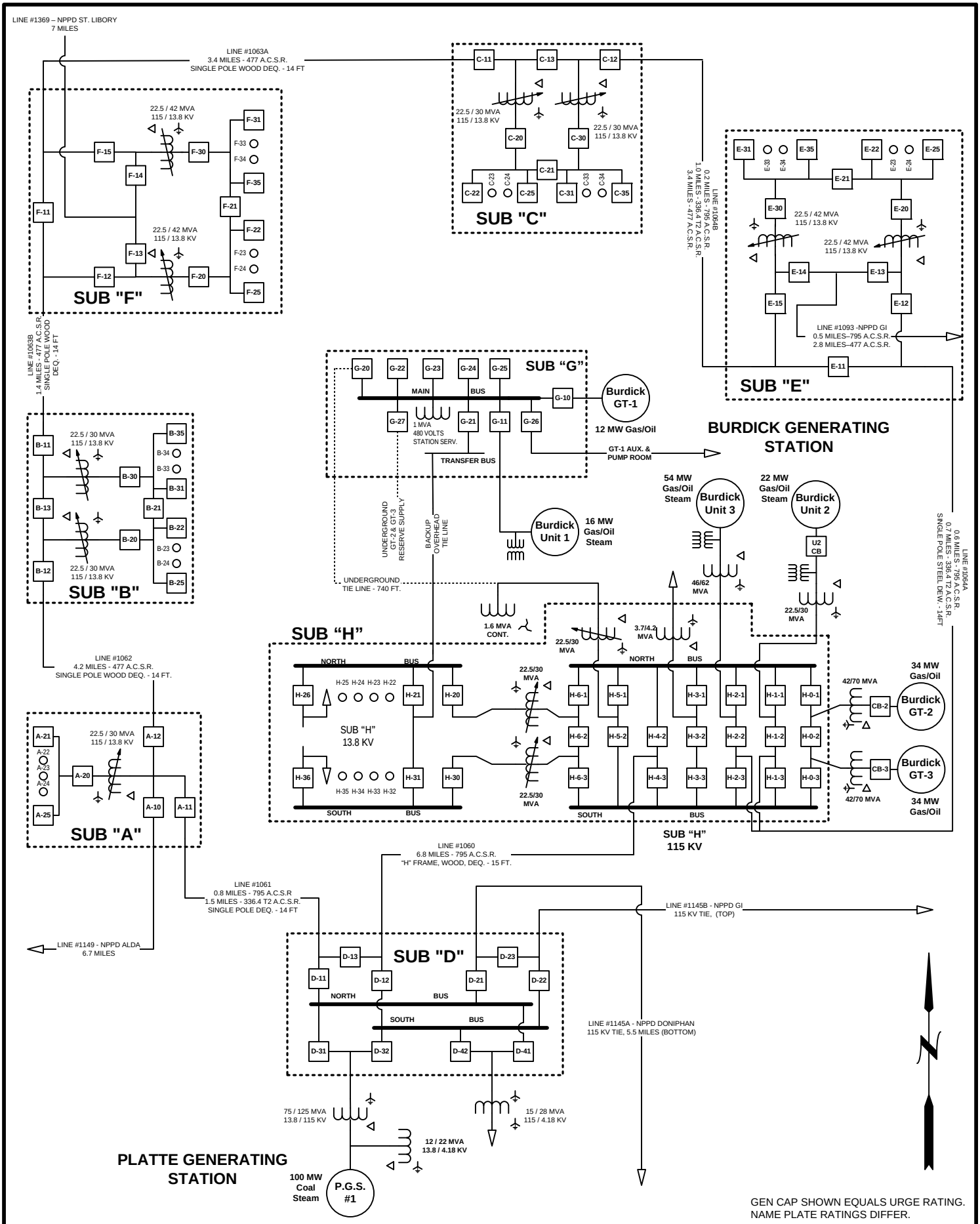
Whooping Crane (*Grus americana*)
Order: *Gruiformes*
Family: *Gruidae*
Status: State and Federally Endangered. **Description:** L 52"(132 cm) W 87"(221 cm). Sexes similar but males are larger. White body with red and black facial markings. Yellow bill and long dark legs. Immature is white with tawny head and neck, and reddish-brown mottling on rest of body. **Habitat:** In Nebraska is found along the Platte Valley, with its wide slow moving river and associated sandbars and islands. Nearby wet meadows, croplands, and marshlands are important for foraging. **Status/Range:** Occasional spring and fall migrant along Platte Valley. 90% of sightings within 30 miles of Platte River, and 80% occurred between Lexington and Grand Island. **Call:** Shrill "*ker-loo-ker-lee-loo*" trumpet. **Comments:** Endangered. Management and protection programs slowly succeeding.

Similar: Sandhill Crane, Snow Geese, and especially American White Pelicans in flight: (Information from Nebraska Game and Parks Commission website)

American White Pelican

The Whooping Crane is one of the rarest birds in North America and also one of the largest. Whooping cranes are vulnerable to accidents during migration. Each spring they travel north from their wintering grounds around Aransas National Wildlife Refuge in Texas to their breeding grounds in Wood Buffalo National Park in central Canada (2,400 miles). Each fall this route is reversed. Their journey traverses eastern Montana, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma and Texas. In Nebraska, they stop to rest and feed on the Platte, North and Middle Loup and Niobrara Rivers. (Information taken from the USFWS Draft Revised International Whooping Crane Recovery Plan Jan 2005)


HOWARD CO.
HALL CO.
LOUP RIVER ROAD
ST. LIBORY JCT.
NORTH ROAD
WEBB ROAD
PRAIRIE ROAD
HWY 281
U.S.
CHAPMAN ROAD
ST. PAUL ROAD
SKY PARK ROAD
R-10-W
R-9-W
ONE - R ROAD
115 KV ROUTE
WHITE CLOUD ROAD
ABBOTT ROAD
AIRPORT ROAD
NE HWY 2
BN-SF RR
T-12-N
T-11-N
AVE.
60TH ROAD
MONITOR ROAD
ENGLEMAN ROAD
CAPITAL AVE.
SUB."F"
13TH ST
GRAND ISLAND CITY LIMITS
OLD POTASH HWY
CITY OF GRAND ISLAND
UTILITIES DEPARTMENT
115 KV ROUTE
SUB."F" TO
ST. LIBORY JCT.
DRN BY: K.J.M.
SCALE: 1"= 1 MILE
DATE: 10/26/2009
FILE: 115KV-EXT



CITY OF GRAND ISLAND
UTILITIES DEPARTMENT

POWER SUPPLY

DRN. BY:	H.M.G./J.L.M.
DATE :	01/28/99
SCALE :	NONE
SHEET :	1 OF 13

DWG. NO. S-56-11

Rev. 5/2/2011

SECTION 00200 – WORK LOCATIONS BY LINE SECTION

To aid the Contractor, a summary of work locations and existing conditions is provided. The Contractor is to perform the work in an order that minimizes disruptions of the 115 kV systems.

The following is the recommended sequence of the work:

Phase 1 Work - March 2012 - Line 1369 Construction:

1. Lean existing City of Grand Island 13. 8 kV distribution out of the way at structure 44. Install concrete pier foundations at structures 30, 44, 62, 97, 124 and 131 to allow maximum amount of cure time prior to structure installation.

2. Lean 29 existing wood pole structures of Line 1063A out of the way from Sub "F" north to the corner to allow clearance to install new double circuit structures. Care is to be taken with the existing Line 1063A fiber optic shield wire so as to prevent any damage as the cable will be transfer and reused on the new double circuit line. Line 1063A is to be returned to service each evening. Lean existing Southern Public Power District 13.8 kV distribution out of the way between structures 49 and 54, structures 73 and 82, structures 93 to 100.

3. Working from the north to the south end of the project, haul, frame and install new direct embedded double and single circuit structures. Structures will be installed with concrete backfill.

4. Haul, frame, and install self-supported steel structures on concrete pier foundations at structures 30, 44, 62, 97, 124 and 131.

5. Install new 48 Fiber OFGW shield wire from NPPD's St. Libory Junction Substation to structure 44. Install new T-2 336.4 kcmil ACSR conductors from NPPD's St. Libory Junction Substation to structure 44. Install new 1/0 ACSR "Raven" three phase four wire 13.8 kV distribution underbuild between structures 50 and 54, structures 73 and 82, structures 94 to 99.

6. Transfer the existing fiber optic shield wire from the existing Line 1063A wood poles to the west shield wire position on the double circuit structures using new support hardware and dampers.

7. Install new 48 Fiber OFGW shield wire from Sub "F" to structure 44. Install new T-2 336.4 kcmil ACSR conductors from Sub "F" to structure #30 for Line 1063A and from Sub "F" to structure 44 for Line 1369.

8. Remove 30 existing wood poles and 477 kcmil ACSR conductors for the old section of Line 1063A north from Sub "F" to the corner structure.

9. Fiber splicing and testing.

10. Clean-up and restoration of right-of-way. Deliver left over conductor and hardware to the City of Grand Island.

SECTION 00200 – WORK LOCATIONS BY LINE SECTION

Phase 2 Work - September 2012 - 115 kV Line Maintenance:

1. Replacement of five complete single pole structures.

2. Replacement of one pole in two H-frame structures.

3. Replacement of one H-frame tangent crossarm

4. Completion of other line maintenance work including tightening or replacing loose or missing hardware, installing new guy guards, repair or replacement of broken down guys and overhead guys, repair or replacement of broken or damage structure grounds, replacement of broken insulators, and pole climbing inspections to determine other work that maybe required.

BY LINE SECTION:

Line 1369

Line segment from:	NPPD St. Libory Junction Substation
Line segment to:	Structure #44
Line phasing:	Phases BAC top to bottom, on single circuit steel poles
Construction type:	48 fiber OFGW on the west or south side of the single circuit structures
Coordination:	Landowners for access. Kinder Morgan for gas line crossing. Southern Public Power District for any distribution.
Anticipated Schedule:	First item of work

Line segment from:	Sub "F"
Line segment to:	Structure #30
Line phasing:	Phases BAC top to bottom, east side of double circuit steel poles
Construction type:	48 fiber OFGW on the east side of the new double circuit structures
Coordination:	City for outage on Line 1063A and Landowners for access. BNSF for railroad crossing[3].
Anticipated Schedule:	Third item of work

Line segment from:	Structure #30
Line segment to:	Structure #44
Line phasing:	Phases BAC top to bottom, on single circuit steel poles
Construction type:	48 fiber OFGW on the west side of the single circuit structures
Coordination:	Landowners for access.
Anticipated Schedule:	Forth item of work

Line 1063A

Line segment from:	Sub "F"
Line segment to:	Structure #30
Line phasing:	Phases BAC top to bottom, west side of double circuit steel poles
Construction type:	Existing 12 fiber OFGW transferred to the west side of the new double circuit structures
Coordination:	City for outage on Line 1063A and Landowners for access. BNSF for railroad crossing[3].
Anticipated Schedule:	Second item of work

Other 115 kV Loop Lines As Required For The Line Maintenance Work

Anticipated Schedule: Last item of work

Notes:
1. Work will not start until after March 1, 2012. An intermittent outage will be provided for Line 1063A and other 115 kV Loop Lines required for the pole replacement and line maintenance work. An intermittent line outage is a transmission line outage restricted to a time period 8 hours or less between 8:00 a.m. and 5:00 p.m., with the line restored otherwise.

2. Given phasing is the preponderance of the line or substation phasing, some short sections may differ.

3. Work on or across Burlington Northern Santa Fe (BNSF) Railroad Property will require the Contractor to contact the BNSF, obtain and provide whatever permits, flagging, and Railroad Protective Liability Insurance that maybe required.

REMOVAL OF EXISTING 115 kV LINE SEGMENTS

SECTION 01595 – POLES, CONDUCTOR AND HARDWARE

1.1 GENERAL

A. The Contractor shall provide for the physical removal of all existing 115 kV transmission line segments as shown on the drawings.

B. The Contractor shall remove, haul away and dispose of all poles at his own expense. Existing poles shall be completely removed, including the embedded portion (butt). Poles removed shall be disposed of in an environmentally safe manner.

C. The Contractor shall remove, haul away and dispose of all insulators, conductor, shield wire and associated hardware at his own expense.

D. Immediately after poles are removed, the Contractor shall backfill all existing pole holes. Backfill material and compaction shall meet all requirements of Section 02200 – Excavation and Backfill. Compaction shall be by a powered mechanical tamping device such as a hydraulic tamper. Tamping shall be in 8" layers to a 6" crown above ground. Final compaction shall be equal to or better than the surrounding soil.

E. The right-of-way including areas where poles holes have been filled and anchors removed shall be restored to a condition that is satisfactory with the property owner or tenant.

F. A list of specific removal units for each existing line segment is included in the "Bid Sheets – Construction Units" contained herein.

MATERIAL SPECIFICATION
SECTION 05120 - TUBULAR STEEL TRANSMISSION POLES

INDEX PAGE

1.1 GENERAL REQUIREMENTS

A. SUMMARY OF WORK

1. This specification outlines the requirements for the design, materials, fabrication, and delivery of tubular steel pole type structures for the 115KV transmission lines for the City of Grand Island. The tubular steel poles proposed by the manufacturer shall be in strict compliance with these specifications unless exception is taken and a qualifying and detailed explanation is provided with the bid package.

2. This specification is supplemented by the loading diagrams (trees), details, and configuration drawings listed below:

Steel pole type "SBPT"	Drawing	SBPT POLE
Steel pole type "SDBPT"	Drawing	SDBPT POLE
Steel pole type "SDBPA"	Drawing	SDBPA POLE
Steel pole type "SVD"	Drawing	SVD POLE
Steel pole type "SVDN"	Drawing	SVDN POLE
Steel pole type "SDTD"	Drawing	SDTD POLE
Steel pole type "SSTM"	Drawing	SSTM POLE
Hardware Assembly Details	Drawings	1369 -OF-1, 1369 -OF-2, 1369 -OF-3, 1369 -OF-4, 1369 -OF-5, 1369 -OF-6, 1369 -OF-8, 1369 -S1, 1369 -C2-T2, 1369 -C3-T2, 1369 -C4-T2, 1369 -C5, 1369 -C6-T2, 1369 -G1, MAINT- C1
Steel Pole Details	Drawings	1369-GI-SPD-1 & 1369-GI-SPD-2
List of Steel Pole Structures	Drawing	1369-STLPOLE Sheets 1 thru 4
Direct Embedded Steel Pole	Drawing	1369-ESPF-1 Sheets 1 & 2, MAINT. - ESPF-3
Concrete Pier Foundations	Drawing	1369-CPF
Structure Loading Tree - SVD	Drawing	1369-LT-1
Structure Loading Tree - SVDN	Drawing	1369-LT-2
Structure Loading Tree - SDTD	Drawing	1369-LT-3

B. REFERENCES

1. The tubular steel poles and anchor bolts shall be designed and manufactured in accordance with the latest revision of the following standards:

   a. ASCE Standard 48-05, "Design of Steel Transmission Pole Structures", 2006

   b. Structural Welding Code - Steel, ANSI/AWS D1.1-92, American Welding Society

c. Annual Book of ASTM Standards, Latest Edition,

(1) ASTM A6 - General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use
(2) ASTM A36/A36M Specification for Structural Steel
(3) ASTM A123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
(4) ASTM A153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

(5) ASTM A194 - Carbon and Alloy Steel Nuts and Bolts for High-Pressure and High-Temperature Service
(6) ASTM A307 Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile
(7) ASTM A325 Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
(8) ASTM A354 Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners
(9) ASTM A370 Test Methods and Definitions for Mechanical Testing of Steel Products
(10) ASTM A385 - Standard Recommended Practice for Providing High Quality Zinc Coatings (Hot-Dip) on Assembled Products
(11) ASTM A449 Specification for Quench and Tempered Steel Bolts and Studs
(12) ASTM A490 Specification for Heat Treated, Steel Structural Bolts, 150 ksi (1035 Mpa) Tensile Strength
(13) ASTM A563 specification for Carbon and Alloy Steel Nuts
(14) ASTM A572/A573M Specification for High Strength Low-Alloy Colombian-Vanadium Steels of Structural Quality
(15) ASTM A588/A588M Specification for High Strength Low-Alloy Structural Steel with 50 ksi (345 Mpa) Minimum Yield Point to 4 in. (100mm) Thick
(16) ASTM A633/A633M Specification for Normalized High Strength Low-Alloy Structural Steel
(17) ASTM A673/A673M Specification for Sampling Procedure for Impact Testing of Structural Steel
(18) ASTM A687 Specification for High Strength Non-Headed Steel Bolts and Studs
(19) ASTM A780 Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
(20) ASTM A871/A871M Specification for High Strength Low-Alloy Structural Steel Plate with Atmospheric Corrosion Resistance
(21) ASTM B695 - Specifications for Coatings of Zinc Mechanically Deposited on Iron and Steel

d. American Concrete Institute, ACI-318 "Building Code Requirements for Reinforced Concrete"

e. National Electrical Manufacturers Association - NEMA TTI - Tapered Tubular Steel Structures

f. Steel Structures Painting Council Surface Preparation Specification (55 PC - SP) - SSPC- SP6 No. 6 Commercial Blast Cleaning

C. DRAWINGS AND DESIGN DATA

1. The receipt of final drawings and final design data (base moment and shear) for the anchor bolt cages is required at the earliest possible date after award of contract. Of equal interest is the final design data for the ground line moment and shear for the embedded structures. The information will permit the Engineer to determine the adequacy of the foundation designs.

2. In addition to the anchor bolt cage details the Engineer will review the following:

   a. Design data for the structures.
   b. Fabrication and erection drawings for the structures.

3. Two copies of the data noted in 1 and 2 above shall be submitted. The Engineer will return one copy marked "Reviewed", "Reviewed As Noted" or "Returned For Correction". For data returned and marked "Reviewed As Noted" or "Returned For Correction", two copies of the corrected data shall be forwarded to the Engineer.

4. The time schedule by structure type for the submittals from the manufacturer shall be developed by the Contractor and the manufacturer.

5. Final structural drawings shall be submitted to the Engineer in AutoCad, on Compact Disc (CD). Files submitted shall have a listing attached. Drawing files are to include any reference files, special fonts, and any other files necessary.

6. All drawings and data shall have the project name above the manufacturer's standard title block.

7. Acknowledgment of review by the Engineer of any design data or drawings implies review of general concept only and does not relieve the supplier of his obligation to comply with these specifications and all applicable standards.

8. The Owner retains the right to reuse design data and drawings at other locations on his system. Contractor will not be liable for any subsequent reuse.

9. All design data and structural drawings shall bear the stamp of a registered professional engineer.

D. BIDDER QUALIFICATIONS

1. Following is a list of acceptable manufacturers:

    a. Valmont - Newmark
    b. Thomas & Betts - Meyer Steel Structures Division
    c. Dis-Tran Steel Pole, LLC
    d. Fort Worth Tubular - FWT, Inc.
    e. Sabre Tubular Structures

2. Other manufacturers may be considered if they can provide qualifications that indicate the manufacturer:

    a. Is regularly engaged in the manufacture of tubular steel structures for electrical transmission lines.
    b. Has previously designed and fabricated tubular steel structures of the general type specified herein.
    c. Has a qualified design staff regularly devoted to the development of stress diagrams and structural drawings and details associated with tubular steel structure design and fabrication.
    d. Can provide a list of at least (10) projects for which the manufacturer has provided tubular steel structures of the same general type that have been satisfactorily supporting transmission lines for a period of not less than three (3) years.

E. DELIVERY, STORAGE, AND HANDLING

1. Arrangements regarding shipment of components and their degree of assembly shall be by mutual agreement between Contractor and manufacturer except that anchor bolts shall be caged and shipped as a completely assembled unit ready to be directly placed in the foundation.

2. Precautions shall be taken to prevent damage to the galvanized surfaces and, in particular, to the epoxy coating on the embedded portion of poles.

3. Storage and handling of the manufacturer's products shall be the responsibility of the Contractor.

F. SEQUENCING AND SCHEDULING

1. Sequencing and scheduling for pole and anchor bolt cage delivery shall be the responsibility of the Contractor.

1.2 TECHNICAL REQUIREMENTS

A. DESIGN

1. The manufacturer is responsible for designing a structure that will safely support all loads and loading conditions specified herein and shown on the supplemental drawings.

2. General outlines of structures and necessary attachments are shown on the attached drawings. Any structural shapes shown are for illustrative purposes only, and are not design requirements. Unless noted otherwise, dimensions shown are minimum and may be increased if required by the manufacturer's design.

3. Structures shall be capable of withstanding wind-induced vibrations with the structure completely or partially erected, with or without insulators, conductors, or shield wires installed (no load, partial load, or full load conditions). The manufacturer shall specify if damping mechanisms are necessary to meet these requirements.

4. All connections of arms to poles shall be bolted.

5. Slip-joints on pole sections will be permitted only if such joints are prefitted and match-marked to prevent misalignment of poles during erection. Each slip joint shall be equipped with special jacking lugs for attachment of a jacking device for assembly in the field. Exceptions to this requirement will not be considered and the manufacturer shall include any associated cost in his quote.

6. All structures shall be designed to resist, in addition to all other loads and their appropriate load-factors, the effects of deflection on all vertical loads (secondary bending), including the dead load of the structure. All unguyed single-column structures shall be designed to support the "worst case" loading condition with a 3-degree rotation of the pole shaft at the design ground line.

7. The Contractor shall submit the following steel pole data with his bid:

   a. Name of manufacturer.
   b. General dimensions and design sketches of all structural components including anchor bolt cages.
   c. Estimated structure weights.
   d. Number of slip joints.
   e. Design calculations for controlling loading conditions.

8. The Owner will not allow any increase in the contract price due to incorrect design calculations.

9. Complete final design calculations and data shall be promptly submitted to the Engineer as specified herein. Calculations must be received prior to, or in conjunction with final design drawings. Calculations, as an absolute minimum, must contain the following:

   a. Computed axial, shear, torsional, bending (including secondary bending) forces and stresses and allowable stresses at least every ten feet along the pole shaft for each loading condition.
   b. Computed forces and stresses in all structural elements including arms, base plates, connections, attachments, and anchor bolts for the controlling loading conditions.
   c. Maximum deflection at the top of the structure and all load points for each loading condition.
   d. When computers are used to perform design calculations, a sketch showing the designer's numbering system for nodes and elements, orientation and origin of coordinate axes, and any other special information shall be included with the computer printouts. Manufacturer shall furnish the Engineer with a computer program description if so requested.

10. For the structures requiring anchor bolts an anchor bolt assembly including any necessary cross-bracing between the bolts, shall be designed and furnished by the manufacturer for attaching the pole to a concrete foundation. The anchor bolt assembly shall be assembled by the manufacturer and shipped as a unit. Normal length anchor bolts shall be designed for a concrete 28-day compressive strength (f=c) of 3,000 PSI. The projection of anchor bolt threads above the top of the foundation shall be three times the diameter of the bolt plus the base plate thickness plus the thickness of one nut plus one inch (increased to the nearest whole inch). Generally, welding of anchor bolts is acceptable at the bottom of the cluster. Anchor bolts shall be symmetrically spaced with respect to all axes. Only an upper portion of the bolts shall be galvanized.

11. The taper of the butt section for direct-embedded poles shall continue beyond the design ground line as shown on the steel pole detail drawings.

12. The shaft deflection shall be limited to 2 percent of the structure height under the camber loading case shown on the drawings.

13. The poles shall be fabricated with an angle and axis of rake to assure that the center of the top of the pole will be vertical with respect to the center of the base when subjected to the camber loading conditions. However if calculations show that the top of the pole will deflect 2 inches or less under the camber loading condition no raking will be required.

14. The manufacturer shall provide upswept arms as shown on the drawings.

15. Due consideration will be given to structures with a minimum number of slip joints. A minimum of one joint will be required on all direct- embedded poles, such that the butt portion of the pole may be set prior to the remainder of the pole.

16. Poles requiring a foundation larger than 6 feet in diameter may have an additional cost penalty. A relevant foundation design feature is that anchor bolts will have a minimum of 4-inch concrete cover.

17. No climbing provisions shall be provided for the poles.

18. All steel poles provided shall be 12 - sided poles. Round steel poles are not acceptable.

19. All direct embedded steel pole shall be furnished with a 2 feet long ground sleeve that is installed centered at the ground line. The steel poles shall be hot dipped galvanized and the lower portion of the pole from the bottom of the pole to the top of the ground sleeve shall be coated with black polyurethane coating with a minimum dry coating thickness of 20 mils.

B. MATERIALS

1. All structural plate material shall conform to ASTM A6 unless herein modified. All structural plate material and anchor bolts furnished shall be mill-certified to meet an impact property of 15 ft.-lbs. at –20°F in the longitudinal direction using the Charpy V- Notch Test. The location of the test sample and the test results will be as prescribed in ASTM A673. The criterion of 15 ft.-lbs. at -20°F is based on full-size test specimens. For sub size specimens, the dimensions and values to be used shall be in accordance with ASTM A673. Heat lot testing (Frequency"H") will be acceptable.

2. All material shall be identified according to yield strength.

3. All steel plates over 1 1/2 inch thick shall be ultrasonically tested in accordance with ASTM E114 to assure against lamellar tearing.

4. The manufacturer shall use suitable quality control procedures to ensure that the correct steel strength is used in the fabrication of the structures.

5. Materials the manufacturer proposes to substitute for those stated herein shall be identified with the applicable ASTM designation and shall be subject to the approval of the Engineer.

6. Materials for poles, arms, arm attachment plates and conductor and overhead ground wire attachment plates shall conform to ASTM A572 and the requirements of 1.2B1.

7. Material for base plates shall conform to ASTM A572, A633 or A871 and the requirements of 1.2B1 and 1.2B3.

8. Anchor bolt material shall meet the requirements of 1.2B1. The thread area plus 6 inches of the bolts shall be hot-dipped galvanized according to ASTM A123. Each anchor bolt shall be furnished with two (2) heavy hex nuts in a suitable grade. Anchor bolt nuts shall be retapped after galvanizing and installed on the anchor bolts to insure proper fitting and to protect the anchor bolt threads during handling and shipping. Two extra nuts shall be furnished with each anchor bolt cage.

9. Fasteners:

   a. All bolts shall conform to ASTM A325 or ASTM A354 grade BC. Nuts shall conform to ASTM A194 grade 2, and shall be tapped .020 in. oversize for pitch and major diameter. Bolts shall be mechanically galvanized in accordance with ASTM B695. Nuts shall be galvanized. Alternate bolting material will considered, but in no instance will hot-dip galvanizing be an approved finish for any material with a yield strength greater than 100 ksi.

   b. All bolts of any one diameter and similar length shall be of the same type and strength.

   c. All bolts and nuts shall be supplied with a galvanized locking device approved by the Engineer. Palnuts, "ANCO" locking nuts, and M-F locknuts are acceptable. Spring washers are not acceptable.

   d. Five percent excess bolts, nuts, and locking devices (with a minimum of one each), of each individual size shall be furnished.

   e. All bolt locations shall permit easy wrench access to both the bolt head and the nut.

C. FABRICATION AND QUALITY CONTROL

1. As a minimum, fabrication shall be in accordance with NEMA Standards, Publication TT1 and ASCE - Design of Steel Transmission Pole Structures.

2. Fabrication tolerances shall be as follows:

   a. Length of pole $\pm$ 3"
   b. Spacing between "arm to pole" connections vertically $\pm$ 3/4".
   c. Location of hardware with respect to top of pole $\pm$ 2".
   d. Location of a drilled hole in a piece $\pm$ 1/8".
   e. Spacing between holes (non-accumulative): base plate $\pm$ 1/8", same connection (other than base plates) $\pm$ 1/16".
   f. Anchor bolts: Length + 3", -0", thread length +2", -0".
   g. Length of coated portion on anchor bolts +12", -0".
   h. Distance between anchor bolt in cluster $\pm$ 1/8", (non-accumulative).
   i. Arms: Length $\pm$ 1", Rise $\pm$ 1" per 10' of arm length.
   j. Angles shown $\pm$ 2 degrees.
   k. Length of overlap of slip joint, +6", -10% of slip joint length.

3. Welding shall be performed by qualified operators using procedures in accordance with Section 5, AWS D1.1.

4. Records pertaining to material and fabrication, including certified mill test reports,

welding procedure, and welding operator test results shall be supplied to the Engineer upon completion of the work.

5. All welding electrodes shall equal or exceed the specified physical properties of the base metal being welded when tested with the applicable AWS specification for welding electrodes.

6. Details of all welds, including electrode type and welding procedure, shall be submitted with the shop detail drawings.

7. Preheating shall be in accordance with the steel producer's minimum recommendation, or as verified by testing for suitability for structural application in accordance with Section 5, AWS D1.1.

8. Longitudinal welds in the slip joint area and all circumferential welds shall be 100% penetration welds.

9. Longitudinal welds other than in the slip joint area shall have 80% minimum weld joint penetration and 100% penetration for a minimum of 3" on either side of a circumferential weld. Welds for attachment of plates, lugs, etc., to poles and cross arms shall be full size, full fusion fillet welds.

10. Base plate and arm bracket joints shall be 100% penetration welds.

11. Weld quality, except for penetration requirements stated in Section 1.2C9, shall conform to Section 8, Part D, Article 8.15 through 8.15.2.2 of AWS D1.1 regardless of the method of welding.

12. The manufacturer may use any combination of inspection methods to satisfy the weld quality requirements of Section 1.2C11. He shall perform ultrasonic inspection of all full penetration welds, and visual inspection on all welds. Ultrasonic examination methods shall be designed to assure weld quality conformance to Section 1.2C11. Longitudinal welds, exclusive of the slip joint weld, shall be ultrasonically checked at random points along the weld. Any areas of questionable weld quality found by the above methods shall be checked by magnetic particle inspection in accordance with ASTM E709. Any and all defects shall be properly repaired.

13. The circumferential weld between the pole and the base plate shall be tested in accordance with the above. In addition, this weld shall be tested in accordance with STM E114 or the AWS equivalent.

14. The manufacturer shall maintain a "Traveler" on all major components. The "Traveler" will list material identification, welder identity, inspection results, and inspector identify. The manufacturer shall furnish the Owner with copies of the "Traveler" upon request and at job completion.

15. The cost of testing welds shall be incidental to the overall fabrication costs and shall be included in the quoted price.

16. Each pole shall have a unique structure identification consisting of letters and numbers which shall be the same as those listed on STLPOLE drawing under the heading "Structure Number". Each separate part of the steel pole structure, including cross arms shall be similarly marked and shall identify the position of the piece in the structure. Markings shall be on one face of the pole 5 feet above ground line and no more than 10 feet above the bottom of the top section of any slip joint and on the anchor bolt cage. All markings shall be at least 3/4 inch high and shall be made with the addition of weld material. The angle bisector shall be identified on the pole base plate and on the anchor bolt assembly with welded markings. All markings shall be clearly legible after galvanizing.

17. Fabrication shall be in strict accordance with shop detail drawings prepared by the manufacturer and approved by the Engineer.

18. Straightening Material - Before being laid out or worked in any manner, structural material shall be straight and clean. If straightening is necessary, it shall be done by methods that will not injure the metal. Members which are bent or warped or otherwise improperly fabricated will be rejected by the Owner.

19. Bending - All forming or bending during fabrication shall be done by methods that will prevent embrittlement or loss of strength in the material being worked.

20. Holes for connection bolts shall be 1/16 inch larger than the nominal diameter of the bolts. Holes in base plates for anchor bolts may be up to 3/16 inch larger than the nominal diameter of the anchor bolts. Connections shall be detailed in a manner to avoid eccentricity and/or rust expansion (pack-out). All splices shall develop the stress indicated for the member being spliced.

21. All holes shall be cylindrical, perpendicular to the member, clean-cut, and chamfered. Where necessary to avoid hole distortion, holes close to the points of bends shall be made after bending.

D. PROTECTIVE COATINGS

1. Material to be galvanized shall be blast cleaned in accordance with SSPC-SP6. Any petroleum-based contaminants shall be cleaned from the surface prior to blast cleaning.

2. Structures shall be galvanized by the hot dip process in accordance with ASTM A123.

3. Precautions shall be taken against embrittlement, warpage, and distortion in accordance with ASTM A143, and in accordance with ASTM A384.

4. After galvanizing, the pole's base plate weld shall be ultrasonically inspected for delayed cracking and repaired if necessary.

5. The galvanized coating shall be uniform. The thickness shall be verified by magnetic testing.

6. Fabrication shall be completed before galvanizing.

7. Embedded poles shall be coated with a two-package epoxy, Corrocote II black epoxy coating, or equal, from the top of the ground sleeve to the bottom of the pole. Dry thickness of the coating shall be 10 mils. A sufficient amount of Corrocote II black epoxy shall be shipped with the structures to allow for field touch up.

E. PACKING AND SHIPPING

1. Each shipment shall include a detailed packing list that identifies all material by part number and associated hardware.

2. Anchor bolt cages shall be shipped completely assembled.

3. All material shall be carefully loaded and secured for shipment.

F. INSPECTION

1. The manufacturer shall give the Owner free access to this work, and whenever requested shall furnish full information as to the progress of the work in its various parts.

2. The Engineer reserves the right to determine conformity to the quality specified herein by any inspection method. Welds and/or other fabrication not conforming to the requirements of these specifications shall be repaired at the manufacturer's expense.

3. The Owner reserves the right to inspect the work either at the place of fabrication or at the job site. In either case, the manufacturer shall not be relieved of any responsibility for the quality of material and workmanship, or the conformance to details and dimensions to those shown on the Owner's or manufacturer's drawings; and any adjustments, changes or repairs, which may be found necessary after the delivery of the material, including all additional handling and shipping charges, shall be paid for by the manufacturer.

4. The failure of the Owner to inspect the work, to require testing of a structure or any part thereof, or to reject any unsatisfactory materials or workmanship shall not relieve manufacturer of his responsibility for the work.

5. A copy of the following test reports shall be promptly furnished to the Owner, as requested (after fabrication of structures):

   a. Certified mill test reports for all structural material.
   b. Certified welding reports for each structure.
   c. Test reports on coating thickness.
   d. Any test reports that indicate non-conformance with the requirements of these specifications shall be grounds for rejection of the affected materials by the Engineer.

G. INSTALLATION

1. The Manufacturer shall provide the Contractor with assembly instructions for the structures.

2. The structures shall fit together properly during installation. The manufacturer, at the manufacturer's expense shall correct improper fitting materials. These expenses shall include costs for loading and transportation back to the factory and returning the parts to the job-site, if necessary.

MATERIAL SPECIFICATION
SECTION 05121 - SPUN PRESTRESSED CONCRETE TRANSMISSION POLES

INDEX PAGE

1.1 GENERAL REQUIREMENTS

A. SUMMARY OF WORK

1. This specification outlines the requirements for the design, materials, fabrication, and delivery of spun prestressed concrete pole type structures for the 115KV transmission lines for the City of Grand Island. The concrete proposed by the manufacturer shall be in strict compliance with these specifications unless exception is taken and a qualifying and detailed explanation is provided with the bid package.

2. This specification is supplemented by the details, and configuration drawings listed below:

Concrete pole type "CBPT"	Drawing	CBPT POLE
Concrete pole type "CDBPT"	Drawing	CDBPT POLE
Concrete pole type "CDBPA"	Drawing	CDBPA POLE
Concrete pole type "SCTM"	Drawing	SCTM POLE
Hardware Assembly Details	Drawings	1369 -OF-1, 1369 -OF-2, 1369 -OF-4, 1369 -OF-6, 1369 -OF-8, 1369 -S1, 1369 -C2-T2, 1369 -C3-T2, 1369 -G2, MAINT. - C1
Steel Pole Details	Drawings	1369-GI-SPD-1 & 1369-GI-SPD-2
Direct Embedded Concrete Pole	Drawing	1369-ESPF-2 Sheets 1 & 2 MAINT. - ESPF-4

B. REFERENCES

1. The spun prestressed concrete poles shall be designed and manufactured in accordance with the latest revision of the following standards:

   a. United States Department of Agriculture, RUS Bulletin 1724E-206, July 30, 2008.

C. DRAWINGS AND DESIGN DATA

1. The receipt of final drawings and final design data for the ground line moment and shear for the embedded structures is required at the earliest possible date after award of contract. The information will permit the Engineer to determine the adequacy of the foundation designs.

2. The Engineer will review the following:

   a. Design data for the structures.
   b. Fabrication and erection drawings for the structures.

3. Two copies of the data noted in 1 and 2 above shall be submitted. The Engineer will return one copy marked "Reviewed", "Reviewed As Noted" or "Returned For Correction". For data returned and marked "Reviewed As Noted" or "Returned For Correction", two copies of the corrected data shall be forwarded to the Engineer.

4. The time schedule by structure type for the submittals from the manufacturer shall be developed by the Contractor and the manufacturer.

5. Final structural drawings shall be submitted to the Engineer in AutoCad, on Compact Disc (CD). Files submitted shall have a listing attached. Drawing files are to include any reference files, special fonts, and any other files necessary.

6. All drawings and data shall have the project name above the manufacturer's standard title block.

7. Acknowledgment of review by the Engineer of any design data or drawings implies review of general concept only and does not relieve the supplier of his obligation to comply with these specifications and all applicable standards.

8. The Owner retains the right to reuse design data and drawings at other locations on his system. Contractor will not be liable for any subsequent reuse.

9. All design data and structural drawings shall bear the stamp of a registered professional engineer.

D. <u>BIDDER QUALIFICATIONS</u>

1. Following is a list of acceptable manufacturers:
   a. StressCrete

2. Other manufacturers may be considered if they can provide qualifications that indicate the manufacturer:

   a. Is regularly engaged in the manufacture of spun prestressed concrete structures for electrical transmission lines.
   b. Has previously designed and fabricated spun prestressed concrete structures of the general type specified herein.
   c. Has a qualified design staff regularly devoted to the development of stress diagrams and structural drawings and details associated with spun prestressed concrete structure design and fabrication.

   d. Can provide a list of at least (10) projects for which the manufacturer has provided spun prestressed concrete structures of the same general type that have been satisfactorily supporting transmission lines for a period of not less than three (3) years.

E. DELIVERY, STORAGE, AND HANDLING

1. Arrangements regarding shipment of components and their degree of assembly shall be by mutual agreement between Contractor and manufacturer.

2. Precautions shall be taken to prevent damage to the poles.

3. Storage and handling of the manufacturer's products shall be the responsibility of the Contractor.

F. SEQUENCING AND SCHEDULING

1. Sequencing and scheduling for pole delivery shall be the responsibility of the Contractor.

1.2 TECHNICAL REQUIREMENTS

A. DESIGN

1. The manufacturer is responsible for designing a structure that will safely support all loads and loading conditions specified herein and shown on the supplemental drawings.

2. General outlines of structures and necessary attachments are shown on the attached drawings. Any structural shapes shown are for illustrative purposes only, and are not design requirements. Unless noted otherwise, dimensions shown are minimum and may be increased if required by the manufacturer's design.

3. Structures shall be capable of withstanding wind-induced vibrations with the structure completely or partially erected, with or without insulators, conductors, or shield wires installed (no load, partial load, or full load conditions). The manufacturer shall specify if damping mechanisms are necessary to meet these requirements.

4. All connections of any arms or other components to poles shall be bolted.

5. Poles shall be round one piece poles without any splice joints.

6. All structures shall be designed to resist, in addition to all other loads and their appropriate load-factors, the effects of deflection on all vertical loads (secondary bending), including the dead load of the structure. All unguyed single-column structures shall be designed to support the "worst case" loading condition with a 3-degree rotation of the pole shaft at the design ground line.

7. The Contractor shall submit the following concrete pole data with his bid:

   a. Name of manufacturer.
   b. General dimensions and design sketches of all structural components.
   c. Estimated structure weights.
   d. Pole diameter at top. bottom, and ground line.
   e. Tip and butt wall thickness.
   f. Prestress strand details concerning quality, size, and dropout location.
   g. 28-day compressive strength of concrete.
   h. Diameter taper (in/ft.)
   i. Deflections and analyzed stress reactions every 10 feet.
   j. Design calculations for controlling loading conditions.

8. The Owner will not allow any increase in the contract price due to incorrect design calculations.

9. Complete final design calculations and data shall be promptly submitted to the Engineer as specified herein. Calculations must be received prior to, or in conjunction with final design drawings.

10. The shaft deflection shall be limited to 2 percent of the structure height under the camber loading case shown on the drawings.

11. The manufacturer shall provide any upswept arms as shown on the drawings.

12. No climbing provisions shall be provided for the poles.

B. MATERIALS

1. All structural plate material shall conform to ASTM A6 unless herein modified. All structural plate material and anchor bolts furnished shall be mill-certified to meet an impact property of 15 ft.-lbs. at –20°F in the longitudinal direction using the Charpy V- Notch Test. The location of the test sample and the test results will be as prescribed in ASTM A673. The criterion of 15 ft.-lbs. at -20°F is based on full-size test specimens. For sub size specimens, the dimensions and values to be used shall be in accordance with ASTM A673. Heat lot testing (Frequency"H") will be acceptable.

3. All steel material shall be identified according to yield strength.

4. Materials for poles, arms, arm attachment plates and conductor and overhead ground wire attachment plates shall conform to ASTM A572 and the requirements of 1.2B1.

9. Fasteners:

   a. All bolts shall conform to ASTM A325 or ASTM A354 grade BC. Nuts shall conform to ASTM A194 grade 2, and shall be tapped .020 in. oversize for pitch and major diameter. Bolts shall be mechanically galvanized in accordance with ASTM B695. Nuts shall be galvanized. Alternate bolting material will considered, but in no instance will hot-dip galvanizing be an approved finish for any material with a yield strength greater than 100 ksi.

   b. All bolts of any one diameter and similar length shall be of the same type and strength.

   c. All bolts and nuts shall be supplied with a galvanized locking device approved by the Engineer. Palnuts, "ANCO" locking nuts, and M-F locknuts are acceptable. Spring washers are not acceptable.

   d. Five percent excess bolts, nuts, and locking devices (with a minimum of one each), of each individual size shall be furnished.

   e. All bolt locations shall permit easy wrench access to both the bolt head and the nut.

C. FABRICATION AND QUALITY CONTROL

1. As a minimum, fabrication shall be in accordance with United States Department of Agriculture, RUS Bulletin 1724E-206, July 30, 2008.

2. Fabrication tolerances shall be as follows:

   a. Length of pole ± 3"
   b. Spacing between "arm to pole" connections vertically ± 3/4".
   c. Location of hardware with respect to top of pole ± 2".
   d. Location of a hole in a piece ± 1/8".
   e. Spacing between holes (non-accumulative): ± 1/8", same connection (other than base plates) ± 1/16".
   f. Arms: Length ± 1", Rise ± 1" per 10' of arm length.
   g. Angles shown ± 2 degrees.

3. Arm bracket joints shall be 100% penetration welds.

4. Weld quality, except for penetration requirements stated in Section 1.2C9, shall conform to Section 8, Part D, Article 8.15 through 8.15.2.2 of AWS D1.1 regardless of the method of welding.

5. Each pole shall have a unique structure identification consisting of letters and numbers which shall be the same as those listed on STLPOLE drawing under the heading "Structure Number". Each separate part of the spole structure, including arms shall be similarly marked and shall identify the position of the piece in the structure. Markings shall be on one face of the pole 5 feet above ground line. All markings shall be at least 3/4 inch high,

6. Fabrication shall be in strict accordance with shop detail drawings prepared by the manufacturer and approved by the Engineer.

7. Holes for connection bolts shall be 1/16 inch larger than the nominal diameter of the bolts.

8. All arm holes shall be cylindrical, perpendicular to the member, clean-cut, and chamfered. Where necessary to avoid hole distortion, holes close to the points of bends shall be made after bending.

D. PACKING AND SHIPPING

1. Each shipment shall include a detailed packing list that identifies all material by part number and associated hardware.

2. All material shall be carefully loaded and secured for shipment.

E. INSPECTION

1. The manufacturer shall give the Owner free access to this work, and whenever requested shall furnish full information as to the progress of the work in its various parts.

2. The Engineer reserves the right to determine conformity to the quality specified herein by any inspection method. Fabrication not conforming to the requirements of these specifications shall be repaired at the manufacturer's expense.

3. The Owner reserves the right to inspect the work either at the place of fabrication or at the job site. In either case, the manufacturer shall not be relieved of any responsibility for the quality of material and workmanship, or the conformance to details and dimensions to those shown on the Owner's or manufacturer's drawings; and any adjustments, changes or repairs, which may be found necessary after the delivery of the material, including all additional handling and shipping charges, shall be paid for by the manufacturer.

4. The failure of the Owner to inspect the work, to require testing of a structure or any part thereof, or to reject any unsatisfactory materials or workmanship shall not relieve manufacturer of his responsibility for the work.

5. A copy of test reports shall be promptly furnished to the Owner, as requested (after fabrication of structures).

G. INSTALLATION

1. The Manufacturer shall provide the Contractor with assembly instructions for the structures.

2. The structures shall fit together properly during installation. The manufacturer, at the manufacturer's expense shall correct improper fitting materials. These expenses shall include costs for loading and transportation back to the factory and returning the parts to the job-site, if necessary.

MATERIAL SPECIFICATION
SECTION 16050 – T-2 OVERHEAD CONDUCTOR

1.0 SCOPE

This specification covers the requirements for type T-2 twisted pair bare overhead conductors.

2.0 Referenced Standards

The latest revision of referenced standards shall apply unless noted otherwise.

3.0 Specific Requirements

3.1 Conductor Size

The following conductor size is to be furnished by the contractor:

Size	Code Name	Stranding	Rated Strength
T-2 336.4 Kcmil ACSR	T-2 Linnet	26/7	28,200#

3.2 Standards

All ACSR conductors shall be Class AA conductors conforming to ASTM B232 with a standard (Class A) hot-dipped galvanized steel core, which meets ASTM B498.

3.3 Plexing of Conductors into T-2 Configuration

All plexing of the two individual cables into the twisted T-2 configuration shall be done using only a planetary machine. A "bow twister" shall not be used for plexing of any T-2 conductors for this project.

3.4 Reel Sizes

The completed conductor shall be shipped on returnable metal reels with weather-resistant tags indicating quantity per reel as follows:

Feet per Reel	Pounds per Reel	Maximum Reel Size
4,050	3,795	RM 66.28

3.5 Protection of Conductor

All conductor reels shall be packaged on reels and protected with heavy paper or fiberboard wrapping secured with weather resistant bands.

The ends of the cable shall be securely attached to the reel. The T-2 cable shall be banded at each end multiple times to maintain the twist and tension in the completed cable.

3.6 Acceptable Manufacturers

Following is a list of acceptable T-2 conductor manufacturers:

a. General Cable/BICC (T-2 conductor)
b. Nexans (ACSR 2 conductor)
c. Southwire

MATERIAL SPECIFICATION
SECTION 16051 – STANDARD SHIELD WIRE

1.0 SCOPE

This specification covers the requirements for standard (Non-OPGW) shield wire.

2.0 Referenced Standards

The latest revision of referenced standards shall apply unless noted otherwise.

3.0 Specific Requirements

3.1 Shield Wire Size

The following shield wire size is to be furnished by the contractor:

Size	Strands	Rated Strength
7#7 Alumoweld	7	19,060#

3.2 Standards

All shield wire shall be concentric-lay stranded, high-strength conductor comprised of hard-drawn aluminum-clad steel wire which meets ASTM B416.

MATERIAL SPECIFICATION
SECTION 16052 – 1/0 ACSR OVERHEAD CONDUCTOR

1.0 SCOPE

This specification covers the requirements for 1/0 ACSR bare overhead conductors.

2.0 Referenced Standards

The latest revision of referenced standards shall apply unless noted otherwise.

3.0 Specific Requirements

3.1 Conductor Size

The following conductor size is to be furnished by the contractor:

Size	Code Name	Stranding	Rated Strength
1/0 ACSR	Raven	6/1	4,380#

3.2 Standards

All ACSR conductors shall be Class AA conductors conforming to ASTM B232 with a standard (Class A) hot-dipped galvanized steel core, which meets ASTM B498.

3.3 Reel Sizes

The completed conductor shall be shipped on wood reels with weather-resistant tags indicating quantity per reel as follows:

Feet per Reel	Pounds per Reel	Maximum Reel Size
6,034	835	NR 36.22

3.4 Protection of Conductor

All conductor reels shall be packaged on reels and protected with heavy paper or fiberboard wrapping secured with weather resistant bands.

SECTION 16121 – OPTICAL FIBER GROUND WIRE (OFGW) AND ACCESSORIES

INDEX PAGE

SECTION 16121 – OPTICAL FIBER GROUND WIRE (OFGW) AND ACCESSORIES

1.1 SCOPE

This specification covers the technical and quality assurance requirements for the furnishing, installation, and testing of optical fiber ground wire (OFGW) and accessories for use on 115 kV transmission line segments for the City of Grand Island, Nebraska. The OFGW shall be composed of an optical communications cable embedded in an overhead ground wire. The OFGW design shall be mechanically and electrically compatible with the design of the transmission lines.

In this specification, the Purchaser is the Construction Contractor designated by the City of Grand Island, Nebraska.

The Contractor shall include with his bid complete data covering the specific OFGW cable he proposes to furnish. The data shall include the physical, optical, and electric characteristics of the cable.

1.2 OPTICAL FIBER GROUND WIRE - 48 Fiber AFL

The supplied cable shall meet all the requirements of IEEE standard 1138-latest issue, "IEEE Standard Construction of Composite Overhead Ground Wire (OPGW) For Use on Electric Utility Power Lines".

The OFGW cable to be provided has the following properties:

Manufacturer – Catalog No.	AFL Specification DNO-4989
Optic Fiber Type:	Single Mode
Number of Fibers:	Forty-eight (48)
Cable Diameter:	0.637 inch (16.2mm)
Cable Breaking Strength:	16,023 pounds
Maximum Cable Design Tension	12,819 pounds
Attenuation @ 1310 nm wavelength: @ 1550 nm wavelength:	0.4 db/km (maximum) 0.3 db/km (maximum)
Fault Current Capacity, Minimum For 1 sec:	13.1 kA
Rated Fault Current, minimum:	172 $(kA)^2$ sec
Design Life:	30 years

1.3 OPTICAL FIBER GROUND WIRE - Existing 12 Fiber FOCAS Cable

The existing 12 fiber OFGW cable installed on Line 1063A will be reused and transferred to the new double circuit structures. New hardware and vibration dampers are to be supplied by the Contractor for the transfer of this cable.

The existing 12 fiber OFGW cable has the following properties:

Manufacturer – Catalog No.	Focas F-507-297-012
Optic Fiber Type:	Single Mode
Number of Fibers:	Twelve (12)
Cable Diameter:	0.507 inch (12.72mm)
Cable Breaking Strength:	17,175 pounds
Attenuation @ 1310 nm wavelength: @ 1550 nm wavelength:	0.4 db/km (maximum) 0.3 db/km (maximum)
Diameter of Optical Fiber:	8 ± 1 micron
Minimum Band Width:	100 MHz – km
Chromatic Dispersion: Coefficient @ 1285-1330 nm: @ 1550 nm:	 3.5 ps/nm-Km (maximum) 18 ps/nm-Km (maximum)
Operating Temperature:	-40°C to 85°C
Installation Temperature:	-20°C to 40°C
One-Second Temperature:	180°C (minimum)
Loss Variation in Temperature Range of -20°C to 150°C:	 ± 0.05 db/km (maximum)
Ultimate Tensile Strength:	17,200 psi
Fault Current Capacity, Minimum For 12 Cycles:	 15 kA
Rated Fault Current, minimum:	65 $(kA)^2$ sec
Design Life:	30 years

1.4 SPLICE BOX AND SPLICE COIL RACK

The Contractor shall furnish splice closures and splice coil racks suitable for splicing the 48 fiber OFGW. A total of four (4) splice boxes and splice coil racks shall be installed at the line termination structure at Sub "F", on structures 44 and 97, and at the line termination structure at the NPPD St. Libory Substation . The splice box shall be located 20 feet off the ground at structure 97. Each OFGW is to extend at least 50 feet past the splice box, and then coiled above ground. The coil of OFGW shall be securely attached at the top and bottom of the splice coil rack.

The Contractor shall furnish all necessary materials required to support the OFGW cable down the structure and for attachment of the splice boxes and splice coil rack to the structures as shown on the drawings.

1.5 ATTACHMENT HARDWARE

The Contractor shall furnish all OFGW hardware as shown on the drawings. All hardware provided shall be designed for the specific OFGW cable diameter and type being furnished. These assemblies shall not compress or damage the fibers.

The OFGW shall be bonded to the structure. A grounding plate is furnished on the steel poles for bonding the ground wire to the OFGW. A suitable means of bonding the OFGW to the structure without compressing or damaging the fibers shall be furnished.

New hardware shall be furnished to attach the existing 12 fiber OFGW for Line 1063A to the new double circuit structures. The existing hardware shall not be reused.

1.6 VIBRATION DAMPERS

The OFGW shall be protected from the damaging effects of aeolian vibration. Spiral vibration dampers shall be installed as shown on the drawings.

1.7 CABLE INSTALLATION

Cable installation shall meet all the manufacturer's requirements described in detail in the AFL Telecommunications document "Recommended Installation Procedures for Composite Optical Ground Wire". The OFGW shall be installed and sagged to meet the tension requirements shown on the drawings and per the sag tables to be provided prior to construction. As described in the guide, an anti-rotational device shall always be used when installing the cable to prevent damage to the cable. A copy of the AFL Telecommunications Installation Guide has been included following this section for reference.

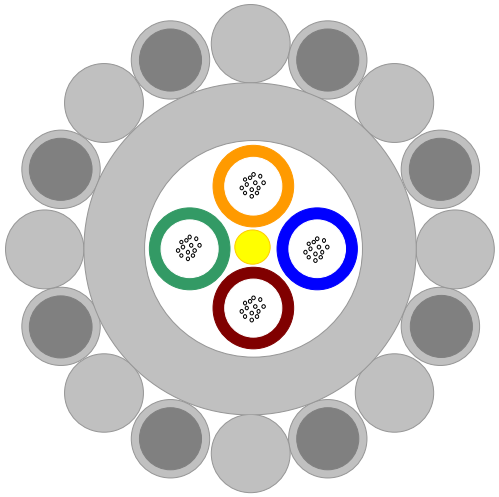
1.8 SPLICING AND TESTING

The Contractor shall splice and test the installed cable per the requirements specified in the Fiber Splicing and Testing Section of these specifications and shall provide documentation to the Owner.

AFL Telecommunications LLC
A Fujikura Business
PO Box 3127
Spartanburg, SC 29304
Tel: 1 800 235 3423
Fax: 1 864 433 5560

Specification DNO-4989

AlumaCore Optical Ground Wire



AC-42/42/637

Component Details					
Component	**#**	**OD**		**Area**	
CENTER					
Aluminum Pipe	1	11.00 mm	0.4331 in	56.55 mm²	0.0877 in²
LAYER 1 - LEFT HAND LAY					
Aluminum Clad Steel (20.3% IACS)	8	2.59 mm	0.1020 in	42.15 mm²	0.0653 in²
Aluminum Alloy 6201	8	2.59 mm	0.1020 in	42.15 mm²	0.0653 in²

Standards	
Designed and Manufactured in accordance with the following:	
Cable	*IEEE 1138, IEC 60794-4*
Fiber	*IEC 60793, ITU-T G.65x Series*
Color Code	*ANSI/EIA 359-A, 598-A, IEC 60304*
Aluminum Pipes	*ASTM B483*
Stainless Steel Tubes	*ASTM A632*
Aluminum Alloy Wires	*ASTM B398, IEC 60104, ASTM B609, IEC 60889*
Aluminum Clad Steel Wires	*ASTM B415, IEC 61232*

Specification DNO-4989

Mechanical / Electrical Details

Calculated Breaking Load	7,268	kg	16,023	lbs
Maximum Cable Design Tension	5,814	kg	12,819	lbs
Approximate Cable Diameter	16.2	mm	0.637	in
Total Cross-Sectional Area	140.85	mm^2	0.2183	in^2
Approximate Cable Weight	579	kg/km	2,056	lbs/mile
Modulus of Elasticity	9,432	kg/mm^2	13,415	kpsi
Coefficient of Linear Expansion	1.78E-05	1/°C	9.88E-06	1/°F
Alcoa Sag10™ Chart Number	1-1441		1-1441	
Calculated DC Resistance (20°C)	0.2739	Ohms/km	0.4408	Ohms/mile
Short Circuit Rating	172	$(kA)^2$•sec	172	$(kA)^2$•sec
Ambient Temperature	40	°C	104	°F
Short Circuit Duration 1 sec	13.1	kA	13.1	kA
Maximum Cable Temperature	210	°C	410	°F

Optical Details

Attenuation Characteristics for Single-mode fibers

Max Individual

0.40 dB/km 1310 nm
0.30 dB/km 1550 nm

48 Fiber Loose Tube Design (4 - 12 fiber units)		**Fiber**
Unit	**Fiber Type**	**Count**
Blue	Single-mode fibers	12
Orange	Single-mode fibers	12
Green	Single-mode fibers	12
Brown	Single-mode fibers	12
	Total Fiber Count	48

Standard Fiber Color Code

Fiber No.	1	2	3	4	5	6	7	8	9	10	11	12
Color	Blue	Orange	Green	Brown	Slate	White	Red	Black	Yellow	Violet	Rose	Aqua

Designs with more than 12 fibers per tube will use the standard color code and binders for identification of the fibers.

Installation and Handling Recommendations

Installation and cable preparation procedures are outlined in the AFL Telecommunications documents listed below. Contact AFL to request copies.

Recommended Installation Procedures for Composite Optical Ground Wire

Installation Instructions for Installing Optical Ground Wire in an AFL Telecommunications Splice Enclosure

Reel Handling

AFL Telecommunications
A Fujikura Business

INSTALLATION INSTRUCTIONS

AFL Optical Ground Wire (OPT-GW)

(Stainless Steel Tube Cable Designs)
(Aluminum Pipe Cable Designs)
(Slotted Core Cable Designs)

Installation Instructions
AFL Optical Ground Wire (OPT-GW)

(Stainless Steel Tube Cable Designs)
(Aluminum Pipe Cable Designs)
(Slotted Core Cable Designs)

CERTAIN INFORMATION SUCH AS THE DATA, OPINIONS OR RECOMMENDATIONS SET FORTH HEREIN OR GIVEN BY AFL REPRESENTATIVES, IS INTENDED AS A GENERAL GUIDE ONLY. EACH INSTALLATION OF OVERHEAD ELECTRICAL CONDUCTOR, UNDERGROUND ELECTRICAL CONDUCTOR, AND/OR CONDUCTOR ACCESSORIES INVOLVES SPECIAL CONDITIONS CREATING PROBLEMS THAT REQUIRE INDIVIDUAL SOLUTIONS AND, THEREFORE, THE RECIPIENT OF THIS INFORMATION HAS THE SOLE RESPONSIBILITY IN CONNECTION WITH THE USE OF THE INFORMATION. AFL DOES NOT ASSUME ANY LIABILITY IN CONNECTION WITH SUCH INFORMATION.

AFL OPTICAL GROUND WIRE

INSTALLATION INSTRUCTIONS

Contents **Section**

1.0 GENERAL INFORMATION

Composite Optical Groundwire (OPT-GW) was developed to provide a large capacity telecommunications system utilizing overhead power transmission lines. Serving the additional purpose of an overhead ground wire, the OPT-GW is constructed of aluminum clad steel strands and aluminum alloy strands stranded with stainless steel tubes or surrounding a fiber unit (core) which contains optical fibers. OPT-GW can be installed using the basic stringing methods currently employed for overhead ground wires, with minor variations.

This document outlines basic installation methods applicable for existing and newly constructed transmission lines. The installer should be thoroughly familiar with the installation of conventional overhead ground wire and conductors. Additional information can be obtained from the *IEEE Guide to Installation of Overhead Transmission Line Conductors*, IEEE Std 524-2003.

2.0 PRECAUTIONS

Care must be taken to avoid damaging the OPT-GW during handling and stringing operations. Avoid sharp bends to the cable and take precautions to prevent crushing the OPT-GW during placement. The transmission quality of the optical fibers can potentially be degraded if the OPT-GW is subjected to excessive pulling tensions or excessively small bend diameters.

Always observe the recommended values for *Maximum Stringing Tensions* and *Minimum Bend Radius*. More information about these values is contained on the following pages.

Cable are normally supplied on non-returnable wooden reels. The cable is covered with a protective covering and the cable reels are lagged with flexible lagging to provide additional protection during transportation. If the cable is not to be installed for a period of over four months from the delivery date, it is recommended that the cable be provided on a steel reel. Please contact AFL for more details or to request shipment on steel reels.

OPT-GW cable reels should always be transported and handled in an upright position. Never lay a reel of cable on its side. It is recommended that each reel of OPT-GW be tested prior to and after installation to ensure that fiber damage has not occurred during shipping and/or stringing operations. All cable protective packaging (wood lagging or flex

wrap) must remain in place on all reels until placed on pay-out racks and rack is in position for cable stringing

Above all, be familiar with and observe all of your company's safety rules when working with overhead transmission lines. These installation recommendations should not supersede any established safety practices.

3.0 CABLE INSTALLATION

Reel Preparation Prior to Beginning a Pull

AFL ships the cable reels with the inner tail securely connected to the outside of the reel flange. This connection should be loosened, *but not removed*, prior to stringing. This allows the inner layers of cable to adjust themselves to the varying tensions seen during installation. As the cable makes these adjustments, the inner tail may lengthen, or "grow," requiring periodic attention to ensure that the cable continues to be in a state where it can "grow" out.

AFL recommends using the *controlled tension stringing* method of installation. Ordinary stringing equipment can be utilized as if installing standard overhead ground wire. Suitable equipment includes pullers, tensioners, reel winders, and stringing blocks.

Figure 1 illustrates a typical stringing setup.

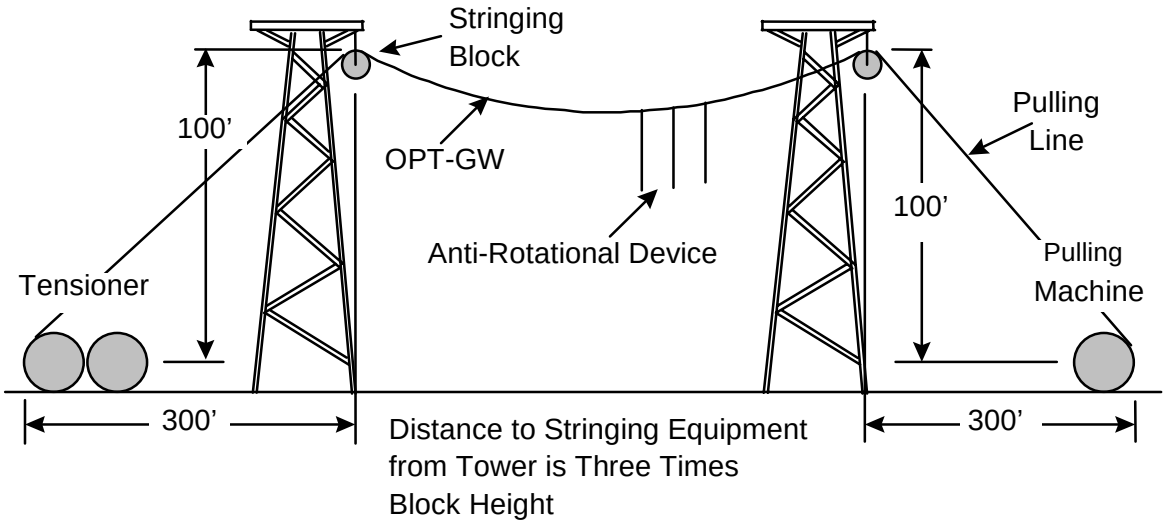


FIGURE 1 - Typical Stringing Setup

There is one primary difference between installing OPT-GW and conventional overhead ground wires. Standard ground wires are typically spliced using compression type connectors and locations of the splices are relatively flexible. The splice locations of the OPT-GW cable must be planned to allow for splicing of the optical fibers. The reel lengths will be engineered to locate the cable splices at predetermined towers on each end of a stringing section.

After installing deadends, the free ends of the OPT-GW are trained down the towers to the ground for splicing. The length of the free cable should be at least the tower height, plus an additional 75 feet (23 meters) to accommodate the splicing. After stringing, this cable

length is typically coiled and temporarily stored at the tower until the splicing occurs.

The OPT-GW will also use special attachment hardware, including deadends, suspension clamps, and wire fittings such as grounding clamps. The hardware is designed to provide the necessary holding strengths and prevent deformation of the fiber unit which could potentially damage the optical fibers.

4.0 STRINGING PROCEDURES

Stranded wire pulling lines are generally used, although nylon ropes have also been employed. In either case, the line must be rated strong enough to withstand the required stringing tensions. The pulling line should have the same direction lay as the OPT-GW to help resist the tendency to rotate under stringing load.

If an existing overhead ground wire is to be removed, it can potentially be used as a pulling line for the OPT-GW. A visual inspection should be made of the existing ground wire to be sure it is in suitable condition. If there is any concern about the existing wire's ability to withstand the stringing tensions, it should be pulled out and replaced with a pulling line.

It is recommended to use a bull-wheel type tensioner with round (not "V" type) polyurethane lined contact grooves. The tensioner should have two bullwheels, each with multiple grooves to minimize cable damage. The tensioner should be capable of maintaining the required tensions at various pulling speeds. Positive braking systems are necessary for pullers and tensioners to maintain the tension when pulling is stopped. Minimum diameter of the bull wheels should not be less that 70 x D (diameter of the OPT-GW). For cable diameters greater than 0.787" (20 mm) please contact AFL

The OPT-GW must be reeved (threaded) through the bullwheel tensioner properly. Left hand lay OPT-GW (typical USA) is reeved from right to left. Right hand lay OPT-GW (typical International), is reeved from left to right. A thorough explanation of the reeving process can be found in IEEE Std 524-2003. This arrangement is necessary to avoid any tendency to loosen the outer layer of strands and to avoid induced torque during installation.

The reel shall be placed directly in line with the tensioner. The distance from the reel to the tensioner should be at least 25 feet (7.5 meters). The OPT-GW shall not be permitted to scrape the reel flanges while being pulled.

The OPT-GW cable reels are not designed to withstand the braking forces present during stringing. Direct tensioning of the OPT-GW from the cable reel is not recommended. Back tension on the reel should only be enough to keep the cable properly seated in the tensioner grooves and to prevent overshooting and birdcaging.

Two basic types of pulling machines are recommended for tension stringing. These are either drum type or bull wheel type pullers. Positive braking systems are required in either case. On a drum type puller, the pulling line is taken up directly onto the drum. On the bull wheel type, the line is threaded onto two bull wheels, much like the tensioner, and onto a self winding drum.

Stringing blocks, sometimes called travelers, are mounted on the structure at the OPT-GW attaching point in the normal manner. Please refer to **Reference A, *OPT-GW Diameters and Bending Radius***, for information on blocks diameters.

The stringing blocks should have neoprene lined grooves. The linings should be in good

condition and adhering to the block. Minor rough areas can be sanded out to ensure the lining is smooth.

Uplift rollers (which attach to the installation sheave wheel) or hold-down blocks (which are separate blocks) need to be placed where uplift of the pulling line is likely to occur (due to its higher tension/weight ratio than the conductor). This will typically occur going up inclines or at a low point in a section. These devices should also have a break away feature in the event of fouling or incorrect installation.

The tensioner and puller should be positioned for a 3:1 ratio to the stringing block on the first structure adjacent to the equipment. See Figure 1. The tensioner should be placed in line with the first two structures (or first span) of the pull. Likewise, the puller should be placed in line with the last two structures (or last span) of the pull. Doing so minimizes the line angle change seen by the cable during the installation process.

This minimum stringing block diameter and distance to the tensioner (3:1) are recommended to help prevent deformation of the fiber unit (aluminum pipe, stainless tell tube or slotted core), which protect the optical fibers in the OPT-GW.

The use of an ***Anti-Rotational Device*** (see drawing on Page 15) depends largely upon the construction of the optical ground wire. Such a device is used to prevent the OPT-GW from twisting while being pulled. Variations of these devices have been successfully used. Please consult the AFL for any inquiries regarding a particular form of anti-rotation device.

For cables with helically stranded stainless steel tubes or designs with two layers of wires, an anti-rotational device may or may not be required. To confirm whether one is needed for your particular application, contact AFL. When in doubt, the conservative approach is to conduct the installation *with* the use of an anti-rotational device. For cables constructed with an unstranded stainless steel tube in the center of the cable or single layer cables, an **anti-rotational device is always a requirement.**

If the anti-rotational device is not preventing the cable rotation or if the anti-rotational device is wrapping around the OPT-GW, a stiffer or heavier device is required. The weight and length of the ARD will depend upon the construction of the optical ground wire.

The anti-rotational device attaches to the OPT-GW with a Kellum type grip. The grip must be appropriately sized for the OPT-GW diameter and pulling tensions.

Normally, the OPT-GW should be kept under constant stringing tension during the stringing process to keep the line clear of both the ground and other obstacles that could cause damage to the cable.

Do not cut the OPT-GW with ratchet cutters, or other types of tools that could crush the fiber unit. The use of a hacksaw will ensure the fiber optic units are free to move within the pipe. During stringing, the first few feet of OPT-GW may elongate, and this will prevent unnecessary straining of the optical fibers.

It is important to monitor the tensions and ensure that excessive tension is not applied as the OPT-GW passes from the reel to the tensioner.

The following values are recommended to help prevent damage to the OPT-GW.

1. Minimum Bull Wheel Diameter ..... 70 x D (D=OPT-GW diameter)
   For larger diameter OPGW cables where 70 x OD exceeds 60” (~1.5m), a 60” (~1.5m) bull wheel may be used. Please consult AFL in such cases.

2. Recommended Block Diameter for first and last structure……..40 x D
   Smaller diameters can be used at tangent structures. See Reference A.

3. Minimum Cable Bend Radius

   During Installation (Dynamic): 20 x D; After Installation (Static): 15 x D

4. Maximum Stringing Tension ……20% OPT-GW's Rated Breaking Strength

   The stringing tension is always measured at the tensioner side. In general the maximum stringing tension should be a half of the maximum sagging tension and never should exceed 20% RBS of the OPT-GW.

5. Pulling Speed ..... 30 to 100 feet per minute (10 to 30 meter per minute)

6. Minimum distance from puller and tensioner to the stringing block ..... 3:1 Ratio

7. Total number of spans in each stringing section ..... Typically 20 to 30*

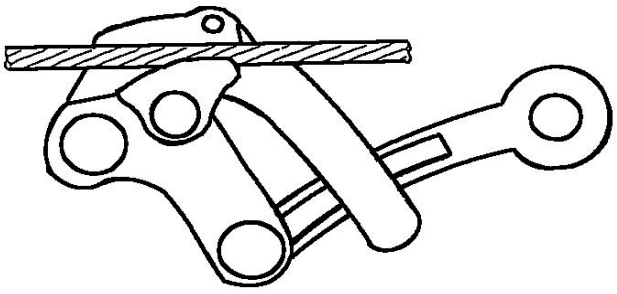
   * The maximum number of spans is included as a reference only; since this will vary considerably due to differences in terrain, span lengths, line angles, etc.

5.0 SAGGING METHODS

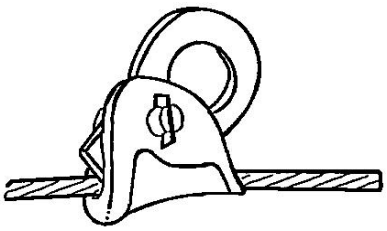
The methods and procedures for sagging the OPT-GW are the same as those for normal overhead ground wires. For determining sags, the installer should use the sag-tension design information provided by the utility or AFL.

A temporary grip is installed on the OPT-GW for tensioning. The grip must be designed to hold the OPT-GW without damage, and in particular not pinch the cable or crush the aluminum pipe. AFL can provide a comealong, sometimes called a pocketbook grip, that can be attached anywhere along the length of an OPT-GW. Figure 4 illustrates a satisfactory comealong design.

Some types of gripping devices that might damage the OPT-GW such as Chicago grip or Kito grip are strictly prohibited to use for OPT-GW.



× Chicago grip (prohibited)



× Kito Grip (prohibited)

Certain types of formed guy grips can also be used successfully, but their use in stringing applications should be checked with the grip's manufacturer.

6.0 DEADENDING AND CLIPPING IN

Deadends are installed on OPT-GW spans that terminate at splicing towers or ends of the system. Deadends are also used at angle structures when the angles are too great to use suspension clamps. Suspension clamps are normally used at the remaining towers. These types of hardware (dead end and single suspension) are illustrated in Figures 2 and 3.

In general, the rule for hardware use is the following:

Single Suspension, to be used at structures with line angles between 0 and 30 degrees.

Double Suspension, to be used at structures with line angles between 30 and 60 degrees.

Dead End, to be used at structures with line angles over 60 degrees.

Sometimes, when double suspensions are not desired, the dead ends can be used starting from line angles of 30 degrees, instead of 60 degrees.

OPT-GW is installed using stringing blocks. If left in the stringing blocks for extended periods of time, the potential for motion induced damage (aeolian vibration) increases. Also, the creep of the cable is affected due to the change in the initial condition on the cable. In order to diminish the probability of motion induced damages and creep rate change, AFL recommends that tensioning and anchoring of the OPT-GW to the structure and removal of the stringing blocks be completed no later than 48 hours after pulling the cable in.

There are several ways to lift the OPT-GW from the stringing blocks in order to install the hardware. Basically, comealongs are attached on both sides of the block and a coffin hoist is placed over the tower arm. The hooks of the coffin hoist are attached to the comealongs and jacked up to form a small loop in the OPT-GW. The block can then be removed and the armor rods can be placed on the OPT-GW then attached to the structure. Alternately, certain types of preformed wire grips can be used instead of comealongs.

If vibration dampers are required for this span, these should be placed on the OPT-GW immediately after clipping in. Dampers may not be required at every structure; their locations will be specified by the utility or AFL. A drawing of an AFL Stockbridge damper is shown in Figure 5.

7.0 SPLICE POINTS

Splice points will be located at the beginning and end of each OPT-GW reel. After completion of sagging and clipping, the surplus OPT-GW should be coiled and attached temporarily to the tower. Coils should be approximately 3.5 to 5 feet (1 to 1.5 meters) in diameter. The coils should be fixed on the tower to prevent any damage to the OPT-GW prior to splicing.

The exposed ends of the OPT-GW should be re-sealed to prevent moisture from entering the fiber units. The cable reel may be supplied with a pair of plastic caps for sealing the cable ends. Electrical tape, RTV silicone, or other means can also be used for this purpose.

The OPT-GW will be trained down the tower and to the ground for splicing. Do not cut off any excess length of the OPT-GW at this time. To facilitate splicing, the OPT-GW should

extend a minimum of 75 feet (23 meters) beyond the bottom of the tower. The length of OPT-GW running down the tower should be attached to the structure using appropriate guide clamps, spaced every 6 to 8 feet (1.8 to 2.4 meters) of running length. Several types of guide clamps are illustrated in Figure 6.

The splice enclosure will typically be installed on the structure between 15 and 20 feet (4.5 to 6 meters) above the ground. In most cases, it will be desirable to store extra cable on the tower. This will allow the splice box to be removed and lowered to the ground if it is ever necessary. This can be accomplished with a simple loop of OPT-GW below the splice box or by permanently storing a coil of OPT-GW higher on the tower.

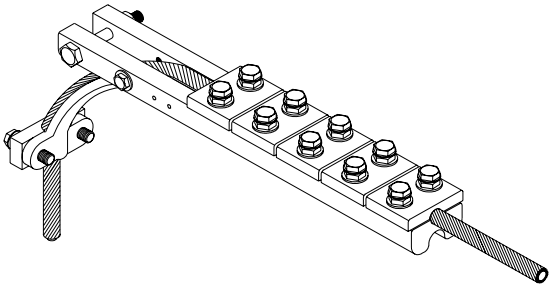


FIGURE 2 - OPT-GW Deadend (Bolted Type)

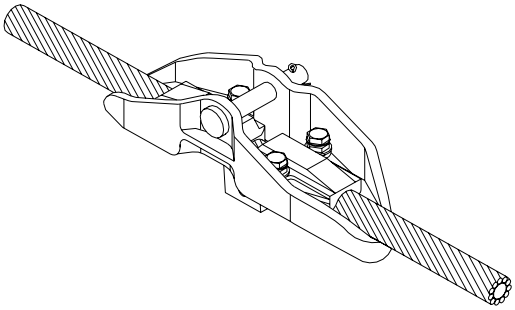


FIGURE 3 - OPT-GW Suspension Unit

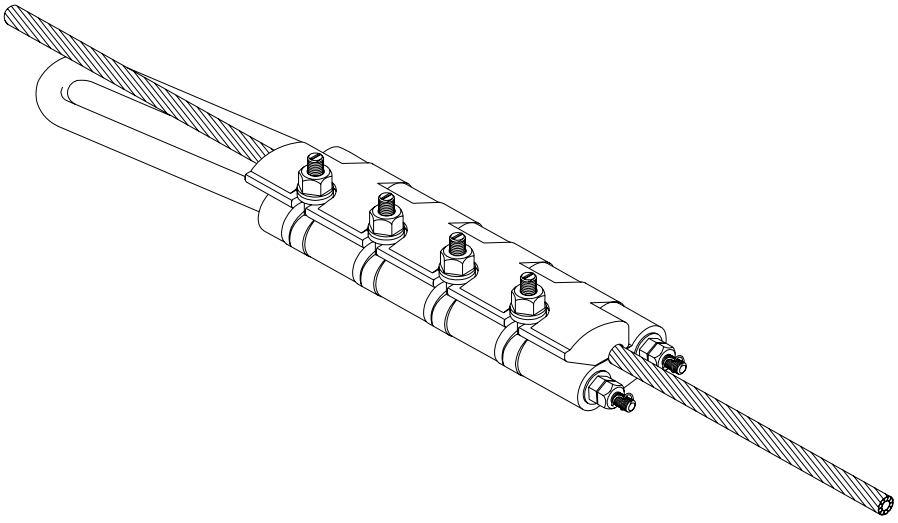


FIGURE 4 - Comealong (Pocketbook Grip)

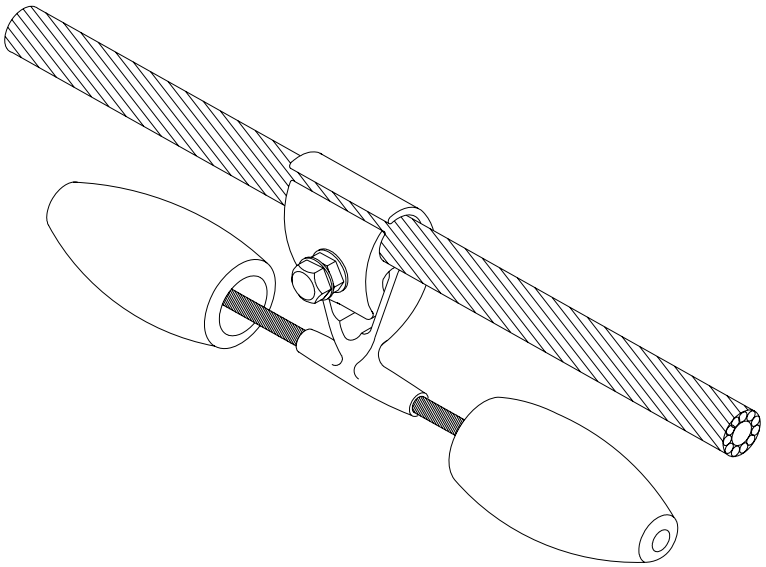
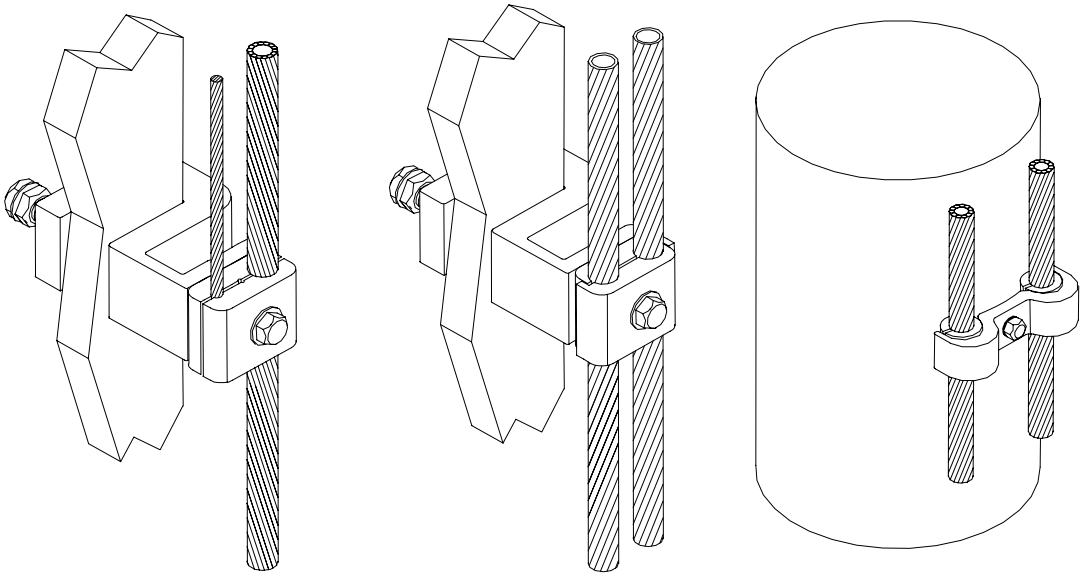


FIGURE 5 - Vibration Damper



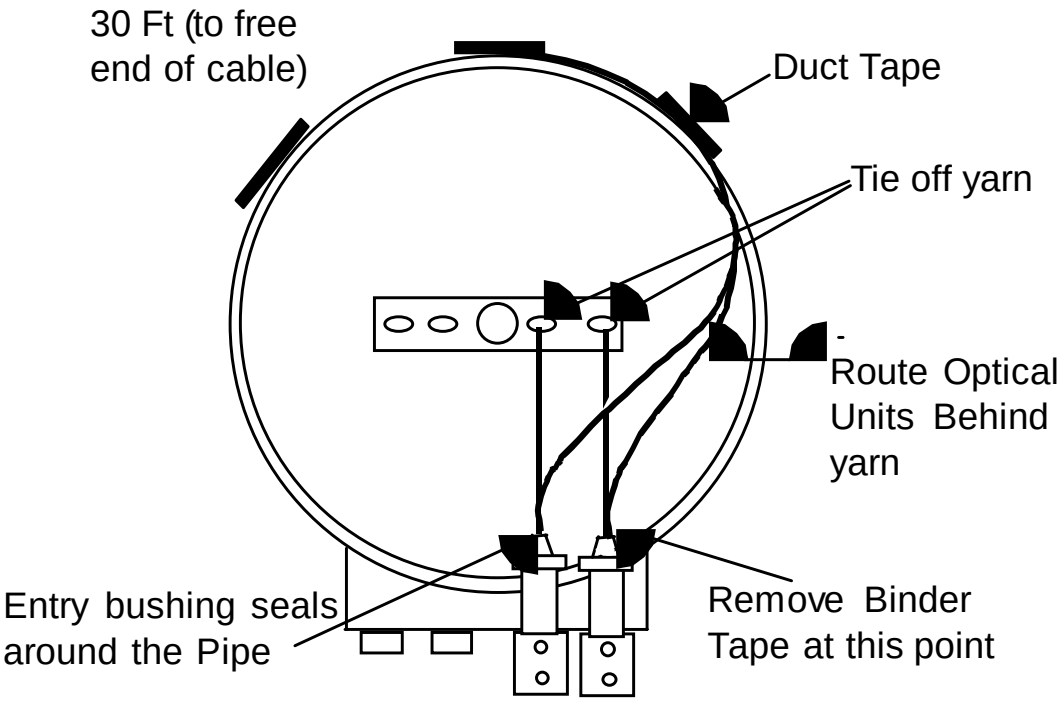
Tower Bonding Clamp | Tower Guide Clamp | Pole Guide Clamp

FIGURE 6 - OPT-GW Guide Clamps and Bonding Clamps

8.0 ANCHORING THE OPTICAL UNITS IN THE SPLICE BOX

The following is an **example** of anchoring the optical units when installing **AFL Loose Tube OPT-GW** (Aluminum pipe designs) in an **AFL Splice Box SBO1 (See Figure 7).**
Place a piece of electrical tape on the individual optical units, 14 to 18 inches (36 to 46 cm) from the entry bushing of the slice box.
Working with one optical unit at a time, cut the binder tape at this mark, on the entry bushing side.
Unwrap the binder tape back to the entry bushing and cut the BINDER TAPE ONLY.
Cut the yarn at the electrical tape and use the yarn to anchor the optical unit by threading the yarn through the eye-bolt and tying in a series of half-hitches.
Make sure that the yarn is tied off in line and to the eye bolt in the proper position from where the individual OPT-GW cables enters the splice box.
Repeat the previous steps for the remaining OPT-GW cable(s).
Tape the optical units together after they have been secured to the eye-bolts (See Figure 7). Tape the units (duct tape is recommended) to the top outside radius of the box (See Figure 7). This will help support the units and prevent damage of the units at the bushing.
Tighten the retaining nut so that the bushing is sealed around the pipe.
Tape the optical units together every 2 feet (0.6 meters).
Stop taping the optical units 6 feet (1.8 meters) from the free end.
Tape each individual optical unit (s) up to 4 feet 10 inches (10 to 25 cm) from the free end.
Remove the yarn and the binder tape from the optical unit(s) along the 4 feet 10 (10 to 25 cm) inches section towards the free end.
A similar procedure is recommended for **AFL Loose Tube OPT-GW and AFL Tight Structure OPT-GW** in an **AFL Splice Box OPTI-GUARD ™.**

Important Note:
If the AFL Loose Tube OPT-GW and AFL Tight Structure OPT-GW (AlumaCore Designs) are not used with AFL Splice Box types (SBO1, OPTI-GUARD ™,LG series), but with another type of splice box, please contact the manufacturer of that splice box regarding instructions for installing the AFL Loose Tube OPT-GW and AFL Tight Structure OPT-GW in their splice box.
No matter the type of splice box used, the aramid yarn must be tied off inside the box, to an eye bolt or other element, to prevent a pull-back tension on the cable core.



Note: There should be 30 ft of optical unit (s) prepped for each individual OPTGW cable that is to be inserted into the Splice Box. The 30 ft of optical unit (s) is divided two sections;
1: 20 ft from box to ground, and 2: 10 ft for storing and splicing.
Should the Splice Box be mounted at a different height, then adjust the amount of OPT-GW cable to be prepped, stored and spliced.

Figure 7- Anchoring the Optical Units in the AFL Splice Box SBO1

REFERENCE A

STRINGING AND HANDLING OPT-GW DIAMETERS

AND

BENDING RADIUS

The following guides apply to AFL Telecommunications OPT-GW Optical Groundwire:

For cable diameters greater than 0.787" (20 mm) please contact AFL:

1. Maximum OPT-GW recommended stringing tension is 20% (at tensioner) of the rated breaking strength.

2. The minimum bull wheel diameter for tensioners is 70 x D.
   (Where D represents the nominal diameter of the OPT-GW).
   For larger diameter OPGW cables where 70 x OD exceeds 60" (~1.5m), a 60" (~1.5m) bull wheel may be used. Please consult AFL in such cases.

3. The recommended stringing sheave (root) diameter is 40 x D.
   (Where D represents the nominal diameter of the OPT-GW).
   This is based on a sheave through angle of 45° and maximum stringing tension (at tensioner) of 20% of the rated strength of the OPT-GW.

   NOTE: Refer to next table for additional information on minimum diameters of the stringing blocks for other conditions.

4. The minimum bending radius after installation (static) for the OPT-GW is 15 x D.
   (Where D represents the nominal diameter of the OPT-GW).
   The minimum bending radius during installation (dynamic) for OPT-GW is 20 x D.
   (Where D represents the nominal diameter of the OPT-GW).

   NOTE: Based on actual OPT-GW size, etc., care must be taken when bending the OPT-GW to avoid kinking the strands and, therefore, damaging the optical fibers contained within the central pipe.

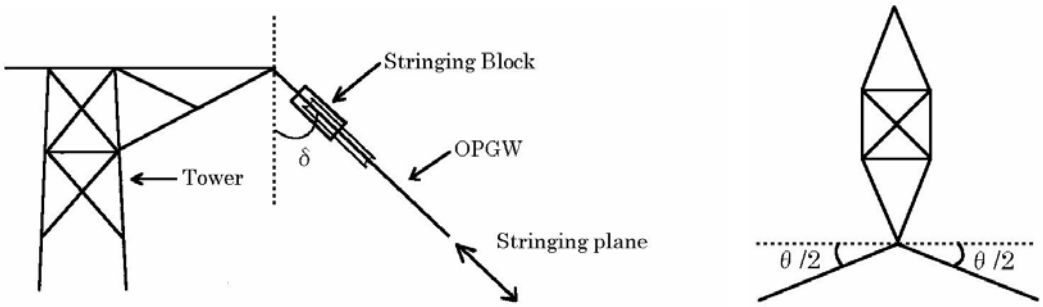
5. The minimum permanent bending radius for the OPT-GW is 15 x d.
   (Where "d" represents the diameter of the aluminum pipe or the slotted core).

   The minimum permanent bending radius for the stainless steel tube is 45 x d.
   (Where "d" represents the diameter of the stainless steel tube).

6. The minimum permanent bending radius for plastic buffer tubes is 3 inches (8 cm).

7. The minimum permanent bending radius for the optical fibers is 1.5 inches (3.8 cm).

8. The swinging angle of the stringing block shall be controlled corresponding to the swinging angle of the OPGW stringing plane to help prevent the cable from riding out of the traveler or excessive twisting during installation. The cable should be travel thought the lowest part of the groove.



The following are minimum diameters of stringing blocks at:

1. First and Last Structures

   The minimum stringing (sheave) block diameter (root) of 40 x D (where "D" represents the diameter of the OPT-GW) is considered satisfactory if the pulling line slope is at least three horizontal to one vertical from the traveler to the site and the stringing tension does not exceed 20% of the OPT-GW's rated breaking strength.

2. Tangent and Angle Structures

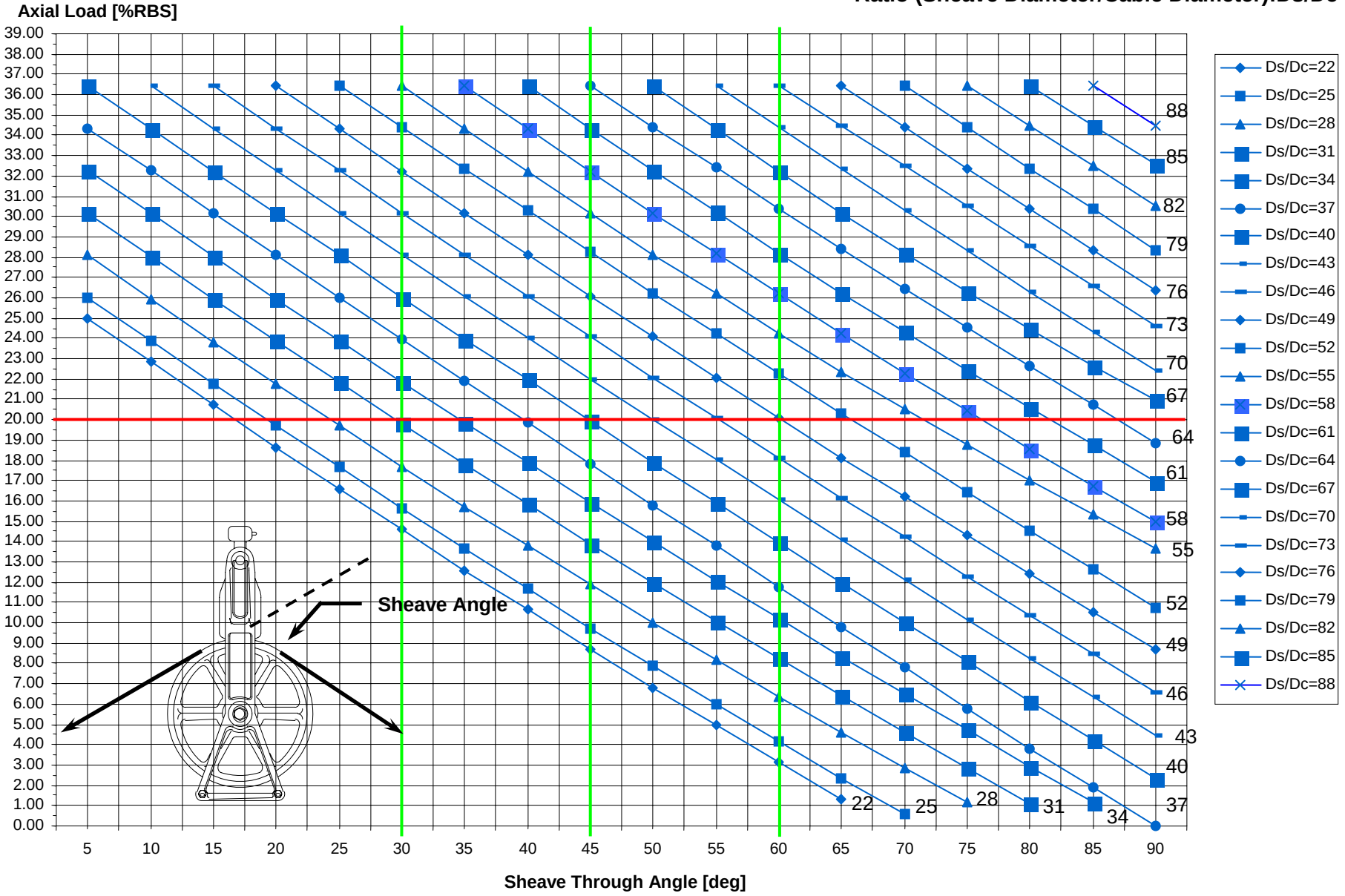
   For tangent structures (line angle=0) and stringing angles of 20° or less, a minimum sheave root diameter of 30 x D is acceptable.

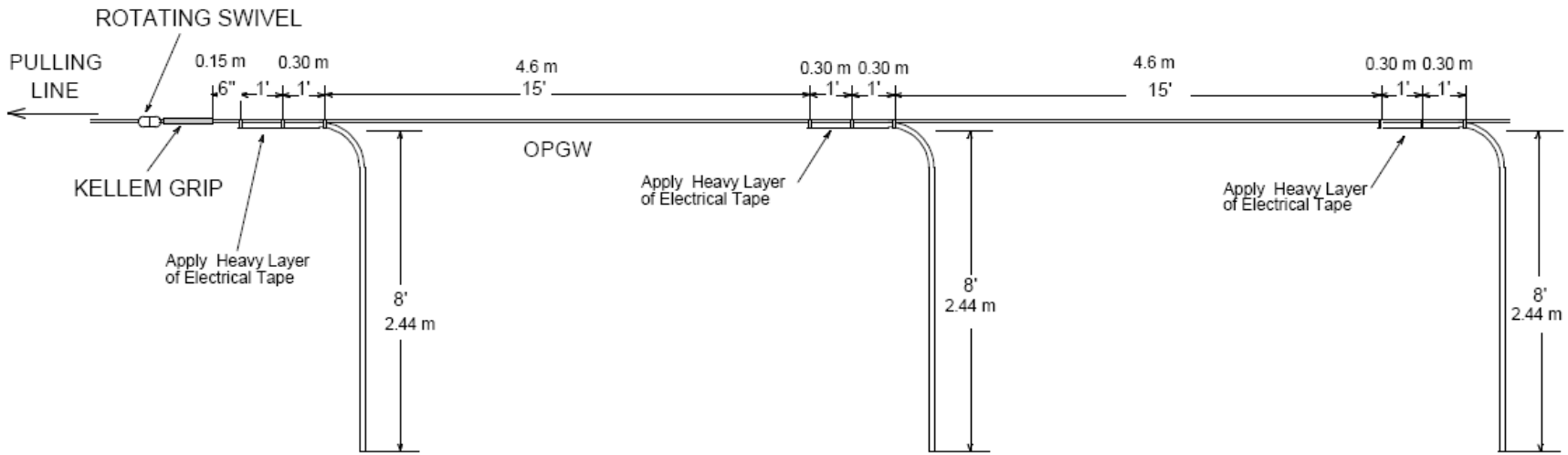
   For stringing angles between 20° and 45°, a minimum sheave root diameter of 40 x D is recommended.

   For stringing angles between 45° and 60°, a minimum sheave root diameter of 50 x D is recommended.

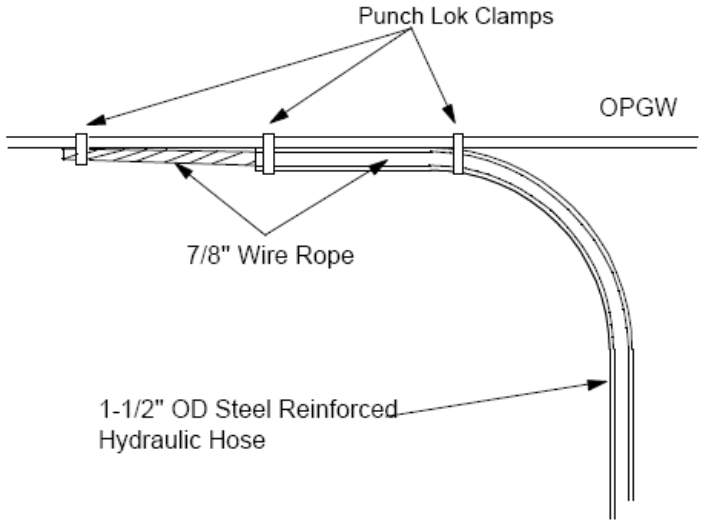
   For stringing angles greater than 60°, a minimum sheave root diameter of 60 x D is recommended.

Ratio (Sheave Diameter/Cable Diameter):Ds/Dc





FOCAS ARD Kit FARD-2	
QUANTITY	DESCRIPTION
3	10 ft weighted Tails, assembled
1	Rotating Swivel
1	P-38 Punch Lok Tool
15	4" I.D. Punch Lok Clamps
1	Kellem Grip
2	Electrical Tape roll



NOTES:

1. Attach hydraulic hose and 7/8" wire Rope to OPGW using punch lok clamps or tubing clamps.
2. Apply heavy layers of electrical tape to attachment points to prevent damage to sheave wheels.

ANTI-ROTATIONAL DIVICE (EXAMPLE)

SECTION 02000 – PROPERTY OWNERS LIST

The table below lists the current owners of property along the transmission line right-of-way. Also listed are any special requirements for obtaining access.

Line 1369 - Sub "F" to NPPD St. Libory Substation

Line Structures	Owner's Name and Address	Special Access Requirements
Sub "F" to #15	City of Grand Island	
#15 to #16	BNSF Railroad Roadmaster 14th & Grand Ave. York, NE, 68467 (402) 362-3873 (402) 429-4055 Cellphone	Railroad Protective Liability Insurance and Railroad Flagger is required.
#16 to #24	East side of 1/2 section line: Phil A. Mader 3326 W. Abbott Rd. Grand Island, NE 68803 West side of 1/2 section line: Todd A. Mader 3930 W. Webb Rd. Grand Island, NE 68803	
#24 to #26	East side of 1/2 section line: Kevin & Bobbi Beverly 3600 W. Airport Road Grand Island, NE 68803 Westside of 1/2 section line: Jeremy Mader 3580 N. Webb Road Grand Island, NE 68803	
#26 to #34	East side of 1/2 section line: Lizabeth N. & Max Mader 3850 North Webb Road Grand Island, NE 68803 (308) 381-2311 (308) 380-4399 Cell - Max (308) 380-8542 Cell - Libby	

SECTION 02000 – PROPERTY OWNERS LIST

Line Structures	Owner's Name and Address	Special Access Requirements
#26 to #34	West side of 1/2 section line: Jeremy Mader 3580 N. Webb Road Grand Island, NE 68803	
#35 to #39	East side of 1/2 section line: Lloyd E. . & Max A. Mader 3951 North Webb Road Grand Island, NE 68803 (308) 382-0953 Lloyd (308) 380-4402 Cell - Lloyd (308) 381-2311 Max Westside of 1/2 section line: Jeremy Mader 3580 N. Webb Road Grand Island, NE 68803	
#40 to #44	Both sides of 1/2 section line: Lloyd E. . & Max A. Mader 3951 North Webb Road Grand Island, NE 68803 (308) 382-0953 Lloyd (308) 380-4402 Cell - Lloyd (308) 381-2311 Max	
#44 to #53	North side of Abbott Road Max A. Mader 3850 North Webb Road Grand Island, NE 68803 (308) 381-2311 Max	
#54 to #62	North side of Abbott Road Robert G. & Reburta R. Wenzl 2422 Riverview Drive Grand Island, NE 68803 (308) 382-9063 (480) 983-7876	

RIGHT-OF-WAY

SECTION 02000 – PROPERTY OWNERS LIST

Line Structures	Owner's Name and Address	Special Access Requirements
#62 to #70	East side of 1/2 section line: Robert G. & Reburta R. Wenzl 2422 Riverview Drive Grand Island, NE 68803 (308) 382-9063 (480) 983-7876 Westside of 1/2 section line: George W. Leiser - Trustee 3981 West One R Road Grand Island, NE 68803 Bill Leiser is the contact: (308) 384-0714	
#64 to #65	Kinder Morgan Gas Transmission Line Greg Smith Project Manager - Encroachments 370 Van Gordon St Lakewood, CO 80228 (303) 914-7848	Restrictions on crossing over pipeline with vehicles and digging near the pipeline - See Kinder Morgan Requirements in Specs.
#71 to #79	East side of 1/2 section line: Lloyd & Pat Mader 3951 North Webb Road Grand Island, NE 68803 (308) 382-0953 West side of 1/2 section line: Glen E. & Betty J. Wiese 4950 West White Cloud Road Grand Island, NE 68803 (308) 384-0467	
#80 to #83	Both sides of 1/2 section line: Lester L. & Myma D. Petzoldt 4020 West White Cloud Road Grand Island, Ne 68803 (308) 382-4981 Steven Petzoldt (son) - Tenant (308) 391-0837	

SECTION 02000 – PROPERTY OWNERS LIST

Line Structures	Owner's Name and Address	Special Access Requirements
#84 to #88	East side of 1/2 section line: Jeff & Susan Koch 5300 North North Road Grand Island, NE 68803 (308) 384-1983 West side of 1/2 section line: William G. & Sandra K. Leiser 4425 North Engleman Road Grand Island, NE 68803 (308) 381-2888	
#89 to #93	East side of 1/2 section line: Robert Bruhn 2430 North Custer Grand Island, NE 68803 (308) 382-9157 West side of 1/2 section line: George M. Jr. & Sherrill A. Albin 210 East Buffalo Circle Hastings, NE 68901 (402) 469-0702	
#94 to #97	East side of 1/2 section line: Robert L. Jr. & Dianna K. Mettenbrink 5900 North North Road Grand Island, NE 68803 (308) 384-7384 (308) 379-4169 West side of 1/2 section line: Michael J. & Heidi S. Isley 4271 West One R Road Grand Island, NE 68803 (308) 384-7582	

SECTION 02000 – PROPERTY OWNERS LIST

Line Structures	Owner's Name and Address	Special Access Requirements
#98	East side of 1/2 section line: Thomas M. & Linda J. Atkins 4323 South North Road Grand Island, NE 68803 (308) 384-7038 Home (308) 391-0488 West side of 1/2 section line: Robert G. Wenzl 2422 Riverview Drive Grand Island, NE 68801 (308) 382-9063	
#98 to #101	East side of 1/2 section line: Robert M. & Kay M. Fielding 4160 West One R Road Grand Island, NE 68803 (308) 382-1251 West side of 1/2 section line: Robert G. Wenzl 2422 Riverview Drive Grand Island, NE 68801 (308) 382-9063	
#101 to #105	East side of 1/2 section line: Thomas M. & Linda J. Atkins 4323 South North Road Grand Island, NE 68803 (308) 384-7038 Home (308) 391-0488 West side of 1/2 section line: Robert G. Wenzl 2422 Riverview Drive Grand Island, NE 68801 (308) 382-9063	

SECTION 02000 – PROPERTY OWNERS LIST

Line Structures	Owner's Name and Address	Special Access Requirements
#106 to #114	East side of 1/2 section line: Thomas R. Rauert 6600 North North Road Grand Island, NE 68803 (308) 382-6310 (308) 380-5536 West side of 1/2 section line: Thomas M. & Linda J. Atkins 4323 South North Road Grand Island, NE 68803 (308) 384-7038 Home (308) 391-0488	
#115 to #124	East side of 1/2 section line: Norma J. & John M. Simonson 1858 Worms Road St. Libory, NE 68872 (308) 894-6603 West side of 1/2 section line: Jerry J. & Barbara J. Simonson 1860 Worms Road St. Libory, NE 68872 (308) 894-3691	
#124 to #132	North side of 1/2 section line: Elmer E. Pollock 4365 West Prairie Road Grand Island, NE 68803 (308) 687-6215 South side of 1/2 section line: Jerry J. & Barbara J. Simonson 1860 Worms Road St. Libory, NE 68872 (308) 894-3691	

SECTION 02100 - RIGHT-OF-WAY CLEARING & STRUCTURE STAKING

INDEX PAGE

SECTION 02100 - RIGHT-OF-WAY CLEARING & STRUCTURE STAKING

1.1 GENERAL INFORMATION

A. The Owner will obtain all permanent right-of-way easements and/or location agreements required for construction of the work.

B. The Contractor shall confine his operations to the immediate construction area and shall use due care in placing construction tools, equipment, excavated materials, and construction materials and supplies, so as to cause the least possible damage to the property. At the conclusion of the work all temporary structures, access roads outside the rights-of-way, and other facilities incidental to the new construction shall be removed and the site shall be restored to its original condition.

C. The Contractor shall provide stakes, tools, equipment and labor necessary to establish all permanent structure locations as indicated on the foundation and/or plan and profile drawings. Any existing bench marks, stakes or other reference points which are found to be disturbed or removed, shall be replaced by the Contractor at no cost to the Owner. The Engineer will provide the Contractor with the State Plane Coordinates for each structure location for his use in staking the structure locations.

1.2 ON PRIVATE PROPERTY

A. The Contractor shall comply with all the limitations and provision of the Owner easements and agreements. The Contractor shall examine these easements and agreements before beginning the work and shall comply with all provisions thereof. The Contractor shall enter proposed rights-of-way only after the Owner notifies him that easements and/or agreements for the specific section of line have been obtained. Problems involving rights-of-way shall be immediately reported to the Owner.

B. The Contractor shall, whenever practicable, use existing roads or lanes to gain access to the construction area and shall, as far as reasonably possible, stay upon property to which the Owner has acquired rights of entry or occupancy.

C. In those cases where the Contractor finds it necessary to enter upon, travel across, or otherwise use privately owned land outside of the rights of such land acquired by the Owner in its right-of-way agreements, the Contractor shall make all necessary arrangements of agreements with the landowners involved for such right of entry and use of their property. The Contractor shall obtain agreement from each property owner and tenant setting forth the Contractor's right of entry and use of the property.

1.3 TREATMENT OF COMPLAINTS AND CLAIMS FOR DAMAGES

A. The Contractor shall promptly comply with all reasonable requests of the landowners and tenants, relative to access to right-of-way and to the general conduct of his work. In cases of disagreement between any landowner or tenant and the Contractor, the Contractor shall notify the Owner immediately, and shall not perform any further operations against the objections of the property owner or tenant without prior approval of the Owner. In the event of any claim for damages by a landowner or tenant the Contractor shall notify the Owner immediately. Damage releases taken by the Contractor from any landowner or tenant shall also name and release the Owner. One (1) copy of all releases obtained by the Contractor shall be forwarded to the Owner.

B. At the termination of the Contractor's work, final settlement of property owners' crop damage claims and other damages, if any, are to be settled and paid by the Contractor. Release forms from all property owners and/or tenants are to be obtained by the Contractor and submitted to Owner prior to final payment by Owner.

C. Such damage to fences, crops, livestock or other personal property, caused by the acts of the contractor, his subcontractors, agents or employees, not mutually agreed upon, shall be ascertained and determined by three (3) disinterested persons, one thereof to be appointed by the Grantor, one by the Contractor, and the third by the two so appointed as aforesaid, and the award of the three such persons shall be final and conclusive and no action shall be brought or maintained for damages until the amount thereof shall have been determined as above provided.

1.4 PROTECTION OF IMPROVEMENTS

A. The Contractor shall take suitable measures to prevent damage to improvements such as lawns, roads, fences, buildings, drains, bridges and pipe lines by the passage of his equipment or by tree felling, burning, and spraying, and shall assume sole responsibility and liability for damages thereby incurred. Owners shall be promptly notified of any pipe lines that are broken by the Contractor's operations, and the Contractor shall make prompt arrangements for their repair. Any damages to dikes, levees, or other water control structures must be repaired on the same day on which the damage is done. Damage to all improvements shall be repaired as required to place such improvements back into as good condition as before the damage was done, and to the satisfaction of the property owner.

RIGHT-OF-WAY

SECTION 01500 - ACCESS ROADS AND FENCES

SECTION 01500 - ACCESS ROADS AND FENCES

2.1 ACCESS ROADS

A. The Contractor shall assume all costs arising from crop damages or other damages which result from his use of alternate access road locations.

B. The Contractor shall, on all access routes, be responsible for all surfacing, drainage, and other such maintenance as may be required for his operations whether on or off the transmission line right-of-way.

C. Any access road used jointly by the Contractor and the property owner or tenant shall be maintained during the construction period so as to be passible at all times for vehicles used by property owner or tenant. On public roads and bridges, limitations on roads, and hauling under adverse road and weather conditions, shall be conformed to by the Contractor. At certain locations, access will be through farm yards of the property owners or tenants. At such locations, the Contractor will be required to exercise care and courtesy in the use of access facilities, by careful driving of equipment, keeping gates closed, and exercising all reasonable precautions to prevent damage to property and injury to persons. At the termination of his work, the Contractor shall be responsible for any necessary repairs to access roads, fences and gates he has used, on private property, to the satisfaction of the property owner or tenant. He shall also make such repairs to public roads and bridges, or pay for the same, as the public authorities may judge to be his responsibility.

2.2 FENCES AND GATES

A. The Contractor shall take down such fences on the right-of-way as may be necessary for the work. He shall, however, during construction, maintain the fences to the extent that they retain their intended usefulness. Upon completion of the construction all fences shall be restored to a condition as good or better than they were found. Farm type gap gates, which meet the approval of the Owner, shall be furnished and installed by the Contractor where required. Where farm type gap gates are put in by the Contractor, as ordered by the Owner, the posts on each side of the gate must be braced with a four (4) inch post, eight (8) feet long, nailed firmly to the fence post and braced into the ground against a two (2) inch by six (6) inch stake driven down two (2) feet into the ground. Wires to be firmly attached to braced posts before wire is cut for gap. The cost of this work shall be considered as having been included in the price stipulated for the appropriate items of the Contract.

B. At completion of the work, if requested by the subject property owner, gates shall be removed and the resulting fence opening permanently closed by the Contractor. The Contractor will provide, at his expense, appropriate sizes and types of compression sleeves for the purpose of splicing fence wires. The Contractor shall also provide the proper tools for the installation of these compression splices. Nicropress tools and sleeves, or equivalent make, will be considered as meeting these requirements.

WORK WITHIN ROADWAY RIGHT-OF-WAY REQUIREMENTS

SECTION 01600 - TEMPORARY TRAFFIC CONTROL & PERMITS

INDEX PAGE

SECTION 01600 - TEMPORARY TRAFFIC CONTROL & PERMITS

2.1 TEMPORARY TRAFFIC CONTROL - CITY ORDINANCE

A. CITY OF GRAND ISLAND ORDINANCE NO. 9289 - TEMPORARY TRAFFIC CONTROL

This ordinance below was adopted by the City February 8, 2011. Areas outside the City Limits would fall under the same MUTCD requirements.

B. ORDINANCE NO. 9289 - Temporary Traffic Control.

Part VI of the Manual on Uniform Traffic Control Devices (MUTCD) is the national standard for work zone traffic control. The current version shall be followed.

Any contractor, utility company, or any other person, firm or corporation performing work within the right-of-way of any public street, public way, or alley in the City of Grand Island shall install and maintain Temporary Traffic Control (TTC) in accordance with the standards of the MUTCD.

Approval of permits to work within public right of way may be contingent upon evidence of capability to provide, install and maintain TTC devices in accordance with the MUTCD and these provisions.

The Director of Public Works or their representative shall have the authority to direct corrective actions for TTC not in compliance with the MUTCD and these provisions. These actions include suspending operations and requiring removal of all equipment and materials from the right of way.

If the TTC is left in place longer than 4 hours and no personnel are on the site, the individual responsible for installing the TTC shall provide telephone numbers of personnel who will be available on 24 hours per day, seven days per week basis to the Director of Public Works. These people shall be responsible for repair, correction, replacement and maintenance of the traffic control devices. These people shall perform inspections of the TTC at the site twice during the day and once during the night every 24 hours until the work is completed and the right of way is cleared.

2.2 RIGHT-OF-WAY PERMITS

The City of Grand Island has obtained a permit for the required work from the Hall County Highway Department. The Contractor shall be responsible for complying with all requirements of the associated permit. Refer to the provided Permit for details.

When it becomes necessary to occupy a portion of a roadway during the execution of this work, the Contractor shall notify the Hall County Highway Department, 2900 West Second Street, Grand Island, NE 68803; (308) 385-5126, at least seventy two (72) hours in advance. The closing of individual roadways or intersections will only be allowed with prior approval of the appropriate Authority having jurisdiction.

2.3 BARRICADES AND WARNING SIGNS

The Contractor shall be responsible for furnishing, installing, and maintaining all barricades, warning signs, or flashing lights adjacent to all work areas and/or coordination of any required detours. Placement and use of reflectorized materials, etc. shall be according to the MUTCD and all revisions thereto published under the direction of the Federal Highway Administration.

In situations where sight distance is limited, or where other safety conditions dictate, the Contractor shall provide additional means of controlling traffic, including but not limited to furnishing flaggers. Flaggers shall be properly attired with vest, head gear and stop/slow paddles, and used according to MUTCD flagging and signage procedures. No separate payment shall be made for the use of flaggers and they shall be considered inclusive for traffic control.

The placement of barricades and warning signs provided by the Contractor shall be as show on the following drawings labeled "TYPICAL TRAFFIC CONTROL PLAN".

2.4 WORK WITHIN THE RIGHT-OF-WAY

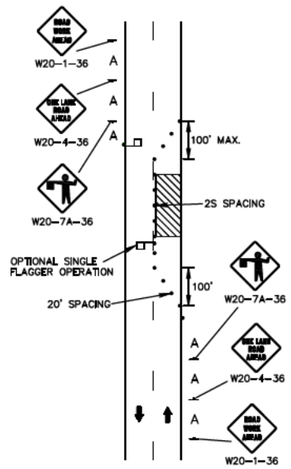
All supplies, materials and/or equipment that may serve as obstructions to traffic shall be properly protected and enclosed by fences or barricades, and not stored within the right-of-way. However, materials waiting to be installed during the construction work day may be placed within the right-of-way, provided they do not limit nor interfere with public access and safety.

Vehicles and equipment, when not in use with the construction work within the right-of-way, shall be kept a minimum of thirty (30) feet from the edge of the surfaced shoulder or roadway.

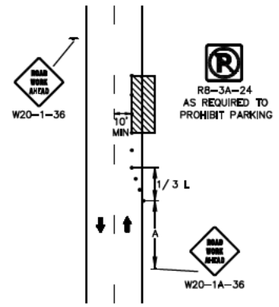
SECTION 01600 - TEMPORARY TRAFFIC CONTROL & PERMITS

All workers within the right-of-way, who are exposed to vehicles using the right-of-way or to construction equipment within the work area, shall wear high-visibility and reflective personal protective safety clothing. Such clothing shall be suitable during both daytime and nighttime usage, and meet the performance Class 2 or Class 3 requirements of ANSI / ISEA 107-2004 publication entitled "American National Standards for High-Visibility Safety Apparel and Headwear."

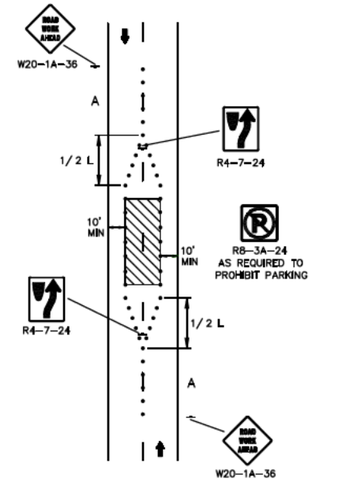
PROJECT NO.	SHEET NO.



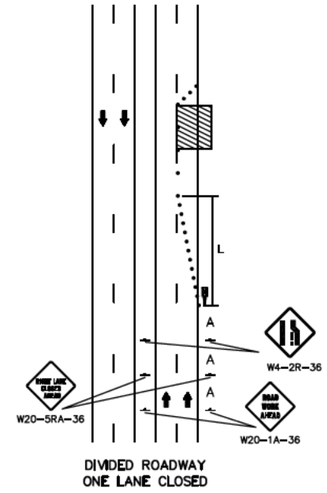
ONE LANE CLOSED WITH FLAGGER



SHOULDER OR PARKING LANE CLOSED



WORK IN CENTER OF ROAD WITH LOW TRAFFIC VOLUMES



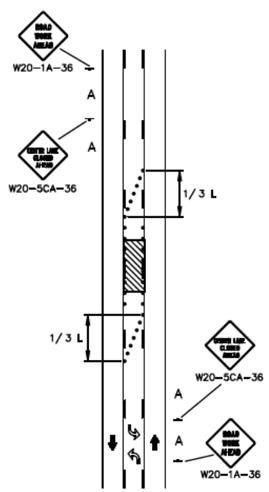
DIVIDED ROADWAY
ONE LANE CLOSED

LEGEND

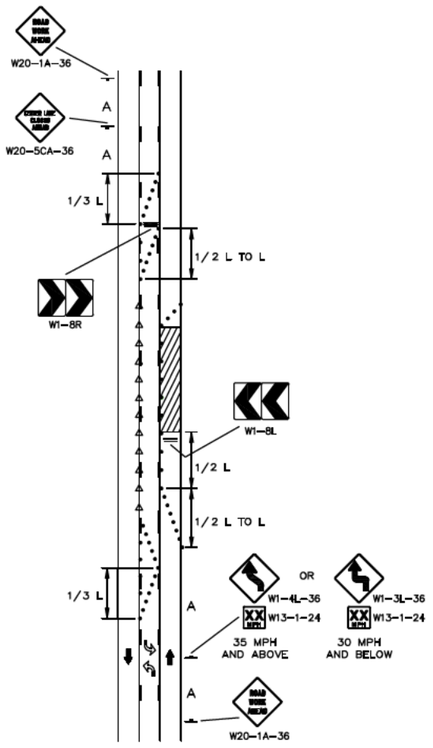
- FLASHING ARROW PANEL
- TYPE III BARRICADE
- REFLECTORIZED PLASTIC DRUM OR TYPE II BARRICADE (SEE NOTE 6)
- SIGN
- 28" CONES OR 28" TUBULAR POST

TAPER FORMULA

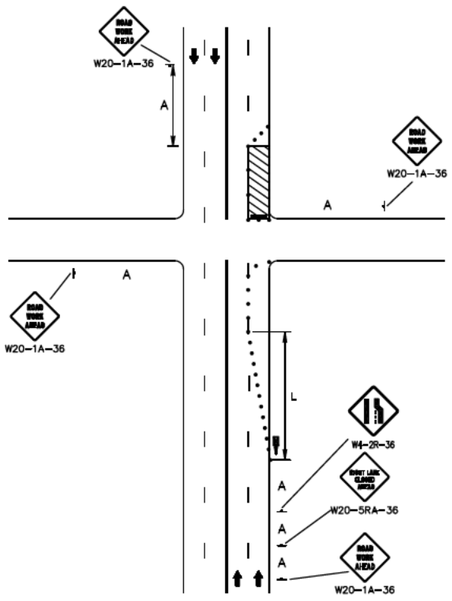
- L = MERGING TAPER
- L/2 = SHIFTING TAPER
- L/3 = SHOULDER TAPER
- L = W x S FOR SPEEDS OF 45 MPH OR HIGHER
- L = $\frac{WS^2}{60}$ FOR SPEEDS OF 40 MPH OR LOWER
- L = MINIMUM LENGTH OF TAPER
- S = NUMERICAL VALUE OF POSTED SPEED LIMIT PRIOR TO WORK
- W = WIDTH OF OFFSET



TWO-WAY LEFT TURN LANE CLOSED



3-LANE ROADWAY
ONE LANE CLOSED



LANE CLOSED NEAR INTERSECTION
(RIGHT LANE CLOSED)

GENERAL NOTES

1. ALL BARRICADE AND SIGN LOCATIONS ON THIS PLAN ARE APPROXIMATE, AND MAY BE ADJUSTED TO FIT FIELD CONDITIONS. THE SIGNS SHALL BE INSTALLED SO AS NOT TO OBSCURE THE VIEW OF OTHER TRAFFIC CONTROL DEVICES.
2. MINIMUM WIDTH OF TRAVELLED LANE SHALL BE AS REQUIRED BY THE ENGINEER.
3. FLASHING ARROW PANEL REQUIRED ON ALL ROADWAYS WITH POSTED SPEED LIMIT 45 MPH OR HIGHER.
4. LONG TERM FLASHING ARROW PANELS IN URBAN RESIDENTIAL AREAS WHERE DIESEL ENGINE NOISE WILL BE DISRUPTIVE TO RESIDENTS, MAY BE REQUIRED TO OPERATE BY 120 VAC OR, IF SIGHT DISTANCE ALLOWS A SOLAR POWERED ARROW PANEL MAY BE USED.
5. THE MAXIMUM SPACING BETWEEN CHANNELIZING DEVICES IN A TAPER SHOULD BE APPROXIMATELY EQUAL IN FEET TO THE SPEED LIMIT. WHERE USED ALONG THE WORK AREA, THE SPACING MAY BE INCREASED TO TWO S SPACING.
6. SUBSTITUTION OF CONES, IF IN ACCORDANCE WITH SECTION 6F.64 OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, IS PERMITTED.

ROAD TYPE	MINIMUM DISTANCE BETWEEN SIGNS
	A
URBAN (LOW SPEED – 25 MPH TO 40 MPH)	150
URBAN (HIGH SPEED – GREATER THAN 45 MPH)	350

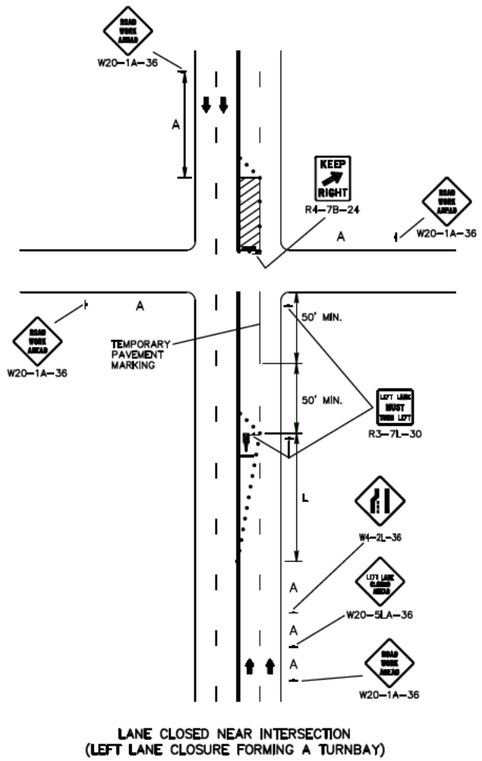
This document originaly sealed 6/22/2011 by Terry A. Brown, E-8731, Use For Reference

CITY OF GRAND ISLAND
ENGINEERING DIVISION

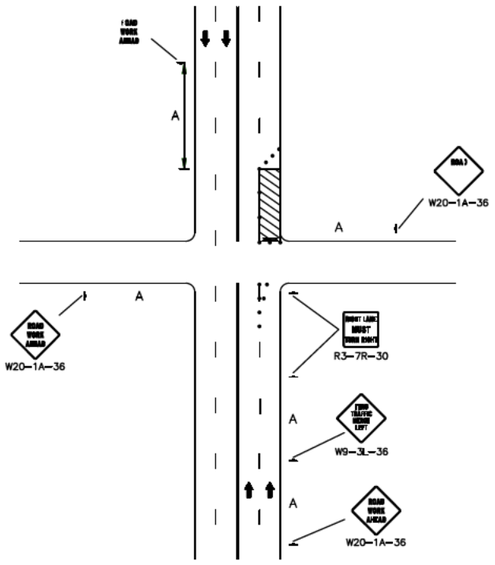
TYPICAL TRAFFIC CONTROL PLAN

DESIGNED 12/10 SG	TYPICAL URBAN TRAFFIC CONTROL PLAN	1/2
REVIEWED		

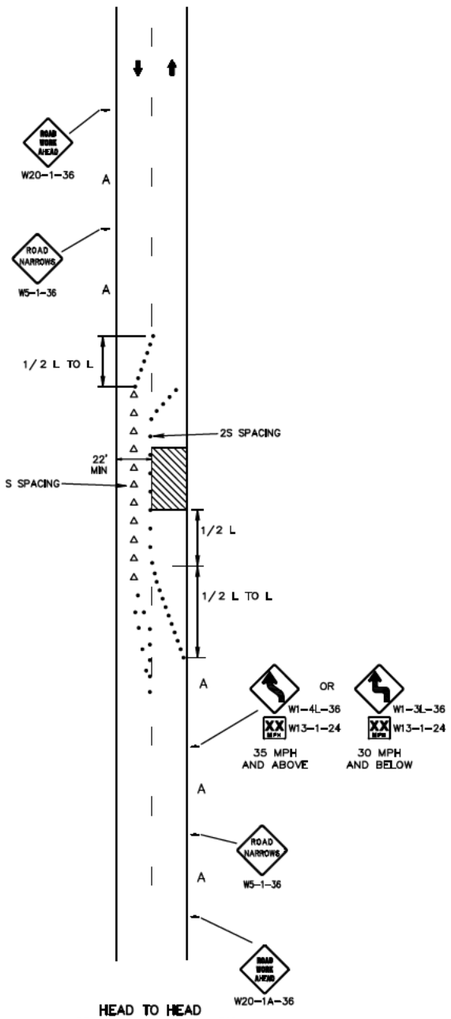
PROJECT NO.	SHEET NO.



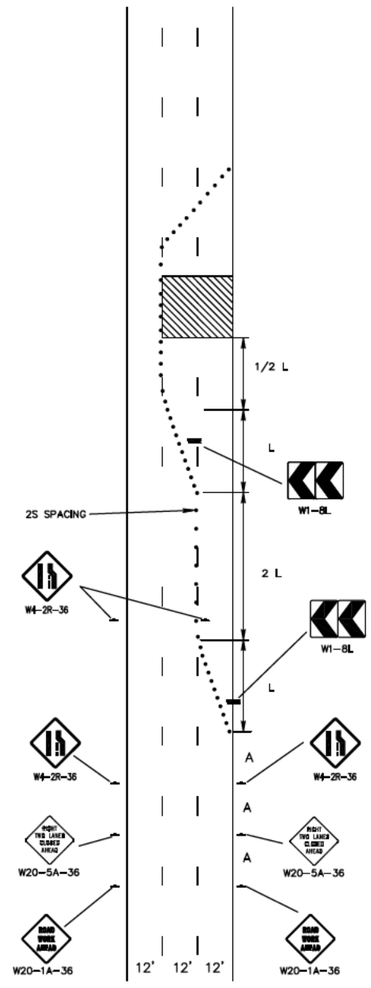
LANE CLOSED NEAR INTERSECTION
(LEFT LANE CLOSURE FORMING A TURNBAY)



LANE CLOSED NEAR INTERSECTION
(RIGHT LANE REMAINS OPEN)



HEAD TO HEAD
SPEEDS BELOW 40 MPH

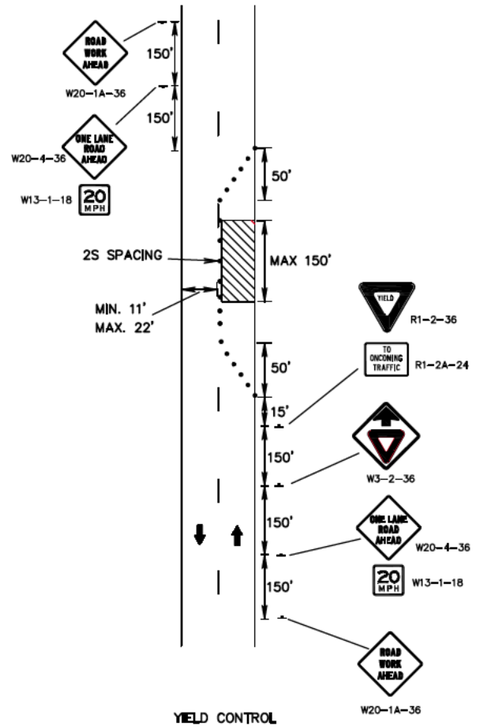


MULTIPLE LANE CLOSURE

MERGING TAPER (L) 12' WIDTH

SPEED	DESCRIPTION
25	8 CONES AT 20' SPACES
30	10 CONES AT 20' SPACES
35	11 CONES AT 25' SPACES
40	11 CONES AT 35' SPACES
45	13 CONES AT 45' SPACES

S = POSTED SPEED LIMIT



YIELD CONTROL
USE FOR SPEED LIMITS OF 40 OR BELOW
USE ON CITY STREETS ONLY

CITY OF GRAND ISLAND
ENGINEERING DIVISION

TYPICAL TRAFFIC CONTROL PLAN

DESIGNED 12/10 SG	TYPICAL URBAN TRAFFIC CONTROL PLAN	2/2
REVIEWED		

RIGHT-OF-WAY

SECTION 02780 - HIGHWAYS, RAILROADS, TRANSMISSION

PIPELINES AND TELEPHONE LINES

INDEX PAGE

SECTION 02780 - HIGHWAYS, RAILROADS, TRANSMISSION PIPELINES AND TELEPHONE LINES

3.1 HIGHWAYS, RAILROADS, TRANSMISSION AND TELEPHONE LINES

A. The Contractor shall make such provisions as may be necessary or required because of traffic or service of any highways or roads, railroads, transmission or telephone lines, all in a manner satisfactory to Owner or operator thereof and to the Owner's Representative. The cost of providing and maintaining all necessary watchmen, signals, guards, temporary structures, etc; of making any necessary repairs, replacements or similar operations; of furnishing indemnity of other bonds if required; and all or any other costs required by this paragraph shall be borne by the Contractor and shall be included in the contract price.

3.2 WORK ON AND ACROSS HIGHWAYS

A. Crossings of highway or road right-of-way shall be made with rubber tired equipment.

B. The Contractor shall not proceed with structure erection, including guard structures, or wire stringing operations on or across highway property without authorization from the Owner.

3.3 WORK ON AND ACROSS RAILROADS

A. The Contractor shall contact each of the railroad companies where work is to be done across or parallel to their facilities. The Contractor shall be responsible for notifying each of the railroad companies of all pertinent details concerning the work and for insuring all necessary precautions are taken to protect the Contractor's and the railroads' equipment, personnel, and property. Such work must be coordinated as to result in the minimum interference to movement of trains. The Contractor shall obtain Railroad Protective Liability Insurance in the limits required by each of the railroad companies to cover the work to be done on the railroad's property. The Contractor shall also have the railroad provide flagmen as required. All expenses in providing such protection, including Railroad Protective Liability Insurance and flagmen, shall be included in the contract price and paid by the Contractor. The City will assist in any arrangements, but will not be responsible for them or their costs.

B. Vehicle crossings of railroad right-of-way, including crossings by rubber tired equipment, shall be made only at established road crossings. If it becomes imperative, in the Contractor's opinion, to cross a railroad at an unestablished crossing other than by foot, the Contractor shall submit a request to the Owner in sufficient time and with appropriate information to permit the Owner to negotiate with the railroad company prior to the time the crossing is required by the Contractor.

C. The Contractor shall not proceed with structure erection, including guard structures, or wire stringing operations on or across railroad property without authorization from the Owner.

D. The Contractor shall follow and be bound by the requirements of the Agreement between the City of Grand Island and the BNSF Railroad dated March 17, 2011, Tracking # 11-42157. A copy of this agreement is included following this section.

E. Prior to entering the Railroad's Premises, the Contractor shall complete the safety-training program at the following Internet Website "http://www.contractororientation.com". This training must be completed no more than one year in advance of the Contractor's entry on the Railroad's Premises.

F. A copy of the executed Agreement between the City of Grand Island and the BNSF Railroad dated March 17, 2011, Tracking # 11-42157 must be available upon request at the job site allowing authorization to do the work. The Contractor shall contact the BNSF Roadmaster at (402) 362-5501 or cell (402) 429-4055, ten (10) days in advance of entry and Before You Dig, Call 1-800-533-2891.

3.4 WORK ON AND ACROSS GAS OR PETROLEUM PIPELINES

A. The Contractor shall contact each of the pipeline companies where work is to be done across or parallel to their facilities. The Contractor shall be responsible for notifying each of the pipeline companies of all pertinent details concerning the work and for insuring all necessary precautions are taken to protect the pipeline company's property.

B. No heavy equipment shall enter any pipeline easement or cross any pipelines without the review by the pipeline owner of the size and weight of that equipment. Special mitigation measures may be necessary before such a crossing may be made. Diggers Hotline of Nebraska shall be

contacted forty-eight (48) hours before beginning anywhere near or within the pipeline easement. The pipeline owner must be notified in advance and must have its own personnel on-site before any equipment is moved or located twenty-five (25) feet or closer to any pipeline or pipeline easement.

C. The Contractor shall be responsible for any special mitigation measures such as the installation and removal of temporary steel plates to allow for the crossing of equipment across the pipeline easement.

3.5 OVERBUILDS, TRANSFERS, REMOVALS

A. Where it is necessary to overbuild an existing electric or telephone circuit, the Contractor shall lean or build through such circuit at his expense. In the event the Contractor is requested to lean, transfer or remove existing circuits because of the requirements of either the Owner or a third party, such work shall be considered as extra work.

JONES LANG LASALLE

Jones Lang LaSalle Americas, Inc.
3017 Lou Menk Drive, Suite 100
Fort Worth, Texas 76131-2800
tel +1 817-230-2600, fax +1 817 306-8265

March 17, 2011

Tracking #11-42157

Mr Travis W Burdett
Assistant Utilities Director
City of Grand Island
P O Box 1968
Grand Island, Nebraska 68801

Dear Mr Burdett:

Enclosed please find one (1) fully executed Agreement for your file. **A copy of the executed Agreement must be available upon request at the job site allowing authorization to do the work.** Please contact the Roadmaster at 402-362-5501 or cell 402-429-4055, ten (10) days in advance of entry and **BEFORE YOU DIG, CALL 1-800-533-2891**.

If you need additional information please contact me at (817) 230-2634.

Sincerely,

Camille Barbosa

Camille Barbosa
Contract Specialist

Enclosures

Cc: Don Marget, BNSF - Don.Marget@bnsf.com

LICENSE FOR ELECTRIC SUPPLY LINE
ACROSS OR ALONG RAILWAY PROPERTY
(Electric Light, Power Supply, Irrespective of Voltage, Overhead or Underground)

THIS LICENSE ("License"), made as of the 17th day of March, 2011 ("Effective Date") by and between **BNSF RAILWAY COMPANY**, a Delaware corporation ("Licensor"), and **CITY OF GRAND ISLAND**, a Nebraska corporation ("Licensee").

NOW THEREFORE, in consideration of the mutual covenants contained herein, the parties agree to the following:

GENERAL

1. Licensor hereby grants Licensee a non-exclusive license, subject to all rights, interests, and estates of third parties including, without limitation, any leases, use rights, easements, liens or other encumbrances, and upon the terms and conditions set forth below, to construct, maintain, and use in strict accordance with the drawings and specifications approved by Licensor as part of Licensee's application process ("the Drawings and Specifications") an electric supply line containing a maximum of eight (8) cables, together with its supporting or containing structures ("Electric Supply Line") across or along the premises of Licensor at or near the station of Grand Island, County of Hall, State of Nebraska, Line Segment 0004, Mile Post 99.57, shown by bold line upon the Drawing No. 1-50962 dated February 11, 2011, marked "Exhibit A", attached hereto and made a part hereof ("Premises").

2. Licensee shall not disturb any improvements of Licensor or Licensor's existing lessees, Licensees, easement beneficiaries or lien holders, if any, or interfere with the use of such improvements.

3. Licensee shall use the Premises solely for construction, maintenance, and use of an Electric Supply Line in accordance with the Drawings and Specifications. Licensee shall not use the Premises for any other purpose. Licensee shall not use or store hazardous substances, as defined by the Comprehensive Environmental Response, Compensation, and Liability Act, as amended ("CERCLA") or petroleum or oil as defined by applicable Environmental Laws on the Premises.

4. In case of the eviction of Licensee by anyone owning or claiming title to or any interest in the Premises, Licensor shall not be liable to refund Licensee any compensation paid hereunder or for any damage Licensee sustains in connection therewith.

5. Any contractors or subcontractors performing work on the Electric Supply Line or entering the Premises on behalf of Licensee, shall be deemed servants and agents of Licensee for purposes of this License.

TERM

6. This License shall commence on the Effective Date and shall continue for a period of twenty-five (25) years, subject to prior termination as hereinafter described.

COMPENSATION

7. (a) Licensee shall pay Licensor, prior to the Effective Date, the sum of Twenty Five Hundred and No/100 Dollars ($2,500) as compensation for the use of the Premises.

(b) Licensee agrees to reimburse Licensor (within thirty (30) days after receipt of bills therefor) for all costs and expenses incurred by Licensor in connection with Licensee's use of the Premises or the presence, construction, maintenance, and use of the Electric Supply Line, including but not limited to the furnishing of Licensor's Flagman and any vehicle rental costs incurred. The cost of flagger services provided by the Railway, when deemed necessary by the Railway's representative, will be borne by the Licensee. The estimated cost for one (1) flagger is $800.00 for an eight (8) hour basic day with time and one-half or double time for overtime, rest days and holidays. The estimated cost for each flagger includes vacation allowance, paid holidays, Railway and unemployment insurance, public liability and property damage insurance, health and welfare benefits, transportation, meals, lodging and supervision. Negotiations for Railway labor or collective bargaining agreements and rate changes authorized by appropriate Federal authorities may increase actual or estimated flagging rates. The flagging rate in effect at the time of performance by the Contractor hereunder will be used to calculate the actual costs of flagging pursuant to this paragraph.

(c) All invoices are due thirty (30) days after the date of invoice. In the event that Licensee shall fail to pay any monies due to Licensor within thirty (30) days after the invoice date, then Licensee shall pay interest on such unpaid sum from thirty (30) days after its invoice date to the date of payment by Licensee at an annual rate equal to (i) the greater of (a) for the period January 1 through June 30, the prime rate last published in *The Wall Street Journal* in the preceding December plus two and one-half percent (2 1/2%), and for the period July 1 through December 31, the prime rate last published in *The Wall Street Journal* in the preceding June plus two and one-half percent (2 1/2%), or (b) twelve percent (12%), or (ii) the maximum rate permitted by law, whichever is less.

COMPLIANCE WITH LAWS

8. (a) Licensee shall observe and comply with any and all laws, statutes, regulations, ordinances, orders, covenants, restrictions, or decisions of any court of competent jurisdiction ("Legal Requirements") relating to the construction, maintenance and use of the Electric Supply Line and the use of the Premises.

(b) Prior to entering the Premises, Licensee shall and shall cause its contractor to comply with all Licensor's applicable safety rules and regulations. Prior to commencing any work on the Premises, Licensee shall complete and shall require its contractor to complete the safety-training program at the following Internet Website "http://www.contractororientation.com". This training must be completed no more than one year in advance of Licensee's entry on the Premises.

DEFINITION OF COST AND EXPENSE

9. For the purpose of this License, "cost' or "costs" "expense" or "expenses" includes, but is not limited to, actual labor and material costs including all assignable additives, and material and supply costs at current value where used.

RIGHT OF LICENSOR TO USE

10. Licensor excepts and reserves the right, to be exercised by Licensor and any other parties who may obtain written permission or authority from Licensor:

(a) to maintain, renew, use, operate, change, modify and relocate any existing pipe, power, communication lines and appurtenances and other facilities or structures of like character upon, over, under or across the Premises;

(b) to construct, maintain, renew, use, operate, change, modify and relocate any tracks or additional facilities or structures upon, over, under or across the Premises; or

(c) to use the Premises in any manner as the Licensor in its sole discretion deems appropriate, provided Licensor uses all commercially reasonable efforts to avoid material interference with the use of the Premises by Licensee for the purpose specified in Section 3 above.

LICENSEE'S OPERATIONS

11. (a) Licensee shall notify Licensor's Roadmaster at 14th & Grant Ave, York, Nebraska 68467, telephone 402-362-5501 or cell 402-429-4055, at least ten (10) business days prior to construction of the Electric Supply Line and prior to entering the Premises for any subsequent maintenance thereon.

(b) In performing the work described in Section 3, Licensee shall use only public roadways to cross from one side of Licensor's tracks to the other.

12. (a) Licensee shall, at its sole cost and expense, construct and at all times maintain the Electric Supply Line in accordance with the National Electric Code.

(b) If the operation or maintenance of said Electric Supply Line shall at any time cause interference, including but not limited to physical interference from electromagnetic induction, electrostatic induction, or from stray or other currents, with the facilities of the Licensor or of any lessee or Licensee of the Licensor, or in any manner interfere with the operation, maintenance, or use by the Licensor of its right-of-way, tracks, structures, pole lines, signal and communication lines, radio, or other equipment, devices, other property or appurtenances thereto, Licensee agrees immediately to make such changes in its Electric Supply Line and furnish such protective devices and/or replacement equipment to Licensor and its lessees or Licensees as shall be necessary, in the judgement of the Licensor's representative, to eliminate such interference. The cost of such protective devices and their installations shall be borne solely by Licensee. If any of the interference covered by this paragraph shall be, in the judgement of the Licensor, or such importance to the safety of the Licensor's operations as to

require immediate corrective action, Licensee, upon notice from the Licensor, shall either, at the Licensor's election, cease using said Electric Supply Line for any purpose whatsoever and remove same, or reduce the voltage or load on said Electric Supply Line, or take such other interim protective measures as the Licensor may deem advisable, until the protective devices and/or replacement equipment required by this paragraph have been installed, put in operation, tested, and found to be satisfactory to correct the interference.

13. (a) Under no conditions shall Licensee be permitted to conduct any tests, investigations or any other activity using mechanized equipment and/or machinery, or place or store any mechanized equipment, tools or other materials, within twenty-five (25) feet of the centerline of any railroad track on the Premises unless Licensee has obtained prior written approval from Licensor. Licensee shall, at its sole cost and expense, perform all activities on and about the Premises in such a manner as not at any time to be a source of danger to or interference with the existence or use of present or future tracks, roadbed or property of Licensor, or the safe operation and activities of Licensor. If ordered to cease using the Premises at any time by Licensor's personnel due to any hazardous condition, Licensee shall immediately do so. Notwithstanding the foregoing right of Licensor, the parties agree that Licensor has no duty or obligation to monitor Licensee's use of the Premises to determine the safe nature thereof, it being solely Licensee's responsibility to ensure that Licensee's use of the Premises is safe. Neither the exercise nor the failure by Licensor to exercise any rights granted in this Section will alter the liability allocation provided by this License.

(b) Licensee shall, at its sole cost and expense, and subject to the supervision of Licensor's Roadmaster, locate, construct and maintain the Electric Supply Line in such a manner and of such material that it will not at any time be a source of danger to or interference with the existence or use of present or future tracks, roadbed or property of Licensor, or the safe operation and activities of its railroad. Further, the Electric Supply Line shall be constructed, installed and maintained in conformity with the plans and specifications shown on the print attached hereto as Exhibit A and made a part hereof (which, if present, are to be deemed part of the Drawings and Specifications). Licensor may direct one of its field engineers to observe or inspect the construction and/or maintenance of the Electric Supply Line at any time for compliance with the Drawings and Specifications. If ordered at any time to halt construction or maintenance of the Electric Supply Line by Licensor's personnel due to non-compliance with the same or any other hazardous condition, Licensee shall immediately do so. Notwithstanding the foregoing right of Licensor, the parties agree that Licensor has no duty or obligation to observe or inspect, or to halt work on, the Electric Supply Line, it being solely Licensee's responsibility to ensure that the Electric Supply Line is constructed in strict accordance with the Drawings and Specifications and in a safe and workmanlike manner in compliance with all terms hereof. Neither the exercise nor the failure by Licensor to exercise any right granted by this Section will alter in any way the liability allocation provided by this License. If at any time Licensee shall, in the sole judgment of Licensor, fail to properly perform its obligations under this Section, Licensor may, at its option and at Licensee's sole expense, arrange for the performance of such work as it deems necessary for the safety of its operations and activities. Licensee

shall promptly reimburse Licensor for all costs and expenses of such work, upon receipt of an invoice for the same. Licensor's failure to perform any obligations of Licensee shall not alter the liability allocation hereunder.

14. Licensee shall, at its sole cost and expense, remove all combustible material from around wooden poles and will at all times keep the space around such poles free of such material, and if removal of such combustible material shall not be attended to with fifteen (15) days after having been requested by Licensor to do so, Licensor shall have the right itself to perform the work and Licensee hereby agrees to reimburse Licensor for the expense so incurred.

15. During the construction and any subsequent maintenance performed on Electric Supply Line, Licensee shall perform such work in a manner to preclude damage to the property of Licensor, and preclude interference with the operation of its railroad. The construction of the Electric Supply Line shall be completed within one (1) year of the Effective Date. Upon completion of the construction of the Electric Supply Line and after performing any subsequent maintenance thereon, Licensee shall, at Licensee's own cost and expense, restore Licensor's premises to their former state as of the Effective Date of this License.

16. If at any time during the term of this License, Licensor shall desire the use of its rail corridor in such a manner as would, in Licensor's reasonable opinion, be interfered with by the Electric Supply Line, Licensee shall, at its sole expense, within thirty (30) days after receiving written notice from Licensor to such effect, make such changes in the Electric Supply Line as in the sole discretion of Licensor may be necessary to avoid interference with the proposed use of Licensor's rail corridor, including, without limitation, the relocation of the existing or the construction of a new Electric Supply Line.

17. (a) Prior to Licensee conducting any boring work on or about any portion of the Premises, Licensee shall explore the proposed location for such work with hand tools to a depth of at least three (3) feet below the surface of the ground to determine whether pipelines or other structures exist below the surface, provided, however, that in lieu of the foregoing, the Licensee shall have the right to use suitable detection equipment or other generally accepted industry practice (e.g., consulting with the Underground Services Association) to determine the existence or location of pipelines and other subsurface structures prior to drilling or excavating with mechanized equipment. Upon Licensee's written request, which shall be made thirty (30) business days in advance of Licensee's requested construction of the Electric Supply Line, Licensor will provide Licensee any information that Licensor's Engineering Department has in its possession concerning the existence and approximate location of Licensor's underground utilities and pipelines at or near the vicinity of the proposed Electric Supply Line. Prior to conducting any such boring work, the Licensee will review all such material. Licensor does not warrant the accuracy of information relating to subsurface conditions and Licensee's operations will be subject at all times to the liability provisions herein.

(b) For all bores greater than 26-inch diameter and at a depth less than 10.0 feet below bottom of rail, a soil investigation will need to be performed by the Licensee and reviewed by Licensor prior to construction. This study is to determine if granular material is present, and to prevent subsidence during the installation process. If the investigation determines in Licensor's reasonable

opinion that granular material is present, Licensor may select a new location for Licensee's use, or may require Licensee to furnish for Licensor's review and approval, in its sole discretion a remedial plan to deal with the granular material. Once Licensor has approved any such remedial plan in writing, Licensee shall, at its sole cost and expense, carry out the approved plan in accordance with all terms thereof and hereof.

18. Any open hole, boring or well constructed on the Premises by Licensee shall be safely covered and secured at all times when Licensee is not working in the actual vicinity thereof. Following completion of that portion of the work, all holes or borings constructed on the Premises by Licensee shall be:

(a) filled in to surrounding ground level with compacted bentonite grout; or

(b) otherwise secured or retired in accordance with any applicable Legal Requirement. All excavated materials shall not remain on Licensor's property for more than ten (10) days and shall be properly disposed of by Licensee in accordance with applicable Legal Requirements.

19. Upon termination of this License, Licensee shall, at its sole cost and expense:

(a) remove all of its equipment from the Premises;

(b) remove the Electric Supply Line at Licensor's sole discretion;

(c) report and restore any damage to the Premises arising from, growing out of, or connected with Licensee's use of the Premises;

(d) remedy any unsafe conditions on the Premises created or aggravated by Licensee; and

(e) leave the Premises in the condition which existed as of the Effective Date of this License.

20. Licensee's on-site supervision shall retain/maintain a fully-executed copy of this License at all times while on the Premises.

LIABILITY

21. **(a) TO THE FULLEST EXTENT PERMITTED BY LAW, LICENSEE SHALL, AND SHALL CAUSE ITS CONTRACTOR TO, RELEASE, INDEMNIFY, DEFEND AND HOLD HARMLESS LICENSOR AND LICENSOR'S AFFILIATED COMPANIES, PARTNERS, SUCCESSORS, ASSIGNS, LEGAL REPRESENTATIVES, OFFICERS, DIRECTORS, SHAREHOLDERS, EMPLOYEES AND AGENTS (COLLECTIVELY, "INDEMNITEES") FOR, FROM AND AGAINST ANY AND ALL CLAIMS, LIABILITIES, FINES, PENALTIES, COSTS, DAMAGES, LOSSES, LIENS, CAUSES OF ACTION, SUITS, DEMANDS, JUDGMENTS AND EXPENSES (INCLUDING, WITHOUT LIMITATION, COURT COSTS, ATTORNEYS' FEES AND COSTS OF INVESTIGATION, REMOVAL AND REMEDIATION AND GOVERNMENTAL OVERSIGHT COSTS) ENVIRONMENTAL OR OTHERWISE (COLLECTIVELY**

"LIABILITIES") OF ANY NATURE, KIND OR DESCRIPTION OF ANY PERSON OR ENTITY DIRECTLY OR INDIRECTLY ARISING OUT OF, RESULTING FROM OR RELATED TO (IN WHOLE OR IN PART):

(i) THIS LICENSE, INCLUDING, WITHOUT LIMITATION, ITS ENVIRONMENTAL PROVISIONS,

(ii) ANY RIGHTS OR INTERESTS GRANTED PURSUANT TO THIS LICENSE,

(iii) LICENSEE'S OCCUPATION AND USE OF THE PREMISES,

(iv) THE ENVIRONMENTAL CONDITION AND STATUS OF THE PREMISES CAUSED BY OR CONTRIBUTED BY LICENSEE, OR

(v) ANY ACT OR OMISSION OF LICENSEE OR LICENSEE'S OFFICERS, AGENTS, INVITEES, EMPLOYEES, OR CONTRACTORS, OR ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY ANY OF THEM, OR ANYONE THEY CONTROL OR EXERCISE CONTROL OVER,

EVEN IF SUCH LIABILITIES ARISE FROM OR ARE ATTRIBUTED TO, IN WHOLE OR IN PART, ANY NEGLIGENCE OF ANY INDEMNITEE. THE ONLY LIABILITIES WITH RESPECT TO WHICH LICENSEE'S OBLIGATION TO INDEMNIFY THE INDEMNITEES DOES NOT APPLY ARE LIABILITIES TO THE EXTENT PROXIMATELY CAUSED BY THE GROSS NEGLIGENCE OR WILLFUL MISCONDUCT OF AN INDEMNITEE.

(b) FURTHER, TO THE FULLEST EXTENT PERMITTED BY LAW, NOTWITHSTANDING THE LIMITATION IN SECTION 21(a), LICENSEE SHALL, AND SHALL CAUSE ITS CONTRACTOR TO, NOW AND FOREVER WAIVE ANY AND ALL CLAIMS, REGARDLESS WHETHER BASED ON THE STRICT LIABILITY, NEGLIGENCE OR OTHERWISE, THAT RAILROAD IS AN "OWNER", "OPERATOR", "ARRANGER", OR "TRANSPORTER" WITH RESPECT TO THE ELECTRIC SUPPLY LINE FOR THE PURPOSES OF CERCLA OR OTHER ENVIRONMENTAL LAWS. LICENSEE WILL INDEMNIFY, DEFEND AND HOLD THE INDEMNITEES HARMLESS FROM ANY AND ALL SUCH CLAIMS REGARDLESS OF THE NEGLIGENCE OF THE INDEMNITEES. LICENSEE FURTHER AGREES THAT THE USE OF THE PREMISES AS CONTEMPLATED BY THIS LICENSE SHALL NOT IN ANY WAY SUBJECT LICENSOR TO CLAIMS THAT LICENSOR IS OTHER THAN A COMMON CARRIER FOR PURPOSES OF ENVIRONMENTAL LAWS AND EXPRESSLY AGREES TO INDEMNIFY, DEFEND, AND HOLD THE INDEMNITEES HARMLESS FOR ANY AND ALL SUCH CLAIMS. IN NO EVENT SHALL LICENSOR BE RESPONSIBLE FOR THE ENVIRONMENTAL CONDITION OF THE PREMISES.

(c) TO THE FULLEST EXTENT PERMITTED BY LAW, LICENSEE FURTHER AGREES, AND SHALL CAUSE ITS CONTRACTOR TO, REGARDLESS OF ANY NEGLIGENCE OR ALLEGED NEGLIGENCE OF ANY INDEMNITEE, TO INDEMNIFY, AND HOLD HARMLESS THE INDEMNITEES AGAINST AND

ASSUME THE DEFENSE OF ANY LIABILITIES ASSERTED AGAINST OR SUFFERED BY ANY INDEMNITEE UNDER OR RELATED TO THE FEDERAL EMPLOYERS' LIABILITY ACT ("FELA") WHENEVER EMPLOYEES OF LICENSEE OR ANY OF ITS AGENTS, INVITEES, OR CONTRACTORS CLAIM OR ALLEGE THAT THEY ARE EMPLOYEES OF ANY INDEMNITEE OR OTHERWISE. THIS INDEMNITY SHALL ALSO EXTEND, ON THE SAME BASIS, TO FELA CLAIMS BASED ON ACTUAL OR ALLEGED VIOLATIONS OF ANY FEDERAL, STATE OR LOCAL LAWS OR REGULATIONS, INCLUDING BUT NOT LIMITED TO THE SAFETY APPLIANCE ACT, THE BOILER INSPECTION ACT, THE OCCUPATIONAL HEALTH AND SAFETY ACT, THE RESOURCE CONSERVATION AND RECOVERY ACT, AND ANY SIMILAR STATE OR FEDERAL STATUTE.

(d) Upon written notice from Licensor, Licensee agrees to assume the defense of any lawsuit or other proceeding brought against any Indemnitee by any entity, relating to any matter covered by this License for which Licensee has an obligation to assume liability for and/or save and hold harmless any Indemnitee. Licensee shall pay all costs incident to such defense, including, but not limited to, attorneys' fees, investigators' fees, litigation and appeal expenses, settlement payments, and amounts paid in satisfaction of judgments.

PERSONAL PROPERTY WAIVER

22. ALL PERSONAL PROPERTY OF LICENSEE, INCLUDING, BUT NOT LIMITED TO, FIXTURES, EQUIPMENT, OR RELATED MATERIALS UPON THE PREMISES WILL BE AT THE RISK OF LICENSEE ONLY, AND NO INDEMNITEE WILL BE LIABLE FOR ANY DAMAGE THERETO OR THEFT THEREOF, WHETHER OR NOT DUE IN WHOLE OR IN PART TO THE NEGLIGENCE OF ANY INDEMNITEE.

INSURANCE

23. Licensee shall, at its sole cost and expense, procure and maintain during the life of this Agreement the following insurance coverage:

A. Commercial General Liability Insurance. This insurance shall contain broad form contractual liability with a combined single limit of a minimum of $2,000,000 each occurrence and an aggregate limit of at least $4,000,000. Coverage must be purchased on a post 1998 ISO occurrence or equivalent and include coverage for, but not limited to, the following:

- Bodily Injury and Property Damage
- Personal Injury and Advertising Injury
- Fire legal liability
- Products and completed operations

This policy shall also contain the following endorsements, which shall be indicated on the certificate of insurance:

- It is agreed that any workers' compensation exclusion does not apply to Licensor's payments related to the Federal Employers Liability Act or a Licensor Wage Continuation Program or similar programs and any payments made are deemed not to be either payments made or obligations assumed

under any Workers Compensation, disability benefits, or unemployment compensation law or similar law.

- The definition of insured contract shall be amended to remove any exclusion or other limitation for any work being done within 50 feet of railroad property.
- Any exclusions related to the explosion, collapse and underground hazards shall be removed.

No other endorsements limiting coverage may be included on the policy.

B. Business Automobile Insurance. This insurance shall contain a combined single limit of at least $1,000,000 per occurrence, and include coverage for, but not limited to the following:

- Bodily injury and property damage
- Any and all vehicles owned, used or hired

C. Workers Compensation and Employers Liability Insurance. This insurance shall include coverage for, but not limited to:

- Licensee's statutory liability under the worker's compensation laws of the state(s) in which the work is to be performed. If optional under State law, the insurance must cover all employees anyway.
- Employers' Liability (Part B) with limits of at least $500,000 each accident, $500,000 by disease policy limit, $500,000 by disease each employee.

D. Railroad Protective Liability Insurance. This insurance shall name only the Licensor as the Insured with coverage of at least $2,000,000 per occurrence and $6,000,000 in the aggregate. The coverage obtained under this policy shall only be effective during the initial installation and/or construction of the Electric Supply Line. **THE CONSTRUCTION OF THE ELECTRIC SUPPLY LINE SHALL BE COMPLETED WITHIN ONE (1) YEAR OF THE EFFECTIVE DATE.** If further maintenance of the Electric Supply Line is needed at a later date, an additional Railroad Protective Liability Insurance Policy shall be required. The policy shall be issued on a standard ISO form CG 00 35 10 93 and include the following:

- Endorsed to include the Pollution Exclusion Amendment (ISO form CG 28 31 10 93)
- Endorsed to include the Limited Seepage and Pollution Endorsement.
- Endorsed to include Evacuation Expense Coverage Endorsement.
- No other endorsements restricting coverage may be added.
- The original policy must be provided to the Licensor prior to performing any work or services under this Agreement

In lieu of providing a Railroad Protective Liability Policy, Licensee may participate in Licensor's Blanket Railroad Protective Liability Insurance Policy available to Licensee or its contractor. The limits of coverage are the same as above. The cost is $400.

☑ I **elect** to participate in Licensor's Blanket Policy;

☐ I **elect not** to participate in Licensor's Blanket Policy.

Other Requirements:

Where allowable by law, all policies (applying to coverage listed above) shall contain no exclusion for punitive damages and certificates of insurance shall reflect that no exclusion exists.

Licensee agrees to waive its right of recovery against Licensor for all claims and suits against Licensor. In addition, its insurers, through policy endorsement, waive their right of subrogation against Licensor for all claims and suits. The certificate of insurance must reflect waiver of subrogation endorsement. Licensee further waives its right of recovery, and its insurers also waive their right of subrogation against Licensor for loss of its owned or leased property or property under its care, custody or control.

Licensee's insurance policies through policy endorsement must include wording which states that the policy shall be primary and non-contributing with respect to any insurance carried by Licensor. The certificate of insurance must reflect that the above wording is included in evidenced policies.

All policy(ies) required above (excluding Workers Compensation and if applicable, Railroad Protective) shall include a severability of interest endorsement and shall name Licensor and Jones Lang LaSalle Global Services – RR, Inc. as an additional insured with respect to work performed under this agreement. Severability of interest and naming Licensor and Jones Lang LaSalle Global Services - RR, Inc. as additional insureds shall be indicated on the certificate of insurance.

Licensee is not allowed to self-insure without the prior written consent of Licensor. If granted by Licensor, any deductible, self-insured retention or other financial responsibility for claims shall be covered directly by Licensee in lieu of insurance. Any and all Licensor liabilities that would otherwise, in accordance with the provisions of this Agreement, be covered by Licensee's insurance will be covered as if Licensee elected not to include a deductible, self-insured retention, or other financial responsibility for claims.

Prior to commencing the Work, Licensee shall furnish to Licensor an acceptable certificate(s) of insurance including an original signature of the authorized representative evidencing the required coverage, endorsements, and amendments and referencing the contract audit/folder number if available. The policy(ies) shall contain a provision that obligates the insurance company(ies) issuing such policy(ies) to notify Licensor in writing at least 30 days prior to any cancellation, non-renewal, substitution or material alteration. This cancellation provision shall be indicated on the certificate of insurance. Upon request from Licensor, a certified duplicate original of any required policy shall be furnished.

Any insurance policy shall be written by a reputable insurance company acceptable to Licensor or with a current Best's Guide Rating of A- and Class VII or better, and authorized to do business in the state(s) in which the service is to be provided.

Licensee WARRANTS that this License has been thoroughly reviewed by Licensee's insurance agent(s)/broker(s), who have been instructed by Licensee to procure the insurance coverage required by this Agreement. Allocated Loss Expense shall be in addition to all policy limits for coverages referenced above.

Not more frequently than once every five years, Licensor may reasonably modify the required insurance coverage to reflect then-current risk management practices in the railroad industry and underwriting practices in the insurance industry.

If any portion of the operation is to be subcontracted by Licensee, Licensee shall require that the subcontractor shall provide and maintain insurance coverages as set forth herein, naming Licensor as an additional insured, and shall require that the subcontractor shall release, defend and indemnify Licensor to the same extent and under the same terms and conditions as Licensee is required to release, defend and indemnify Licensor herein.

Failure to provide evidence as required by this section shall entitle, but not require, Licensor to terminate this License immediately. Acceptance of a certificate that does not comply with this section shall not operate as a waiver of Licensee's obligations hereunder.

The fact that insurance (including, without limitation, self-insurance) is obtained by Licensee shall not be deemed to release or diminish the liability of Licensee including, without limitation, liability under the indemnity provisions of this License. Damages recoverable by Licensor shall not be limited by the amount of the required insurance coverage.

For purposes of this section, Licensor shall mean "Burlington Northern Santa Fe Corporation", "BNSF Railway Company" and the subsidiaries, successors, assigns and affiliates of each.

ENVIRONMENTAL

24. (a) Licensee shall strictly comply with all federal, state and local environmental laws and regulations in its use of the Premises, including, but not limited to, the Resource Conservation and Recovery Act, as amended (RCRA), the Clean Water Act, the Oil Pollution Act, the Hazardous Materials Transportation Act, CERCLA (collectively referred to as the "Environmental Laws"). Licensee shall not maintain a treatment, storage, transfer or disposal facility, or underground storage tank, as defined by Environmental Laws on the Premises. Licensee shall not release or suffer the release of oil or hazardous substances, as defined by Environmental Laws on or about the Premises.

(b) Licensee shall give Licensor immediate notice to Licensor's Resource Operations Center at (800) 832-5452 of any release of hazardous substances on or from the Premises, violation of Environmental Laws, or inspection or inquiry by governmental authorities charged with enforcing Environmental Laws with respect to Licensee's use of the Premises. Licensee shall use the best efforts to promptly respond to any release on or from the Premises. Licensee also shall give Licensor immediate notice of all measures undertaken on behalf of Licensee to investigate, remediate, respond to or otherwise cure such release or violation.

(c) In the event that Licensor has notice from Licensee or otherwise of a release or violation of Environmental Laws arising in any way with respect to the Electric supply Line which occurred or may occur during the term of this License,

Licensor may require Licensee, at Licensee's sole risk and expense, to take timely measures to investigate, remediate, respond to or otherwise cure such release or violation affecting the Premises or Licensor's right-of-way.

(d) Licensee shall promptly report to Licensor in writing any conditions or activities upon the Premises known to Licensee which create a risk of harm to persons, property or the environment and shall take whatever action is necessary to prevent injury to persons or property arising out of such conditions or activities; provided, however, that Licensee's reporting to Licensor shall not relieve Licensee of any obligation whatsoever imposed on it by this License. Licensee shall promptly respond to Licensor's request for information regarding said conditions or activities.

ALTERATIONS

25. Licensee may not make any alterations to the Premises or permanently affix anything to the Premises or any buildings or other structures adjacent to the Premises without Licensor's prior written consent.

NO WARRANTIES

26. LICENSOR'S DUTIES AND WARRANTIES ARE LIMITED TO THOSE EXPRESSLY STATED IN THIS LICENSE AND SHALL NOT INCLUDE ANY IMPLIED DUTIES OR IMPLIED WARRANTIES, NOW OR IN THE FUTURE. NO REPRESENTATIONS OR WARRANTIES HAVE BEEN MADE BY LICENSOR OTHER THAN THOSE CONTAINED IN THIS LICENSE. LICENSEE HEREBY WAIVES ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THE PREMISES WHICH MAY EXIST BY OPERATION OF LAW OR IN EQUITY, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY, HABITABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

QUIET ENJOYMENT

27. LICENSOR DOES NOT WARRANT ITS TITLE TO THE PROPERTY NOR UNDERTAKE TO DEFEND LICENSEE IN THE PEACEABLE POSSESSION OR USE THEREOF. NO COVENANT OF QUIET ENJOYMENT IS MADE.

DEFAULT

28. If default shall be made in any of the covenants or agreements of Licensee contained in this document, or in case of any assignment or transfer of this License by operation of law, Licensor may, at its option, terminate this License by serving five (5) days' notice in writing upon Licensee. Any waiver by Licensor of any default or defaults shall not constitute a waiver of the right to terminate this License for any subsequent default or defaults, nor shall any such waiver in any way affect Licensor's ability to enforce any Section of this License. The remedy set forth in this Section 28 shall be in addition to, and not in limitation of, any other remedies that Licensor may have at law or in equity.

LIENS AND CHARGES

29. Licensee shall promptly pay and discharge any and all liens arising out of any construction, alterations or repairs done, suffered or permitted to be done by Licensee on Premises. Licensor is hereby authorized to post any notices or take any other action upon or with respect to Premises that is or may be permitted by law to prevent the attachment of any such liens to Premises; provided, however, that failure of Licensor to take any such action shall not relieve Licensee of any obligation or liability under this Section 29 or any other Section of this License. Licensee shall pay when due any taxes, assessments or other charges (collectively, "Taxes") levied or assessed upon the Improvements by any governmental or quasi-governmental body or any Taxes levied or assessed against Licensor or the Premises that are attributable to the Improvements.

TERMINATION

30. This License may be terminated by Licensor, at any time, by serving thirty (30) days' written notice of termination upon Licensee. This License may be terminated by Licensee upon execution of Licensor's Mutual Termination Letter Agreement then in effect. Upon expiration of the time specified in such notice, this License and all rights of Licensee shall absolutely cease.

31. If Licensee fails to surrender to Licensor the Premises, upon any termination of this License, all liabilities and obligations of Licensee hereunder shall continue in effect until the Premises are surrendered. Termination shall not release Licensee from any liability or obligation, whether of indemnity or otherwise, resulting from any events happening prior to the date of termination.

ASSIGNMENT

32. Neither Licensee, nor the heirs, legal representatives, successors, or assigns of Licensee, nor any subsequent assignee, shall assign or transfer this License or any interest herein, without the prior written consent and approval of Licensor, which may be withheld in Licensor's sole discretion.

NOTICES

33. Any notice required or permitted to be given hereunder by one party to the other shall be in writing and the same shall be given and shall be deemed to have been served and given if (i) placed in the United States mail, certified, return receipt requested, or (ii) deposited into the custody of a nationally recognized overnight delivery service, addressed to the party to be notified at the address for such party specified below, or to such other address as the party to be notified may designate by giving the other party no less than thirty (30) days' advance written notice of such change in address.

If to Licensor: Jones Lang LaSalle Global Services - RR, Inc.
3017 Lou Menk Drive, Suite 100
Fort Worth, TX 76131-2800
Attn: Licenses/Permits

with a copy to: BNSF Railway Company
2500 Lou Menk Dr. – AOB-3
Fort Worth, TX 76131
Attn: Manager – Land Revenue Management

If to Licensee: City of Grand Island
P O Box 1968
Grand Island, Nebraska 68801

SURVIVAL

34. Neither termination nor expiration will release either party from any liability or obligation under this License, whether of indemnity or otherwise, resulting from any acts, omissions or events happening prior to the date of termination or expiration, or, if later, the date when the Electric Supply Line and improvements are removed and the Premises are restored to its condition as of the Effective Date.

RECORDATION

35. It is understood and agreed that this License shall not be placed on public record.

APPLICABLE LAW

36. All questions concerning the interpretation or application of provisions of this License shall be decided according to the substantive laws of the state of Texas without regard to conflicts of law provisions.

SEVERABILITY

37. To the maximum extent possible, each provision of this License shall be interpreted in such manner as to be effective and valid under applicable law, but if any provision of this License shall be prohibited by, or held to be invalid under, applicable law, such provision shall be ineffective solely to the extent of such prohibition or invalidity, and this shall not invalidate the remainder of such provision or any other provision of this License.

INTEGRATION

38. This License is the full and complete agreement between Licensor and Licensee with respect to all matters relating to Licensee's use of the Premises, and supersedes any and all other agreements between the parties hereto relating to Licensee's use of the Premises. However, nothing herein is intended to terminate any surviving obligation of Licensee or Licensee's obligation to defend and hold Licensor harmless in any prior written agreement between the parties.

MISCELLANEOUS

39. In the event that Licensee consists of two or more parties, all the covenants and agreements of Licensee herein contained shall be the joint and several covenants and agreements of such parties.

40. The waiver by Licensor of the breach of any provision herein by Licensee shall in no way impair the right of Licensor to enforce that provision for any subsequent breach thereof.

Jones Lang LaSalle Global Services – RR, Inc. is acting as representative for BNSF Railway Company.

IN WITNESS WHEREOF, this License has been duly executed, in duplicate, by the parties hereto as of the day and year first above written.

BNSF RAILWAY COMPANY
Jones Lang LaSalle Global Services - RR, Inc., its Attorney in Fact
3017 Lou Menk Drive, Suite 100
Fort Worth, TX 76131-2800

Ed Darter
Title: Vice President - National Accounts

CITY OF GRAND ISLAND
P O Box 1968
Grand Island, Nebraska 68801

By:

Title: Mayor

TRACKING NO. 11-42157

EXHIBIT "A"

ATTACHED TO CONTRACT BETWEEN

BNSF RAILWAY COMPANY

AND

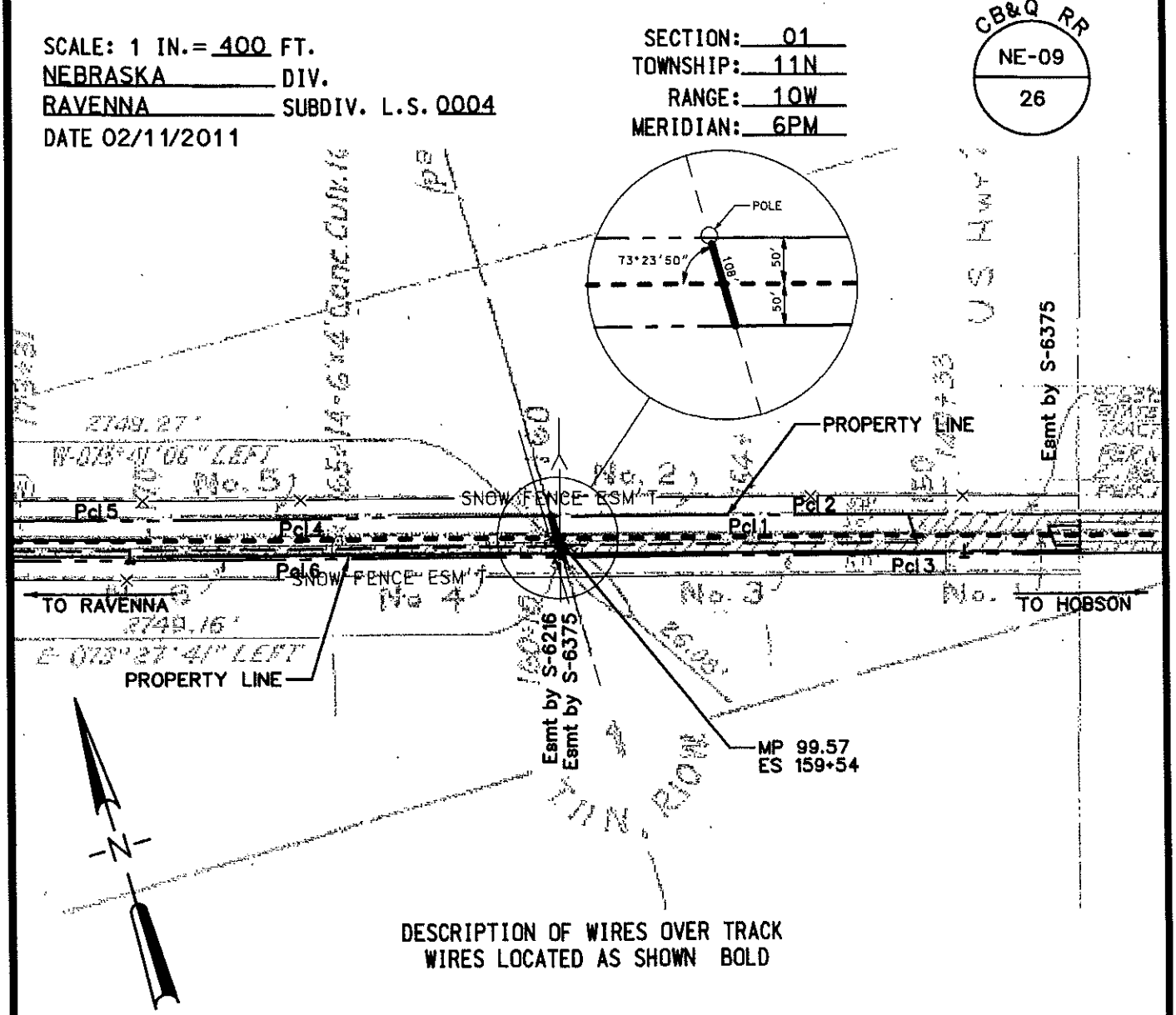
CITY OF GRAND ISLAND

MAP REF. R77096

SCALE: 1 IN. = 400 FT.
NEBRASKA DIV.
RAVENNA SUBDIV. L.S. 0004
DATE 02/11/2011

SECTION: 01
TOWNSHIP: 11N
RANGE: 10W
MERIDIAN: 6PM

CB&Q RR
NE-09
26



DESCRIPTION OF WIRES OVER TRACK
WIRES LOCATED AS SHOWN BOLD

TYPE	NUMBER	VOLTAGE	DISTANCE ABOVE TOP OF RAIL	CLEARS RAILWAY COMPANY'S WIRES
ELECTRIC	8	115KV	36'	-

NEAR GRAND ISLAND
COUNTY OF HALL

STATE OF NE

JWD

DRAWING NO. 1-50962

Crossing Notes

Line #2 700-010-00-00

460+44.0 CL US HIGHWAY 2
462+22.0 CL BURIED TELEPHONE LINE
481+23.0 CL DIR TRACK
481+25.0 CL DIR TRACK
479+28.0 16" 700-009-00-00

468+48.0 CL ROAD

410+96.0 CL ROAD

402+59.0 CL ROAD

Line #1 700-009-00-00

471+77.0 CL US HIGHWAY 2
472+48.0 CL DIR TRACK
472+48.0 CL DIR TRACK
479+48.0 CL 700-010-00-00

485+95.0 CL ROAD

543+95.0 CL OH PWR LINE
543+95.0 CL ROAD

551+40.0 CL ROAD

Sheet Notes and Routing Notes

Line #2 700-010-00-00

485+28.0 PROPERTY LINE
485+25.0 CL VENT
481+25.0 PROPERTY LINE
481+25.0 FENCE
480+78.0 47°55' PI RIGHT

469+48.0 00°16' PI RIGHT
468+48.0 SECTION LINE 34

446+11.0 FENCE
445+96.0 JOINT TO 2" ROAD S.

439+80.0 FENCE
439+80.0 HALF SECTION LINE

425+42.0 FENCE

411+34.0 PI
410+96.0 SECTION LINE 35

402+39.0 SECTION LINE 26

383+10.0 FENCE
382+10.0 HALF SECTION LINE

Line #1 700-009-00-00

471+77.0 QUARTER SEC. LINE
472+13.0 PROPERTY LINE
472+85.0 PROPERTY LINE
473+05.0 CL VENT
474+70.0 47°55' PI RIGHT

485+00.0 00°05' PI RIGHT
485+40.0 PROPERTY LINE
485+60.0 SECTION LINE 34
486+30.0 PROPERTY LINE

514+57.0 FENCE
514+57.0 HALF SECTION LINE

529+90.0 FENCE

543+17.0 PI
543+42.0 SECTION LINE 35
543+78.0 PROPERTY LINE

550+45.0 PROPERTY LINE
551+20.0 SECTION LINE 26
552+32.0 PROPERTY LINE

572+20.0 HALF SECTION LINE

Owner (Line #1)

471+39.0 UNKNOWN 472+13.0 UNKNOWN 472+85.0 UNKNOWN 485+40.0 UNKNOWN 486+30.0 UNKNOWN 543+78.0 UNKNOWN 550+45.0 UNKNOWN 552+32.0 UNKNOWN 586+09.0

Map View

Pipe Schematic and Pipe Material

Line #2 700-010-00-00

481+45.0 BEGIN 12" 0.188" WALL
481+25.0 END CASING

469+68.0 0.00 TAP

468+14.0 1.00 MUE

440+05.0 1.00 MUE

410+97.0 1.00 MUE
410+96.0 0.00 90P

401+95.0 1.00 MUE

382+71.0 1.00 MUE

485+90.0

8" x 0.188"
X42
7/1/1954

368+31.0

Line #1 700-009-00-00

473+16.0 END CASING
473+85.0 CL TEST LEAD

486+30.0 CL TEST LEAD

543+78.0 CL TEST LEAD

552+32.0 CL TEST LEAD

471+39.0

16" x 0.203"
X60
12/1/1981

543+95.0

16" x 0.250"
X60
12/1/1981

543+75.0

16" x 0.203"
X60
12/1/1981

550+95.0

16" x 0.250"
X60
12/1/1981

552+71.0

16" x 0.203"
X60
12/1/1981

586+09.0

Line #2 700-010-00-00

MAOP

483+00 TO 368+31.0 MAOP: 960 MOP: 850

EXTERNAL COATING

483+00 TO 368+31.0 #2, CTE

DOT CLASS

483+00 TO 368+31.0 CLASS 1

Line #1 700-009-00-00

MAOP

471+39 TO 586+09.0 MAOP: 855 MOP: 850

JOB RANGE

471+39 TO 586+09.0 1007

EXTERNAL COATING

471+39 TO 473+16.0 TGF-3, CTE
473+16 TO 586+09.0 PIPECLAD 1500, FBE

DOT CLASS

471+39 TO 586+09.0 CLASS 1

LEGEND

- MILEPOST
- MAINLINE VALVE (MLV)
- WATER CROSSING
- CATHODIC TEST STATION
- AERIAL MARKER
- LAUNCHER
- RECEIVER
- REDUCER
- BRANCH CONNECT
- GROUND BED
- STATION EQUATION
- REGULATOR SETTING
- WELD CAP
- DRIP
- CASING
- ELECTRIC
- WATER LINE
- FIBER OPTIC
- EXISTING PIPELINE
- CL ROAD
- PROPERTY LINE
- POWER LINE
- FENCE
- TELEPHONE LINE
- RAILROAD
- RIGHT OF WAY
- TRANSMISSION LINE
- HIGH CONSEQUENCE AREA
- TOWNSHIP LINE
- STATE LINE
- COUNTY LINE

KINDER MORGAN

0 125 250 500 750 1,000 1,250 Feet

Operating Company
KMIGT

System **KMIGT**

Line and Route Description

NORTH PLATTE TO GRAND ISLAND
RIVERDALE CHECK STA TO GRAND ISLAND COMP STA

NORTH PLATTE TO GRAND ISLAND LOOP
RIVERDALE CHECK STA TO GRAND ISLAND COMP STA

Legal Boundary
HALL, NE

T12N R10W, Sec. 33
T12N R10W, Sec. 34
T12N R10W, Sec. 35
T12N R10W, Sec. 26

District
Great Plains North

Generate Date
10/26/09

Sheet #
062

- No poles or structures, including anchors or guy wires shall be placed or located within the easement of any KMIGT pipelines.
- No guy wires shall cross over any KMIGT pipeline easements.
- Conductors shall at all times be at least thirty (30) feet above the top of the ground, i.e. ground clearance to the lowest conductor must be a minimum of thirty (30) feet.
- No heavy equipment shall enter any KMIGT pipeline easement or cross any KMIGT pipelines without the review by KMIGT of the size and weight of that equipment. Special mitigation measures may be necessary before such a crossing may be made.
- Diggers Hotline of Nebraska, (800) 331-5666, shall be contacted forty-eight (48) hours before beginning work anywhere near or within KMIGT's pipeline easement.
- KMIGT must be notified in advance and must have its own personnel on-site before any equipment is moved or located twenty-five (25) feet or closer to any KMIGT pipeline or pipeline easement.
- The electric power conductors shall be maintained at sufficient distances from KMIGT pipeline(s) to minimize induced AC pipeline voltages and fault currents that can be potentially harmful to KMIGT's pipelines or personnel. The electric transmission power company shall:
    - Provide electrical current loading conditions (including electrical current amps and % maximum load) upon request to ensure appropriate consideration of induced voltages.
    - Be responsible for any costs associated with maintaining theoretical induced AC current densities on KMIGT's pipeline(s) less than 30 Amps/square meter assuming a $1cm^2$ holiday and costs associated with remediation of potential fault currents.
    - Be responsible for funding an AC interference study in accordance with KMIGT's requirements when induced voltages greater than 2.0 volts AC, when any AC related damage has been identified or as other conditions warrant as deemed appropriate by KMIGT.
    - Be responsible for the cost of any required mitigation as indicated by the study in accordance with KMIGT's standards. The study shall include consideration of AC fault currents, induced AC voltages and human safety considerations.

KINDER MORGAN

Guidelines for Design and Construction near Kinder Morgan Operated Facilities

Name of Company: Kinder Morgan Interstate Gas Transmission, LLC (KMIGT)

The list of design, construction and contractor requirements, including but not limited to the following, for the design and installation of foreign utilities or improvements on KM right-of-way (ROW) are not intended nor do they waive or modify any rights KM may have under existing easements or ROW agreements. Reference existing easements and amendments for additional requirements. This list of requirements is applicable for KM facilities on easements only. Encroachments on fee property should be referred to the ROW Department.

Design

- KM shall be provided sufficient prior notice of planned activities involving excavation, blasting, or any type of construction on KM's ROW to determine and resolve any location, grade or encroachment problems and provide protection of our facilities and the public **before** the actual work is to take place.

- Encroaching entity shall provide KM with a set of drawings for review and a set of final construction drawings showing all aspects of the proposed facilities in the vicinity of KM's ROW. The encroaching entity shall also provide a set of as-built drawings showing the proposed facilities in the vicinity of KM's ROW.

- Only facilities shown on drawings reviewed by **KMIGT** (Company) will be approved for installation on KM's ROW. All drawing revisions that effect facilities proposed to be placed on KM's ROW must be approved by KM in writing.

- KM shall approve the design of all permanent road crossings.

- Encroaching entity shall, at the discretion of the Kinder Morgan, Inc., incorporate Heath ATI "sniffer" Gas Detection Units in the design of paved areas or "Green Belt" areas of KM ROW. The units shall be installed per KM Standard **TYP-V-0100-B010**.

- Any repair to surface facilities following future pipeline maintenance or repair work by KM will be at the expense of the developer or landowner.

- The depth of cover over the KM pipelines shall not be reduced nor drainage altered without KM's written approval.

- Construction of any permanent structure, building(s) or obstructions within KM pipeline easement is **not** permitted.

- Planting of shrubs and trees is not permitted on KM pipeline easement.

- Irrigation equipment i.e. backflow prevent devices, meters, valves, valve boxes, etc. shall not be located on KM easement.

- Foreign line, gas, water, electric and sewer lines, etc., may cross perpendicular to KM's pipeline within the ROW, provided that a minimum of two (2) feet of vertical clearance is maintained between KM pipeline(s) and the foreign pipeline. Constant line elevations must be maintained across KM's entire ROW width, gravity drain lines are the only exception. Foreign line crossings below the KM pipeline must be evaluated by KM to ensure that a significant length of the KM line is not exposed and unsupported during construction. When installing underground utilities, the last line should be placed beneath all existing lines unless it is impractical or unreasonable to do so. Foreign line crossings above the KM pipeline with less than 2 feet of clearance must be evaluated by KM to ensure that additional support is not necessary to prevent settling on top of the KM natural gas pipeline.

- A foreign pipeline shall cross KM facilities at as near a ninety-degree angle as possible. A foreign pipeline shall not run parallel to KM pipeline within KM easement without written permission of KM.

- The foreign utility should be advised that KM maintains cathodic protection on their pipelines. The foreign utility must coordinate their cathodic protection system with KM's. At the request of KM, foreign utilities shall install (or allow to be installed) cathodic protection test leads at all crossings for the purposes of monitoring cathodic protection. The KM Cathodic Protection (CP) technician and the foreign utility CP technician shall perform post construction CP interference testing. Interference issues shall be resolved by mutual agreement between foreign utility and KM. All costs associated with the correction of cathodic protection problems on KM pipeline as a result of the foreign utility crossing shall be borne by the foreign utility for a period of one year from date the foreign utility is put in service.

- The metallic foreign line shall be coated with a suitable pipe coating for a distance of at least 10 feet on either side of the crossing unless otherwise requested by the KM CP Technician.

- AC Electrical lines must be installed in conduit and properly insulated.

- DOT approved pipeline markers shall be installed so as to indicate the route of the foreign pipeline across the KM ROW.

- No power poles, light standards, etc. shall be installed on KM easement.

Construction

- Contractors shall be advised of KM's requirements and be contractually obligated to comply.

- The continued integrity of KM's pipelines and the safety of all individuals in the area of proposed work near KM's facilities are of the utmost importance. Therefore, contractor must meet with KM representatives prior to construction to provide and receive notification listings for appropriate area operations and emergency personnel. **KM's on-site representative will require discontinuation of any work that, in his opinion, endangers the operations or safety of personnel, pipelines or facilities.**

- The Contractor must expose all KM transmission and distribution lines prior to crossing to determine the exact alignment and depth of the lines. A KM representative must be present. In the event of parallel lines, only one pipeline can be exposed at a time.

- KM will not allow pipelines to remain exposed overnight without consent of KM designated representative. Contractor may be required to backfill pipelines at the end of each day.

- A KM representative shall do all line locating. A KM representative shall be present for hydraulic excavation. The use of probing rods for pipeline locating shall be performed by KM representatives only, to prevent unnecessary damage to the pipeline coating.

- Notification shall be given to KM at least 72 hours before start of construction. A schedule of activities for the duration of the project must be made available at that time to facilitate the scheduling of Kinder Morgan, Inc.'s work site representative. Any Contractor schedule changes shall be provided to Kinder Morgan, Inc. immediately.

- Heavy equipment will not be allowed to operate directly over KM pipelines or in KM ROW unless written approval is obtained from **KMIGT** (Company). Heavy equipment shall only be allowed to cross KM pipelines at locations designated by Kinder Morgan, Inc. Contractor shall comply with all precautionary measures required by KM to protect its pipelines. When inclement weather exists, provisions must be made to compensate for soil displacement due to subsidence of tires.

- Excavating or grading which might result in erosion or which could render the KM ROW inaccessible shall not be permitted unless the contractor/developer/owner agrees to restore the area to its original condition and provide protection to KM's facility.

- A KM representative shall be on-site to monitor any construction activities within twenty-five (25) feet of a KM pipeline or aboveground appurtenance. The contractor **shall not** work within this distance without a KM representative being on site. Only hand excavation shall be permitted within a minimum of 18 inches (refer to state specific rules/regulations regarding any additional clearance requirements) of KM pipelines, valves and fittings. However, proceed with extreme caution when within three (3) feet of the pipe.

- Ripping is only allowed when the position of the pipe is known and not within ten (10) feet of KM facility unless company representative is present. .

- Temporary support of any exposed KM pipeline by Contractor may be necessary if required by KM's on-site representative. Backfill below the exposed lines and 12" above the lines shall be replaced with sand or other selected material as approved by KM's on-site representative and thoroughly compacted in 12" lifts to 95% of standard proctor dry density minimum or as approved by KM's on-site representative. This is to adequately protect against stresses that may be caused by the settling of the pipeline.

- No blasting shall be allowed within 1000 feet of KM's facilities unless blasting notification is given to KM including complete Blasting Plan Data. A pre-blast meeting shall be conducted by the organization responsible for blasting.

KM shall be indemnified and held harmless from any loss, cost of liability for personal injuries received, death caused or property damage suffered or sustained by any person resulting from any blasting operations undertaken within 500 feet of its facilities. The organization responsible for blasting shall be liable for any and all damages caused to KM's facilities as a result of their activities whether or not KM representatives are present. KM shall have a signed and executed Blasting Indemnification Agreement before authorized permission to blast can be given.

No blasting shall be allowed within 300 feet of KM's facilities unless blasting notification is given to KM a minimum of one week before blasting. *(note: covered above)*KM shall review and analyze the blasting methods. A written blasting plan shall be provided by the organization responsible for blasting and agreed to in writing by KM in addition to meeting requirements for 500' and 1000' being met above. A written emergency plan shall be provided by the organization responsible for blasting. *(note: covered above)*

- **Any** contact with any KM facility, pipeline, valve set, etc. shall be reported immediately to KM. If repairs to the pipe are necessary, they will be made and inspected before the section is re-coated and the line is back-filled.

- KM personnel shall install all test leads on KM facilities.

- Burning of trash, brush, etc. is not permitted within the KM ROW.

Insurance Requirements

- All contractors, and their subcontractors, working on Company easements shall maintain the following types of insurance policies and minimum limits of coverage. All insurance certificates carried by Contractor and Grantee shall include the following statement: "Kinder Morgan and its affiliated or subsidiary companies are named as additional insured on all above policies (except Worker's Compensation) and waiver of subrogation in favor of Kinder Morgan and its affiliated or subsidiary companies, their respective directors, officers, agents and employees applies as required by written contract." **Contractor shall furnish Certificates of Insurance evidencing insurance coverage prior to commencement of work and shall provide thirty (30) days notice prior to the termination or cancellation of any policy.**

1. Statutory Coverage Workers' Compensation Insurance in accordance with the laws of the states where the work is to be performed. If Contractor performs work on the adjacent on navigable waterways Contractor shall furnish a certificate of insurance showing compliance with the provisions of the Federal Longshoreman's and Harbor Workers' Compensation Law.
2. Employer's Liability Insurance, with limits of not less than **$1,000,000** per occurrence and **$1,000,000** disease each employee.
3. Commercial General Liability Insurance with a combined single limit of not less than **$2,000,000** per occurrence and in the aggregate. All policies shall include coverage for blanket contractual liability assumed.
4. Comprehensive Automobile Liability Insurance with a combined single limit of not less than **$1,000,000.** If necessary, the policy shall be endorsed to provide contractual liability coverage.
5. If necessary Comprehensive Aircraft Liability Insurance with combined bodily injury, including passengers, and property damage liability single limits of not less than **$5,000,000** each occurrence.
6. Contractor's Pollution Liability Insurance this coverage shall be maintained in force for the full period of this agreement with available limits of not less then **$2,000,000** per occurrence.
7. Pollution Legal Liability Insurance this coverage must be maintained in a minimum amount of **$5,000,000** per occurrence.

Table of Contents

1. Applicability

- ☒ Gathering
- ☒ Processing
- ☒ Transmission/Regulated Onshore Gathering
- ☐ Kinder Morgan Power Company

2. Scope

This procedure applies to all facilities and provides guidance in addressing all construction projects or activities that encroach upon the Company's pipelines, fee owned property, easements, etc. Such encroachments must be evaluated to assure compliance with Company requirements as those requirements are prescribed in this procedure, prevent damage to the pipeline facilities and protect the public and employees.

3. Core Information and Requirements

Third Party activities near pipeline facilities that may require inspection and or assessment including, but are not limited to:

- Blasting
- Installing foreign pipelines
- Installing electric cables, telephone or cable TV lines
- Drilling holes for poles, posts, anchors or oil, water and gas wells

- Installing parking lots, driveways, mobile homes, garages, sheds, swimming pools, barns, junkyards or trees
- Any other activities that may require excavation
- Crossing pipelines with heavy vehicles or equipment
- Permanent or temporary removal of cover from pipelines (e.g., agricultural land leveling, road or highway construction, drainage work)

3.1. Basic Rights

The **Right-of-Way (ROW) Department** enforces Company land rights insofar as or to the extent provided by underlying agreements.

When a third party's activities threaten the safety of Company operated facilities, the Company will request that the third party discontinue such action. If the third party fails to adhere to the request, then assistance from operations management and the **ROW Department** shall be pursued. When a third party damages a pipeline or other Company operated facility, the Company has the right to reimbursement for such damages.

The Company has certain basic land rights through easements, franchises, permits, license agreements, leasehold, fee ownership, etc., that allow for constructing and operating Company facilities. The value and extent of the Company's rights depend upon the underlying agreement's terms and conditions.

The Company has the right to act in accordance with the terms and conditions of the underlying agreement. In cases where the Company owns the property in fee, any encroachment on the property is considered trespassing. The Company is prepared to take any legal action necessary to protect its real and personal property rights and the safety and property of other persons.

3.2. Basic Responsibilities

The Company has the following basic responsibilities in relation to its pipelines:

- When Company pipelines are identified by pipeline markers, stakes or by telling a third party where the line is located, such identifiers must be accurate and comply with the requirements of state One-Call organizations and KM procedures whichever is more stringent.
- Managers and supervisors shall plan accordingly for workload fluctuations, vacations, etc. to ensure notices received are completed in a timely manner.
- In states without One-Call organizations, each region should organize a system to record and respond to incoming communications regarding planned construction projects, excavations and encroachments affecting pipeline facilities. Obtain the following information:
    - Excavator's name and telephone number
    - Location of the planned excavation and the type of activity
    - Date and time of the planned excavation

3.3. One-Call Systems

Every location will participate in a state One-Call system. Attachment 1 – One-Call Center and Emergency Phone Numbers lists the One-Call center phone numbers, as well as Company control center phone numbers. The One-Call system serves as a means for receiving and recording excavation notification as well as notifying excavators how to identify temporary pipeline markings. In order to maintain the One-Call database; once each calendar year, each location shall review their current pipeline assets and compare them with the lines in PODS or One-Call Agency database to ensure that all lines the Company operates are listed and have not been sold or abandoned.

Participating in the state One-Call program may meet the following damage prevention requirements:

- If the State One-Call Center maintains a list of excavators who have used the One-Call service, document in local files how to easily access this information when it is needed or store the information in the Public Awareness Database.
- If the State One-Call Center provides notification to excavators explaining the One-Call program and excavation procedures, obtain documentation for local files or store the information in the Public Awareness Database.

3.3.1. Receiving Notices from One-Call Centers

When the field receives a One-Call notice of intended excavation, a response is required per the procedures below and state One-Call Laws.

When the field receives a notice of intended activity, (One-Call) the person receiving the information will determine as to the location of work versus the Company's assets. If Company assets will not be impacted, document in the electronic One-Call system or use the local district's One-Call form. The documentation must include justification for no physical locate and the individuals name.

When the person receiving the one call determines there is a question as to whether Company assets will be impacted, a Company representative will contact the excavator for additional clarification. If at this time, it is determined that Company assets will not be impacted, document in the electronic One-Call system or use the local district's One-Call form. The documentation must include justification for no physical locate, excavator contacted, and the individuals name.

If the work is within 50-feet of Company assets, or if there is a potential for the work to encroach to within 50-feet of Company assets, Company Personnel will physically mark the asset according to Subsection 3.4 – Marking Underground Structures below, and document in the electronic One-Call system or use the local district's One-Call form. For all physical locates, **O&M Form OM200-31 – Line Locate Inspection Report** shall be completed.

3.3.2. Design or Planning Notification

When the one call notification is a request to meet for the purposes of design or planning, the Company Representative is to contact the person designated on the one call ticket as the contact person to ensure that no excavation is planned in the area noted on the one call ticket and to schedule a meeting at a mutually agreeable time. If an excavation is planned, which meets the definition of this procedure or the state one call law then Subsection 3.3.1 – Receiving Notices from One-Call Centers applies. Also, refer to Subsection 3.4.3 – Meeting Requirements with Excavator.

3.4. Marking Underground Structures

Company personnel will locate and mark pipelines in areas where excavation activities are observed or will occur as indicated by the One-Call notification. ONLY Company personnel are approved to locate and mark underground structures.

Exception: Line marking may not be required for routine long-term activities where the depth of cover is known, and it has been established that the activity will not, in any way, affect the integrity of the pipeline. These include activities such as tilling of farmland, and road grading operations. In these cases, a standing procedure may be established with the parties involved that would apply as long as surface conditions and/or activities do not change. All other parts of this procedure do apply.

3.4.1. Locate and mark the pipeline, within 50-feet of the excavation work area, as specified below.

- Pipelines will be marked within 48 hours of receipt of notification (excluding weekends and holidays) or in accordance with local One-Call laws, and before any excavation activities begin. Emergency Notifications will be responded to promptly.

- Locates and markings shall be performed safely. Consideration should be given to items such as, but not limited to; traffic, site conditions, and personal protective equipment (refer to **O&M Procedure 120 – Personal Protective Equipment**).
- Available Company records/strip maps/alignment sheets are to be reviewed prior to marking the pipeline(s). Look for taps, both active and abandoned, or any other below grade facilities. The minimum length of pipeline to be marked shall be as required by conditions of the site and job. Any errors or omissions discovered shall be communicated to the Engineering Records Department immediately
- Perform a visual inspection of the locate area to determine if there is evidence of a Company pipeline which is not on any record, map or alignment sheet. Also, be aware of other pipelines that might be in the area that are not on Company drawings.
- When marking the line, the marks must be able to identify where the pipeline is located, the lesser of within 2-feet off the center point, or as required by state One-Call Laws. If this criterion is not possible, then no mark shall be made, but a positive "finding" (pothole) will be necessary.
- Point of Intersection (PI) and other changes of direction shall be marked so that the pipe's location is clearly delineated.
- When marking facilities, Company is to consider the type of facility being located, the terrain of the land, the type of excavation being done and the method to adequately mark its facility for the excavator. The spacing of the markings shall be 10-feet or less apart.
- Any crossings in the area must be marked.
- Any crossing, not shown on the alignment sheet must be reported immediately to the Engineering Records Department for inclusion on as-built drawings.
- Temporarily mark the physical location of a pipeline using yellow flags, laths and/or fluorescent yellow paint per the ULCC Color Code Guide. Use the appropriate marking for the existing and expected surface conditions.
- When feasible, the owner/operator of a facility is identified by the markings at the time the facility is located.
- Locate and mark any transmission or gathering facility within 50-feet of the excavation work.
- Buoys, poles or PVC markers may be used for submerged underwater facilities in areas such as wide commercially navigable waterways and bays. Markers should be placed as close as practical over the facilities that are submerged in such a manner without impeding or creating additional hazards.

Multiple Company pipelines in the same ROW will be marked individually. Care should be taken at all locations where there are multiple lines in the same ROW (either KM or third party). A sweep of the area should be performed to help identify the intended pipeline as well as any other lines that may be in the vicinity.

- If there is doubt concerning the location or depth of the line, either request assistance to locate or excavate the pipeline to determine exact location.
- Contact the excavator and arrange to meet an authorized representative of the excavator. Discuss provisions in Subsection 3.4.3 – Meeting Requirements with Excavator.
- All marked locations shall be photographed and the photos attached to the completed One-Call ticket, electronically stored in the One-Call system, or attached to **O&M Form OM200-31 – Line Locate Inspection Report** or otherwise tied to the ticket before filing per Section 5 – Documentation.
- All One-Calls must be responded to, via the electronic One-Call system, even if there is no conflict with Company facilities.
- Additional notification may be made by phone, fax, or email. The date and name of the person contacted should be recorded in the electronic One-Call System.

3.4.2. Line Locating Equipment used in Locating Pipelines for Marking

Conductive locating (direct connection to the pipeline) is the preferred method for locating Company pipelines.

Line locating equipment will be field checked for proper operation prior to initial use, each day that it is used for locating. Documentation of this check should be recorded in the ticket notes section of the electronic one call system or other approved method. If Inductive locating is used for locating Company pipelines, a direct positive confirmation by a water probe, probe rod, vacuum truck or other methods must be performed.

3.4.3. Meeting Requirements with Excavator

- Meet with the encroaching party's representative. Obtain the information needed by the Company concerning the type of activity, crossing, drawings, schedules, blasting plans including charge size and location (if applicable), contact information (names, numbers), etc. Use this opportunity to obtain contractor information for Company's damage prevention program and to promote the use of the applicable state One-Call systems and the national 811 number.
- Review with the excavator/encroaching party's supervisor or designated responsible person the requirements of this procedure (O&M Procedure 204 – Construction Near Company Facilities) such as scope of the job; location of Company facilities; the requirements for crossing Company lines or facilities; and the requirements that a Company Representative must be on-site whenever work will be done within 25-feet of Company Facilities.
    - Required clearance from any underground structure not associated with the pipeline is 24-inches
    - Company pipelines must be exposed per Subsection 3.8 – Excavating Pressurized Lines of this procedure.
- Excavations entered by and performed by Company employees or their representatives must meet the requirements of **O&M Procedure 109 – Excavating, Trenching and Shoring**
- Special provisions are required when working over or near Dresser coupled lines. These provisions are outlined in **O&M Procedure 237 – Dresser-Coupled Pipelines**
- Verify that the information received concerning dates, locations and scope of work is accurate
- The Company representative assigned to locate a pipeline or monitor excavation activities shall complete the **O&M Form OM200-31 – Line Locate Inspection Report** and sign
- For excavations 25-feet or less from Company assets, contractor should counter sign **O&M Form OM200-31 – Line Locate Inspection Report**. The original will be given to the third party excavator's representative on the site during the initial meeting with a copy retained for district records
- For excavations greater than 25-feet, contractor is not required to counter sign **O&M Form OM200-31 – Line Locate Inspection Report**. Retain the document for district records
- The form must be re-issued for changes in activities, including, but not limited to:
- Changes in the scope of work that could affect the safety of the line
- Changes of affected personnel on the site (excavator, supervisor, etc.)
- Changes to the schedule/work plan, that is, digging faster or moving to another area e.g., across the road.

O&M Form OM200-31 – Line Locate Inspection Report helps assure communications between the Company representative and the third party excavator regarding the planned or actual date(s) of excavation activities. If applicable, the form should include any observation waivers granted and the basis on which the exception was granted, with instructions to

contact the KM Employee if any of the conditions, which was the basis for exception, change.

If the excavator refuses to sign, the Company representative will so indicate on the form.

3.5. Surveillance, Awareness and Reporting

Be alert for upcoming projects that may encroach upon or endanger Company operated pipelines or facilities. Construction activity that may involve Company operated pipelines or facilities should be immediately reported to the appropriate supervisor. If the appropriate supervisor cannot be reached, notify the next available supervisor or Gas Control.

The public is often aware of projects, including underground phone, electrical, sewer and water facilities and street construction projects long before work begins. Since rural road construction and land leveling are less publicized, inform area contractors and road crews of Company line locations and the rules regarding construction activity.

Notify Operations Manager or designee of any construction projects that may affect or endanger Company operated facilities. Report any activities on fee owned property to ROW. When construction work is within city or corporate limits or part of a city project, contact city officials and remind them of the Company's rules and policies. Try to attend any city or county planning committee meetings concerning major construction activities that could affect the Company's assets. The necessary provisions can then be written into an ordinance or into the contract under which the work will be performed.

3.6. Investigating Third Party Construction Activity – Company Not Notified

Immediately investigate any construction activity near Company pipelines to see that proper procedures are or were followed.

When Third Party construction activity involving a Company pipeline or facility is started without prior approval, notify the operations supervisor immediately. Contact the **ROW Department** to determine the Company's rights. Inspect the premises immediately and take necessary steps to correct or prevent unsafe conditions.

If a Third Party is seen within 50-feet of, or working over the Company's pipeline, the excavation and construction activities shall immediately be stopped until the Company facilities have been located and investigated for possible damage.

When physical evidence of an unmonitored encroachment over the pipeline is discovered, the area must be investigated to determine if excavation is required and documented in STARS. If excavation is required, the pipeline shall be inspected for excavation damage in conformance with existing company procedures. Upon discovery of pipeline damage, an ERL notification shall be initiated and the occurrence treated as an Abnormal Operation in conformance with **O&M Procedure 1902 – Abnormal Operation**. If excavation is not required by further investigation is appropriate, an above ground survey may be conducted using methods defined in NACE RP-0502-2002.

When land leveling or improvements involving a Company pipeline or facility are started without prior approval, notify the operations supervisor immediately. Contact the **ROW Department** to determine the Company's rights. Inspect the premises immediately and take necessary steps to correct or prevent unsafe conditions.

If excavation activities are identified within Kinder Morgan's pipeline easement that are not allowed by the pipeline easement or permit agreement, the activities shall be stopped until an agreement is reached. If excavation activities continue, local management should be advised and Kinder Morgan's Legal Department and/or local law enforcement authorities may be called for assistance.

3.7. Inspecting Third Party Construction Activity – Company Notified

Excavation Monitoring - A Company representative shall, unless excepted by Subsection 3.7.1 – Exceptions to Mandatory Observations, be present during construction activity within 25-feet of

the Company operated transmission or gathering pipeline facilities. **Excavation Observation** - A Company employee will, unless excepted by Subsection 3.7.1 – Exceptions to Mandatory Observations, be continuously present during excavation and backfilling activities to observe compliance with agreed upon design/specification/scope of work and to ensure the excavation and backfilling criteria are being met. If a Company employee is not onsite, absolutely no work is to be allowed without the permission of the Company employee. Observation is mandatory when excavation activity is within 10-feet of the pipeline. If the excavation results in a foreign utility crossing of KM's pipeline, the KM employee shall complete **O&M Forms OM200-01 – Foreign Structures Report** and **O&M Form OM200-03 – Underground Structure Crossing Report**. If the excavation results in the exposure of a KM pipeline, the KM employee shall complete **O&M Form OM200-02 – Transmission Buried Pipeline Inspection Report**.

A Company representative may give permission for work over the pipeline to be performed without being on site after they have met with the excavator, marked the pipeline, and reasonably assured themselves that there was no risk of the surface activities affecting the integrity of the asset. Work is defined as disturbing the soil, moving any heavy equipment over the pipeline with less than the required cover.

In the event of parallel encroachments or other circumstances where this provision will require a Company representative to be present for a long duration, and there is to be no crossing of the Company's pipeline, the contractor's work schedule shall be provided to the Company and a meeting held with Company inspector(s) when necessary to review the schedule. Any deviations to the schedule will require advance Company approval.

Company representatives should be aware of the **O&M Form OM200-29 – Guidelines for Design and Construction near Kinder Morgan Operated Facilities** during construction near Company facilities:

3.7.1. Exceptions to Mandatory Observations

3.7.1.1. Alternatives to On-Site Observation 10' to 25'.

Acceptable alternatives include:

- Concrete Barriers installed between the area of excavation and the KM pipe
- Permanent or temporary fencing installed between the area of the excavation an the KM pipe
- Video monitoring

Waiver to Observations

When the scope and location of the proposed excavation is greater than 10-feet from the KM asset and there appears to be no benefit to being continuously present during excavation and backfilling to protect the Kinder Morgan asset, a waiver to the observation may be granted.

Examples where this may be applicable include, but are not limited to:

- Excavation, such as paving or digging foundation footings on private property when the pipeline is under the city street or on the opposite side of the road.
- Replacing utility poles when the utility easement is offset from the pipeline at a distance greater than 10-feet and guy wires will not encroach upon the easement.
- Excavation on the other side of an immovable barrier or natural demarcation, such as, construction separated from our pipeline by railroad, or stone/concrete fence, etc.
- Other digging that will not damage the pipeline, i.e. hand digging, shallow/well defined.
- Other situations where the activity will not affect the pipeline.

Care should be taken to ensure that the scope of work does not include utility work that could potentially cross the pipeline or that the pipeline is not within the designated excavation area (white lined area).

Note: KM does not have the authority to waive a State One-Call requirement.

When seeking a waiver to continuous observation, for construction within 25-feet but greater than 10-feet of the pipeline, the KM Line Locator must contact the Damage Prevention Supervisor, Area Manager or Operations Supervisor to get their concurrence. After approval, the site should be monitored periodically to ensure work remains within the original scope.

- The justification, date and time of the concurrence and the name of the person granting the exception must be recorded in the note section of the electronic one call system.
- The person granting the exception must also record the decision and the basis for the decision in their records.

3.7.1.2. Exceptions to Company Personnel Observing/Monitoring Excavation and Backfilling Activities

- Operations Management will decide when it is necessary to use a contract representative to monitor excavation and/or backfilling activities.
- The Damage Prevention Supervisor will follow the appropriate Kinder Morgan procedure(s) for selection and contracting of a contract representative.
- The Damage Prevention Supervisor will coordinate with the Operations Manager to ensure that the contract representative has completed the required training and approve the Operator Qualification (OQ) credentials.
- The Damage Prevention Supervisor must confirm proficiency and knowledge of covered procedures and training for the contract representative.
- As a minimum the contract representative shall be Operator Qualified on the following tasks:
    - Abnormal Operations
    - Damage Prevention During Excavation Activities
    - Backfilling
    - Inspection
    - Inspection of Materials
    - Line Locating (only the written portion of the Line Locating OQ process is required to demonstrate an awareness of this task)
- The Damage Prevention Supervisor will be responsible for ensuring that the contract representative has reviewed, understands and provides proper documentation of the following Kinder Morgan Operating & Maintenance (O&M) Procedures.
    - **O&M Procedure 109 – Excavating, Trenching and Shoring**
    - **O&M Procedure 159 – Incident Reporting and Investigation**
    - **O&M Procedure 166 – Safety Hazard/Near Miss Reporting**
    - **O&M Procedure 168 – Safety Orientation**
    - **O&M Procedure 204 – Construction Near Company Facilities**
    - **O&M Procedure 205 – Pipeline Markers and Cover**
    - **O&M Procedure 214 – Reporting Pipeline Safety-Related Conditions**
- The Operations Manager will communicate to the Director of Operations the intent to utilize a contract representative for excavations and/or backfilling activities within their area of responsibility.
- The Director of Operations will review the need to utilize contract inspectors and if deemed necessary will conditionally approve the use per project.

- Final approval to use contract inspectors will not be given until all training is completed.
- The Damage Prevention Supervisor will be responsible for ensuring that the contract representative has reviewed, understands and provides proper documentation of the following Kinder Morgan Construction Inspection procedures:
  - **CON0020 – General Requirements**
  - **C1010 – Clearing, Grading and Site Preparation**
  - **C1100 – Backfilling**
  - **C1160 – Horizontal Directional Drilling**
- The Damage Prevention Supervisor will be responsible for ensuring that the contract representative has reviewed, understands and provides proper documentation of the **Kinder Morgan Contractor Safety Manual**.
- The Damage Prevention Supervisor will be responsible for providing copies of the training requirements stated above to the Operations Manager for approval, then to the Director of Operations for review and approval before proceeding with the use of contract representatives during excavations and backfilling activities on existing Kinder Morgan right-of-ways and property. Including the following:
  - Confirmation of the completion and acceptable scores of the OQ training stated above.
  - Copies of O&M Procedures, Construction Inspection Manual and Contractor Safety Manual - signed and dated by the contract representative as well as the project manager or their designee.
  - A general summary that identifies the planned excavation and backfilling activities.
- The Director of Operations will:
  - Provide confirmation to the Damage Prevention Supervisor and Operations Manager, via email, if they are in agreement that all training requirements have been satisfied and use of the contract representative for monitoring of excavation and/or backfilling activities is approved.

    - OR -
  - Respond to the Damage Prevention Supervisor and Operations Manager, via email, that training requirements are deficient and the use of the contract representative is NOT approved.

3.7.2. Kinder Morgan Initiated Excavation Activities

When excavating, Kinder Morgan and Contractors doing work for Kinder Morgan have the same obligations to comply with state one call laws and follow the practices that we expect from 3rd party excavators. To that end, the person responsible for excavating on behalf of KM will:

- Make notification to the appropriate one call center of the intent to excavate.
- If the excavation location cannot be specifically identified by landmark, address, legal description or GPS point, identify the proposed area of excavation using white lining prior to notification of the One-Call center.
- Maintain the ticket number from the one call center that verifies the locate request was requested.
- If multiple excavators for KM are working at the same site, each will have a separate one call reference.
- When practical the KM excavator will request a meeting with the other facility locator(s) at the job site prior to the actual marking of facility locations.

- Coordinate work that requires temporary or permanent interruption of a facility's service with the affected facility owner/operator.
- Re-call the one call center if the facility owner/operator fails to respond to the KM request for a locate (within the timeframe established by the state one call law).
- Verify that the excavation site is at the correct location as described on the one call ticket.
- Verify the locate markings and check for unmarked facilities by conducting an electronic and visual sweep of the site. Perform an "electronic sweep" of the white lined area by using a KM approved locator, set to inductive mode. Visually check for such things as signs, markings, and trenches that might indicate underground utilities are present.
- The excavator should review the location of underground facilities with the facility operator prior to excavation.
- The KM employee on site should have access to the names and phone numbers of all facility owner/operators contacts and the one call center.
- Reasonable care will be used to avoid damaging underground facilities. The excavation should be planned to avoid damage and or minimize interference with the underground facilities in or near the work area.
- Protect and preserve the staking, marking or other designations for underground facilities until no longer required for proper and safe excavation. If any facility mark is removed or no longer visible, excavation is to be stopped and the facility owner or one call center is notified to request a re-mark.
- An observer is required to assist the equipment operator when operating excavation equipment around known underground facilities.
- Mechanical excavation is not allowed within the tolerance zone of the underground facility unless otherwise allowed by this procedure or state law, whichever is more stringent.
- The facility owner/operator is to be contacted, either directly or through the one call center if an underground facility is not found where one has been marked or if an unmarked underground facility is found. Following this notification work can be continued, unless otherwise in state law, if the work can be performed without damaging the facility.
- Exposed pipeline facilities will be supported and protected from damage.
- The one call center will be called to refresh the ticket if it is expected that the excavation will continue past the life of the ticket.
- If an underground facility is damaged or is discovered to be damaged, the owner/operator of the damaged facility will be notified either directly or via the one call center (unless otherwise specified by state law). All breaks, leaks, nicks, dents, gouges, grooves, or other damages to facility lines conduits, coatings or cathodic protection will be reported.
- If the damage results in the escape of any flammable, toxic, or corrosive gas or liquid or endangers life, health, or property 911 and the facility owner/operator is to be notified immediately. Reasonable measures will be taken to protect those in immediate danger (employees, contractors, public), property and the environment until the facility owner/operator or emergency responders have arrived and completed their assessment.
- In the case of an emergency excavation of a KM pipeline, maintenance or repairs may be made immediately provided the one call center and impacted facility owner/operators are notified as soon as reasonably possible. This includes situations that involve danger to life, health or property.
- Protect all facilities from damage when backfilling an excavation. Trash, debris or other material that could damage existing facilities or interfere with the accuracy of future locates is not to be buried in the excavation.
- For trenchless excavations (boring, etc.) the KM excavator will adhere to all best practices stated in this section.
- All applicable federal and state safety regulations, which include training as it relates to the protection of underground facilities, will be adhered to.

- High Consequence Areas: An excavation in an HCA shall be evaluated for the potential of stress corrosion cracking (SCC) by reviewing the existing conditions with the SCC criteria (refer to the **Pipeline Integrity Management Program**)

When a KM pipeline is exposed **O&M Form OM200-02 – Transmission Buried Pipeline Inspection Report** must be completed

3.8. Excavating Pressurized Lines

Before excavation by powered equipment, the line must be located with a water probe, probe rod, vacuum truck or exposed by hand. Prodding shall be done during excavation across the entire ditch. When power equipment is within 24-inches of any point on the circumference of the pipeline, probe bars shall be used to verify depth and to size the line. Locate the top of pipe and both sides at the point the line is being crossed. When excavating, power equipment shall not dig closer than 18-inches to any point on the circumference of the pipeline and prodding shall be done during excavation. Pipeline shall be exposed by hand digging only at this point. Be aware of possible side taps and or top taps that have been abandoned or are not reflected on alignments; for known taps additional hand digging may be required.

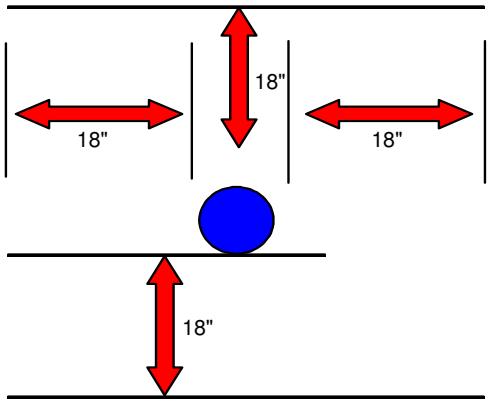


Figure 1 – Horizontal and Vertical Offsets

If a probe rod must be used, inspecting the coating in the excavated area is required and any damaged areas must be repaired before backfilling. DO NOT locate pressurized lines using power equipment.

Power equipment excavation should be done with the equipment positioned parallel to the pipeline unless ROW congestion prevents adequately positioning excavating equipment. Digging across the line with power equipment positioned above the line should be avoided wherever possible.

Care should be used when removing rock adjacent to the pipeline. With any type of rock breaker, the force of the tool should always be directed away from the pipeline. Rock breakers can move in unexpected directions when rock is broken. Use a protective barrier (e.g., wood, rubber) placed between the tool and pipe during this operation. Ensure that the protective barrier is adequate to protect the pipeline integrity should any inadvertent deflection of the tool occur.

If circumstances warrant it a hand held jack hammer may be used within the buffer zone as long as all of the other conditions of this part are met and:

- The tool operator should also exercise caution to avoid placing their body, arms, hands, etc. between the tool and the pipeline in order to avoid “pinch points” if the tool is deflected.
- The pipeline pressure will be reduced as low as operationally acceptable by the system Gas Control
- The excavation meets OSHA requirements with emphasis on the following;

- Adequate unrestricted work space is provided to allow proper handling and manipulation of the jack hammer and other tools
- An excavation exit plan is available.

- All other personal protective equipment required for this type of work; gloves, face shield, long sleeves, hard hats, steel-toed shoes, etc. will be utilized.

High Consequence Areas: An excavation in an HCA shall be evaluated for the potential of stress corrosion cracking (SCC) by reviewing the existing conditions with the SCC, criteria (refer to **O&M Procedure 917 – Stress Corrosion Cracking**).

3.9. Horizontal Distance

When new facility construction parallels the Company's transmission or gathering pipelines, horizontal clearances shall be as defined in Table 1 – Horizontal Distance from Company Facilities or shall be the extent of the ROW, whichever is less. Establish any horizontal clearance less than that specified in the table by agreement between the Company and the underground facility's owner. Discuss horizontal clearances requested within fee owned property with the **ROW Department**.

Third Party Facility	Horizontal Distance from Company Facilities
Buried pipelines	At least 10-feet
Buried telephone cable	At least 10-feet
Overhead telephone cable	At least 25-feet
Buried electric cables 440 VAC or less	At least 10-feet
Buried electric cables 440 VAC to 37.5 KVAC	At least 25-feet
Overhead electric lines 37.5 KVAC or less	At least 25-feet
Buried or overhead electric lines – facilities over 37.5 KV, AC or DC electric cable	Only by agreement between the utility and the Company's Regional Technical Manager or designee

Table 1 - Horizontal Distance from Company Facilities

3.10. Vertical Facility Clearance

Follow recommended minimum vertical clearances as shown in Table 2 – Vertical Clearance from Company Facilities when repairing, installing or constructing pipelines or cables across a Company transmission or gathering pipeline. Maintain underground utility depth to obtain these clearances across the entire easement. The Company must approve any deviation from vertical clearance requirements.

Third Party Facility	Vertical Clearance from Company Facility
New construction	When installing underground utilities, the last line should be placed beneath all existing lines unless it is impossible or unreasonable to do so.
Buried steel pipelines	At least a 24-inch vertical earth separation from a Company pipeline
Buried non-steel pipelines	At least a 24-inch vertical earth separation from a Company pipeline. At least a 24-inch vertical earth separation from a Company pipeline 12-inches or greater in diameter. Install flagging tape above the Company pipeline, approximately 3-feet on each side and directly over the cable or utility line for a distance of at least 15-feet.
Buried telephone and electric cables – 440 VAC or less	At least a 24-inch vertical earth separation from a Company pipeline The cable must have a nonconductive outer sheath extending at least 10-feet each direction from the Company pipeline. Install flagging tape above the Company pipeline, approximately 3-feet on each side and directly over the cable or utility line for a distance of at least 15-feet.
Fiber optic cables	Efforts should be made to install all fiber optic cable crossings at least 3-feet below Company pipelines. Installing a concrete barrier is recommended but may not be practical when the cable is a direct bore. In that case, the clearance and markings become more critical.
Buried electric cables 440 VAC to 37.5 KVAC	At least a 24-inch vertical earth separation from a Company pipeline. The cable shall have a nonconductive outer sheath extending at least 10-feet each direction from the Company pipeline. Install flagging tape above the Company pipeline, approximately 3-feet on each side and directly over the cable or utility line for a distance of at least 15-feet.
Facilities over 37.5 KV	Vertical separation of an electric cable or line operating at more than 37.5 Kilovolts A.C. or D.C. will be established by agreement between the utility involved and the Company Regional Technical Manager or designee.

Table 2 - Vertical Clearance from Company Facility

3.11. Engineering Assessment

When an encroachment with the potential to impact a Company facility is identified, an assessment and determination of the impact shall be required. Company representatives will notify the Regional Technical Manager or designee, who can include local **ROW Department**, or regional corrosion supervisor, to review information and respond to the third party. Upon notification of an encroachment by a third party, gather pertinent facts, including:

- The exact location, scope, description and schedule of the proposed third party activity
- The exact location and description of the company facility(s)
- Identify encroaching entity and record contact information.
- Identify local Operations contact.
- Determine which pipeline(s) or other company facilities are impacted. Record location and rechain station from inventory sheet or PODS database.
- Gather critical pipeline data such as pipe specifications, MAOP, class location, depth and coating type. Depending on the coating type, it may be necessary to take a coating sample and test for asbestos. Refer to **O&M Procedure 1211 – Asbestos**.
- Contact designated Land Department representative for ROW information.
- Fee property or easement, (i.e. year established) (contact the **ROW Department**)
- ROW width, (i.e. special conditions) (contact the **ROW Department**)
- Determine scope of third party project and scope of Company mitigation work.
- Determine project scheduling.

- Review Corrosion records prior to approval of a parking lot to determine if any recoating or other maintenance work is needed.

The Engineering Assessment required by this section must include analysis of the impact of abnormal loads or stresses on the pipeline.

- The pipe must be protected from hazards that may cause the pipe to sustain abnormal loads.
- Pipe must be of sufficient thickness or adequate protection must be provided to withstand anticipated external pressure and loads.
- Adequate protection must be provided to prevent damage that might result from the proximity of structures that are within 24-inches of the pipeline.

After conducting the Engineering Assessment, the Regional Technical Manager may approve permanent structures to be built with clearance from the pipeline of less than 24-inches but no closer than 12-inches. Variance from the requirements of this procedure for clearance of structures of less than 12-inches must be obtained through **O&M Procedure 001 – Standards Modification**.

3.12. Heavy Equipment/Vehicle Crossings, Roadways and Parking Lots:

Roads, construction equipment crossings and parking lots over steel pipelines shall be evaluated using the Company's stress calculation program, "**PLStress**" or other suitable method for calculating stress for uncased pipelines by Regional Technical Manager or designee to determine the total stress on the pipeline. If the total stress exceeds recommended limits, a permanent protective structure should be considered. For pipelines constructed of material other than steel, contact Regional Technical Manger or designee.

The following information will be required for the stress analysis. This information should then be provided to Regional Technical Manager or designee and used as inputs into the stress calculation for heavy loads crossing uncased pipelines.

- Loaded vehicle axle load (single, tandem)

  (1) Heaviest construction equipment evaluated at the bottom of the sub-base
  (2) Street legal vehicles such as concrete truck, trash truck, commercial vehicles evaluated at the top of the finished structure

- Equipment make and model
- Caterpillar equivalent make and model, if available
- Depth of cover over pipeline
- Soil Characteristics
- Roadway or parking lot material (asphalt, concrete, dirt, gravel, etc).

3.13. Directional Drilling

A Company representative must follow the procedures outlined in this section when a third party, contractor, etc. will perform directional drilling operations parallel to and/or within the minimum specified clearance of the Company's pipeline facilities.

The Company representative can ask a contractor to stop drilling if the operation is deemed unsafe or there is a concern that damage to the pipeline facilities may occur. A contractor is responsible for any damage to the pipeline facilities incurred because of the drilling.

Before starting a job, the contractor will:

- Notify One-Call for a utility locate request
- Contact the Company and advise of the proposed drilling route, expected clearance between the drilling tool and pipeline facilities and construction schedule
- Demonstrate that the boring tool can be accurately positioned
- The Company representative will periodically measure clearance when practical between the boring tool and pipeline facilities and if necessary, require a viewing window to help

determine that the tool will miss the pipeline. A third party's facility must maintain the vertical and horizontal clearances described in Tables 1 – Horizontal Distance from Company Facilities and Table 2 – Vertical Clearance from Company Facilities.

Upon completion of the directional drill, the Company representative will:

- Conduct a leakage survey along the length of the directional drilled path
- Refer to **O&M Procedure 215 – Patrolling and Leak Detection** for leakage survey documentation.

Field personnel will complete applicable OM Buried Facility Reports and develop as-built Company drawings (except for block cards) and send to Engineering Mapping/CADD in Lakewood. Drawings should indicate the third party's name, location of its utility line and the measured horizontal and vertical separation between the third party's and Company's facilities.

3.14. Land Leveling or Improvement – Company Notified

When advance notice of proposed land leveling or improvement is received, field personnel will notify the **ROW Department**. Submit requests to reduce pipeline cover or construction over the pipeline to Regional Technical Manager or designee for review.

- Upon notification, determine to what extent the Company pipeline may be affected.
- Evaluate alternatives for sloping the land or making improvements to avoid relocating Company pipeline or removing soil over a buried line. If possible, the landowner should achieve desired results without jeopardizing or disturbing the Company pipeline.
- Conduct a cover survey, profile and mark the pipeline's location.

If the leveling or improvement cannot be accomplished without relocating or modifying the Company pipeline, gather pertinent facts, including:

- The exact location and description of the proposed leveling or improvement
- A description of the required modification to Company pipeline facilities
- Possible alternatives to avoid disturbing Company pipeline
- The Regional Technical Manager or designee will review the information and determine required modifications.

Regional Technical Manager or designee will provide modification details and costs and will advise what agreements are necessary between the Company and landowner. The **ROW Department** will then contact the landowners and notify them of the portion of the cost for which they are responsible before beginning the project.

3.15. Blasting and Seismic Activity

Provide the Technical Manager or designee the following information when blasting is anticipated:

- Configuration of explosive charges (point, line or grid)
- Number of charges, spacing between charges, types of charges and weights
- Distance between pipeline and nearest charge for each pipeline
- Angle between pipeline and explosive line or grid (if grid, number of rows and charges per row)
- Pipe description of each pipeline
- Alternatives to blasting that were considered

Technical Manager or designee will prescribe proper blasting procedures and minimum distances to avoid pipeline damage for all blasting within 300-feet of the pipeline. Standoff distances of 100-feet for line or grid configurations containing a total charge weight of greater than 100 pounds are required.

If the Technical Manager or designee believes blasting could damage a facility, field personnel must perform leakage surveys as often as necessary during and after blasting to verify the pipeline's integrity

3.16. Buildings near Pipelines

It is recommended that buildings be a minimum of 25-feet or greater (if required by local ordinances) from any gathering or transmission pipeline or off the pipeline easement, whichever distance is greater. Contact the **ROW Department** to determine the Company's rights.

4. Training

Regional management will ensure that individuals involved in tasks required in this procedure are trained in operating locating instruments, appropriate documentation and all other provisions of this procedure.

Persons performing locating functions must meet the requirements of the Company Operator Qualification program.

Personnel should review this information as necessary before performing the procedure.

In order to ensure that responses made by a Company representative to an excavation notification is handled correctly, and that line locating procedures are properly followed, the local supervisor, manager, or director, shall periodically, but at least once each calendar year, accompany the Company Representatives assigned to line locate duties to assess work demands, quality of line marking, and coordination of excavations along the ROW. Records to substantiate these reviews will be maintained by the local manager.

5. Documentation

5.1. Company Report Forms

With the exception of distribution systems, report all foreign crossings, foreign structure retirements and inspection activities on **O&M Form OM200-01 – Foreign Structures Report** or the state's One-Call form. Report the condition of existing underground pipeline **O&M Form OM200-02 – Transmission Buried Pipeline Inspection Report**. Report any pipeline damage or any near-miss from third party activities into **STARS** as soon as possible.

Report metallic foreign structure crossings on **O&M Form OM200-03 – Underground Structure Crossing Report**. Use **O&M Form OM200-31 – Line Locate Inspection Report** to document on-site communications with contractors or other third parties. Report any pipeline damage or near-miss into **STARS** as soon as possible.

5.2. Response to Third Party

A response letter should be written to the third party outlining what impact the encroachment has to our pipeline(s), request additional information, if needed, identify any special requirements and relay our expectations for reimbursement (if adjustment is required).

The Company's **O&M Form OM200-29 – Guidelines for Design and Construction near Kinder Morgan Operated Facilities** should be included, in their entirety, in the response letter.

All correspondence should be sent to the appropriate Operations and ROW Department/ROW representative for review/comment prior to sending to the encroaching entity. Consideration should be given as to whether any response should be recorded as a legal document along with the existing easement.

5.3. Photographs

Photographs shall be maintained in local files where they will be readily identifiable to the location. Photographs shall be attached to a hard copy of the completed One-Call ticket, or electronically stored in the electronic One-Call system, or attached to **O&M Form OM200-31 – Line Locate Inspection Report**. Photographs shall be retained in accordance with applicable state laws for One-Call documentation.

5.4. All Documentation

In the event of litigation, unresolved situations, or as instructed by management, affirmative steps must be taken to preserve all records (whether in electronic or written form) until such time as otherwise directed by a representative of Company's legal department.

6. References

- 49 CFR 192.614 (c)(3), (4) and (6)(ii), 192.929(b)1, 192.935(d)2; 192.935(b)1ii
- Iowa Chapter 479, Section 479A.26
- Common Ground Alliance Best Practices
- **O&M Procedure 120 – Personal Protective Equipment**
- **O&M Procedure 205 – Pipeline Markers and Cover**
- **O&M Procedure 206 – Land and Right-Of-Way**
- **O&M Procedure 214 – Reporting Pipeline Safety-Related Conditions**
- **O&M Procedure 215 – Patrolling and Leak Detection**
- **O&M Procedure 232 – Damage Prevention and Public Awareness**
- **O&M Procedure 237 – Dresser-Coupled Pipelines**
- **O&M Procedure 903 – External Corrosion Control for Buried or Submerged Pipelines**
- **O&M Procedure 917 – Stress Corrosion Cracking**
- **O&M Procedure 1700 – Inspection & Maintenance, I-0265.00 – Maintain Pipelines in One-Call System**
- **O&M Form OM200-01 – Foreign Structures Report**
- **O&M Form OM200-02 – Transmission Buried Pipeline Inspection Report**
- **O&M Form OM200-03 – Underground Structure Crossing Report**
- **O&M Form OM200-29 – Guidelines for Design and Construction near Kinder Morgan Operated Facilities**
- **O&M Form OM200-31 – Line Locate Inspection Report**
- **Construction Drawing CST-P-1000-A305 – Typical Undercrossing of Tile Drainlines**
- **Construction Drawing CST-P-1000-A325 – Crossing Foreign Pipelines**
- **STARS**
- **Pipeline Integrity Management Program**
- **PLStress** Pipeline Stress Calculation

Attachment 1 – One-Call Center and Emergency Phone Numbers

State	One-Call Center	Telephone Number
Alabama	Alabama One-Call	800-292-8525
Arkansas	Arkansas One-Call System, Inc.	800-482-8998
Colorado	Utility Notification Center of Colorado	800-922-1987
Illinois	JULIE, Inc.	800-892-0123
Indiana	Indiana Underground Plant Protection Service	800-382-5544
Iowa	Underground Plant Location Service, Inc.	800-292-8989
Kansas	Kansas One-Call System, Inc.	800-344-7233
Louisiana	DOTTIE – Louisiana One-Call System, Inc.	800-272-3020
Mississippi	Mississippi One-Call	800-227-6477
Missouri	Missouri One-Call System, Inc.	800-344-7483
Montana	Montana One-Call	800-551-8344
	Utilities Underground Locating Center	800-424-5555
Nebraska	Diggers Hotline of Nebraska	800-331-5666
New Mexico	New Mexico One-Call System, Inc.	800-321-2537
Oklahoma	Oklahoma One-Call System, Inc.	800-522-6543
Ohio	Ohio Utilities Protection Service	800-362-2764
Texas	TESS - Texas Excavation Safety System, Inc.	800-344-8377
	Texas One-Call System	800-245-4545
	Lone Star Notification Center	800-669-8344
Wyoming	One-Call of Wyoming	800-849-2476
National	Call 811	811

Company Emergency Control Center Numbers

Entity	Telephone Number
Kinder Morgan	888-763-3690
Kinder Morgan Interstate Gas Transmission Company	888-763-3690
Kinder Morgan Louisiana Pipeline, LLC	800-733-2490
Kinder Morgan North Texas Pipeline	800-633-0184
Kinder Morgan Tejas Pipeline, LLC	800-568-7512
Kinder Morgan Texas Pipeline, LLC	800-633-0184
Midcontinent Express Pipeline, LLC	800-733-2490
Natural Gas Pipeline Company of America	800-733-2490
Trailblazer Pipeline Company	800-733-2490
TransColorado Gas Transmission	800-944-4817
Rockies Express Pipeline, LLC	877-436-2253

RIGHT-OF-WAY

SECTION 14500 - MATERIALS HANDLING AND RESPONSIBILITY

FOR WORK AND MATERIAL

INDEX PAGE

SECTION 14500 - MATERIALS HANDLING AND RESPONSIBILITY FOR WORK AND MATERIAL

4.1 MATERIALS HANDLING AND RESPONSIBILITY FOR WORK AND MATERIAL

A. Material storage sites for transmission lines shall be obtained by the Contractor. He shall receive, unload, and haul material from these locations to the job sites. All expenses incurred for obtaining these storage sites will be paid by the Contractor.

B. Contractor assumes all risk of and shall bear all loss or damage whatsoever, howsoever caused, which may occur to or upon said work or material before entire completion and final acceptance thereof by Owner. Contractor shall immediately repair and restore at his expense any work damaged or destroyed so that all and every part thereof shall be duly completed in the manner and within the time herein provided.

C. The Contractor shall receive all material , either as received directly from the manufacturer or at the various storage points. The Contractor shall have full responsibility for it and be liable for the theft thereof, from the right-of-way or storage yards and for all loss and damage thereof which may occur at any time prior to acceptance of the entire job. Upon completion of the contract, the Contractor and the Owner's Representative will determine the quantities of materials actually incorporated into the line for unit cost adjustments.

RIGHT-OF-WAY

SECTION 01720 - SPECIAL CONDITIONS

INDEX PAGE

SECTION 01720 - SPECIAL CONDITIONS

5.1 INGRESS AND EGRESS ON RIGHT-OF-WAY

Ingress and egress to and from the centerline of construction and all work to be performed thereon shall be limited to the right-of-way. However, whenever practicable to do so, regularly established highways or farm roads may be used for ingress and egress provided there are no special conditions which must be met as hereafter specified.

5.2 SPECIAL CONDITIONS IN EASEMENT DOCUMENTS

The Contractor will be provided with a list of any special easements conditions prior to start of construction.

5.3 SPECIAL CONDITIONS IN PERMIT DOCUMENTS

A. Contractor shall abide by all special conditions specifically stated or inferred by all crossing and/or construction permits obtained for crossing roads, railroads, highways, etc. No timber or trees shall be cut or removed unless specific approval is obtained from the proper authorities by the Contractor.

B. A copy of all permit applications and approvals, if required, may be obtained from the Owner. The Contractor shall be responsible for notifying the proper authorities at the time indicated in the permit documents, before, during, and after construction as may be required by the various agencies for which permits have been obtained.

FOUNDATION INSTALLATION AND EARTHWORK

SECTION 02200 - EXCAVATION AND BACKFILL

INDEX PAGE

SECTION 02200 - EXCAVATION AND BACKFILL

1.1 EXCAVATION

A. The Contractor shall excavate earth, rock, tree stumps, roots, pavement, foundations and other materials encountered. Suitable excavated material shall be placed in backfill. Excess excavation and materials grading shall be wasted and disposed of to a site determined by the Contractor.

B. Foundations in earth shall be excavated to clean level surfaces of undisturbed material. The volume of over excavation on sides or bottoms shall be filled with concrete. In either case, the cost of the backfill or additional concrete used in the foundation shall be borne by the Contractor.

C. Excavations shall be maintained in a safe, clean and sound condition up to the time of placement of foundations. Whenever necessary, the Contractor shall re-excavate materials which have accumulated in previously prepared holes. Any muck or other unsatisfactory bearing material resulting from frost actions or entrance of water into excavations shall be removed and replaced with concrete at the Contractor's expense. The Contractor shall effectively cover all holes when not attended to prevent hazardous conditions and ensure safety of people and livestock. The Contractor shall be responsible for all damages to persons, property, and livestock as a result of ineffective covering.

D. Augered holes shall not be out of plumb by more than one and one-half inches (1-1/2") in 10 feet. The depth of holes shall be accurately controlled to the elevations shown on the drawings. During the pouring operation, the Contractor shall continuously monitor the hole to be aware if any caving occurs and all loose earth and contaminated concrete shall be removed from the hole before concreting is resumed.

E. The Contractor shall do all bracing, sheeting and shoring necessary to perform and protect all excavations as required for safety, and to conform to laws and regulations of governmental bodies having jurisdiction.

F. In the event sloughing and caving occurs due to underlying soil conditions, the Contractor will take the necessary steps to encase that portion of the augered hole necessary to install the foundation to the depth shown on the plan.

G. In the event ground water is encountered prior to reaching the required depth, the Engineer shall be contacted. Based on the local conditions and a mutual decision by the Engineer and the Contractor, it may be decided that a steel casing should be installed.

H. There shall be no voids between the outside of any encasement and the surrounding earth. To insure this, the encasement must be pulled as the concrete pour is being made so the fresh concrete is placed against the undisturbed earth. The encasement shall be of sufficient strength to withstand any driving force required to place it and any extracting force necessary to remove it.

I. In the event the Contractor is unable to extract the encasement, the soil density shall be checked adjacent to the encasement to determine if soil voids exist. If any voids exist between the encasement and the surrounding earth, they shall be pressure filled with a lean mixture of concrete with aggregate size compatible with the voids being filled. The cost of soil testing and pressure filling the soil voids shall be borne by the Contractor.

J. Payment for hole encasement authorized in writing by the Engineer will be based on linear feet of encasement installed by the Contractor at the prices quoted in the Contractor's Proposal for the diameter installed. Contractor's unit price shall include all costs involved.

K. The Contractor shall have on the project, in quantities sufficient to meet the schedule, and use cylindrical foundation excavating equipment capable of exerting a continuous torque of 75,000 ft.-lb. or more. This equipment must also have the capability to exert a downward force of 12,000 lbs. or more not including the weight of the Kelly bar and tools.

L. Extenders used on auger bits to increase the diameter of the hole shall not be more than one foot of radius to increase the diameter by two feet.

1.2 BACKFILL

A. Structures embedded directly into an open hole shall be backfilled as shown on the drawings as soon as practicable. Fill material shall be placed in layers not exceeding eight (8) inches. Each layer shall be compacted by powered mechanical tamper to the compaction of the surrounding soil. Each layer shall be placed evenly on all sides so as not to damage or displace the structures. The top portion of the backfill shall be clean soil removed from the excavation. Top portion is to extend a minimum of three inches below ground level to a point six inches higher than the ground level. This cover shall evenly slope from the high point to the ground level at the edge.

B. Backfill material for wood poles shall be clean soil removed from the excavation. Backfill material for direct embedded steel poles shall be concrete meeting the requirements of Section 03300- Cast-In-place Concrete.

C. The degree of compaction to be attained for all backfill shall be the equivalent density of adjacent undisturbed earth.

D. Large stones, muck, frozen material, roots or other undesirable material shall not be permitted or used for backfill.

FOUNDATION INSTALLATION AND EARTHWORK

SECTION 03300 - CAST-IN-PLACE CONCRETE

SECTION 03300 - CAST-IN-PLACE CONCRETE

2.1 GENERAL

A. Furnish and install all cast-in-place concrete and miscellaneous materials required, as specified herein and shown on drawings.

B. Requirements of Section 02200 Excavation and Backfill apply to all work under this section.

C. Provide foundations, as shown on the drawings, for the following:

1. Drilled piers for tubular steel poles.
2. Directly embedded tubular steel poles.

D. The details of the foundations shown on the drawings submitted with this specification are to be used for preparing bids. Actual construction shall be based on drawings indicating that the design is released for construction. Cost adjustments for deviations from the bid drawings shall be made based on related unit prices furnished with the bid.

E. Concrete shall conform to the requirements of ACI-318 and as modified by this specification.

2.2 MATERIALS

A. Where the use of the following materials is specified herein, such materials shall be in accordance with these requirements:

1. Cement: ASTM C150, Type I, II or III and Type IA, IIA or IIIA.

2. Fine aggregate: Clean natural sand, ASTM C33.

3. Coarse aggregate: Crushed stone or washed gravel, conforming to ASTM C33.

4. Water: Clean and free from deleterious substances.

5. Admixtures:

   a. Air entering agent: ASTM C260; Grace “Darex AEA”, Master Builders “MB-VR”, Protex “Air Entraining Solution”, Sika Chemical “AER”, or acceptable equal.

6. Reinforcing steel:
   a. Bars not otherwise noted: ASTM A615 Grade 60.

2.3 PRELIMINARY REVIEW

A. The source and quality of concrete materials and the concrete proportions proposed for the work shall be submitted to the Engineer for review before the concrete work is started. Review of these reports will be for general acceptability only and continued compliance with all contract provisions will be required.

B. The report for each tentative concrete mix submitted for review shall contain the following information:

1. Slump on which design is based.

2. Total gallons of water per cubic yard.

3. Cement factor.

4. Ratio of fine to total aggregates.

5. Weight (surface dry) of each aggregate per cubic yard.

6. Quantity of each admixture.

7. Air content.

8. Compressive strength based on seven (7) day and 28 day compression tests at Contractor's expense.

9. Times of initial set.

10. In the event the Contractor wishes, he may provide concrete that conforms to the requirements of ASTM C94 "Standard Specification for Ready – Mixed Concrete". Such a mix will be subject to verification that the compressive strength is not less than specified.

2.4 LIMITING REQUIREMENTS

A. Each concrete mix shall be designed and concrete shall be controlled within the following limiting requirements.

B. Coarse aggregate sizes listed hereinafter are the nominal sizes given in Table 2 of ASTM C33. To qualify as a certain aggregate size, the gradation of the aggregate must be within the tabulated limits.

C. Total water content: Total water content of concrete shall not exceed 6.4 gallons of water per hundred pounds of cement in the mix.

D. Slump: Unless otherwise instructed by the Project Construction Drawings or authorized by the Owner, slump shall be six (6) to eight (8) inches.

E. Ratio of fine to total aggregate: The ratio of fine to total aggregate based on solid volumes (not weights) shall be:

Coarse Aggregate Size:

	Minimum Ratio	Maximum Ratio
½ inch to No. 4	0.40	0.55
3/4 inch to No. 4	0.35	0.50
1 inch to No. 4	0.30	0.46

F. Initial set: The initial set as determined by ASTM C403 shall be attained in not less than five (5) hours after the water and cement are added to the aggregates.

G. Total air content: the total volumetric air content of concrete after placement shall be five percent (5%) plus or minus one percent (1%).

H. Admixtures: the admixture content, batching method and time of introduction to the mix shall be in accordance with the manufacturer's recommendations for compliance with these specifications.

I. Strength: the minimum acceptable compressive strengths as determined by ASTM C39 shall be:

Age	Minimum Strength
28 days	3,000 PSI-except as noted below
28 days	4,000 PSI-placed in water by tremie

J. In the event any test cylinder indicates concrete strength less than the specified minimum, the concrete represented by the test shall be subject to further investigation at the Owner's option. The cost of further investigation shall be borne by the Contractor.

K. If the additional investigation verifies the existence of defective concrete, the Contractor shall remove and replace all defective concrete at his expense.

2.5 STORAGE OF MATERIALS

A. Cement shall be stored in suitable moisture-proof enclosures. Reclaimed cement or cement which has become caked or lumpy shall not be used.

B. Aggregates shall be stored so that segregation and the inclusion of foreign materials are prevented. The bottom six (6) inches of aggregate piles that have been in contact with the ground shall not be used.

C. Reinforcing steel shall be carefully handled and shall be stored on supports which will keep the steel from contact with the ground.

2.6 BATCHING AND MIXING

A. Batching and mixing shall be performed with suitable equipment located at the construction site or by an acceptable ready-mix concrete supplier. Ready-mix concrete shall conform to ASTM C94.

B. Batching:

1. The measurement of aggregates and cement shall be by weight. Aggregate weights shall be adjusted for the moisture content.

2. Each admixture shall be dispensed by a mechanical device that will ensure accurate and automatic measurement.

3. The minimum amount of water required to produce the desired slump shall be batched automatically.

C. Mixing:

1. Concrete shall be mixed until all ingredients are uniformly distributed throughout the batch.

2.7 PLACEMENT

A. The handling, depositing and compacting of concrete shall conform to these specifications subject to adjustment by the Engineer for weather or placement conditions.

B. Concrete shall not be pumped through aluminum pipe or aluminum alloy pipe.

C. Monolithic placement of foundations is required.

D. Conveyance and distribution:

1. The method and equipment used for transporting concrete shall be such that concrete having the required composition and consistency will be delivered to its final position without objectionable segregation of loss of slump.

2. All concrete mixing and placing of equipment and methods shall be subject to approval by the Engineer.

3. It is specifically a provision of this specification that mixer trucks must have an accurate water measuring device in good order at all times and positive cutoff water valves that will not permit additional water to leak into the mixing drum.

4. Mixer trucks not properly equipped and maintained shall not be used on this work.

5. Special care shall be taken to keep drum fins clean so that proper mixing of aggregates will be accomplished.

E. Depositing concrete:

1. The starting time of mixing the batch in the presence of moisture and of the pouring of each batch shall be recorded in a manner satisfactory to the Engineer, and the elapsed time of mixing shall not exceed one and one-half (1-1/2) hours. Concrete shall be placed only in the presence of a duly authorized representative of the Owner. Concrete placement will not be permitted when, in the opinion of the Owner, weather conditions or other pertinent factors prevent proper placement and consolidation.

2. Concrete shall be placed in continuous horizontal layers, in such a manner that each succeeding layer shall be deposited, spaded, vibrated, or otherwise worked into place, before the preceding layer has taken its initial set.

3. Depositing concrete in a large quantity at any point and running or working it along the forms will not be permitted. Concrete shall not be dropped a distance of more than four (4) feet except by permission of the Owner.

4. Placing concrete in the augered holes shall be done by a tremie or drop chute. All surfaces of forms and embedded materials that have become encrusted with dried mortar or grout from concrete previously placed or with mud or other foreign material, shall be cleaned of all such refuse before the surrounding or adjacent concrete is placed.

5. Any concrete retained in truck mixers so long as to require additional water to permit satisfactory placing shall be wasted.

6. Retempering of concrete will not be permitted.

7. Adding dry cement to reduce the slump will be allowed only when approved by the Owner.

8. Wasted concrete, concrete spillage and concrete ordered removed from the work shall be removed from the right-of-way or otherwise disposed of at the direction of the Owner. Wash water used for cleaning concrete mixing and handling facilities, or any other waste containing cementitious materials shall be dumped in a suitable location away from the right-of-way unless written permission is obtained from the landowner. Duplicate copies of such consent from landowners shall be sent to the Owner.

F. Compaction:

1. During and immediately after depositing all concrete shall be throughly compacted, worked around reinforcements and embedments, and worked into the corners of the forms.
2. All concrete shall be compacted by means of mechanical vibrating equipment.

G. Hot weather concreting:

1. Hot weather concreting shall comply with ACI 305. At air temperatures of 90° F or above, special procedures shall be adopted to keep the concrete as cool as possible during placement and curing. The temperature of the concrete when it is placed in the work shall not exceed 90° F.

H. Cold weather concreting:

1. Cold weather concreting shall comply with ACI 306. The temperature of concrete at the time of mixing shall be not less than that indicated in the following table for corresponding outdoor temperature (in shade) existing at the time of placement:

Outdoor Temperature	Concrete Temperature
Below 30° F	70° F
Between 30° F & 45°F	60° F
Above 45°F	45° F

2. When deposited, the temperature of heated concrete shall be not over 80° F.

3. When freezing temperatures may be expected during the curing periods, suitable means shall be provided for maintaining the concrete at temperatures of not less than 50° F for five (5) days or 70°F for three (3) days after the concrete is placed. Concrete and adjacent form surfaces shall be kept moist at all times. Sudden cooling of concrete shall not be permitted.

4. The use of calcium chloride will not be permitted.

I. Tremie concrete

1. Tremie concrete placed in water shall have a minimum compressive strength of 4000 psi at twenty-eight (28) days, and the slump shall be in the range of five (5) to seven (7) inches.

2. No concrete shall be placed in water except with the permission of the Owner, and the method of depositing the concrete shall be approved by the Owner. The tremie tube method shall be used in placing concrete in water.

2.8 CONCRETE TESTS

A. Field control tests consisting of slump tests, air content tests, and the preparation of concrete test specimens shall be made by the Contractor. The Contractor shall provide for making the tests and test specimens and for storing, curing, and handling and delivering test specimens to a testing laboratory retained and paid by the Contractor.

B. Slump:

1. A slump test shall be made from the first, every other and last truckload of concrete used for each pier. Slump shall be determined in accordance with ASTM C143.

C. Air content:

1. An air content test shall be made the first, every other and last truckload of concrete used for each pier. Air content shall be determined in accordance with ASTM C231.

D. Compression tests:

1. A set of three (3) compression test cylinders shall be made from the first and last truckload of concrete for each pier. One (1) cylinder of each set shall be tested at an age of seven (7) days, another at an age of twenty-eight (28) days and the third held for testing if the twenty-eight day break is low.

2. Concrete test cylinders shall be made, cured, stored and delivered to the laboratory in accordance with ASTM C31. The cylinders will be tested in accordance with ASTM C39.

3. Each set of compression test cylinders shall be marked or tagged with the date and time of day the cylinders were made, all locations in the work where the concrete was placed, the air content and the slump.

E. Test reports:

1. The Contractor shall furnish the Owner one (1) copy of all test reports made by the laboratory.

2.9 REINFORCEMENT

A. Reinforcements shall be accurately formed. Unless otherwise indicated on the drawings or specified herein, the details of fabrication shall conform to ACI 318, latest revision.

B. Welding:

1. Unless otherwise authorized by the Owner, welding of reinforcement and tack welding is prohibited.
2. Welded chairs and supports may be used, provided they are clamped or wired to the reinforcement.

C. Placement:

1. Reinforcements shall be accurately positioned on supports or other reinforcements and secured in place prior to placing concrete.

D. Splices:

1. Splices shall be tension-lapped splices except as otherwise authorized by the Owner.

2.10 ANCHOR BOLTS

Anchor bolts in concrete piers shall be set carefully and maintained at the lines and grades shown on the drawings. The Contractor shall be fully responsible for the adequacy and accuracy of his work. Minimum tolerances will be included in the Owner's evaluation of the acceptability of defectiveness of the foundation. The following minimum tolerances shall apply.

1. The elevation of the top of the anchor bolts with respect to the top of Concrete –0.0 to + ¼".

2. The anchor bolt shall not deviate from the vertical more than one-sixteenth (1/16) inch in one (1) foot.

3. Individual anchor bolts in groups shall not deviate from their centerlines Parallel to the centerlines of structures by more than one-sixteenth (1/16) inch in one (1) foot.

4. The center of the completed anchor bolt groups for any structure shall be within one-sixteenth (1/16) inch of the staked centerline of the structure.

2.11 FORMS

A. Forms shall be designed to produce hardened concrete having the shape, lines and dimensions indicated on the drawings. Forms shall be constructed and maintained in proper position and accurate alignment. Forms shall conform to ACI 347 and the following additional requirements.

1. Form removal:

a. Forms shall not be removed or disturbed until the concrete has attained sufficient strength to safely support all dead and live loads. Care shall be taken in form removal to avoid surface gouging, corner or edge breakage, or other damage to the concrete.

b. Under normal conditions, after placing concrete, the minimum waiting period before the forms may be stripped shall be governed by the following schedule, but the use of this schedule shall not relieve the Contractor of responsibility for the safety of the structure.

c. Side forms of footings and piers.

Average Air Temperature Above 50° F	40° - 50 °F
3 days	5 days

d. When temperatures below 40°F occur, the forms shall remain in place for an additional time equal to the time the structure has been exposed to the lower temperature.

e. Test results of field control cylinders may be used for determining when forms may be removed. Forms may be removed after tests on such cylinders show that at least 75 percent of the required 28 day strength has been attained.

2.12 FINISHING FORMED SURFACES

A. All fins and other surface projections shall be removed from all exposed formed concrete surfaces. Exterior surfaces which will be exposed above grade shall be cleaned and rubbed. Rubbing shall produce a smooth, uniform surface free of marks, voids, surface glaze, and discolorations.

B. All finished formed surfaces shall have a one (1) inch crown as shown on drawings.

C. The exposed portions of the tops of all foundations shall be steel trowel finished.

2.13 CURING

A. Concrete shall be protected from loss of moisture for not less than seven (7) days by polyethylene film or membrane curing compound applied as recommended by the manufacturer.

B. Membrane curing compound shall not be used on concrete surfaces which will receive a separate finish or coating. Water curing only will be permitted on the surfaces which will receive a separate finish or neoprene waterproofing coating.

1. Water curing:

a. Water saturation of concrete surfaces shall begin within 12 hours in dry weather and within 24 hours in damp weather. The rate of water application shall be regulated to provide complete surface coverage with a minimum of runoff.

2. Membrane curing:

a. Membrane curing compound shall be applied within thirty (30) minutes after final finishing of the surface or as soon as possible without damaging the surface.

2.14 REPAIRING DEFECTIVE CONCRETE

A. Defects in formed concrete surfaces shall be repaired to the satisfaction of the Owner within 24 hours, and defective concrete shall be replaced within 48 hours after the adjacent forms have been removed. All concrete which is defective to a depth in excess of one (1) inch shall be cut out and removed to sound concrete. Cut surfaces shall be coated with epoxy bonding compound before the repair concrete is placed.

2.15 TOP OF CONCRETE

A. The tops of all piers shall be installed at the T.O.C. elevations as shown on drawings. Top of pier shall be taken as top of 1" crown at center of pier.

STRUCTURE ERECTION

SECTION 05170 - TUBULAR STEEL STRUCTURES

INDEX PAGE

SECTION 05170 - TUBULAR STEEL STRUCTURES

1.1 GENERAL

A. The location, type and height of each structure is shown on the plan and profile drawings.

1.2 HANDLING OF STRUCTURES

A. The Contractor shall exercise care in unloading, delivery, handling and erecting structures so as not to damage the finish. The Contractor and Owner together shall inspect and reject any member which has been damaged when received by the Contractor and thereafter the Contractor shall replace at his expense, members damaged by his carelessness.

B. No member shall be assembled which in the opinion of the Contractor or Owner is not acceptable. If any member is rejected after erection, it shall be removed and replaced by the Contractor without expense to the Owner.

C. Structure members stored pending erection shall be sorted and neatly piled, supported with suitable blocking furnished by the Contractor, so that no part of any member shall be in contact with the ground. No members shall be used as unloading or loading skids.

D. Structures shall be received by the Contractor and stored temporarily at a location chosen by the Contractor and acceptable to the Owner. The Contractor shall be responsible for removing the structures from any temporary storage site to the structure sites. Cost of this moving shall be at the expense of the Contractor.

1.3 ERECTION OF STRUCTURES

A. The ends of each section shall have match marks identifying proper sections and orientation of sections to be assembled. These match marks shall be properly aligned and the sections kept level during assembly . Any damage to slip joints caused by improper alignment shall be repaired at the Contractor's expense.

B. All poles with slip joint connections shall be equipped with jacking nuts or lugs on either side of the joint for assembly by means of mechanical, hydraulic or electric assembly tools, which shall be furnished by the Contractor. The joint shall be assembled to the recommended overlap distance.

C. Each nut shall be secured by a lock nut specified in Section 05120. In the case of bolts used in tapped holes, a lockwasher shall be placed under the head of the bolt. The end of the bolt shall extend at least one thread length beyond the outer face of the nut, but not more than one and one-half (1-1/2) inches. Nuts shall be tightened with a torque wrench to the following values:

Bolt Size	Bolt Material Steel, Ft. Lb.
5/8"	75
3/4"	125
7/8"	200
1"	300

D. The anchor bolts shall be furnished in a pre-assembled rigid pre-positioned cluster.

E. The Contractor shall provide all necessary tools and instruments to install and torque test all nuts. Wrench jaws shall not damage the nut. Nuts which are damaged thru the use of improper tools or improper installation procedures shall be replaced at the Contractor's expense.

F. After erection, the structure shall be checked for plumb or specified condition of rake. The structure shall be within three (3) inches of that specified by the design.

G. Where any damage has occurred to the galvanized finish, the Contractor shall remove all rust by wire brushing or sandblasting. The damaged area shall be painted with two (2) coats of "Galvanox".

1.4 WELDING

A. Per Owner's request for welding to reinforce or modify, or for other reasons, the welding shall be practiced only by personnel well trained in the art and shall be in accordance with the provisions of the American Welding Society Specifications AWS D1.1.

STRUCTURE ERECTION

SECTION 05171 - CONCRETE STRUCTURES

SECTION 05171 - CONCRETE STRUCTURES

1.1 GENERAL

A. The location, type and height of each structure is shown on the plan and profile drawings.

1.2 HANDLING OF STRUCTURES

A. The Contractor shall exercise care in unloading, delivery, handling and erecting structures so as not to damage the concrete finish. Contractor is to follow recommended pole handling practices supplied by the manufacturer. The Contractor and Owner together shall inspect and reject any pole which has been damaged when received by the Contractor and thereafter the Contractor shall replace at his expense, poles damaged by his carelessness.

B. No pole shall be assembled which in the opinion of the Contractor or Owner is not acceptable. If any pole is rejected after erection, it shall be removed and replaced by the Contractor without expense to the Owner.

C. Concrete poles stored pending erection shall be sorted and neatly piled, supported with suitable blocking furnished by the Contractor, so that no part of any pole shall be in contact with the ground.

D. Structures shall be received by the Contractor and stored temporarily at a location chosen by the Contractor and acceptable to the Owner. The Contractor shall be responsible for removing the structures from any temporary storage site to the structure sites. Cost of this moving shall be at the expense of the Contractor.

1.3 ERECTION OF STRUCTURES

A. Each concrete pole includes predrilled holes for the mounting of hardware assemblies. The Contractor shall use proper care in the attachment and location of hardware on the pole. Any damage to the pole caused by improper alignment shall be repaired at the Contractor’s expense.

B. The Contractor shall use the manufacture's recommended practices for lifting the concrete poles.

C. Each nut shall be secured by a lock nut specified in Section 05120. In the case of bolts used in tapped holes, a lockwasher shall be placed under the head of the bolt. The end of the bolt shall extend at least one thread length beyond the outer face of the nut, but not more than one and one-half (1-1/2) inches. Nuts shall be tightened with a torque wrench to the following values:

Bolt Size	Bolt Material Steel, Ft. Lb.
5/8"	75
3/4"	125
7/8"	200
1"	300

D. The Contractor shall provide all necessary tools and instruments to install and torque test all nuts. Wrench jaws shall not damage the nut. Nuts which are damaged thru the use of improper tools or improper installation procedures shall be replaced at the Contractor's expense.

E. After erection, the structure shall be checked for plumb or specified condition of rake. The structure shall be within three (3) inches of that specified by the design.

1.4 FIELD DRILLING OF ADDITIONAL HOLES

A. In the event that additional holes are required to be drilled in the concrete poles in the field, the Contractor shall follow the manufactures recommended practices.

B. A rotary hammer drill that uses a spline drill bit shall be used. A Dewalt D25551K or similar rotary hammer drill shall be used.

C. Carry must be taken in alignment of the drill so as to not hit the internal steel in the pole. The drill bits are not capable of drilling through the steel reinforcement in the pole. The drilling shall be done in both directions and not completely through the pole or you will risk blowing out the exist side of the hole.

IMPORTANT! PLEASE READ BEFORE HANDLING THE POLES

1) Prior to unloading, inspect general condition of poles to be sure no obvious damage has occurred during shipping
2) Use the sketches shown below as a guide for unloading the poles. Be sure that crane straps are in good condition
3) Always use experienced crane operators following all safety rules
4) When storing poles, it is crucial that the pole is blocked up in a level position so it does not bend under its own weight (see below)
5) When installing, raise pole as smoothly as possible referring to the sketches below.
6) Call one of our toll free numbers listed below if there are any questions or concerns

HANDLING INSTRUCTIONS FOR POLES SHORTER THAN 80'

BUTT
TIP
B
HANDLING AND UNLOADING

	POLE LENGTH UP TO 50'	POLE LENGTH BETWEEN 50 & 80'
A	LOCATE ABOVE POINT OF BALANCE	20% OF DISTANCE FROM POLE TIP
* B	RECOMMENDED MINIMUM 10'	MIN. 20% & UP TO 50% POLE LENGTH
** C	10% OF POLE LENGTH	15% OF POLE LENGTH
** D	25% OF POLE LENGTH	30% OF POLE LENGTH

BUTT
TIP
C
D
POLE STORAGE

* WHEN HEAVY HARDWARE IS BEING ERECTED ON POLE, CONTACT MANUFACTURER FOR LOCATION OF TOP PICK-UP POINT OR REFER TO APPROVAL DRAWING FOR FACTORY INSTALLED PICK UP HOLE.

** WHEN STORING FOR ANY LENGTH OF TIME, POLES MUST BE SUPPORTED SO THAT THEY ARE NOT BENT UNDER THEIR OWN WEIGHT.

*** IDEALLY, A SPREAD OF 50% OF POLE LENGTH IS BEST FOR UNLOADING POLES OVER 50' IN LENGTH.

◁ USE WEDGES AT ENDS OF EACH ROW TO KEEP STORAGE UNIT SECURE

BUTT
TIP
A
ERECTION

HANDLING INSTRUCTIONS FOR POLES 80' AND LONGER

BUTT
TIP
B
C
HANDLING AND UNLOADING

	80'	85'	90'	95'	100'	105'	110'
* A	25'	25'	25'	30'	30'	30'	35'
B	15'	15'	20'	25'	25'	25'	25'
C	25'	25'	25'	30'	30'	30'	30'
** D	10'	10'	10'	10'	15'	15'	15'
** E	10'	15'	15'	15'	15'	15'	15'

BUTT
TIP
D
E
CENTER SUPPORT TO BE CENTERED BETWEEN POINTS "D" & "E"
POLE STORAGE

* WHEN HEAVY HARDWARE IS BEING ERECTED ON POLE, CONTACT MANUFACTURER FOR LOCATION OF TOP PICK-UP POINT OR REFER TO APPROVAL DRAWING FOR FACTORY INSTALLED PICK UP HOLE.

** WHEN STORING FOR ANY LENGTH OF TIME, POLES MUST BE SUPPORTED SO THAT THEY ARE NOT BENT UNDER THEIR OWN WEIGHT.

◁ USE WEDGES AT ENDS OF EACH ROW TO KEEP STORAGE UNIT SECURE

BUTT
TIP
A
ERECTION

KING
King Luminaire • StressCrete • Est. 1953
STRESSCRETE GROUP

840 Walkers Line
Burlington, Ontario L7R 3X9
Phone 1-800-268-7809

9200 Energy Lane
Northport, Alabama 35476
Phone 1-800-435-6563

14503 Wallick Road
Atchison, Kansas 66002
Phone 1-800-837-1024

\STRESS\DWGS\1024D042

STRUCTURE ERECTION

SECTION 16390 - STRUCTURE GROUNDING

2.1 GENERAL

A. The Contractor shall furnish all grounding material and install the grounding material as shown on the drawings or as directed by the Owner.

B. Contractor is to take ground readings at each structure to determine if additional grounding is required. Contractor shall install additional ground rods and couplings as required until a maximum of 10 ohms resistance is reached with a maximum of 6 total rods per structure.

C. The Contractor shall measure and record, on the Plan and Profile drawings, the ground resistance after installing the ground rods. The Contractor shall furnish the equipment for making these measurements and furnish the results (ohms) to the Owner.

D. Grounding shall be installed immediately after the structure has been erected.

E. All steel structures shall be grounded using galvanized ground rods and 5/16” galvanized grade BB soft annealed steel ground wire. Steel poles shall be grounded by the use of a minimum of a 40 feet galvanized ground rod per pole. The top of the ground rod shall be driven a foot below the surface of the ground. Below grade, a continuous steel ground wire shall connect between the driven ground rod and the steel pole. The connection between the steel ground wire and the galvanized ground rod shall be a galvanized ground wire clamp.

F. All concrete poles shall be grounded with copperclad ground rods and 5/16" Copperweld (7#10) ground wire. Concrete poles shall be grounded by the use of a minimum of a 40 feet copperclad ground rod per pole. The top of the ground rod shall be driven a foot below the surface of the ground. Below grade, a continuous copper ground wire shall connect between the driven ground rod and the shield wire(s). The connection between the steel ground wire and the galvanized ground rod shall be a ground wire clamp.

G. All wood poles shall be grounded with copperclad ground rods and No. 2 bare copper ground wire. Wood poles shall be grounded by the use of a minimum of a 40 feet copperclad ground rod per pole. The top of the ground rod shall be driven a foot below the surface of the ground. Below grade, a continuous copper ground wire shall connect between the driven ground rod and the shield wire(s). The connection between the steel ground wire and the galvanized ground rod shall be a ground wire clamp.

HARDWARE AND INSULATOR INSTALLATION

SECTION 08780 - GENERAL INFORMATION

1.1 GENERAL

A. The intent of this specification is to cover wire stringing and installation of insulators and hardware in connection with wood and tubular steel pole transmission line construction.

1.2 CONTRACTOR'S OBLIGATIONS

The Contractor's obligations include but are not limited to the following items:

A. Furnishing dies, presses and joint compounds for installing splices, compression fitting and bolted connections.

B. Wire stringing complete, including the installation of insulators, conductor and shield wire accessories, conductor and shield wire, and miscellaneous hardware.

C. Protection of work until complete, including leaving in a safe and secure manner all incomplete work left overnight.

D. Furnish miscellaneous material not specified by the Owner.

1.3 MATERIALS AND MATERIAL HANDLING

A. All surplus and scrap material shall be removed from the site(s) by the Contractor.

SECTION 16300 - INSULATORS, CONDUCTOR AND SHIELD WIRE ACCESSORIES

INDEX PAGE

SECTION 16300 - INSULATORS, CONDUCTOR AND SHIELD WIRE ACCESSORIES

2.1 INSULATORS

A. Insulators shall be clean when hung; the porcelain portions shall be bright and the metal portions free from dirt. Cracked insulators and insulators with loose cement shall not be installed. Insulators found with defects shall be separated from the good insulators and disposed of by the Contractor.

B. Suspension insulator strings shall not exceed three (3) inches out of plumb after the conductors are "clipped in".

2.2 CONDUCTOR AND SHIELD WIRE ACCESSORIES

A. COMPRESSION AND PREFORMED ACCESSORIES

1. Preformed, compression deadends, splices and jumper terminals shall be installed in accordance with manufacturer's recommendations.

B. BOLTED ACCESSORIES

1. Heat treated "U" bolts of suspension and deadend clamps shall be properly seated and nuts uniformly tightened, as indicated on an approved torque wrench, to the following torque limits:

"U" Bolt Size (Inch)	Min. (Ft./Lbs.)	Max. (Ft./Lbs.)
1/2	45	50
9/16	65	70
5/8	80	85
3/4	95	100

2. After the initial tightening of deadend clamps, the "U" bolts shall be further seated by firmly driving them down with a hammer. The nuts shall then be fully retighten to the proper torque.

3. All other bolted fittings shall be installed with bolts properly seated, and nuts securely and uniformly tightened.

SECTION 16300 - INSULATORS, CONDUCTOR AND SHIELD WIRE ACCESSORIES

C. GENERAL

1. Hardware shall be handled in such a way as to prevent contact with the ground. Hardware shall be clean when installed.

2. Horizontal bolts or pins shall have the nut and/or cotter on the pole side of the connection. In the case of horizontal conductor configurations, horizontal bolts or pins of center phase connections shall have the nut and/or cotter consistently on one (1) side or the other of the connections. Vertical bolts or pins shall have the nut and/or cotter on the underside of the connection.

3. Ball and socket connections in horizontal or semi-horizontal planes, as in deadend configurations, shall have the cotter pins installed with the eyes on top so that the spread portions may be viewed from the ground. Ball and socket connections in a vertical plane shall have the eyes of the cotter pins consistently on one side or another of the connections with the long axis of the pins in line with the conductor.

4. Hump back cotters shall be spread to a minimum opening of 45 degrees. Straight cotters shall have the ends spread and turned back to an opening of 180 degrees.

5. Bolted electrical contact surfaces of jumper terminals, parallel groove clamps, terminal lugs, tee connectors, etc. shall be cleaned, coated with Alcoa No. 2 Electrical Joint Compound, abraded through the grease with emery cloth or wire brush, and then bolted together with the grease in place. The Alcoa No. 2 Electrical Joint Compound shall be furnished by the Contractor.

6. Preformed Deadend Grips shall be installed in accordance with the recommendations of the Manufacturer. The ends of the individual rods in a set shall not vary by more then one (1) inch after installation. Care shall be taken to prevent damage to preformed rods by pliers, channel-locks or other tools.

SECTION 02786 - WIRE STRINGING

INDEX PAGE

SECTION 02786 - WIRE STRINGING

1.0 STRINGING – General Requirements

A. The Contractor shall furnish all stringing sheaves, ropes, temporary anchors and protective material during wire string operation.

B. The wire stringing shall meet all of the requirements of IEEE Standard 524 (Latest Revision) "IEEE Guide to the Installation of Overhead Transmission Line Conductors".

C. The stringing sheaves provided by the Contractor shall be approved by the Engineer. The selection of sheaves shall be in accordance with IEEE Standard 524 (Latest Revision) "IEEE Guide to the Installation of Overhead Transmission Line Conductors". The sheaves shall have roller or ball bearings fitted for lubrication. The conductor stringing sheaves shall have groove contact face lined with neoprene. In all cases sheaves shall swing freely and not bind against structure.

D. The hangers for the stringing sheaves used in stringing any section of wire shall be of such length that the wire in the sheave is held at a uniform distance, not exceeding two (2) feet, above or below the position which it will have when finally placed in the suspension clamp, strain clamp or compression deadend.

E. All reels shall be inspected for loose nails which may damage the wire. The set-up of reels when stringing the conductor or shield wire shall be such as to avoid any unnecessary cutting of conductor and the consequent accumulation of a number of short lengths when the job is completed.

F. The Contractor's general method of wire stringing shall be approved by the Owner. The Contractor shall exercise care to see that the wire is not injured or damaged during the pulling operation, and shall station personnel as required along the line to inspect for damage, and to take action as needed to prevent damage to the wires. Wires shall be continuously inspected during installation and any cuts, kinks, foreign matter or other abnormalities of wire shall be called to the attention of the Owner. Repairs shall be performed by the Contractor. In the event that conductor damage is too severe for repair, the conductor shall be replaced.

G. Wires shall only be pulled through properly sized string sheaves. Pulling wires along or through wet ground, mud, water, slurry ponds, etc., where foreign material will adhere or enter the interstices of the wire shall not be permitted.

SECTION 02786 - WIRE STRINGING

H. All conductors shall be installed by the "Tension Stringing" method. The conductors shall be kept from touching ground, water, or above ground objects including guard structures. Each instance of cable contact with such foreign objects will require the Contractor to suspend further pulling operations so that a thorough inspection of contact area can be made by the Owner's representatives. At no time during the tensioning operation shall more tension be placed on the wires than the wires shall normally experience at the initial stringing tension shown on the stringing sag charts.

I. Guard structures will be required to maintain adequate clearances over roads, railroads, communication and power lines or other locations as right-of-way conditions dictate. Size, location, design, strength, excavation for and construction and removal of guard structures shall be the Contractor's responsibility. At roadways guard structures will be set, lighted, etc.; as required by the roadway authority. In all cases where the guard structures are set within the shoulders and/or median area of roadways, the structures shall be marked with flashers and have warning signs set out along the roadway to warn motorists as a safety precaution. The Contractor shall backfill all pole holes and mound earth over holes to compensate for settling, and shall be responsible for repaving all holes as needed to return area to original condition.

J. The Contractor shall determine wire pulling set-ups and structure capabilities to withstand pulling tension. It is the Contractors responsibility to make the proper determination as to which structures can have unbalanced tensions.

The following steel pole structures have full dead-end capability and will support any or all wires dead- ended on the pole shaft (not an arm) on one (1) side of the structure.

115 kV Steel Poles
- SVD
- SDTD
- SVDN

All structure arms except those listed below have been designed to support vertical loads imposed by wire stringing provided the location of the tensioners do not create a wire slope greater than three (3) horizontal to one (1) vertical.

SECTION 02786 - WIRE STRINGING

The following structures are not designed for vertical stringing loads:

SST, SDT, SDTA and all arms on structure SDTD.

During stringing, no vertical stringing load shall be applied to any horizontal pull-off plate.

2.0 STRINGING – T2 Conductor Requirements

2.1 General

T-2 conductor consists of two standard bare concentric stranded conductors twisted around each other. T-2 conductors are installed using techniques and equipment similar to that described in the preceding sections for single wire conductors, with a few special procedures used to maintain equal tension between the two component conductors. These special details are described in the sub-sections that follow.

2.2 Shipping Reels and Handling

T-2 conductor is to be shipped on reels large enough to accommodate the length ordered. It is important to maintain the relationship of the two individual conductor components established during manufacturing. Therefore, T-2 conductor shall not be rewound in the field from the shipping reel to another reel because the tension in the individual conductors cannot be controlled. Reels containing T-2 conductors shall be stored upright resting on the rims; never lay the reel on its side.

2.3 T-2 Conductor Stringing Method

The tension method shall be used for all T-2 conductor installation, except for slack spans.

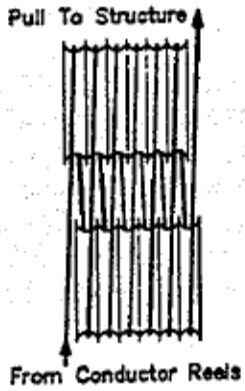
2.4 Tension Machines

Several types of tension machines are available for use in the installation of T-2 conductors. Figures 1 and 2 illustrate two multigroove bullwheel tensioners. The Figure 1 illustration represents a unit where the grooves are vertical, but the alignment of the front and back bullwheels are offset by ½ the groove spacing. This design is satisfactory for installing smaller sizes of T-2 conductor where the conductor will lay flat in the bottom of the groove. The Engineer shall be consulted before using this type of tensioner. If the conductor is too large, the ridge between the grooves may separate the T-2 conductor into individual conductors.

SECTION 02786 - WIRE STRINGING

The Figure 2 sketch illustrates another common type of tensioner where the two bullwheels are in line but one is tilted at a small angle to the vertical as described in the note next to the sketch. This allows the conductor to ride in the bottom of the grooves. This unit is the preferred tensioner for use on T-2 conductor installation. An inline tensioner with three or more rollers offset in the same plain to snub the conductor is not acceptable for use in T-2 conductor installation. "V" groove tensioners are also not acceptable for use in T-2 conductor installation.

Figure 1



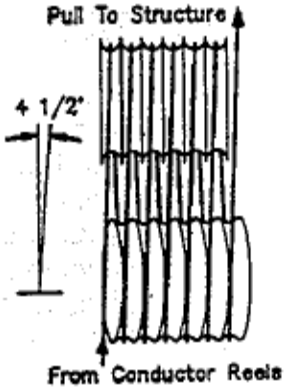
Offset Bull Wheels

The rear wheel is offset ½ groove width from the line of the front wheel. The conductor is "kinked" as it leaves the front wheel and enters the rear wheel.

Tilted Bull Wheel

On the underside, the groove of both wheels are aligned while on top, the 1st groove of the backwheel lines up with the 2nd groove of the front wheel. This unit is recommended for T-2.

Figure 2



2.5 Tensioner and Sheaves – Overall Diameter and Groove Width

The minimum diameter at the base of the sheave groove in a stringing sheave should not be less than 14 times the maximum diameter of the T-2 conductor. The minimum diameter of the groove in the tensioner should not be less than 28 times the maximum diameter of the T-2 conductor. The groove in the tensioner and sheave must be wide enough for the T-2 to pass through with the two component conductors laying flat and parallel while being supported in the lower 1/3 of the groove.

The two parameters considered in selecting the minimum diameter of the stringing sheave are the bending radius of the T-2 and the force needed to rotate the sheave. Round conductor will lay in the bottom of the groove and will pass easily through. Smaller than recommended diameter sheaves and high stringing tensions can cause forces which restrict sheave rotation and possibly damage

sheave lining materials. If the sheave does not rotate, it is possible the twist length of the T-2 might be shortened; this builds a torque into the conductor which may not be released until the end of the length or a swivel is encountered. If it is necessary to use smaller than recommended sheaves, tensions must be reduced to avoid conductor damage (crushing) or redistribution of the twist length. It will also be necessary to shorten the pull length, thereby reducing the number of sheaves, since the effect is cumulative.

Larger than minimum sheaves and low as tolerable stringing tensions are recommended for T-2 conductor installation.

2.6 Stringing T-2 Conductor

The T-2 conductor is shipped from the factory with a metal band securing the ends of the two conductors together. A second metal band is located approximately 10 feet into the reel from the first band. These metal bands must remain on the conductor assembly during installation. Use only one pulling sock over the end of the two conductors. After placing the pulling sock over the end of the conductor assembly, band the sock and tape the end to protect the stringing sheave surface. It is not necessary to remove the second band placed on the T-2 conductor at the factory. The second band will be helpful later to maintain the component conductor length and tension relationship when splicing and dead ending.

Position the payout reel back from the tensioner a sufficient distance to allow the conductor to adjust from the circular wrap on the reel to a straight orientation before entering the tensioner. Due to the fact that T-2 conductor is not always put on the reels evenly at the factory, an observer shall monitor the conductor as it is being pulled from the payout reel to insure that constant tension is maintained. A sudden jump in the conductor from one side of the payout reel to the other due to being unevenly wound can cause the conductor to go slack and result in the conductor jumping out of the bullwheel groove. The tension on the payout reel should be set only high enough to prevent overrun when the pull is interrupted. High payout tension can distort the twist as the T-2 conductor enters the tensioner and shall be avoided.

Any sheave that touches or supports the T-2 between the payout reel and the tensioner, between the tensioner and the first structure, and at the first structure, shall have a minimum diameter of 14 times the maximum diameter (2 times the diameter of the individual sub-conductors) of the T-2 being installed. Rollers that are too small can distort the twist and cause loops.

The use of travelers to provide clearance from a front reel for a conductor leaving a reel placed in back of another should be avoided. The traveler can cause twist distortion if tension or traveler size and position is not correct.

The tensioner should be aligned with the section of line to be strung. The angle of the T-2 conductor between the ground and sheave at the first structure should not exceed 15 degrees. This practice will limit the vertical load on the structure and also the pressure of the sheave on the conductor. For example, if the first sheave is 25 feet higher than the tensioner, the tensioner must be set back at least 100 feet from the structure.
The two component conductors are twisted during manufacturing with a machine that establishes the twist length of 9 feet. However, this twist will vary in the field because the torsional stiffness of the T-2 will depend on the tension in the component conductors, the distance between vertical supports, and the conductor size.

2.7 Sagging T-2 Conductor

Accepted sag methods for standard conductor are satisfactory for T-2 conductor. Use sag values specified in the provided stringing sag charts for that section of line. Tension shall be applied to the conductor by gripping both component conductors separately and using an equalizer of a design which will cause each component conductor to take its proper share of the load.

2.8 Splicing T-2 Conductor

T-2 conductors are joined by separately splicing the component conductors. To do this, overlap the two lengths of T-2 by approximately 5 feet. Cut one of the component conductors at one end of the overlap. Use a compression splice to join this component conductor to one of the component ends from the other length.

With this compression splice completed, cut the other component conductor of the second length where it is aligned with the end of the uncut member of the first length. An additional twist may be needed before the second splice is made to remove any looseness between the component conductors. These two ends may now be spliced. This procedure will result in the component conductor splices being staggered by approximately 5 feet and each component conductor will carry its share of line tension.

2.9 Dead Ending T-2 Conductors

A yoke plate and two compression dead ends are to be used to dead end the T-2 conductor. The use of the yoke plate insures that the two component conductors are maintained at the same tension.

SECTION 02787 - SPLICING

2.1 SPLICING

A. No splices shall be permitted in spans over main lines of railroads, and major communication of power lines. In other spans only one splice per span will be permitted on each wire and this splice shall be no closer than 50 feet to any structure.

B. Splices when required shall be of compression type, and made in accordance with manufacturer's recommendations.

C. Any loose strands shall be worked down to the cable ends and then fastened at intervals with bands of tape. The ends of the cable strands shall be examined for defects.

D. The lengths of cable ends to be inserted in the splicing sleeve or dead-end fitting shall be cleaned with a stainless steel wire brush, emery cloth such as wet or dry Fabricut manufactured by Minnesota Mining and Manufacturing Company, or equal means, to obtain perfectly clean and bright surfaces.

E. At the completion or pressing operations, die marks and burrs shall be sanded smooth and all wrapping, binding and excess grease and compound shall be removed. The strands of the cables shall be snugly seated when the splice or dead-end is complete.

F. The Contractor shall clean the splicing or dead ending sites of all scraps and debris and dispose of same in suitable location away from the line.

G. Slight bends in the sleeve or fitting may be removed by hammering, using a hard wood block to protect the fitting from the direct blows of the hammer.

SECTION 02788 - SAGGING

INDEX PAGE

SECTION 02788 - SAGGING

3.1 SAGGING

A. The Engineer will furnish the Contractor with sag-tension data for the various wire sizes and spans covered by the specifications for this job.

B. Wire sagging operations shall meet all the requirements of IEEE Standard 524 (Latest Revision) "IEEE Guide to the Installation of Overhead Transmission Conductors".

C. Suitable thermometers shall be provided by the Contractor. These thermometers shall be inserted in a basket made from conductor with a sufficient number of center strands removed to allow entry of the thermometer. The thermometer shall be suspended from the structure, near the sagger's position, at least one-half (½) hour before sagging so that the accurate readings may be made at the time for sagging. The method of using the thermometers shall be approved by the Engineer. Sagging operations shall not be carried on when, in the opinion of the Owner, wind prevents satisfactory sagging. Before pulling cable to sag, precautions shall be taken to prevent this operation from affecting the sag in adjacent, previously sagged section.

D. The Contractor's method of sagging will be approved by **or** indicated by the Engineer. For sagging up to and including five (5) spans, the sagger shall take at least **one (1)** measurement with the sagger located in one (1) of the longer spans near the far end away from the pulling end. For sagging pulls of more than five (5) spans, the sagger shall take **no less than two (2)** measurements with the first measurement taken in one (1) of the longer spans near the far end away from the pulling end and the second measurement taken in one (1) of the longer spans near the pulling end. As far as practicable, sags shall be made in level spans longer then the ruling span.

E. Required accuracy in sagging shall be such that with wires bolted or pressed in final position the actual sag shall not deviate from the computed sag by more than two percent (2%) or .4 foot whichever is smaller provided that phase clearances and conductor to static wire clearances are not reduced by greater amounts.

F. Sags will be spot checked by the Owner. The Owner will be given such assistance in the form of equipment and personnel from the Contractor as required. Resagging of incorrectly sagged spans will be at the expense of the Contractor.

G. Clipping-in of conductor and shield wire shall be accomplished as soon as practical, normally within 72 hours, and before cables are damaged by abrasion and flattening or breaking of strands due to vibration in the stringing sheaves. The Contractor shall be required to replace damaged cable or repair such at his own expense.

H. Prior to making up compression deadends, the Contractor shall assemble on the ground a complete dead-end string and measure the overall length of the string when placed under tension, from the point of contact with the structure to the point of cutoff of the conductor.

3.2 JUMPER LOOPS

A. Jumper loops, when completed, shall present a smooth uniformly curving appearance without sharp bends or “cork screws”. Where line post insulators are used, the length of the jumper loop shall be the maximum possible to still permit the bottom portion of the loop to leave the clamp top clamp without any reverse vertical bend in the loop in either side of the clamp top clamp.

SECTION 16123 – FIBER OPTIC CABLE TESTING AND SPLICING

1.1 SCOPE

This specification covers the technical and quality assurance requirements for the testing and splicing of optical fiber cable to be installed or replaced on the 115 kV transmission loop for the City of Grand Island, Nebraska.

The Contractor shall be responsible for the testing, splicing, and the termination into splice boxes of all fiber at locations shown on the drawings. The contractor shall plan his work to minimize the outage time of any active fiber cables.

The testing is to be broken into three parts.

1. Testing of the cable prior to splicing.
2. Partial intermediate test of the spliced cable
3. Final testing of the complete spliced cable from one end.

The test prior to splicing is to determine if the cable has been damaged in any way due to handling or installation. The intermediate testing is to be partial testing to get fibers back into service. The final testing is to be after all equipment is in place, and shall completely test all fibers, and terminations from either the Substation F or the NPPD St. Libory Junction end of the cable.

1.2 TESTING OF FIBER PRIOR TO SPLICING

Prior to splicing of the fiber, each fiber in each cable shall be tested as described below to determine if any damage has occurred during installation.

Using an optical time domain reflectometer (OTDR), test each fiber in the cable at both 1300 nm and 1550 nm. Using an optical source and power meter, check losses in each fiber in the cable at both 1300 nm and 1550 nm.

The Owner shall be notified in the event that any defective fibers are found. Cables found with defective fibers shall either be completely replaced or the defective section of the cable found and removed and a new section spliced in. The Owner shall approve any partial cable replacements and the addition of additional splice points prior to the corrective work being started.

1.3 CABLE TERMINATION AND SPLICING

All cable preparation and termination of the cables into the splice boxes shall be per the cable manufacturer's and splice box manufacturer's instructions. In addition to these manufacturer's instructions, all splices shall be fusion spliced in exact accordance with all applicable industry standards regarding, but not limited to, the following:

1. Preparation of fibers prior to splicing.
2. Cleanliness of splice machine, fiber cleaver, and other equipment.
3. Minimization of torsional forces on the splice.
4. Protection of the fiber splice with a heat-shrink protector.
5. Maintaining a 2 inch or greater loop diameter to avoid losses due to macrobending.
6. Fiber organization in the splice tray and splice enclosure.
7. Arrangement of slack fiber. Tie wraps shall be utilized wherever appropriate to maintain as much order as possible (entry into splice trays, etc.) Careful attention shall be given to the arrangement of "bare" fiber in the splice trays.

1.3 INTERMEDIATE TESTING OF FIBER AFTER SPLICING

After splicing, the attenuation of each fusion splice shall be measured. The maximum allowable attenuation due to each fusion splice is 0.05 dB. Splices with attenuation greater than 0.05 dB, shall be rejected and the splice remade. Testing at this point is to be limited to what is required to get the fiber path in service between the two end points.

1.4 FINAL TESTING OF FIBER

The final testing of each fiber in each fiber path is to be completed after all equipment is in place and the substations back on line. This final testing shall completely test all fibers, splices, and terminations from end-to-end. The final testing shall include:

1. A splice test shall be performed bi-directionally with an OTDR at both 1300 nm and 1550 nm.
2. Using an optical source and power meter, check losses in each fiber in the cable at both 1300 nm and 1550 nm.

Any problems or defective splices in any fiber or cable found during this testing shall be corrected prior to the completion of these final tests.

For documentation purposes, each fiber of each cable shall be tested from end to end and the trace both printed and saved to disk. Final results and documentation shall be properly labeled to identify which cable and which fiber the results correspond with. Copies of the final results and documentation of all testing shall be provided to the Owner within 30 days of the completion of the tests.

INSPECTION/REPAIR OF EXISTING 115 kV LINE SEGMENTS

SECTION 01450 – 115 KV LINE MAINTENACE AND POLE REPLACEMENTS

1.1 In 2011, all of the existing wood poles on the 115 kV City loop system were treated and visually checked from the ground. This project includes the replacement of defective poles and other line maintenance items that were identified by the inspection program. A detailed listing of the maintenance work required by structure number is included on the following pages. This work can be summarized into the following work items:

1. Four existing 115 kV wood pole tangent structures are to be replaced with either direct embedded steel poles or direct embedded spun concrete poles.

2. One single pole wood guy stub structure is to be replaced with a wood guy stub structure.

3. Two existing 115 kV H- frame structures, a two pole tangent structure and a three pole deadend structure, are to have one pole replaced with wood poles.

4. Thirty-eight (38) structures are to be inspected and loose or missing hardware replaced or tightened.

5. Twenty-seven (27) structures that have missing or damaged guy guards are to have new guy markers installed.

6. Forty-seven (47) wood pole structures and twelve (12) steel pole structures that have broken or damaged ground wires are to have repairs made including the addition of ground rods to bring the grounding resistance at the structure to 10 ohms or less.

7. Four (4) structures are to have broken down guys or overhead guys replaced.

8. One (1) wood H-frame tangent structure has a defective cross arm that is to be replaced with a new arm.

9. One (1) single pole davit arm tangent structure with porcelain suspension insulators has a broken or damaged insulator that is to be replaced.

10. Fifteen (15) structures have possible above ground pole problems that are to have climbing inspections performed to determine the extent of repairs needed. The Contractor shall make the required repairs to correct the problems found.

1.2 The Contractor shall conduct a visual inspection of the 115 kV transmission line structures that require repair or maintenance listed in the following lists and drawings contained herein. The Contractor shall check all items from the ground up. This is to include the structure, poles, arms, bracing, nuts, bolts, fastenings, insulators, tie downs, staples, wires, splices, coverings, ground wire, and other such items.

1.3 The Contractor shall repair and/or replace all items found missing, broken or in need of repair. All fasteners, clamps, bolts, nuts, etc. which appear to be loose shall be properly tightened. Damaged or missing items shall be replaced.

1.4 Material required for the repair and/or replacement of these items shall be obtained as follows:

1. The four existing 115 kV wood pole tangent structures that are to be replaced with either direct embedded steel poles or direct embedded spun concrete poles, the Contractor shall furnish the poles and all material for the new structures.

2. The one single pole wood guy stub structure that is to be replaced with a wood guy stub structure, the City will furnish the wood pole and the Contractor shall furnish all other material required.

3. The two existing 115 kV H-frame structures, a two pole tangent structure and a three pole deadend structure, that are to have one pole replaced with a wood pole, The City will furnish the wood poles and the Contractor will furnish all other material required.

4. The one (1) wood H-frame tangent structure that has a defective cross arm that is to be replaced with a new arm, the City will furnish the new crossarm assembly and the Contractor will furnish all other material required.

5. Porcelain suspension insulators that are required to replace broken or damaged insulators will be furnished by the City.

6. Smaller items for fixing existing structures like nuts, bolts, ground wire splices, staples, ground rods, ground clamps, guy markers, and other such items are to be furnished by the Contractor. Larger items like bracing or arms

maybe scavenged from the poles and structures being removed under this contract or the City may have some items in storage that can be used.

1.5 Unit prices for this work shall be a lump sum price for each of the maintenance item bid units to furnish the material and labor to compete the line maintenance work items listed on the following lists and contained in the bid units.

WOOD POLE STRUCTURES

Line No.	Structure ID	Pole Ht / Class / Type	Material	Replace Complete Structure	Replace One Pole in a H-Frame Structure	Tighten or Replace Loose or Missing Hardware	Install / Replace Missing / Damaged Guy Guard(s)	Repair / Replace Broken or Damaged Ground Wire Including Ground Rods to Bring Ground Resistance to 10 Ohms or Less	Climbing Inspection of Entire Structure Including Pole Above Ground	Inspect, Repair or Replace Down Guy or Overhead Guy	Replace Crossarm in H-Frame Structure	Replace Damaged or Broken Insulator	Reported Item Description
1060	DD-43W		WOOD			1							Hardware Damaged Loose or Missing, STRUCTURE NOT ON MAP
1060	DD-42E		WOOD										STRUCTURE NOT ON MAP
1060	DD-42W		WOOD			1							STRUCTURE NOT ON MAP
1060	DD-27	70/1 ST1	WOOD			1							Hardware Damaged Loose or Missing
1060	DD-8	80/1 ST	WOOD			1							Hardware Damaged Loose or Missing
1060	D-63N	75/1 TSA	WOOD										
1060	D-63S	75/1 TSA	WOOD			1							
1060	D-62N	70/1 TSA	WOOD										
1060	D-62S	70/1 TSA	WOOD				1	1					Guy Marker Missing
1060	D-61N	70/1 Dead En	WOOD				1						Guy Marker Missing
1060	D-60S	70/1 Dead En	WOOD				1						Guy Marker Missing
1060	D-59N	70/1 TSA	WOOD										Hardware Damaged Loose or Missing, Guy Marker Missing
1060	D-59S	70/1 TSA	WOOD			1	1						Guy Marker Missing
1060	D-58N	70/1 TSA	WOOD										Hardware Damaged Loose or Missing
1060	D-58S	70/1 TSA	WOOD			1		1					
1060	D-57N	75/1 TSA	WOOD										Hardware Damaged Loose or Missing
1060	D-57S	75/1 TSA	WOOD			1							Hardware Damaged Loose or Missing
1060	D-56N	70/1 DESA	WOOD										Groundwire Broken or Damaged, DGW BGL
1060	D-56C	70/1 DESA	WOOD										Climbing Inspection Recommended, NEED TO INSPECT ECC 30FT AGL
1060	D-56S	70/1 DESA	WOOD					1	1				
1060	D-55N	70/1 TSA	WOOD										
1060	D-55S	70/1 TSA	WOOD			1		1					
1060	D-52N	70/1 TSA	WOOD										Hardware Damaged Loose or Missing
1060	D-52S	70/1 TSA	WOOD			1							Hardware Damaged Loose or Missing
1060	D-51N	70/1 TSA	WOOD										Hardware Damaged Loose or Missing, DGW ON STATIC, Groundwire Broken or Damaged
1060	D-51S	70/1 TSA	WOOD			1		1					
1060	D-50N	70/1 TSA	WOOD										
1060	D-50S	70/1 TSA	WOOD					1					
1060	D-47N	70/1 TSA	WOOD										
1060	D-47S	70/1 TSA	WOOD					1			1		Groundwire Broken or Damaged, DGW BGL
1060	D-44N	80/1 TSA	WOOD										
1060	D-44S	80/1 TSA	WOOD			1							Hardware Damaged Loose or Missing
1060	D-43N	85/1 TSA	WOOD										Hardware Damaged Loose or Missing
1060	D-43S	85/1 TSA	WOOD			1							
1060	D-42N	85/1 TSA	WOOD										Hardware Damaged Loose or Missing
1060	D-42S	85/1 TSA	WOOD			1							Hardware Damaged Loose or Missing
1060	D-41N	80/1 TSA	WOOD										Hardware Damaged Loose or Missing
1060	D-41S	80/1 TSA	WOOD			1							
1060	D-39N	70/1 DESA	WOOD										Guy Marker Missing
1060	D-39C	70/1 DESA	WOOD										Guy Marker Missing
1060	D-39S	70/1 DESA	WOOD				1		1				Guy Marker Missing, NEED TO INSPECT COMPRESSION WOOD 30FT AGL, Climbing Inspection Recommended
1060	D-38W	70/1 DESA F	WOOD										Guy Marker Missing
1060	D-38C	70/1 DESA	WOOD										Guy Marker Missing
1060	D-38E	70/1 DESA	WOOD				1						Guy Marker Missing
1060	D-37W	70/1 TSA	WOOD										Hardware Damaged Loose or Missing
1060	D-37E	70/1 TSA	WOOD			1							
1060	D-36W	70/1 TSA	WOOD										
1060	D-36E	70/1 TSA	WOOD			1							
1060	D-35W	70/1 TSA	WOOD										Hardware Damaged Loose or Missing
1060	D-35E	70/1 TSA	WOOD			1							Hardware Damaged Loose or Missing
1060	D-34W	70/1 TSA	WOOD										
1060	D-34E	70/1 TSA	WOOD					1					
1060	D-31W	70/1 MASA	WOOD										
1060	D-31C	70/1 MASA	WOOD										
1060	D-31E	70/1 MASA	WOOD				1						Guy Marker Missing
1060	D-30W	70/1 TSA	WOOD										
1060	D-30E	70/1 TSA	WOOD					1					
1060	D-29W	70/1 TSA	WOOD										Groundwire Broken or Damaged, DGW ON STATIC
1060	D-29E	70/1 TSA	WOOD			1		1					
1060	D-27W	70/1 MASA	WOOD										Guy Marker Missing
1060	D-27C	70/1 MASA	WOOD										Guy Marker Missing, DGW ON STATIC, Groundwire Broken or Damaged
1060	D-27E	70/1 MASA	WOOD				1	1					Guy Marker Missing

WOOD POLE STRUCTURES

Line No.	Structure ID	Pole Ht / Class / Type	Material	Replace Complete Structure	Replace One Pole in a H-Frame Structure	Tighten or Replace Loose or Missing Hardware	Install / Replace Missing / Damaged Guy Guard(s)	Repair / Replace Broken or Damaged Ground Wire Including Ground Rods to Bring Ground Resistance to 10 Ohms or Less	Climbing Inspection of Entire Structure Including Pole Above Ground	Inspect, Repair or Replace Down Guy or Overhead Guy	Replace Crossarm in H-Frame Structure	Replace Damaged or Broken Insulator	Reported Item Description
1060	D-25W	70/1 TSA	WOOD										
1060	D-25E	70/1 TSA	WOOD					1					Groundwire Broken or Damaged, FRAYED STATIC GROUND
1060	D-24W	75/1 TSA	WOOD										
1060	D-24E	75/1 TSA	WOOD					1					
1060	D-22W	70/1 TSA	WOOD										
1060	D-22E	70/1 TSA	WOOD					1					
1060	D-20W	70/1 TSA	WOOD										
1060	D-20E	70/1 TSA	WOOD										
1060	D-18W	70/1 TSA	WOOD										Pole Set Shallow
1060	D-18E	70/1 TSA	WOOD						1				Overhead Inspection Recommended
1060	D-17W	70/1 TSA	WOOD										
1060	D-17E	70/1 TSA	WOOD			1							Hardware Damaged Loose or Missing
1060	D-16W	70/1 TSA	WOOD										Overhead Inspection Recommended
1060	D-16E	70/1 TSA	WOOD						1				
1060	D-15W	70/1 TSA	WOOD										Hardware Damaged Loose or Missing, DGW AGL, Groundwire Broken or Damaged
1060	D-15E	70/1 TSA	WOOD			1		1					
1060	D-14W	80/1 TSA	WOOD										Hardware Damaged Loose or Missing
1060	D-14E	80/1 TSA	WOOD			1		1					Groundwire Broken or Damaged, DGW BGL
1060	D-13W	80/1 DESA	WOOD										Guy Marker Missing
1060	D-13C	80/1 DESA	WOOD										Guy Marker Missing
1060	D-13E	80/1 DESA	WOOD			1	1						Guy Marker Missing
1060	D-10W	70/1 TSA	WOOD										Overhead Inspection Recommended
1060	D-10E	70/1 TSA	WOOD			1			1				
1060	D-9W	70/1 TSA	WOOD										
1060	D-9E	70/1 TSA	WOOD			1							Hardware Damaged Loose or Missing, X-braces have loose locknuts (3 out of 4)
1060	D-8W	70/1 TSA	WOOD										Hardware Damaged Loose or Missing
1060	D-8E	70/1 TSA	WOOD			1		1					Groundwire Broken or Damaged, DGW ON STATIC, W locknuts on both X-braces are loose
1060	D-7W	70/1 TSA	WOOD										Hardware Damaged Loose or Missing
1060	D-7E	70/1 TSA	WOOD			1							Hardware Damaged Loose or Missing, Top 2 X-braces have loose locknuts
1060	D-6W	70/1 TSA	WOOD										Groundwire Broken or Damaged, DGW ON STATIC
1060	D-6E	70/1 TSA	WOOD					1					W ground wire broken at top of pole
1060	D-5W	75/1 TSA	WOOD										
1060	D-5E	75/1 TSA	WOOD			1		1					Hardware Damaged Loose or Missing, DGW ON STATIC, Groundwire Broken or Damaged, E btm X-brace has a loose locknut
1060	D-4E	80/1 TSA	WOOD		1								REJECT POLE - NEEDS REPLACED
1060	D-3W	85/1 TSA	WOOD										
1060	D-3E	85/1 TSA	WOOD					1		1			Guy Marker Missing, Guy Slack or Broken, Guys wire seem very loose. Lightning break has a bent metal bar.
1060	D-2W	90/1 TSA	WOOD										Hardware Damaged Loose or Missing
1060	D-2E	90/1 TSA	WOOD			1		1					Hardware Damaged Loose or Missing, West ground readings ranged from 14 ohm - 700 ohms. Tested 40-50 times. Top cross arm has a slight crack.
1093	15N	75/1TSA	WOOD										
1093	15S	75/1 TSA	WOOD					1					HIGH GROUND OHM READING
1063A	C-44	80/1 ST	WOOD	1									(NEEDS REPLACED)lLarge long splits in pole approx 1/2" wide & 6" deep. Also broken ground at base.
1063A	C-41	90/1 VD	WOOD					1					HIGH GROUND OHM READING
1063A	C-37	90/1 ST	WOOD			1							South most arm may be loose from pole & bent up (snagged) ground wires
1063A	C-36	90/1 ST	WOOD			1							Hardware Damaged Loose or Missing
1063A	C-26	80/1 ST	WOOD					1					Groundwire Broken or Damaged, DGW ON STATIC, SOME LONG SPLITS IN POLE
1063A	C-25	80/1 ST	WOOD						1				Overhead Inspection Recommended
1063A	C-24	80/1 VD	WOOD				1						Guy Marker Missing, loose anchor cable on east side of pole & broken shields
1063A	C-23	80/1 VD	WOOD				1						Guy Marker Missing
1063A	C-14	80/1 ST	WOOD			1							ARMS MAY NOT BE TIGHT AGINST POLE
1063A	C-5	80/1 ST	WOOD					1					Groundwire Broken or Damaged
1063B	B-131	80/1 ST	WOOD				1						Guy Marker Missing, Cracks in pole
1093	46S	75/1 DESA	WOOD										Guy Marker Missing
1093	46N	75/1 DESA	WOOD			1	1						Hardware Damaged Loose or Missing, ANCHORS LOOSE AND FRAYING
1093	44S	70/1 TSA	WOOD										
1093	44N	70/1 TSA	WOOD					1					Groundwire Broken or Damaged, DGW BGL, GROUND CABLE BROKEN OFF
1093	40S	70/1 TSA	WOOD										
1093	40N	70/1 TSA	WOOD					1					GROUND CABLE BROKEN
1093	38N	70/1 TSA	WOOD					1					Pole Set Shallow
1093	37S	70/1 DESA	WOOD										Guy Marker Missing
1093	37C	70/1 DESA	WOOD										
1093	37N	70/1 DESA	WOOD				1	1					Guy Marker Missing, LIGHTNING BREAK MISSING
1093	26N	70/1 TSA	WOOD			1			1				Hardware Damaged Loose or Missing, Overhead Inspection Recommended

WOOD POLE STRUCTURES

Line No.	Structure ID	Pole Ht / Class / Type	Material	Replace Complete Structure	Replace One Pole in a H-Frame Structure	Tighten or Replace Loose or Missing Hardware	Install / Replace Missing / Damaged Guy Guard(s)	Repair / Replace Broken or Damaged Ground Wire Including Ground Rods to Bring Ground Resistance to 10 Ohms or Less	Climbing Inspection of Entire Structure Including Pole Above Ground	Inspect, Repair or Replace Down Guy or Overhead Guy	Replace Crossarm in H-Frame Structure	Replace Damaged or Broken Insulator	Reported Item Description
1093	23S	70/1 TSA	WOOD										Groundwire Broken or Damaged, DGW AGL
1093	23N	70/1 TSA	WOOD					1					Groundwire Broken or Damaged, DGW AGL
1093	22S	70/1 TSA	WOOD										Groundwire Broken or Damaged, DGW AGL
1093	22N	70/1 TSA	WOOD					1					Groundwire Broken or Damaged, DGW AGL
1093	21S	75/1 TSA	WOOD					1					GROUND CABLE BROKEN
1064B	C-122	80/1 VD	WOOD										
1064B	C-122G		WOOD				1						Guy Marker Missing, GUY POLE NOT ON MAP, Guyed - no ground - splitting -corner pole
1064B	C-120	80/1 ST	WOOD					1					
1064B	C-117	80/1 ST	WOOD					1					some splitting
1064B	C-113	85/1 ST Fibe	WOOD					1					
1064B	C-112	90/1 VD	WOOD				1						Guy Marker Missing, Guyed - no ground
1064B	C-106	80/1 VD	WOOD				1						Guy Marker Missing, Guyed - no ground
1064B	C-104	80/1 VD	WOOD				1						Guy Marker Missing, Guyed - no ground
1064B	C-96	85/1 VD	WOOD										
1064B	C-96G		WOOD				1		1				Guy Marker Missing, GUY POLE NOT ON MAP, Overhead Inspection Recommended
1064B	C-87	80/1 ST	WOOD					1	1				Overhead Inspection Recommended
1064B	C-72	80/1 ST	WOOD									1	
1064B	C-71	85/1 VD	WOOD										
1064B	C-71G	50/ 1 Stub	WOOD	1									REJECT POLE - NEEDS REPLACED, GUY POLE NOT ON MAP, Guy Marker Missing, Guyed - no ground
1064B	C-68	80/1 ST	WOOD					1					Groundwire Broken or Damaged, DGW BGL, splits in pole
1064B	C-66	80/1 ST	WOOD			1		1	1				Hardware Damaged Loose or Missing, FRAYED GROUND ON STATIC, Overhead Inspection Recommended, Unable to measure -splits in pole
1064B	C-64	80/1 ST	WOOD			1		1					Hardware Damaged Loose or Missing, Unable to measure -splits in pole
1064B	C-62	80/1 ST	WOOD			1							Hardware Damaged Loose or Missing, splits in pole
1064B	C-58	80/1 ST	WOOD					1	1				Overhead Inspection Recommended, Unable to measure
1064B	C-51	80/1 ST	WOOD					1					small splits in pole
1064B	C-50	80/1 ST	WOOD					1					Groundwire Broken or Damaged, DGW BGL, splits in pole
1063B	B-110	80/1 ST	WOOD						1				Overhead Inspection Recommended
1063B	B-106	80/1 ST	WOOD						1				Overhead Inspection Recommended
1063B	B-103	80/1 ST	WOOD						1				Overhead Inspection Recommended, Cracks in pole
1063B	B-101	80/1 ST	WOOD	1									REJECT POLE - NEEDS REPLACED
1062	B-88	80/1 ST	WOOD				1						Guy Marker Missing, GUY ANCHOR DAMAGE
1062	B-73	85/H1 ST	WOOD	1									Pole snapped at base during wind storm - NEEDS REPLACED
1062	B-67	80/1 ST	WOOD	1									REJECT POLE - NEEDS REPLACED
1062	B-66	80/1 ST	WOOD			1							Hardware Damaged Loose or Missing
1062	B-54	80/1 VD	WOOD				1						Guy Marker Missing
1062	B-45	80/1 ST	WOOD					1					Groundwire Broken or Damaged
1093	47N	70/1 DESA	WOOD		1								REJECT POLE - NEEDS REPLACED, Guy Marker Missing, Guy Slack or Broken, IN NPPD SUBSTATION / NO TEST
1093	47S	70/1 DESA	WOOD				1			1			Guy Marker Missing, Guy Slack or Broken, IN NPPD SUBSTATION / NO TEST
1062	B-23	85/1 VDP	WOOD				1						Guy Marker Missing, ANCHOR/SPLIT/COVER PROBLEMS
1062	B-21	90/1 VDP	WOOD				1						ANCHOR SHIELD BROKEN
1062	B-11	80/1 VD	WOOD				1						Guy Marker Missing
1062	B-7	80/1 ST	WOOD						1				Overhead Inspection Recommended
1061	A-43	85/1 VD	WOOD							1			ANCHOR FRAY, SPLITS IN POLE
1061	A-53	80/1 ST	WOOD					1					GROUND CABLE DAMAGED
1061	A-54	80/1 ST	WOOD					1					GROUND CABLE DAMAGED
1061	A-55	80/1 ST	WOOD					1					Groundwire Broken or Damaged, GROUND CABLE BROKE OFF
1145 A&B	DD-56N	85/1 H2	WOOD				1						Guy Marker Missing
1145 A&B	DD-59S	85/1 DCTS	WOOD					1					Groundwire Broken or Damaged
1145 A&B	DD-65E	85/1 DCTS	WOOD							1			Guy Slack or Broken
1145 A&B	DD-66C	85/1 H2	WOOD										Guy Marker Missing
1145 A&B	DD-66W	85/1 H2	WOOD				1						Guy Marker Missing
TOTALS				**5**	**2**	**38**	**27**	**47**	**15**	**4**	**1**	**1**	

WOOD POLES TO BE REPLACED

STEEL POLE STRUCTURES

Line No.	Structure ID	Material	Foundation	Height / Type	Repair / Replace Broken or Damaged Ground Wire Including Ground Rods to Bring Ground Resistance to 10 Ohms or Less	Ground Resistance	Reported Item Description
1064B	C-150	STEEL POLE CONCRETE	CONC. FOUNDATION	70' SVD	1	OPEN	Groundwire Broken or Damaged, Ground loose
1064A	E-1A	STEEL POLE CONCRETE	CONC. FOUNDATION	85' SVD	1	7.2	Groundwire Broken or Damaged
1063A	C-47	STEEL POLE CONCRETE	CONC. FOUNDATION	70' Dead End	1	0.09	Groundwire Broken or Damaged, Frayed Ground
1060	4A	STEEL POLE	IN EARTH	100' TS	1	194	Measured resistance twice - second time measured 350.
1060	5A	STEEL POLE	IN EARTH	105' TS	1	OPEN	Groundwire Broken or Damaged
1060	6A	STEEL POLE	IN EARTH	115' TS	1	OPEN	Groundwire Broken or Damaged
1064A	E-166	STEEL POLE	IN CONCRETE	80' SST	1	7.2	Resistivity Over 250000
1064B	C-152	STEEL POLE	IN CONCRETE	91' SST	1	OPEN	Groundwire Broken or Damaged
1064B	C-147	STEEL POLE	IN CONCRETE	80' SST	1	OPEN	Groundwire Broken or Damaged
1061	A-5	STEEL POLE	IN CONCRETE	93' SDT	1	NA	
1061	A-4A	STEEL POLE CONCRETE	CONC. FOUNDATION	70' SDTF	1	170	Pole In Middle Of Creek' Groundwire Corrosion
1061	A-4	STEEL POLE	IN CONCRETE	93' SDT	1	NA	
TOTALS					12		

SECTION 01700 - CLEAN UP AND FINAL INSPECTION

1.1 CLEAN UP

A. The Contractor shall clean up the work as it progresses from day to day and shall remove from the right-of-way and adjoining premises, driveways, roads and streets, all waste material and rubbish. When the work is completed in each section of line, the Contractor shall remove from the right-of-way all tools, equipment, rubbish and debris for which, in the opinion of the Owner, the Contractor or his subcontractors are responsible, and shall leave the working area free and clear from all obstructions and hindrances, unless otherwise permitted by the specifications or by the Owner.

B. All storage yards shall be kept in a neat and orderly manner at all times, prior to acceptance of the complete work, the Contractor shall remove all tools, equipment, machinery, rubbish, and waste materials from the storage areas.

C. After all construction work has been completed, the Contractor shall remove all culverts except those required to be retained by the Owner. After removal, the terrain shall be restored to its original condition as near as practicable.

D. The Contractor shall fill all ruts and holes left by his or by other contractor's equipment and grade the traveled way to restore the right-of-way to as near its original condition as practicable and to the satisfaction of the Owner.

1.2 FINAL INSPECTION

A. The Contractor shall notify the Owner in writing when all work has been completed, including clean-up, on a section of line. This will enable the Owner to arrange for final inspection of the released section. The Owner will endeavor to conduct such final inspection within 10 days of notification. The Contractor shall be responsible for correction of all work not satisfactory to the Owner.

Appendix A
Stringing Sag Charts

STRINGING SAG CHART 1369-A1-1
OFGW - 48 Fiber
Structure SUB "F" to #44
Structure #44 to # 62

OPGW Catalog #: DNO-4989 42/ 42 mm2/ 637

Ruling Span: 250.0 Feet
Customary Heavy Load Zone

Stringing Sag Table Using Initial Sag
Max Tension = 3,900 lbs

Design: 3,900 lbs @ 0 Deg °F, 1.00 in Ice, 0.00 PSF Wind, Initial

H Tens (lbs)	1733	1296	1238	1184	1133	1086	1043	1002	965	930	898	868	840	814	790
Temp °F>	0	30	35	40	45	50	55	60	65	70	75	80	85	90	95
Sag Span	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches
200.0	13	18	19	20	21	21	22	23	24	25	26	27	28	29	30
205.0	14	19	20	21	22	23	24	24	25	26	27	28	29	30	31
210.0	15	20	21	22	23	24	25	26	27	28	29	30	31	32	33
215.0	16	21	22	23	24	25	26	27	28	29	30	31	32	33	34
220.0	16	22	23	24	25	26	27	28	29	30	31	33	34	35	36
225.0	17	23	24	25	26	27	28	29	31	32	33	34	35	36	37
230.0	18	24	25	26	27	28	30	31	32	33	34	36	37	38	39
235.0	19	25	26	27	28	30	31	32	33	35	36	37	38	40	41
240.0	19	26	27	28	30	31	32	34	35	36	37	39	40	41	43
245.0	20	27	28	30	31	32	34	35	36	38	39	40	42	43	44
250.0	21	28	29	31	32	34	35	36	38	39	41	42	43	45	46
255.0	22	29	31	32	33	35	36	38	39	41	42	44	45	47	48
260.0	23	30	32	33	35	36	38	39	41	42	44	45	47	48	50
265.0	24	32	33	35	36	38	39	41	42	44	46	47	49	50	52
270.0	25	33	34	36	38	39	41	42	44	46	47	49	51	52	54
275.0	25	34	36	37	39	41	42	44	46	47	49	51	53	54	56
280.0	26	35	37	39	40	42	44	46	47	49	51	53	54	56	58
285.0	27	37	38	40	42	44	45	47	49	51	53	55	56	58	60
290.0	28	38	40	41	43	45	47	49	51	53	55	57	58	60	62
295.0	29	39	41	43	45	47	49	51	53	55	57	59	60	62	64
300.0	30	41	42	44	46	48	50	52	54	56	59	61	63	65	67

STRINGING SAG CHART 1369-A1-2
OFGW - 48 Fiber
Structure SUB "F" to #44
Structure #44 to # 62

OPGW Catalog #: DNO-4989 42/ 42 mm2/ 637

Ruling Span: 250.0 Feet — Stringing Sag Table Using Initial Sag
Customary Heavy Load Zone — Max Tension = 3,900 lbs

Design: 3,900 lbs @ 0 Deg °F, 1.00 in Ice, 0.00 PSF Wind, Initial

H Tens (lbs)	1733	1296	1238	1184	1133	1086	1043	1002	965	930	898	868	840	814	790
Temp °F>	0	30	35	40	45	50	55	60	65	70	75	80	85	90	95
3rd Wave Span	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec
200.0	3.17	3.66	3.75	3.83	3.92	4.00	4.09	4.17	4.25	4.33	4.40	4.48	4.55	4.62	4.69
205.0	3.25	3.76	3.84	3.93	4.02	4.10	4.19	4.27	4.35	4.43	4.51	4.59	4.67	4.74	4.81
210.0	3.33	3.85	3.94	4.03	4.11	4.20	4.29	4.37	4.46	4.54	4.62	4.70	4.78	4.86	4.93
215.0	3.41	3.94	4.03	4.12	4.21	4.30	4.39	4.48	4.57	4.65	4.73	4.81	4.89	4.97	5.05
220.0	3.49	4.03	4.12	4.22	4.31	4.40	4.49	4.58	4.67	4.76	4.84	4.93	5.01	5.09	5.16
225.0	3.56	4.12	4.22	4.31	4.41	4.50	4.60	4.69	4.78	4.87	4.95	5.04	5.12	5.20	5.28
230.0	3.64	4.21	4.31	4.41	4.51	4.60	4.70	4.79	4.88	4.97	5.06	5.15	5.23	5.32	5.40
235.0	3.72	4.30	4.41	4.50	4.60	4.70	4.80	4.90	4.99	5.08	5.17	5.26	5.35	5.43	5.52
240.0	3.80	4.40	4.50	4.60	4.70	4.80	4.90	5.00	5.10	5.19	5.28	5.37	5.46	5.55	5.63
245.0	3.88	4.49	4.59	4.70	4.80	4.90	5.00	5.10	5.20	5.30	5.39	5.49	5.58	5.66	5.75
250.0	3.96	4.58	4.69	4.79	4.90	5.00	5.11	5.21	5.31	5.41	5.50	5.60	5.69	5.78	5.87
255.0	4.04	4.67	4.78	4.89	5.00	5.10	5.21	5.31	5.41	5.52	5.61	5.71	5.80	5.90	5.99
260.0	4.12	4.76	4.87	4.98	5.09	5.20	5.31	5.42	5.52	5.62	5.72	5.82	5.92	6.01	6.10
265.0	4.20	4.85	4.97	5.08	5.19	5.30	5.41	5.52	5.63	5.73	5.83	5.93	6.03	6.13	6.22
270.0	4.28	4.95	5.06	5.18	5.29	5.40	5.52	5.63	5.73	5.84	5.94	6.05	6.15	6.24	6.34
275.0	4.36	5.04	5.15	5.27	5.39	5.50	5.62	5.73	5.84	5.95	6.05	6.16	6.26	6.36	6.46
280.0	4.44	5.13	5.25	5.37	5.49	5.60	5.72	5.83	5.95	6.06	6.16	6.27	6.37	6.47	6.57
285.0	4.51	5.22	5.34	5.46	5.58	5.70	5.82	5.94	6.05	6.16	6.27	6.38	6.49	6.59	6.69
290.0	4.59	5.31	5.44	5.56	5.68	5.80	5.92	6.04	6.16	6.27	6.38	6.49	6.60	6.71	6.81
295.0	4.67	5.40	5.53	5.66	5.78	5.90	6.03	6.15	6.26	6.38	6.49	6.61	6.71	6.82	6.92
300.0	4.75	5.50	5.62	5.75	5.88	6.00	6.13	6.25	6.37	6.49	6.60	6.72	6.83	6.94	7.04

STRINGING SAG CHART 1369-A2-1
OFGW - 48 Fiber
Structure #62 to #97, Structure #97 to # 124
Structure #97 to # 124, Structure #124 to # 131

OPGW Catalog #: DNO-4989 42/ 42 mm2/ 637

Ruling Span: 300.0 Feet
Customary Heavy Load Zone

Stringing Sag Table Using Initial Sag
Max Tension = 3,900 lbs

Design: 3,900 lbs @ 0 Deg °F, 1.00 in Ice, 0.00 PSF Wind, Initial

H Tens (lbs)	1255	1019	988	960	933	907	883	861	840	820	801	784	767	751	736
Temp °F>	0	30	35	40	45	50	55	60	65	70	75	80	85	90	95
Sag Span	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches
225.0	24	29	30	31	32	33	33	34	35	36	37	38	39	39	40
230.0	25	30	31	32	33	34	35	36	37	38	39	39	40	41	42
235.0	26	32	33	34	35	36	36	37	38	39	40	41	42	43	44
240.0	27	33	34	35	36	37	38	39	40	41	42	43	44	45	46
245.0	28	34	35	37	38	39	40	41	42	43	44	45	46	47	48
250.0	29	36	37	38	39	40	41	42	43	44	46	47	48	49	50
255.0	30	37	38	40	41	42	43	44	45	46	47	48	49	51	52
260.0	31	39	40	41	42	43	45	46	47	48	49	50	51	53	54
265.0	33	40	41	43	44	45	46	48	49	50	51	52	53	55	56
270.0	34	42	43	44	46	47	48	49	51	52	53	54	55	57	58
275.0	35	43	45	46	47	49	50	51	53	54	55	56	58	59	60
280.0	36	45	46	48	49	50	52	53	54	56	57	58	60	61	62
285.0	38	47	48	49	51	52	54	55	56	58	59	61	62	63	64
290.0	39	48	50	51	53	54	56	57	58	60	61	63	64	65	67
295.0	40	50	51	53	54	56	57	59	60	62	63	65	66	68	69
300.0	42	52	53	55	56	58	59	61	63	64	66	67	69	70	71
305.0	43	53	55	57	58	60	61	63	65	66	68	69	71	72	74
310.0	45	55	57	58	60	62	63	65	67	68	70	72	73	75	76
315.0	46	57	59	60	62	64	66	67	69	71	72	74	76	77	79
320.0	48	59	60	62	64	66	68	69	71	73	75	76	78	80	81
325.0	49	60	62	64	66	68	70	72	73	75	77	79	80	82	84
330.0	51	62	64	66	68	70	72	74	76	78	79	81	83	85	86

STRINGING SAG CHART 1369-A2-2
OFGW - 48 Fiber
Structure #62 to #97, Structure #97 to # 124
Structure #97 to # 124, Structure #124 to # 131

OPGW Catalog #: DNO-4989 42/ 42 mm2/ 637

Ruling Span: 300.0 Feet
Customary Heavy Load Zone

Stringing Sag Table Using Initial Sag
Max Tension = 3,900 lbs

Design: 3,900 lbs @ 0 Deg °F, 1.00 in Ice, 0.00 PSF Wind, Initial

H Tens (lbs)	1255	1019	988	960	933	907	883	861	840	820	801	784	767	751	736
Temp °F>	0	30	35	40	45	50	55	60	65	70	75	80	85	90	95
3rd Wave Span	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec
225.0	4.19	4.65	4.72	4.79	4.86	4.93	4.99	5.06	5.12	5.18	5.24	5.30	5.36	5.42	5.47
230.0	4.28	4.75	4.83	4.90	4.97	5.04	5.10	5.17	5.23	5.30	5.36	5.42	5.48	5.54	5.59
235.0	4.38	4.85	4.93	5.00	5.08	5.15	5.21	5.28	5.35	5.41	5.48	5.54	5.60	5.66	5.71
240.0	4.47	4.96	5.03	5.11	5.18	5.26	5.33	5.39	5.46	5.53	5.59	5.65	5.72	5.78	5.84
245.0	4.56	5.06	5.14	5.22	5.29	5.36	5.44	5.51	5.58	5.64	5.71	5.77	5.84	5.90	5.96
250.0	4.65	5.16	5.24	5.32	5.40	5.47	5.55	5.62	5.69	5.76	5.82	5.89	5.95	6.02	6.08
255.0	4.75	5.27	5.35	5.43	5.51	5.58	5.66	5.73	5.80	5.87	5.94	6.01	6.07	6.14	6.20
260.0	4.84	5.37	5.45	5.54	5.62	5.69	5.77	5.84	5.92	5.99	6.06	6.13	6.19	6.26	6.32
265.0	4.93	5.47	5.56	5.64	5.72	5.80	5.88	5.96	6.03	6.10	6.17	6.24	6.31	6.38	6.44
270.0	5.03	5.58	5.66	5.75	5.83	5.91	5.99	6.07	6.14	6.22	6.29	6.36	6.43	6.50	6.57
275.0	5.12	5.68	5.77	5.86	5.94	6.02	6.10	6.18	6.26	6.33	6.41	6.48	6.55	6.62	6.69
280.0	5.21	5.78	5.87	5.96	6.05	6.13	6.21	6.29	6.37	6.45	6.52	6.60	6.67	6.74	6.81
285.0	5.31	5.89	5.98	6.07	6.16	6.24	6.32	6.41	6.49	6.56	6.64	6.72	6.79	6.86	6.93
290.0	5.40	5.99	6.08	6.17	6.26	6.35	6.44	6.52	6.60	6.68	6.76	6.83	6.91	6.98	7.05
295.0	5.49	6.09	6.19	6.28	6.37	6.46	6.55	6.63	6.71	6.79	6.87	6.95	7.03	7.10	7.17
300.0	5.59	6.20	6.29	6.39	6.48	6.57	6.66	6.74	6.83	6.91	6.99	7.07	7.15	7.22	7.30
305.0	5.68	6.30	6.40	6.49	6.59	6.68	6.77	6.86	6.94	7.03	7.11	7.19	7.27	7.34	7.42
310.0	5.77	6.40	6.50	6.60	6.70	6.79	6.88	6.97	7.06	7.14	7.22	7.30	7.38	7.46	7.54
315.0	5.87	6.51	6.61	6.71	6.80	6.90	6.99	7.08	7.17	7.26	7.34	7.42	7.50	7.58	7.66
320.0	5.96	6.61	6.71	6.81	6.91	7.01	7.10	7.19	7.28	7.37	7.46	7.54	7.62	7.70	7.78
325.0	6.05	6.71	6.82	6.92	7.02	7.12	7.21	7.31	7.40	7.49	7.57	7.66	7.74	7.82	7.90
330.0	6.14	6.82	6.92	7.03	7.13	7.23	7.32	7.42	7.51	7.60	7.69	7.78	7.86	7.94	8.03

STRINGING SAG CHART 1369-A3
OFGW - 48 Fiber
Structure #131 to NPPD St. Libory Sub

OPGW Catalog #: DNO-4989 42/ 42 mm2/ 637

Ruling Span: 300.0 Feet — Stringing Sag Table Using Initial Sag
Customary Heavy Load Zone — Max Tension = 3,555 lbs

Design: 3,555 lbs @ 0 Deg °F, 1.00 in Ice, 0.00 PSF Wind, Initial

H Tens (lbs)	941	807	789	772	756	741	726	712	699	686	674	663	652	642	631
Temp °F>	0	30	35	40	45	50	55	60	65	70	75	80	85	90	95
Sag Span	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In
280.0	4- 1	4- 9	4-10	5- 0	5- 1	5- 2	5- 4	5- 5	5- 6	5- 7	5- 8	5-10	5-11	6- 0	6- 1
285.0	4- 3	4-11	5- 1	5- 2	5- 3	5- 5	5- 6	5- 7	5- 8	5-10	5-11	6- 0	6- 1	6- 2	6- 4
290.0	4- 5	5- 1	5- 3	5- 4	5- 5	5- 7	5- 8	5- 9	5-11	6- 0	6- 1	6- 3	6- 4	6- 5	6- 6
295.0	4- 6	5- 3	5- 5	5- 6	5- 8	5- 9	5-10	6- 0	6- 1	6- 3	6- 4	6- 5	6- 6	6- 8	6- 9
300.0	4- 8	5- 6	5- 7	5- 9	5-10	5-11	6- 1	6- 2	6- 4	6- 5	6- 6	6- 8	6- 9	6-10	7- 0
305.0	4-10	5- 8	5- 9	5-11	6- 0	6- 2	6- 3	6- 5	6- 6	6- 8	6- 9	6-10	7- 0	7- 1	7- 3
310.0	5- 0	5-10	6- 0	6- 1	6- 3	6- 4	6- 6	6- 7	6- 9	6-10	7- 0	7- 1	7- 3	7- 4	7- 5

H Tens (lbs)	941	807	789	772	756	741	726	712	699	686	674	663	652	642	631
Temp °F>	0	30	35	40	45	50	55	60	65	70	75	80	85	90	95
3rd Wave Span	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec
280.0	6.02	6.50	6.57	6.65	6.72	6.79	6.85	6.92	6.99	7.05	7.11	7.17	7.23	7.29	7.35
285.0	6.13	6.62	6.69	6.77	6.84	6.91	6.98	7.04	7.11	7.18	7.24	7.30	7.36	7.42	7.48
290.0	6.24	6.73	6.81	6.88	6.96	7.03	7.10	7.17	7.24	7.30	7.37	7.43	7.49	7.55	7.61
295.0	6.34	6.85	6.93	7.00	7.08	7.15	7.22	7.29	7.36	7.43	7.49	7.56	7.62	7.68	7.74
300.0	6.45	6.96	7.04	7.12	7.20	7.27	7.34	7.42	7.49	7.55	7.62	7.69	7.75	7.81	7.88
305.0	6.56	7.08	7.16	7.24	7.32	7.39	7.47	7.54	7.61	7.68	7.75	7.81	7.88	7.94	8.01
310.0	6.67	7.20	7.28	7.36	7.44	7.51	7.59	7.66	7.74	7.81	7.87	7.94	8.01	8.07	8.14

STRINGING SAG CHART 1369-A4-1
OFGW - 12 Fiber FOCAS
Structure SUB "F" to #30
Final Sags For Existing Cable

Stringing Sag Table Using Final Sag Ruling Span: 250.0 feet

OPGW Catalog #: FOCAS 12 Fiber 93 mm2/ 507

NESC Heavy Load Zone Max Tension = 3,640 lbs

Design: 3,640. lbs @ 0. Deg F , 1.00 in Ice, 4.00 PSF Wind, Initial

H Tens (LBS)	921.	888.	857.	828.	802.	777.	754.	733.	713.	695.	677.	661.	646.	631.
Temp F >	30.	35.	40.	45.	50.	55.	60.	65.	70.	75.	80.	85.	90.	95.
Sag Span	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In
215.0	2- 3	2- 4	2- 5	2- 6	2- 7	2- 8	2- 9	2-10	2-10	2-11	3- 0	3- 1	3- 2	3- 3
220.0	2- 4	2- 5	2- 6	2- 7	2- 8	2- 9	2-10	2-11	3- 0	3- 1	3- 2	3- 3	3- 4	3- 5
225.0	2- 5	2- 6	2- 7	2- 9	2-10	2-11	3- 0	3- 1	3- 2	3- 3	3- 4	3- 5	3- 6	3- 7
230.0	2- 7	2- 8	2- 9	2-10	2-11	3- 0	3- 1	3- 2	3- 3	3- 4	3- 5	3- 6	3- 7	3- 8
235.0	2- 8	2- 9	2-10	2-11	3- 1	3- 2	3- 3	3- 4	3- 5	3- 6	3- 7	3- 8	3- 9	3-10
240.0	2- 9	2-10	3- 0	3- 1	3- 2	3- 3	3- 4	3- 6	3- 7	3- 8	3- 9	3-10	3-11	4- 0
245.0	2-11	3- 0	3- 1	3- 2	3- 4	3- 5	3- 6	3- 7	3- 9	3-10	3-11	4- 0	4- 1	4- 2
250.0	3- 0	3- 1	3- 3	3- 4	3- 5	3- 7	3- 8	3- 9	3-10	4- 0	4- 1	4- 2	4- 3	4- 4
255.0	3- 1	3- 3	3- 4	3- 6	3- 7	3- 8	3-10	3-11	4- 0	4- 2	4- 3	4- 4	4- 5	4- 6
260.0	3- 3	3- 4	3- 6	3- 7	3- 9	3-10	3-11	4- 1	4- 2	4- 3	4- 5	4- 6	4- 7	4- 9

STRINGING SAG CHART 1369-A4-2
OFGW - 12 Fiber FOCAS
Structure SUB "F" to #30
Final Sags For Existing Cable

Stringing Sag Table Using Final Sag Ruling Span: 250.0 feet

OPGW Catalog #: FOCAS 12 Fiber 93 mm2/ 507

NESC Heavy Load Zone Max Tension = 3,640 lbs

Design: 3,640. lbs @ 0. Deg F , 1.00 in Ice, 4.00 PSF Wind, Initial

H Tens (LBS)	921.	888.	857.	828.	802.	777.	754.	733.	713.	695.	677.	661.	646.	631.
Temp F >	30.	35.	40.	45.	50.	55.	60.	65.	70.	75.	80.	85.	90.	95.
3rd Wave Span	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec
215.0	4.43	4.51	4.59	4.67	4.74	4.82	4.89	4.96	5.03	5.10	5.16	5.22	5.29	5.35
220.0	4.53	4.61	4.70	4.78	4.85	4.93	5.00	5.08	5.15	5.21	5.28	5.35	5.41	5.47
225.0	4.63	4.72	4.80	4.88	4.96	5.04	5.12	5.19	5.26	5.33	5.40	5.47	5.53	5.60
230.0	4.74	4.82	4.91	4.99	5.07	5.15	5.23	5.31	5.38	5.45	5.52	5.59	5.66	5.72
235.0	4.84	4.93	5.02	5.10	5.18	5.27	5.34	5.42	5.50	5.57	5.64	5.71	5.78	5.84
240.0	4.94	5.03	5.12	5.21	5.29	5.38	5.46	5.54	5.61	5.69	5.76	5.83	5.90	5.97
245.0	5.04	5.14	5.23	5.32	5.41	5.49	5.57	5.65	5.73	5.81	5.88	5.95	6.02	6.09
250.0	5.15	5.24	5.34	5.43	5.52	5.60	5.69	5.77	5.85	5.93	6.00	6.08	6.15	6.22
255.0	5.25	5.35	5.44	5.54	5.63	5.71	5.80	5.88	5.96	6.04	6.12	6.20	6.27	6.34
260.0	5.35	5.45	5.55	5.64	5.74	5.83	5.91	6.00	6.08	6.16	6.24	6.32	6.39	6.47

STRINGING SAG CHART 1369-A5
7#7 Alumoweld Shield Wire
LINE 1063A - Structure SUB "F" to #1

Conductor: 7 # 7 Alumoweld

Ruling Span: 316.0 Feet — **Stringing Sag Table Using Initial Sag**
Special Load Zone — **Max Tension = 3,640 lbs**

Design: 3,640 lbs @ 0 Deg °F, 1.00 in Ice, 4.00 PSF Wind, Initial

H Tens (lbs)	948	824	807	791	775	760	746	733	720	708	696	685	674	663	653
Temp °F>	0	30	35	40	45	50	55	60	65	70	75	80	85	90	95
Sag Span	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In
306.0	4- 1	4- 9	4-10	4-11	5- 0	5- 1	5- 3	5- 4	5- 5	5- 6	5- 7	5- 8	5- 9	5-10	5-11
311.0	4- 3	4-11	5- 0	5- 1	5- 2	5- 3	5- 5	5- 6	5- 7	5- 8	5- 9	5-10	6- 0	6- 1	6- 2
316.0	4- 5	5- 0	5- 2	5- 3	5- 4	5- 6	5- 7	5- 8	5- 9	5-10	6- 0	6- 1	6- 2	6- 3	6- 4
321.0	4- 6	5- 2	5- 4	5- 5	5- 6	5- 8	5- 9	5-10	5-11	6- 1	6- 2	6- 3	6- 4	6- 5	6- 7
326.0	4- 8	5- 4	5- 6	5- 7	5- 8	5-10	5-11	6- 0	6- 2	6- 3	6- 4	6- 5	6- 7	6- 8	6- 9

Conductor: 7 # 7 Alumoweld

Ruling Span: 316.0 Feet — **Stringing Sag Table Using Initial Sag**
Special Load Zone — **Max Tension = 3,640 lbs**

Design: 3,640 lbs @ 0 Deg °F, 1.00 in Ice, 4.00 PSF Wind, Initial

H Tens (lbs)	948	824	807	791	775	760	746	733	720	708	696	685	674	663	653
Temp °F>	0	30	35	40	45	50	55	60	65	70	75	80	85	90	95
3rd Wave Span	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec
306.0	6.04	6.48	6.54	6.61	6.68	6.74	6.81	6.87	6.93	6.99	7.05	7.11	7.16	7.22	7.27
311.0	6.14	6.58	6.65	6.72	6.79	6.85	6.92	6.98	7.04	7.10	7.16	7.22	7.28	7.34	7.39
316.0	6.23	6.69	6.76	6.83	6.90	6.96	7.03	7.09	7.16	7.22	7.28	7.34	7.40	7.45	7.51
321.0	6.33	6.79	6.86	6.94	7.00	7.07	7.14	7.20	7.27	7.33	7.39	7.45	7.51	7.57	7.63
326.0	6.43	6.90	6.97	7.04	7.11	7.18	7.25	7.32	7.38	7.45	7.51	7.57	7.63	7.69	7.75

STRINGING SAG CHART 1369-A6
7#7 Alumoweld Shield Wire
LINE 1369 - Structure SUB "F" to #1

Conductor: 7 # 7 Alumoweld

Ruling Span: 243.0 Feet
Special Load Zone

Stringing Sag Table Using Initial Sag
Max Tension = 3,640 lbs

Design: 3,640 lbs @ 0 Deg °F, 1.00 in Ice, 4.00 PSF Wind, Initial

H Tens (lbs)	1576	1228	1178	1132	1087	1046	1007	970	936	903	873	845	819	794	771
Temp °F>	0	30	35	40	45	50	55	60	65	70	75	80	85	90	95
Sag Span	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In
233.0	1- 6	1-10	1-11	2- 0	2- 1	2- 2	2- 3	2- 4	2- 5	2- 6	2- 7	2- 8	2- 9	2-10	2-11
238.0	1- 6	1-11	2- 0	2- 1	2- 2	2- 3	2- 4	2- 5	2- 6	2- 8	2- 9	2-10	2-11	3- 0	3- 1
243.0	1- 7	2- 0	2- 1	2- 2	2- 3	2- 4	2- 6	2- 7	2- 8	2- 9	2-10	2-11	3- 0	3- 1	3- 2
248.0	1- 8	2- 1	2- 2	2- 3	2- 5	2- 6	2- 7	2- 8	2- 9	2-10	2-11	3- 1	3- 2	3- 3	3- 4
253.0	1- 9	2- 2	2- 3	2- 5	2- 6	2- 7	2- 8	2- 9	2-10	3- 0	3- 1	3- 2	3- 3	3- 4	3- 6

Conductor: 7 # 7 Alumoweld

Ruling Span: 243.0 Feet
Special Load Zone

Stringing Sag Table Using Initial Sag
Max Tension = 3640 lb

Design: 3,640 lbs @ 0 Deg °F, 1.00 in Ice, 4.00 PSF Wind, Initial

H Tens (lbs)	1576	1228	1178	1132	1087	1046	1007	970	936	903	873	845	819	794	771
Temp °F>	0	30	35	40	45	50	55	60	65	70	75	80	85	90	95
3rd Wave Span	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec
233.0	3.57	4.04	4.12	4.21	4.29	4.38	4.46	4.54	4.63	4.71	4.79	4.87	4.95	5.02	5.10
238.0	3.64	4.13	4.21	4.30	4.38	4.47	4.56	4.64	4.73	4.81	4.89	4.97	5.05	5.13	5.21
243.0	3.72	4.21	4.30	4.39	4.48	4.56	4.65	4.74	4.83	4.91	5.00	5.08	5.16	5.24	5.32
248.0	3.79	4.30	4.39	4.48	4.57	4.66	4.75	4.84	4.92	5.01	5.10	5.18	5.27	5.35	5.43
253.0	3.87	4.39	4.48	4.57	4.66	4.75	4.84	4.93	5.02	5.11	5.20	5.29	5.37	5.46	5.54

STRINGING SAG CHART 1369-A7
7#7 Alumoweld Shield Wire
Structure #131 to NPPD St. Libory Sub

Conductor: 7 # 7 Alumoweld

Ruling Span: 300.0 Feet — **Stringing Sag Table Using Initial Sag**
Customary Heavy Load Zone — **Max Tension = 3,275 lbs**

Design: 3,275 lbs @ 0 Deg °F, 1.00 in Ice, 0.00 PSF Wind, Initial

H Tens (lbs)	852	746	731	717	704	691	679	668	657	646	636	626	617	608	599
Temp °F>	0	30	35	40	45	50	55	60	65	70	75	80	85	90	95
Sag Span	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In
280.0	3-10	4- 5	4- 6	4- 7	4- 8	4- 9	4-10	4-11	5- 0	5- 1	5- 2	5- 3	5- 3	5- 4	5- 5
285.0	4- 0	4- 6	4- 7	4- 9	4-10	4-11	5- 0	5- 1	5- 2	5- 3	5- 4	5- 5	5- 6	5- 7	5- 8
290.0	4- 1	4- 8	4- 9	4-11	5- 0	5- 1	5- 2	5- 3	5- 4	5- 5	5- 6	5- 7	5- 8	5- 9	5-10
295.0	4- 3	4-10	4-11	5- 1	5- 2	5- 3	5- 4	5- 5	5- 6	5- 7	5- 8	5- 9	5-10	5-11	6- 0
300.0	4- 5	5- 0	5- 1	5- 3	5- 4	5- 5	5- 6	5- 7	5- 8	5- 9	5-11	6- 0	6- 1	6- 2	6- 3
305.0	4- 7	5- 2	5- 3	5- 5	5- 6	5- 7	5- 8	5- 9	5-11	6- 0	6- 1	6- 2	6- 3	6- 4	6- 5
310.0	4- 8	5- 4	5- 6	5- 7	5- 8	5- 9	5-11	6- 0	6- 1	6- 2	6- 3	6- 5	6- 6	6- 7	6- 8

Conductor: 7 # 7 Alumoweld

Ruling Span: 300.0 Feet — **Stringing Sag Table Using Initial Sag**
Customary Heavy Load Zone — **Max Tension = 3,275 lbs**

Design: 3,275 lbs @ 0 Deg °F, 1.00 in Ice, 0.00 PSF Wind, Initial

H Tens (lbs)	852	746	731	717	704	691	679	668	657	646	636	626	617	608	599
Temp °F>	0	30	35	40	45	50	55	60	65	70	75	80	85	90	95
3rd Wave Span	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec
280.0	5.83	6.23	6.29	6.35	6.41	6.47	6.53	6.58	6.64	6.69	6.75	6.80	6.85	6.90	6.95
285.0	5.93	6.34	6.40	6.46	6.52	6.58	6.64	6.70	6.76	6.81	6.87	6.92	6.97	7.02	7.07
290.0	6.04	6.45	6.51	6.58	6.64	6.70	6.76	6.82	6.88	6.93	6.99	7.04	7.09	7.15	7.20
295.0	6.14	6.56	6.63	6.69	6.75	6.82	6.88	6.94	6.99	7.05	7.11	7.16	7.22	7.27	7.32
300.0	6.25	6.67	6.74	6.80	6.87	6.93	6.99	7.05	7.11	7.17	7.23	7.28	7.34	7.39	7.45
305.0	6.35	6.78	6.85	6.92	6.98	7.05	7.11	7.17	7.23	7.29	7.35	7.41	7.46	7.52	7.57
310.0	6.45	6.90	6.96	7.03	7.10	7.16	7.23	7.29	7.35	7.41	7.47	7.53	7.58	7.64	7.70

STRINGING SAG CHART 1369-A8-1
T-2 336.4 ACSR 26/7 "T-2 Linnet"
Structure SUB "F" to #44
Structure #44 to # 62

Conductor: 2 - 336.4 Kcmil 26/ 7 Stranding ACSR "T-2 LINNET"

Ruling Span: 250.0 Feet — Stringing Sag Table Using Initial Sag
Special Load Zone — Max Tension = 5,000 lbs

Design: 5,000 lbs @ 0 Deg °F, 1.00 in Ice, 4.00 PSF Wind, Initial

H Tens (lbs)	2364	2000	1948	1899	1851	1806	1763	1721	1682	1645	1609	1575	1542	1511	1481
Temp °F>	0	30	35	40	45	50	55	60	65	70	75	80	85	90	95
Sag Span	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In
200.0	2- 0	2- 4	2- 5	2- 6	2- 7	2- 7	2- 8	2- 9	2-10	2-10	2-11	3- 0	3- 1	3- 1	3- 2
205.0	2- 1	2- 6	2- 6	2- 7	2- 8	2- 9	2-10	2-10	2-11	3- 0	3- 1	3- 2	3- 2	3- 3	3- 4
210.0	2- 2	2- 7	2- 8	2- 9	2-10	2-10	2-11	3- 0	3- 1	3- 2	3- 3	3- 3	3- 4	3- 5	3- 6
215.0	2- 4	2- 9	2- 9	2-10	2-11	3- 0	3- 1	3- 2	3- 3	3- 4	3- 4	3- 5	3- 6	3- 7	3- 8
220.0	2- 5	2-10	2-11	3- 0	3- 1	3- 2	3- 3	3- 4	3- 4	3- 5	3- 6	3- 7	3- 8	3- 9	3-10
225.0	2- 6	3- 0	3- 1	3- 2	3- 2	3- 3	3- 4	3- 5	3- 6	3- 7	3- 8	3- 9	3-10	3-11	4- 0
230.0	2- 8	3- 1	3- 2	3- 3	3- 4	3- 5	3- 6	3- 7	3- 8	3- 9	3-10	3-11	4- 0	4- 1	4- 2
235.0	2- 9	3- 3	3- 4	3- 5	3- 6	3- 7	3- 8	3- 9	3-10	3-11	4- 0	4- 1	4- 2	4- 3	4- 4
240.0	2-10	3- 5	3- 6	3- 7	3- 8	3- 9	3-10	3-11	4- 0	4- 1	4- 2	4- 3	4- 4	4- 5	4- 7
245.0	3- 0	3- 6	3- 7	3- 8	3-10	3-11	4- 0	4- 1	4- 2	4- 3	4- 4	4- 5	4- 7	4- 8	4- 9
250.0	3- 1	3- 8	3- 9	3-10	3-11	4- 1	4- 2	4- 3	4- 4	4- 5	4- 6	4- 8	4- 9	4-10	4-11
255.0	3- 3	3-10	3-11	4- 0	4- 1	4- 3	4- 4	4- 5	4- 6	4- 7	4- 9	4-10	4-11	5- 0	5- 2
260.0	3- 4	3-11	4- 1	4- 2	4- 3	4- 5	4- 6	4- 7	4- 8	4-10	4-11	5- 0	5- 1	5- 3	5- 4
265.0	3- 6	4- 1	4- 3	4- 4	4- 5	4- 7	4- 8	4- 9	4-11	5- 0	5- 1	5- 2	5- 4	5- 5	5- 6
270.0	3- 7	4- 3	4- 4	4- 6	4- 7	4- 9	4-10	4-11	5- 1	5- 2	5- 3	5- 5	5- 6	5- 8	5- 9
275.0	3- 9	4- 5	4- 6	4- 8	4- 9	4-11	5- 0	5- 2	5- 3	5- 4	5- 6	5- 7	5- 9	5-10	5-11
280.0	3-11	4- 7	4- 8	4-10	4-11	5- 1	5- 2	5- 4	5- 5	5- 7	5- 8	5-10	5-11	6- 1	6- 2
285.0	4- 0	4- 9	4-10	5- 0	5- 1	5- 3	5- 5	5- 6	5- 8	5- 9	5-11	6- 0	6- 2	6- 3	6- 5
290.0	4- 2	4-11	5- 0	5- 2	5- 4	5- 5	5- 7	5- 8	5-10	6- 0	6- 1	6- 3	6- 4	6- 6	6- 7
295.0	4- 4	5- 1	5- 3	5- 4	5- 6	5- 7	5- 9	5-11	6- 0	6- 2	6- 4	6- 5	6- 7	6- 9	6-10
300.0	4- 5	5- 3	5- 5	5- 6	5- 8	5-10	5-11	6- 1	6- 3	6- 5	6- 6	6- 8	6-10	6-11	7- 1

STRINGING SAG CHART 1369-A8-2
T-2 336.4 ACSR 26/7 "T-2 Linnet"
Structure SUB "F" to #44
Structure #44 to # 62

Conductor: 2 - 336.4 Kcmil 26/ 7 Stranding ACSR "T-2 LINNET"

Ruling Span: 250.0 Feet — Stringing Sag Table Using Initial Sag
Special Load Zone — Max Tension = 5,000 lbs

Design: 5,000 lbs @ 0 Deg °F, 1.00 in Ice, 4.00 PSF Wind, Initial

H Tens (lbs)	2364	2000	1948	1899	1851	1806	1763	1721	1682	1645	1609	1575	1542	1511	1481
Temp °F>	0	30	35	40	45	50	55	60	65	70	75	80	85	90	95
3rd Wave Span	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec
200.0	4.19	4.55	4.61	4.67	4.73	4.79	4.85	4.91	4.96	5.02	5.07	5.13	5.18	5.24	5.29
205.0	4.29	4.66	4.73	4.79	4.85	4.91	4.97	5.03	5.09	5.14	5.20	5.26	5.31	5.37	5.42
210.0	4.39	4.78	4.84	4.90	4.97	5.03	5.09	5.15	5.21	5.27	5.33	5.39	5.44	5.50	5.55
215.0	4.50	4.89	4.96	5.02	5.09	5.15	5.21	5.27	5.33	5.40	5.45	5.51	5.57	5.63	5.68
220.0	4.60	5.01	5.07	5.14	5.20	5.27	5.33	5.40	5.46	5.52	5.58	5.64	5.70	5.76	5.82
225.0	4.71	5.12	5.19	5.25	5.32	5.39	5.45	5.52	5.58	5.65	5.71	5.77	5.83	5.89	5.95
230.0	4.81	5.23	5.30	5.37	5.44	5.51	5.58	5.64	5.71	5.77	5.84	5.90	5.96	6.02	6.08
235.0	4.92	5.35	5.42	5.49	5.56	5.63	5.70	5.76	5.83	5.90	5.96	6.03	6.09	6.15	6.21
240.0	5.02	5.46	5.53	5.61	5.68	5.75	5.82	5.89	5.96	6.02	6.09	6.16	6.22	6.28	6.35
245.0	5.13	5.57	5.65	5.72	5.79	5.87	5.94	6.01	6.08	6.15	6.22	6.28	6.35	6.41	6.48
250.0	5.23	5.69	5.76	5.84	5.91	5.99	6.06	6.13	6.20	6.27	6.34	6.41	6.48	6.55	6.61
255.0	5.34	5.80	5.88	5.96	6.03	6.11	6.18	6.25	6.33	6.40	6.47	6.54	6.61	6.68	6.74
260.0	5.44	5.92	5.99	6.07	6.15	6.23	6.30	6.38	6.45	6.52	6.60	6.67	6.74	6.81	6.88
265.0	5.55	6.03	6.11	6.19	6.27	6.35	6.42	6.50	6.58	6.65	6.72	6.80	6.87	6.94	7.01
270.0	5.65	6.14	6.22	6.31	6.39	6.47	6.55	6.62	6.70	6.78	6.85	6.92	7.00	7.07	7.14
275.0	5.76	6.26	6.34	6.42	6.50	6.59	6.67	6.75	6.82	6.90	6.98	7.05	7.13	7.20	7.27
280.0	5.86	6.37	6.46	6.54	6.62	6.71	6.79	6.87	6.95	7.03	7.10	7.18	7.26	7.33	7.40
285.0	5.96	6.48	6.57	6.66	6.74	6.83	6.91	6.99	7.07	7.15	7.23	7.31	7.39	7.46	7.54
290.0	6.07	6.60	6.69	6.77	6.86	6.95	7.03	7.11	7.20	7.28	7.36	7.44	7.52	7.59	7.67
295.0	6.17	6.71	6.80	6.89	6.98	7.07	7.15	7.24	7.32	7.40	7.49	7.57	7.65	7.72	7.80
300.0	6.28	6.83	6.92	7.01	7.10	7.19	7.27	7.36	7.44	7.53	7.61	7.69	7.78	7.86	7.93

STRINGING SAG CHART 1369-A9-1
T-2 336.4 ACSR 26/7 "T-2 Linnet"
Structure #62 to #97, Structure #97 to # 124
Structure #97 to # 124, Structure #124 to # 131
Structure #131 to NPPD St. Libory Sub

Conductor: 2 - 336.4 Kcmil 26/ 7 Stranding ACSR "T-2 LINNET"

Ruling Span: 300.0 Feet — Stringing Sag Table Using Initial Sag
Special Load Zone — Max Tension = 5,000 lbs

Design: 5,000 lbs @ 0 Deg °F, 1.00 in Ice, 4.00 PSF Wind, Initial

H Tens (lbs)	1903	1702	1672	1644	1617	1591	1566	1542	1519	1497	1475	1454	1434	1415	1396
Temp °F>	0	30	35	40	45	50	55	60	65	70	75	80	85	90	95
Sag Span	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In
225.0	3- 1	3- 6	3- 7	3- 7	3- 8	3- 9	3- 9	3-10	3-11	3-11	4- 0	4- 1	4- 2	4- 2	4- 3
230.0	3- 3	3- 8	3- 8	3- 9	3-10	3-11	3-11	4- 0	4- 1	4- 2	4- 2	4- 3	4- 4	4- 4	4- 5
235.0	3- 5	3-10	3-10	3-11	4- 0	4- 1	4- 1	4- 2	4- 3	4- 4	4- 5	4- 5	4- 6	4- 7	4- 7
240.0	3- 7	4- 0	4- 0	4- 1	4- 2	4- 3	4- 4	4- 4	4- 5	4- 6	4- 7	4- 8	4- 8	4- 9	4-10
245.0	3- 8	4- 2	4- 2	4- 3	4- 4	4- 5	4- 6	4- 7	4- 7	4- 8	4- 9	4-10	4-11	4-11	5- 0
250.0	3-10	4- 4	4- 4	4- 5	4- 6	4- 7	4- 8	4- 9	4-10	4-11	4-11	5- 0	5- 1	5- 2	5- 3
255.0	4- 0	4- 6	4- 7	4- 7	4- 8	4- 9	4-10	4-11	5- 0	5- 1	5- 2	5- 3	5- 4	5- 4	5- 5
260.0	4- 2	4- 8	4- 9	4-10	4-11	5- 0	5- 0	5- 1	5- 2	5- 3	5- 4	5- 5	5- 6	5- 7	5- 8
265.0	4- 4	4-10	4-11	5- 0	5- 1	5- 2	5- 3	5- 4	5- 5	5- 6	5- 7	5- 8	5- 9	5- 9	5-10
270.0	4- 6	5- 0	5- 1	5- 2	5- 3	5- 4	5- 5	5- 6	5- 7	5- 8	5- 9	5-10	5-11	6- 0	6- 1
275.0	4- 8	5- 2	5- 3	5- 4	5- 5	5- 7	5- 8	5- 9	5-10	5-11	6- 0	6- 1	6- 2	6- 3	6- 4
280.0	4-10	5- 5	5- 6	5- 7	5- 8	5- 9	5-10	5-11	6- 0	6- 1	6- 2	6- 3	6- 4	6- 6	6- 7
285.0	5- 0	5- 7	5- 8	5- 9	5-10	5-11	6- 1	6- 2	6- 3	6- 4	6- 5	6- 6	6- 7	6- 8	6- 9
290.0	5- 2	5- 9	5-10	6- 0	6- 1	6- 2	6- 3	6- 4	6- 5	6- 7	6- 8	6- 9	6-10	6-11	7- 0
295.0	5- 4	6- 0	6- 1	6- 2	6- 3	6- 5	6- 6	6- 7	6- 8	6- 9	6-10	7- 0	7- 1	7- 2	7- 3
300.0	5- 6	6- 2	6- 3	6- 5	6- 6	6- 7	6- 8	6-10	6-11	7- 0	7- 1	7- 3	7- 4	7- 5	7- 6
305.0	5- 8	6- 4	6- 6	6- 7	6- 8	6-10	6-11	7- 0	7- 2	7- 3	7- 4	7- 5	7- 7	7- 8	7- 9
310.0	5-11	6- 7	6- 8	6-10	6-11	7- 0	7- 2	7- 3	7- 4	7- 6	7- 7	7- 8	7-10	7-11	8- 0
315.0	6- 1	6-10	6-11	7- 0	7- 2	7- 3	7- 5	7- 6	7- 7	7- 9	7-10	7-11	8- 1	8- 2	8- 3
320.0	6- 3	7- 0	7- 2	7- 3	7- 5	7- 6	7- 7	7- 9	7-10	8- 0	8- 1	8- 2	8- 4	8- 5	8- 6
325.0	6- 6	7- 3	7- 4	7- 6	7- 7	7- 9	7-10	8- 0	8- 1	8- 3	8- 4	8- 5	8- 7	8- 8	8-10
330.0	6- 8	7- 5	7- 7	7- 9	7-10	8- 0	8- 1	8- 3	8- 4	8- 6	8- 7	8- 9	8-10	9- 0	9- 1

STRINGING SAG CHART 1369-A9-2
T-2 336.4 ACSR 26/7 "T-2 Linnet"
Structure #62 to #97, Structure #97 to # 124
Structure #97 to # 124, Structure #124 to # 131, Structure #131 to NPPD St. Libory Sub

Conductor: 2 - 336.4 Kcmil 26/ 7 Stranding ACSR "LINNET/TP"

Ruling Span: 300.0 Feet — Stringing Sag Table Using Initial Sag
Special Load Zone — Max Tension = 5,000 lbs

Design: 5,000 lbs @ 0 Deg °F, 1.00 in Ice, 4.00 PSF Wind, Initial

H Tens (lbs)	1903	1702	1672	1644	1617	1591	1566	1542	1519	1497	1475	1454	1434	1415	1396
Temp °F>	0	30	35	40	45	50	55	60	65	70	75	80	85	90	95
3rd Wave Span	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec
225.0	5.25	5.55	5.60	5.65	5.69	5.74	5.79	5.83	5.87	5.92	5.96	6.00	6.05	6.09	6.13
230.0	5.37	5.67	5.72	5.77	5.82	5.87	5.91	5.96	6.01	6.05	6.09	6.14	6.18	6.22	6.26
235.0	5.48	5.80	5.85	5.90	5.95	5.99	6.04	6.09	6.14	6.18	6.23	6.27	6.32	6.36	6.40
240.0	5.60	5.92	5.97	6.02	6.07	6.12	6.17	6.22	6.27	6.31	6.36	6.40	6.45	6.49	6.54
245.0	5.72	6.04	6.10	6.15	6.20	6.25	6.30	6.35	6.40	6.44	6.49	6.54	6.58	6.63	6.67
250.0	5.83	6.17	6.22	6.27	6.33	6.38	6.43	6.48	6.53	6.58	6.62	6.67	6.72	6.76	6.81
255.0	5.95	6.29	6.35	6.40	6.45	6.51	6.56	6.61	6.66	6.71	6.76	6.81	6.85	6.90	6.95
260.0	6.07	6.41	6.47	6.53	6.58	6.63	6.69	6.74	6.79	6.84	6.89	6.94	6.99	7.04	7.08
265.0	6.18	6.54	6.59	6.65	6.71	6.76	6.81	6.87	6.92	6.97	7.02	7.07	7.12	7.17	7.22
270.0	6.30	6.66	6.72	6.78	6.83	6.89	6.94	7.00	7.05	7.10	7.15	7.21	7.26	7.31	7.36
275.0	6.42	6.78	6.84	6.90	6.96	7.02	7.07	7.13	7.18	7.23	7.29	7.34	7.39	7.44	7.49
280.0	6.53	6.91	6.97	7.03	7.09	7.14	7.20	7.26	7.31	7.37	7.42	7.47	7.53	7.58	7.63
285.0	6.65	7.03	7.09	7.15	7.21	7.27	7.33	7.39	7.44	7.50	7.55	7.61	7.66	7.71	7.76
290.0	6.77	7.16	7.22	7.28	7.34	7.40	7.46	7.52	7.57	7.63	7.69	7.74	7.79	7.85	7.90
295.0	6.88	7.28	7.34	7.40	7.47	7.53	7.59	7.65	7.70	7.76	7.82	7.87	7.93	7.98	8.04
300.0	7.00	7.40	7.47	7.53	7.59	7.65	7.71	7.77	7.83	7.89	7.95	8.01	8.06	8.12	8.17
305.0	7.12	7.53	7.59	7.66	7.72	7.78	7.84	7.90	7.96	8.02	8.08	8.14	8.20	8.25	8.31
310.0	7.23	7.65	7.72	7.78	7.85	7.91	7.97	8.03	8.10	8.16	8.22	8.27	8.33	8.39	8.45
315.0	7.35	7.77	7.84	7.91	7.97	8.04	8.10	8.16	8.23	8.29	8.35	8.41	8.47	8.52	8.58
320.0	7.47	7.90	7.96	8.03	8.10	8.16	8.23	8.29	8.36	8.42	8.48	8.54	8.60	8.66	8.72
325.0	7.58	8.02	8.09	8.16	8.23	8.29	8.36	8.42	8.49	8.55	8.61	8.67	8.74	8.80	8.85
330.0	7.70	8.14	8.21	8.28	8.35	8.42	8.49	8.55	8.62	8.68	8.75	8.81	8.87	8.93	8.99

STRINGING SAG CHART 1369-A10-1
1/0 ACSR 6/1 "RAVEN"
Structure #50 to #54, Structure #73 to # 82, Structure #94 to #99

Conductor: #1/0 AWG 6/ 1 Stranding ACSR "RAVEN"

Ruling Span: 300.0 Feet — **Stringing Sag Table Using Initial Sag**
Customary Heavy Load Zone — **Max Tension = 2,080 lbs at NECS Heavy**

Design: 2,080 lbs @ 0 Deg °F, 0.50 in Ice, 4.00 PSF Wind, Initial

H Tens (lbs)	1328	1116	1080	1044	1008	972	936	900	865	830	796	762	729	697	666
Temp °F>	0	30	35	40	45	50	55	60	65	70	75	80	85	90	95
Sag Span	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In	Ft-In
280.0	1- 1	1- 4	1- 4	1- 5	1- 5	1- 6	1- 7	1- 7	1- 8	1- 9	1-10	1-11	2- 0	2- 1	2- 2
285.0	1- 2	1- 4	1- 5	1- 5	1- 6	1- 7	1- 7	1- 8	1- 9	1-10	1-11	2- 0	2- 1	2- 2	2- 3
290.0	1- 2	1- 5	1- 5	1- 6	1- 7	1- 7	1- 8	1- 9	1-10	1-11	1-11	2- 1	2- 2	2- 3	2- 4
295.0	1- 3	1- 5	1- 6	1- 7	1- 7	1- 8	1- 9	1-10	1-10	1-11	2- 0	2- 1	2- 2	2- 4	2- 5
300.0	1- 3	1- 6	1- 7	1- 7	1- 8	1- 9	1- 9	1-10	1-11	2- 0	2- 1	2- 2	2- 3	2- 5	2- 6
305.0	1- 4	1- 7	1- 7	1- 8	1- 9	1- 9	1-10	1-11	2- 0	2- 1	2- 2	2- 3	2- 4	2- 6	2- 7
310.0	1- 4	1- 7	1- 8	1- 9	1- 9	1-10	1-11	2- 0	2- 1	2- 2	2- 3	2- 4	2- 5	2- 6	2- 8
315.0	1- 5	1- 8	1- 8	1- 9	1-10	1-11	2- 0	2- 0	2- 1	2- 3	2- 4	2- 5	2- 6	2- 7	2- 9
320.0	1- 5	1- 8	1- 9	1-10	1-11	1-11	2- 0	2- 1	2- 2	2- 3	2- 4	2- 6	2- 7	2- 8	2-10
325.0	1- 6	1- 9	1-10	1-11	1-11	2- 0	2- 1	2- 2	2- 3	2- 4	2- 5	2- 7	2- 8	2- 9	2-11

STRINGING SAG CHART 1369-A10-2
1/0 ACSR 6/1 "RAVEN"
Structure #50 to #54, Structure #73 to # 82, Structure #94 to #99

Conductor: #1/0 AWG 6/ 1 Stranding ACSR "RAVEN"

Ruling Span: 300.0 Feet
Customary Heavy Load Zone

Stringing Sag Table Using Initial Sag
Max Tension = 2,080 lbs at NECS Heavy

Design: 2,080 lbs @ 0 Deg °F, 0.50 in Ice, 4.00 PSF Wind, Initial

H Tens (lbs)	1328	1116	1080	1044	1008	972	936	900	865	830	796	762	729	697	666
Temp °F>	0	30	35	40	45	50	55	60	65	70	75	80	85	90	95
3rd Wave Span	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec	Sec
280.0	3.09	3.38	3.43	3.49	3.55	3.62	3.69	3.76	3.83	3.91	4.00	4.08	4.18	4.27	4.37
285.0	3.15	3.44	3.49	3.55	3.62	3.68	3.75	3.82	3.90	3.98	4.07	4.16	4.25	4.35	4.45
290.0	3.20	3.50	3.55	3.61	3.68	3.75	3.82	3.89	3.97	4.05	4.14	4.23	4.32	4.42	4.52
295.0	3.26	3.56	3.61	3.68	3.74	3.81	3.88	3.96	4.04	4.12	4.21	4.30	4.40	4.50	4.60
300.0	3.31	3.62	3.68	3.74	3.81	3.88	3.95	4.03	4.11	4.19	4.28	4.38	4.47	4.58	4.68
305.0	3.37	3.68	3.74	3.80	3.87	3.94	4.01	4.09	4.18	4.26	4.35	4.45	4.55	4.65	4.76
310.0	3.42	3.74	3.80	3.86	3.93	4.00	4.08	4.16	4.24	4.33	4.43	4.52	4.62	4.73	4.84
315.0	3.48	3.80	3.86	3.93	4.00	4.07	4.15	4.23	4.31	4.40	4.50	4.59	4.70	4.80	4.91
320.0	3.54	3.86	3.92	3.99	4.06	4.13	4.21	4.29	4.38	4.47	4.57	4.67	4.77	4.88	4.99
325.0	3.59	3.92	3.98	4.05	4.12	4.20	4.28	4.36	4.45	4.54	4.64	4.74	4.85	4.96	5.07

Appendix B
Soil Boring Log and Data

GSI Geotechnical Services, Inc.
Superior service...practical solutions

GEOTECHNICAL EXPLORATION

CITY OF GRAND ISLAND
115kV TRANSMISSION LINE 1369
SUBSTATION F TO ST. LIBORY JUNCTION
GRAND ISLAND, NEBRASKA

GSI JOB NO. 115052

JUNE 2, 2011

Prepared By:

Geotechnical Services, Inc.
2960 North Diers Avenue
Grand Island, Nebraska
68803-1243

Prepared For:

Advantage Engineering, Inc.
Mr. Barry Smith
769 Spirit of St. Louis Boulevard
Chesterfield, Missouri 63005

GSI Geotechnical Services, Inc.
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TABLE OF CONTENTS

GSI Geotechnical Services, Inc.
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GEOTECHNICAL EXPLORATION FOR

CITY OF GRAND ISLAND 115KV TRANSMISSION LINE 1369 SUBSTATION F TO ST. LIBORY JUNCTION GRAND ISLAND, NEBRASKA

GSI JOB NO. 115052

JUNE 2, 2011

1. INTRODUCTION

1.1 General

This report presents a summary of the findings from our geotechnical exploration for the City of Grand Island 115kV transmission line 1369 project, located in Grand Island, Nebraska. The scope of work was outlined in our proposal dated March 17, 2011. Written authorization was provided by Mr. Barry Smith representing Advantage Engineering, Inc., on March 18, 2011.

The purpose of this geotechnical study was to explore subsurface conditions at the proposed site, perform laboratory testing on selected samples, and provide general site considerations with respect to the proposed design and construction.

The scope of services for this exploration did not include a wetlands evaluation, an environmental assessment, or an exploration for the presence of hazardous or toxic materials in the soil, surface water, groundwater, or air within or adjacent to this site. Any statements in this report or on the boring logs regarding odors noted, unusual or suspicious items, or conditions observed are strictly for the information of our client. If contamination is suspected or is a concern, GSI recommends that the scope of this study be expanded to include an environmental assessment.

The firm of Geotechnical Services, Inc. (GSI) prepared this report. This report has been prepared for the exclusive use of the client in accordance with generally accepted geotechnical engineering practices.

1.2 Project Description

The site is located between Capital Avenue and Prairie Road, and between Engleman Road and Webb Road on the north side of Grand Island, Nebraska. We understand the project will consist of a 115 kV transmission line 1369. The proposed site structures will be founded on piers.

2. FIELD EXPLORATION

The geotechnical exploration included a total of six exploratory borings within the proposed site, extending to depths of 30 feet below existing grade. GSI drilled the borings on April 7, 11, and 12, 2011, using a CME-45 and a Mobile B-61; both truck mounted drilling rigs, using 3.25-inch hollow stem augers.

The site plan was provided by Mr. Barry Smith, representing Advantage Engineering, Inc. The test borings were surveyed and marked by others using wooden lathe. The test borings were drilled within 10 feet of the wooden lathe. The location of the borings in relation to existing and proposed features is indicated on the Boring Location Diagram (Appendix A). Boring elevations are referenced to the existing ground surface at the time of the exploration. The location of the borings should be considered accurate only to the degree implied by the methods used.

Our drill crew obtained 3 soil samples within the upper 10 feet and generally obtained the remaining samples at 5-foot intervals during the field exploration. Split-barrel samples (designated "S-#" sample) were obtained while performing Standard Penetration Tests (SPT) with a 1 3/8-inch I.D., thick-walled sampler, driven in general accordance with ASTM D1586-84, "*Penetration Test and Split-Barrel Sampling of Soils.*" The "N" value, reported in blows per foot, equals the number of blows required to drive the sampler over the last 12 inches of the sample interval using a 140-pound hammer falling 30 inches. Our drill crew obtained undisturbed samples (designated "U-#" sample) with thin-walled tube samplers, 3-inch outside diameter, hydraulically pushed in general accordance with ASTM D1587, "Thin Walled Tube Sampling of Soils." The recovered samples were sealed in plastic containers, labeled, and protected for transportation to the laboratory for further examination, testing, and classification.

The drill crew prepared the field boring logs during the field exploration. The field logs report drilling and sampling methods, sampling intervals, groundwater measurements, and the encountered subsurface conditions.

3. LABORATORY TESTING

The engineer reviewed the field boring logs to outline the depth, thickness, and extent of the soil strata. The samples taken from the borings were examined in our laboratory and visually classified in general accordance with ASTM D2488, "*Description and Identification of Soils (Visual-Manual Procedure).*" At the request of Advantage Engineering, Inc., the following tests were performed on the encountered soils:

- Water Content (ASTM D2216, "*Laboratory Determination of Water (Moisture) Content of Soil and Rock*")
- Unit Weight (ASTM D2937, "*Density of Soil in Place by the Drive-Cylinder Method*")
- Minus No. 200 Sieve Wash (ASTM D1140-00, "*Amount of Material in Soils Finer Than the No. 200 (75-µm) Sieve*")
- Unconfined Compressive Strength (ASTM D2166, "*Unconfined Compressive Strength of Cohesive Soil*")

All tests were conducted in general accordance with current ASTM or state-of-the-practice test procedures. Laboratory test results are presented on the boring logs and in Appendix C.

Water content tests content and unit weight tests were used to evaluate the existing moisture-density state of the soils. No. 200 sieve tests were used to help classify the soils under the Unified Soils Classification System. Unconfined compression tests were used to define the stress-strain characteristics and related shear strength of the soils.

Based on the results of this testing program, the field logs were reviewed and supplemented as presented in Appendix B. The final logs represent our interpretation of the field logs and reflect the additional information obtained from the laboratory testing. Stratification boundaries indicated on the boring logs were based on observations during drilling, an extrapolation of information obtained by inspecting samples from the borings, and comparisons of similar engineering characteristics. Locations of these boundaries are approximate and the transitions between soil types may be gradual rather than clearly defined.

4. GENERAL SITE CONDITIONS

4.1 Surface Conditions

At the time of the exploration, the terrain was slightly sloping to fairly level. The site is located between Capital Avenue and Prairie Road, and between Engleman Road and Webb Road on the north side of Grand Island, Nebraska. Existing site features for each location include:

- Test boring (DH-1), grass-covered area with overhead lines,
- Test boring (DH-2), cornfield with overhead lines,
- Test boring (DH-3), grass-covered area with overhead lines,
- Test boring (DH-4), grass-covered area,
- Test boring (DH-5), grass-covered area, and
- Test boring (DH-6), cornfield.

4.2 Subsurface Conditions

According to the Soil Survey of Hall County, Nebraska, by the Soil Conservation Service (U.S. Department of Agriculture), the surficial site soils are comprised of Invale and Alda soils. The Invale loamy fine sand generally consists of well drained soil occurring on a nearly level to gently sloping flood plain on river valley. The parent material consists of sandy alluvium. The Alda loam generally consists of somewhat poorly drained soil occurring on a nearly level flat on flood plain on river valley with a low runoff class. The parent material consists of loamy alluvium over sandy and gravelly alluvium.

Although there was some variability in the encountered subsurface conditions, a general soil profile could be developed. The soil encountered within the depths of exploration generally consisted of a developed zone of cohesive soils underlain by alluvial deposits of granular soils and zones of interbedded cohesive and granular soils.

In borings DH-1, DH-3, DH-4, DH-5, and DH-6, we encountered zones of interbedded alluvial deposits at depths of approximately 2½ to 3½ feet below grade, extending to depths of 6 to 18½ feet below grade. The deposits were described as light olive gray to olive brown, moist to wet, very soft to firm, lean clay with sand and clayey sand. SPT Blow Counts "N" of 3 to 10 indicates very soft to firm consistencies. Laboratory testing performed on this material indicated moisture contents ranging from 12 to 27 percent above the water table, dry densities of 92 to 108 pcf, and an unconfined compressive strengths ranging from 0.30 to 1.64 tsf.

We encountered alluvial deposits in the borings at depths of approximately 6 to 18½ feet below grade, extending to approximately 30 feet below grade (full depth of exploration in all borings). The alluvial deposits were described as light brown, slightly moist to wet, loose to dense, fine to coarse grained, poorly graded sand. SPT Blow Counts "N" ranging from 9 to 38 indicate a loose to dense relative density. Laboratory testing performed on this material indicated moisture contents ranging from 2 to 5 percent above the water table.

Groundwater observations were made during drilling and after completion of the borings to evaluate groundwater conditions. Groundwater was noted in the borings at the depths indicated in the table below.

TABLE A – GROUNDWATER CONDITIONS

Boring	Depth to Groundwater (At end of Drilling) Feet
DH-1	8½
DH-2	8
DH-3	9
DH-4	7
DH-5	18½
DH-6	5

There is uncertainty involved with short-term water level observations in the boreholes. Further, the groundwater level, and the amount and level of any perched water on the site may be expected to fluctuate with variations in precipitation, site grading, drainage, and adjacent land use. Long-term monitoring in piezometers or observation wells would be required to evaluate the potential range of groundwater conditions. Naturally, allowances must be made for the seasonal variation in the water table.

5. SITE CONSIDERATIONS

The major considerations with respect to the encountered soil conditions and the proposed construction include the variability of the design properties of the encountered soils (SPT Blow Counts of encountered alluvial deposits ranged from 3 to 33 blows per foot), depth of encountered water table and granular deposits (dewatering or casing may be necessary depending on construction practices), and soft surficial cohesive soils, which may be susceptible to pumping and rutting.

6. CLOSING REMARKS - LIMITATIONS

This report is presented in broad terms to provide an assessment of the subsurface conditions and their potential effect on the adequate design and economical construction of the proposed structures. The conditions and considerations contained in this report are based on the site conditions existing at the time of the exploration, the project layout described herein, and the assumption that the information obtained from our six borings is representative of subsurface conditions throughout the site. Any changes in the location of the proposed structures should be assumed to invalidate the conditions and considerations described in this report. If there is a substantial lapse in time between the submission of this report and the start of construction, or if

site conditions or the project layout have significantly changed (due to further development of grading plans, natural causes, or construction operations at or adjacent to the site) we recommend that this report be reviewed to determine the applicability of encountered conditions and site considerations.

We make no warranty for the contents of this report, neither expressed nor implied, except that our professional services were performed in accordance with engineering principles and practices generally accepted at this time and location.

Respectfully Submitted,
Geotechnical Services, Inc.

Prepared by,

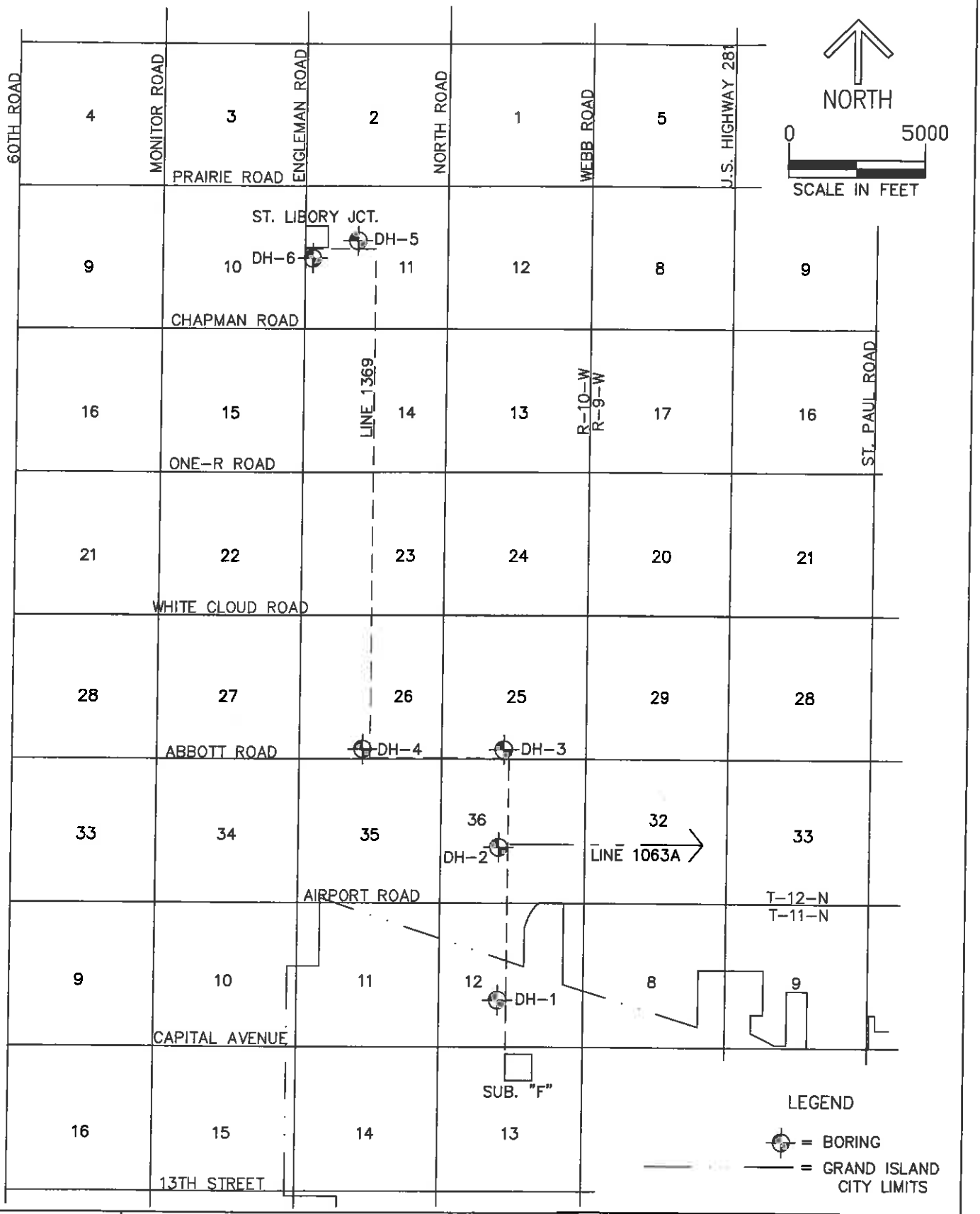
James D. Sorgenfrei, P.E.
Project Engineer/Vice President

Reviewed by,

J. Fred Jones, P.E.
Executive Vice President

APPENDIX A

Boring Location Diagram



REVISED/REPRINTED	

BORING LOCATION DIAGRAM

CITY OF GRAND ISLAND
115kV TRANSMISSION LINE 1369
GRAND ISLAND, NEBRASKA

GSI
Geotechnical Engineering & Environmental Consultants
2960 North Diers Avenue
Grand Island, Nebraska

GSI PROJECT #	115052
DRAWN/CHECKED	EAD/JS
DATE	04/26/11
ISSUE #	1
PRINT #	1

APPENDIX B

Boring Logs

Unified Soil Classification System (USCS)

BORING LOG No. DH-1

BORING NO.	LOCATION OF BORING	ELEVATION	DATUM	DRILLER	LOGGER
DH-1	See Boring Location Diagram			Matt Wold	James Sorgenfrei

WATER LEVEL OBSERVATIONS				TYPE OF SURFACE	DRILL RIG
WHILE DRILLING	END OF DRILLING	24 HOURS AFTER DRILLING		Grass	CME-45
				DRILLING METHOD	TOTAL DEPTH
8'	8.5'	Backfilled at End of Drilling		3.25-Inch Inside Diameter Hollow Stem Augers	30'

DEP FT	SAMPLE DATA: SAMPLE NO. & TYPE	SAMPLE DATA: "N" BLOWS (FT)	SAMPLE DATA: % REC	SOIL DESCRIPTION: COLOR, MOISTURE, CONSISTENCY / GEOLOGIC DESCRIPTION & OTHER REMARKS	USCS CLASS	LABORATORY DATA: % MC	LABORATORY DATA: DRY DENS pcf	LABORATORY DATA: Qu tsf	DEP FT
				DEVELOPED ZONE Brown, Moist, Clayey Sand					
	U-1				SC	12.0	97.4		
				3.5'					
5	U-2	10		ALLUVIAL DEPOSITS Light Olive Brown, Very Moist, Firm, Sandy Lean Clay with Some Rust and Fine Sand	CL	18.1	107.9	0.30	5
				6.0'					
	S-3	10		ALLUVIAL DEPOSITS Light Brown, Moist, Loose, Poorly Graded Sand, Medium to Fine Sand		4.5			
				Wet Below a Depth of 8 Feet					
10	S-4	10							10
	S-5	12		Medium Dense, Medium to Coarse Sand with Some Gravel Below a Depth of 13 1/ 2 Feet					
15									15
					SP				
	S-6	10							
20									20
	S-7	20							
25									25
	S-8	30							
30									30
				30.0'					
				Bottom of Boring @ 30'					
35									35

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PROJECT: 115kV Transmission Line 1369
LOCATION: Grand Island, Nebraska
JOB NO.: 115052
DATE: 04/12/11

BORING LOG No. DH-2

BORING NO.	LOCATION OF BORING	ELEVATION	DATUM	DRILLER	LOGGER
DH-2	See Boring Location Diagram			Matt Wold	James Sorgenfrei

WATER LEVEL OBSERVATIONS				TYPE OF SURFACE	DRILL RIG
WHILE DRILLING	END OF DRILLING	24 HOURS AFTER DRILLING		Bare Ground	CME-45
				DRILLING METHOD	TOTAL DEPTH
7.5'	8'	Backfilled at End of Drilling		3.25-Inch Inside Diameter Hollow Stem Augers	30'

DEP FT.	SAMPLE DATA: SAMPLE NO. & TYPE	"N" BLOWS (FT)	% REC	SOIL DESCRIPTION: COLOR, MOISTURE, CONSISTENCY / GEOLOGIC DESCRIPTION & OTHER REMARKS	USCS CLASS	LABORATORY DATA: % MC	DRY DENS pcf	Qu tsf	DEP FT.
				DEVELOPED ZONE Dark Brown, Moist, Lean Clay					
	U-1			Olive Brown Below a Depth of 1 1/2 Feet	CL	16.5	111.5	1.11	
				3.5'					
5	S-2	8		ALLUVIAL DEPOSITS Light Brown, Moist, Loose, Medium to Fine Grained, Poorly Graded Sand		2.1			5
	S-3	9		Very Moist Below a Depth of 6 Feet					
				Wet Below a Depth of 7 1/2 Feet, Medium Dense with Some Gravel					
10	S-4	10		Medium Dense and Medium Grained with Some Gravel Below a Depth of 8 1/2 Feet					10
15	S-5	13			SP				15
20	S-6	18							20
25	S-7	20							25
30	S-8	39		Dense Below a Depth of 28 1/2 Feet					30
				30.0'					
				Bottom of Boring @ 30'					
35									35

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PROJECT: 115kV Transmission Line 1369
LOCATION: Grand Island, Nebraska
JOB NO.: 115052
DATE: 04/11/11

BORING LOG No. DH-3

BORING NO	LOCATION OF BORING	ELEVATION	DATUM	DRILLER	LOGGER
DH-3	See Boring Location Diagram			James Tinnell	James Sorgenfrei

WATER LEVEL OBSERVATIONS				TYPE OF SURFACE	DRILL RIG
WHILE DRILLING	END OF DRILLING	24 HOURS AFTER DRILLING		Bare Ground	B-61
				DRILLING METHOD	TOTAL DEPTH
8.5'	9'	Backfilled at End of Drilling		3.25-Inch Inside Diameter Hollow Stem Augers	30'

DEP FT.	SAMPLE DATA: SAMPLE NO. & TYPE	"N" BLOWS (FT)	% REC	SOIL DESCRIPTION: COLOR, MOISTURE, CONSISTENCY / GEOLOGIC DESCRIPTION & OTHER REMARKS	USCS CLASS	LABORATORY DATA: % MC	DRY DENS pcf	Qu tsf	DEP FT.
				DEVELOPED ZONE Dark Brown, Moist, Firm, Lean Clay with Sand					
	U-1				CL	20.7	100.4	0.64	
				3.5'					
5	S-2	5		ALLUVIAL DEPOSITS Olive Brown, Moist, Firm, Lean Clay with Sand	CL	20.8			5
				6.0'					
	S-3	9		Light Brown,Very Moist, Loose, Fine Grained, Poorly Graded Sand		14.9			
				Wet and Medium to Fine Grained Below a Depth of 8 1/2 Feet					
10	S-4	9							10
				Light Olive Gray, Medium Dense, Medium to Fine Grained with Gravel Below a Depth of 13 1/2 Feet					
15	S-5	20							15
					SP				
20	S-6	21							20
25	S-7	19							25
				Light Brown, Medium to Coarse Grained Below a Depth of 28 1/2 Feet					
30	S-8	28							30
				30.0'					
				Bottom of Boring @ 30'					
35									35

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PROJECT: 115kV Transmission Line 1369
LOCATION: Grand Island, Nebraska
JOB NO.: 115052
DATE: 04/07/11

BORING LOG No. DH-4

BORING NO	LOCATION OF BORING	ELEVATION	DATUM	DRILLER	LOGGER
DH-4	See Boring Location Diagram			James Tinnell	James Sorgenfrei

WATER LEVEL OBSERVATIONS				TYPE OF SURFACE	DRILL RIG
WHILE DRILLING	END OF DRILLING	24 HOURS AFTER DRILLING		Grass	CME-45
				DRILLING METHOD	TOTAL DEPTH
6.5'	7'	Backfilled at End of Drilling		3.25-Inch Inside Diameter Hollow Stem Augers	30'

DEP. FT.	SAMPLE DATA: SAMPLE NO. & TYPE	SAMPLE DATA: "N" BLOWS (FT)	SAMPLE DATA: % REC	SOIL DESCRIPTION: COLOR, MOISTURE, CONSISTENCY / GEOLOGIC DESCRIPTION & OTHER REMARKS	USCS CLASS	LABORATORY DATA: % MC	LABORATORY DATA: DRY DENS pcf	LABORATORY DATA: Qu tsf	DEP. FT.
				DEVELOPED ZONE Dark Brown, Very Moist, Soft, Lean Clay					
	U-1			Brown	CL	27.4	93.8	0.46	
				3.5'					
5	S-2	5		ALLUVIAL DEPOSITS Light Olive Gray, Very Moist, Soft, Lean Clay with Fine Sand		24.2			5
					CL				
	S-3	4		Wet with Rust Stains Below a Depth of 6 1/2 Feet					▽ ▽
				8.5'					
10	S-4	3		ALLUVIAL DEPOSITS Olive Brown, Soft, Clayey Sand					10
					SC				
15	S-5	4		Gray with Sand Seams and 1 Inch Cobble					15
				18.5'					
20	S-6	11		ALLUVIAL DEPOSITS Gray, Medium to Coarse Sand with Some Gravel					20
25	S-7	12			SP				25
30	S-8	18							30
				30.0'					
				Bottom of Boring @ 30'					
35									35

GSI Geotechnical Services, Inc.
2860 N. Diers Avenue, Grand Island, NE 68803
(308) 381-1967 Fax (308) 381-2467

PROJECT: 115kV Transmission Line 1369
LOCATION: Grand Island, Nebraska
JOB NO.: 115052
DATE: 04/12/11

BORING LOG No. DH-5

BORING NO.	LOCATION OF BORING	ELEVATION	DATUM	DRILLER	LOGGER
DH-5	See Boring Location Diagram			Matt Wold	James Sorgenfrei

WATER LEVEL OBSERVATIONS				TYPE OF SURFACE	DRILL RIG
WHILE DRILLING	END OF DRILLING	24 HOURS AFTER DRILLING		Grass	CME-45
				DRILLING METHOD	TOTAL DEPTH
13'	13.5'	Backfilled at End of Drilling		3.25-Inch Inside Diameter Hollow Stem Augers	30'

DEP FT	SAMPLE DATA: SAMPLE NO. & TYPE	SAMPLE DATA: "N" BLOWS (FT)	SAMPLE DATA: % REC	SOIL DESCRIPTION: COLOR, MOISTURE, CONSISTENCY / GEOLOGIC DESCRIPTION & OTHER REMARKS	USCS CLASS	LABORATORY DATA: % MC	LABORATORY DATA: DRY DENS. pcf	LABORATORY DATA: Qu tsf	DEP FT
				DEVELOPED ZONE Dark Brown, Moist, Soft, Clay Sand	SC	14.3	92.5		
	U-1			2.5'					
				ALLUVIAL DEPOSITS Light Olive Brown, Moist, Firm, Lean Clay with Some Rust and Fine Sand					
5	U-2					27.3	90.4	0.59	5
				Very Moist Below a Depth of 6 Feet	CL	27.7			
	S-3	7							
				Soft Below a Depth of 8 1/2 Feet					
10	S-4	5				27.1			10
				10.0'					
				ALLUVIAL DEPOSITS Light Olive Brown, Very Moist, Soft, Clayey Sand with Some Rust					
					SC				
15	S-5	4							15
				18.5'					
				ALLUVIAL DEPOSITS Light Brown, Wet, Medium Dense, Fine Grained, Poorly Graded Sand with Clay					
20	S-6	12			SP-SC				20
				23.5'					
				ALLUVIAL DEPOSITS Light Brown, Wet, Medium Dense, Fine Grained, Poorly Graded Sand					
25	S-7	13			SP				25
				Dense Below a Depth of 28 1/2 Feet					
30	S-8	38		30.0'					30
				Bottom of Boring @ 30'					
35									35

GSI Geotechnical Services, Inc.
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PROJECT: 115kV Transmission Line 1369
LOCATION: Grand Island, Nebraska
JOB NO.: 115052
DATE: 04/11/11

BORING LOG No. DH-6

BORING NO.	LOCATION OF BORING	ELEVATION	DATUM	DRILLER	LOGGER
DH-6	See Boring Location Diagram			Matt Wold	James Sorgenfrei

WATER LEVEL OBSERVATIONS				TYPE OF SURFACE	DRILL RIG
WHILE DRILLING	END OF DRILLING	24 HOURS AFTER DRILLING		Bare Ground	CME-45
				DRILLING METHOD	TOTAL DEPTH
4.5'	5'	Backfilled at End of Drilling		3.25-Inch Inside Diameter Hollow Stem Augers	30'

DEP. FT.	SAMPLE DATA: SAMPLE NO. & TYPE	"N" BLOWS (FT)	% REC.	SOIL DESCRIPTION: COLOR, MOISTURE, CONSISTENCY / GEOLOGIC DESCRIPTION & OTHER REMARKS	USCS CLASS	LABORATORY DATA: % MC	DRY DENS. pcf	Qu tsf	DEP. FT.
				DEVELOPED ZONE Brown, Moist, Loose, Lean Clay with Sand	CL	7.2	92.3		
	U-1			2.5'					
				ALLUVIAL DEPOSITS Light Brown, Moist, Loose, Poorly Graded Sand, Fine Sand					
5	S-2	6		Wet Below 4 1/2 Feet	SP				5 ▽
				6.0'					
	S-3	3		ALLUVIAL DEPOSITS Light Brown, Wet, Very Soft, Lean Clay with Sand					
10	U-4				CL	25.4	100.0	1.64	10
				13.5'					
15	S-5	19		ALLUVIAL DEPOSITS Light Brown, Wet, Medium Dense, Fine Grained, Poorly Graded Sand, Fine Sand					15
20	S-6	20			SP				20
25	S-7	23							25
30	S-8	25		Very Fine Grained Below a Depth of 28 1/2 Feet					30
				30.0'					
				Bottom of Boring @ 30'					
35									35

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PROJECT: 115kV Transmission Line 1369
LOCATION: Grand Island, Nebraska
JOB NO.: 115052
DATE: 04/11/11

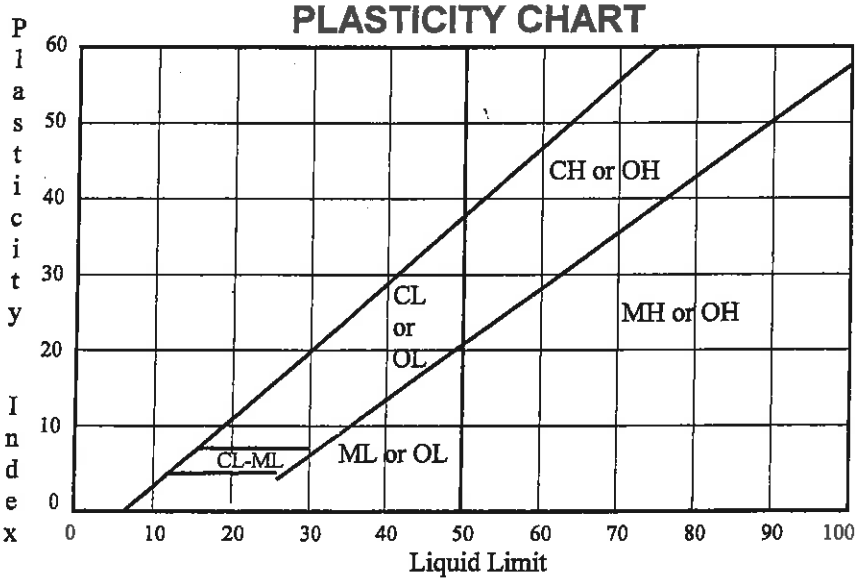
UNIFIED SOIL CLASSIFICATION SYSTEM

GROUP NAME	GROUP SYMBOL	SOIL DESCRIPTION	Comments
Peat	Pt	Highly organic soils	50% or more is smaller than No. 200 sieve
Fat Clay	CH	Clay - Liquid limit > 50% *	
Plastic Silt	MH	Silt - Liquid limit > 50% *	
Lean Clay	CL	Clay - Liquid limit < 50% *	
Silt	ML	Silt - Liquid limit < 50% *	
Silty Clay	CL-ML	Silty Clay *	
Clayey Sand	SC	Sands with 12 to 50 percent smaller than No. 200 sieve *	More than 50% is larger than No. 200 sieve and % sand > % gravel
Silty Sand	SM		
Poorly Graded Sand with Clay	SP-SC	Sands with 5 to 12 percent smaller than No. 200 sieve *	
Poorly Graded Sand with Silt	SP-SM		
Well Graded Sand with Clay **	SW-SC		
Well Graded Sand with Silt **	SW-SM		
Poorly Graded Sand	SP	Sands with less than 5 percent smaller than No. 200 sieve *	
Well Graded Sand **	SW		
Clayey Gravel	GC	Gravels with 12 to 50 percent smaller than No. 200 sieve *	More than 50% is larger than No. 200 sieve and % gravel > % sand
Silty Gravel	GM		
Poorly Graded Gravel with Clay	GP-GC	Gravels with 5 to 12 percent smaller than No. 200 sieve *	
Poorly Graded Gravel with Silt	GP-GM		
Well Graded Gravel with Clay **	GW-GC		
Well Graded Gravel with Silt **	GW-GM		
Poorly Graded Gravel	GP	Gravels with less than 5 percent smaller than No. 200 sieve *	
Well Graded Gravel **	GW		

* See Plasticity Chart for definition of silts and clays.

** See definition for well graded.

PLASTICITY CHART



LEGEND OF TERMS

SAMPLE IDENTIFICATION

U - Undisturbed (shelby tube)
S – Split-barrel/SPT (disturbed)
C - California Sampler
L - Lasky continuous sampler
A - Auger cuttings (sack sample)
B - Bulk sample (auger cuttings)
H - Head-space sample

CONSISTENCY OF COHESIVE SOILS

Unconfined Compressive Strength, Qu, psf

<500	Very Soft
500-1000	Soft
1000-2000	Medium Stiff (Firm)
2000-4000	Stiff
4000-8000	Very Stiff
>8000	Hard

RELATIVE DENSITY OF GRANULAR SOILS

N - blows per foot

0-3	Very Loose
4-9	Loose
10-29	Medium Dense
30-49	Dense
50-80	Very Dense

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CLASSIFICATION CRITERIA FOR SANDS AND GRAVELS

Well graded sands (SW) $C_u = D_{60}/D_{10} \geq 6$ and $C_c = (D_{30})^2/(D_{10} \times D_{60}) \leq 3$ and ≥ 1

Well graded gravels (GW) $C_u = D_{60}/D_{10} \geq 4$ and $C_c = (D_{30})^2/(D_{10} \times D_{60}) \leq 3$ and ≥ 1

Boulders	Cobbles	Coarse Gravel	Fine Gravel	Coarse Sand	Medium Sand	Fine Sand	FINES (silt or clay)
Sieve sizes 10"		3"	3/4"	#4	#10	#40	#200

APPENDIX C

Laboratory Test Results

Drill Hole No	Sample No	Sample Depth (ft)	Sample Dia (in)	Sample Length (in)	Water Content (%)	Density		Void Ratio	Sat (%)	Unconfined Comp		Atterberg Limits			Cons Test *	% Passing #200	Classification
						Wet (pcf)	Dry (pcf)			QU (tsf)	Strain (%)	LL	PL	PI			
DH-1	U-1	1 – 2.5	2.85	3.74	12.0	109.7	97.4	0.717	45								
	U-2	3.5 - 5	2.85	5.25	18.1	127.4	107.9	0.550	88	0.30	2.4					55.2	Sandy Lean Clay (CL)
	S-3	6 - 7.5			4.5												
DH-2	U-1	1 -2.5	2.85	5.57	16.5	129.9	111.5	0.499	89	1.11	3.6						
	S-2	3.5 - 5			2.1												
DH-3	U-1	1 – 2.5	2.85	5.55	20.7	121.1	100.4	0.666	83	0.64	2.7						
	S-1	3.5 - 5			20.8											72.4	Lean Clay with Sand (CL)
	S-2	6 - 7.5			14.9												
DH-4	U-1	1 – 2.5	2.85	5.59	27.4	119.5	93.8	0.783	94	0.46	6.3						
	S-2	3.5 - 5			24.2											74.9	Lean Clay with Sand (CL)
DH-5	U-1	1 – 2.5	2.85	5.54	14.3	105.8	92.5	0.807	47								
	U-2	3.5 - 5	2.85	5.58	27.3	115.0	90.4	0.851	86	0.59	2.7					95.6	Lean Clay (CL)
	S-3	6 - 7.5			27.7												
	S-4	8.5 - 10			27.1												
	S-5	13.5 - 15			32.7											91.0	Lean Clay (CL)
DH-6	U-1	1 - 2.5	2.85	2.63	7.2	98.9	92.3	0.812	24								
	U-3	8.5 - 10	2.85	5.56	25.4	125.4	100.0	0.672	101	1.64	3.1					56.3	Sandy Lean Clay (CL)

GSI

2960 N. Diers Avenue * Grand Island, NE 68803 * Phone: 308.381.1987

SUMMARY OF SOIL TESTS

Project

115 kV Transmission Line 1369

Location

Grand Island, Nebraska

Job Number 115052

Date 6/20/11

BID UNITS

GRAND ISLAND TRANSMISSION LINE
CONSTRUCTION UNITS

UNIT NO.	NAME AND DESCRIPTION OF CONSTRUCTION UNIT	NO. OF UNITS	UNIT PRICE			EXTENDED PRICE - LABOR AND MATERIALS
			LABOR	MATERIALS	LABOR & MATERIALS	
	DIRECT EMBEDDED STEEL POLE UNITS					
SP1	TYPE SBPT 80'-H3 SINGLE CIRCUIT TANGENT STEEL POLE *	1 or 0				
SP2	TYPE SBPT 85'-H3 SINGLE CIRCUIT TANGENT STEEL POLE *	69 or 0				
SP3	TYPE SBPT 85'-H4 SINGLE CIRCUIT TANGENT STEEL POLE *	13 or 0				
SP4	TYPE SBPT 85'-H6 SINGLE CIRCUIT TANGENT STEEL POLE *	4 or 0				
SP5	TYPE SBPT 85'-H7 SINGLE CIRCUIT TANGENT STEEL POLE *	1 or 0				
SP6	TYPE SBPT 90'-H3 SINGLE CIRCUIT TANGENT STEEL POLE *	2 or 0				
SP7	TYPE SBPT 90'-H4 SINGLE CIRCUIT TANGENT STEEL POLE *	2 or 0				
SP8	TYPE SBPT 95'-H3 SINGLE CIRCUIT TANGENT STEEL POLE *	1 or 0				
SP9	TYPE SBPT 95'-H4 SINGLE CIRCUIT TANGENT STEEL POLE *	3 or 0				
SP10	TYPE SDBPT 80'-H10 DOUBLE CIRCUIT TANGENT STEEL POLE *	1 or 0				
SP11	TYPE SDBPT 85'-H5 DOUBLE CIRCUIT TANGENT STEEL POLE *	24 or 0				
SP12	TYPE SDBPT 85'-H6 DOUBLE CIRCUIT TANGENT STEEL POLE *	1 or 0				
SP13	TYPE SDBPT (MOD) 95'-H5 DOUBLE CIRCUIT TANGENT STEEL POLE *	1 or 0				
SP14	TYPE SDBPA 2 - 85'-H3 DOUBLE CIRCUIT ANGLE STEEL POLE *	2 or 0				
	* INCLUDES DIRECT EMBEDDED FOUNDATION WITH CONCRETE BACKFILL INSTALLATION. DUE TO THE HIGH WATER TABLE IN THE AREA, UNIT PRICES SHALL ALSO INCLUDE ANY DEWATERING OR THE INSTALLATION AND REMOVAL OF SHEET BARRELS REQUIRED TO HOLD THE HOLE OPEN.					
	NOTE: MATERIAL PRICES INCLUDED IN THIS BID SHALL BE FIRM. THE PRICES SHALL INCLUDE ALLOWANCES FOR ANY AND ALL INCREASES IN THE PRICES OF STEEL OR ALUMINUM THAT MAY OCCUR. THIS SHALL INCLUDE ALL PRICES QUOTED FOR THE STEEL POLE STRUCTURES AND CONDUCTOR. NO INCREASES IN THE TOTAL PRICE OF THE CONTRACT WILL BE MADE AS A RESULT OF MATERIAL PRICE INCREASES.					

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GRAND ISLAND TRANSMISSION LINE
CONSTRUCTION UNITS

UNIT NO.	NAME AND DESCRIPTION OF CONSTRUCTION UNIT	NO. OF UNITS	UNIT PRICE			EXTENDED PRICE - LABOR AND MATERIALS
			LABOR	MATERIALS	LABOR & MATERIALS	
	DIRECT EMBEDDED CONCRETE POLE UNITS					
CP1	TYPE CBPT 80'-H3 SINGLE CIRCUIT TANGENT CONCRETE POLE *	0 or 1				
CP2	TYPE CBPT 85'-H3 SINGLE CIRCUIT TANGENT CONCRETE POLE *	0 or 69				
CP3	TYPE CBPT 85'-H4 SINGLE CIRCUIT TANGENT CONCRETE POLE *	0 or 13				
CP4	TYPE CBPT 85'-H6 SINGLE CIRCUIT TANGENT CONCRETE POLE *	0 or 4				
CP5	TYPE CBPT 85'-H7 SINGLE CIRCUIT TANGENT CONCRETE POLE *	0 or 1				
CP6	TYPE CBPT 90'-H3 SINGLE CIRCUIT TANGENT CONCRETE POLE *	0 or 2				
CP7	TYPE CBPT 90'-H4 SINGLE CIRCUIT TANGENT CONCRETE POLE *	0 or 2				
CP8	TYPE CBPT 95'-H3 SINGLE CIRCUIT TANGENT CONCRETE POLE *	0 or 1				
CP9	TYPE CBPT 95'-H4 SINGLE CIRCUIT TANGENT CONCRETE POLE *	0 or 3				
CP10	TYPE CDBPT 80'-H10 DOUBLE CIRCUIT TANGENT CONCRETE POLE *	0 or 1				
CP11	TYPE CDBPT 85'-H5 DOUBLE CIRCUIT TANGENT CONCRETE POLE *	0 or 24				
CP12	TYPE CDBPT 85'-H6 DOUBLE CIRCUIT TANGENT CONCRETE POLE *	0 or 1				
CP13	TYPE CDBPT (MOD) 95'-H5 D. CIRCUIT TANGENT CONCRETE POLE *	0 or 1				
CP14	TYPE CDBPA 2 - 85'-H3 DOUBLE CIRCUIT ANGLE CONCRETE POLE *	0 or 2				
	* INCLUDES DIRECT EMBEDDED FOUNDATION WITH CONCRETE BACKFILL INSTALLATION. DUE TO THE HIGH WATER TABLE IN THE AREA, UNIT PRICES SHALL ALSO INCLUDE ANY DEWATERING OR THE INSTALLATION AND REMOVAL OF SHEET BARRELS REQUIRED TO HOLD THE HOLE OPEN.					
	NOTE: MATERIAL PRICES INCLUDED IN THIS BID SHALL BE FIRM. THE PRICES SHALL INCLUDE ALLOWANCES FOR ANY AND ALL INCREASES IN THE PRICES OF STEEL OR ALUMINUM THAT MAY OCCUR. THIS SHALL INCLUDE ALL PRICES QUOTED FOR THE POLE STRUCTURES AND CONDUCTOR. NO INCREASES IN THE TOTAL PRICE OF THE CONTRACT WILL BE MADE AS A RESULT OF MATERIAL PRICE INCREASES.					

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GRAND ISLAND TRANSMISSION LINE
CONSTRUCTION UNITS

UNIT NO.	NAME AND DESCRIPTION OF CONSTRUCTION UNIT	NO. OF UNITS	UNIT PRICE			EXTENDED PRICE - LABOR AND MATERIALS
			LABOR	MATERIALS	LABOR & MATERIALS	
	SELF SUPPORTED DEAD END STEEL POLE UNITS					
SP13	TYPE SVD 75' SINGLE CIRCUIT DEAD END STEEL POLE	4				
SP14	TYPE SVDN 75' SINGLE CIRCUIT DEAD END STEEL POLE	1				
SP15	TYPE SDTD 95' DOUBLE CIRCUIT DEAD END / TANGENT STEEL POLE	1				
	NOTE: MATERIAL PRICES INCLUDED IN THIS BID SHALL BE FIRM. THE PRICES SHALL INCLUDE ALLOWANCES FOR ANY AND ALL INCREASES IN THE PRICES OF STEEL OR ALUMINUM THAT MAY OCCUR. THIS SHALL INCLUDE ALL PRICES QUOTED FOR THE POLE STRUCTURES AND CONDUCTOR. NO INCREASES IN THE TOTAL PRICE OF THE CONTRACT WILL BE MADE AS A RESULT OF MATERIAL PRICE INCREASES.					

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GRAND ISLAND TRANSMISSION LINE
CONSTRUCTION UNITS

UNIT NO.	NAME AND DESCRIPTION OF CONSTRUCTION UNIT	NO. OF UNITS	UNIT PRICE			EXTENDED PRICE - LABOR AND MATERIALS
			LABOR	MATERIALS	LABOR & MATERIALS	
	STEEL POLE CONCRETE PIER FOUNDATION UNITS					
FA-30	8'-6" DIAMETER x 27'-6" LONG PIER FOR STRUCTURE 30	1				
FA-44	6'-0" DIAMETER x 23'-6" LONG PIER FOR STRUCTURE 44	1				
FA-62	6'-0" DIAMETER x 23'-6" LONG PIER FOR STRUCTURE 62	1				
FA-97	6'-0" DIAMETER x 23'-6" LONG PIER FOR STRUCTURE 97	1				
FA-124	6'-0" DIAMETER x 23'-6" LONG PIER FOR STRUCTURE 124	1				
FA-132	6'-0" DIAMETER x 23'-6" LONG PIER FOR STRUCTURE 132	1				
	CONCRETE FOUNDATION UNITS TO INCLUDE ALL REQUIRED EXCAVATION AND THE FURNISHING OF CONCRETE, ANCHOR BOLT CAGE, REBAR, AND REBAR TIES. CONCRETE SHALL INCLUDE QUANTITY FOR OVERSIZED HOLE. DUE TO THE HIGH WATER TABLE IN THE AREA, UNIT PRICES SHALL ALSO INCLUDE ANY DEWATERING OR THE INSTALLATION AND REMOVAL OF SHEET BARRELS REQUIRED					
	STEEL POLE CONCRETE PIER FOUNDATION ADJUSTMENT UNITS PRICE PER FOOT FOR INCREASING OR DECREASING DEPTH:					
FDA-6	6'-0" DIAMETER PIER	0				
FDA-8.5	8'-6" DIAMETER PIER	0				
RSA	PRICE PER POUND FOR INCREASING OR DECREASING REINFORCING STEEL	0				

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TOTAL, EXTENDED LABOR & MATERIALS	

GRAND ISLAND TRANSMISSION LINE
CONSTRUCTION UNITS

UNIT NO.	NAME AND DESCRIPTION OF CONSTRUCTION UNIT	NO. OF UNITS	UNIT PRICE			EXTENDED PRICE - LABOR AND MATERIALS
			LABOR	MATERIALS	LABOR & MATERIALS	
	STEEL OR CONCRETE POLE DIRECT EMBEDDED POLE FOUNDATION ADJUSTMENT UNITS PRICE PER FOOT FOR INCREASING OR DECREASING DEPTH:					
FDA-4.0	4'-0" DIAMETER FOUNDATION	0				
FDA-4.5	4'-6" DIAMETER FOUNDATION	0				
FDA-5.0	5'-0" DIAMETER FOUNDATION	0				

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GRAND ISLAND TRANSMISSION LINE
CONSTRUCTION UNITS

UNIT NO.	NAME AND DESCRIPTION OF CONSTRUCTION UNIT	NO. OF UNITS	UNIT PRICE			EXTENDED PRICE - LABOR AND MATERIALS
			LABOR	MATERIALS	LABOR & MATERIALS	
	HARDWARE ASSEMBLY UNITS					
OF-1	OFGW SUPPORT - SUSPENSION 48 FIBER DOUBLE CIRCUIT POLE	27				
OF-2	OFGW SUPPORT - SUSPENSION 48 FIBER SINGLE CIRCUIT POLE	98				
OF-3	OFGW SUPPORT - DEAD END (60°-180°) 48 FIBER SINGLE CIR. POLE	5				
OF-4	OFGW SUPPORT - SUSPENSION 12 FIBER DOUBLE CIRCUIT POLE	27				
OF-5	OFGW SUPPORT - DEAD END (60°-180°) 12 FIBER SINGLE CIR. POLE	1				
OF-6	OFGW ATTACHMENT WITH SPLICE CASE & SPLICE COIL STORAGE RACK - STRS #44 & #97	2				
OF-7	OFGW ATTACHMENT WITH SPLICE CASE & SPLICE COIL STORAGE RACK - SUBSTATION STRUCTURES	2				
OF-8	OFGW SUPPORT - SUSPENSION 12 FIBER SINGLE CIRCUIT POLE	2				
OF-9	OFGW SUPPORT - DEAD END (180°) 12 FIBER SINGLE CIRCUIT POLE	1				
S1	SHIELD WIRE DEAD END - 7 NO. 7 ALUMOWELD	6				
C2-T2	115 KV BRACED POST ASSEMBLY - SINGLE CIRCUIT POLE	300				
C3-T2	115 KV BRACED POST ASSEMBLY - DOUBLE CIRCUIT POLE	81				
C4-T2	115 KV CONDUCTOR DEAD END ASSEMBLY - T-2 336.4 ACSR	33				
SUB F TERM	115 KV T-2 CONDUCTOR LINE TERMINATION AT SUB "F" INCLUDING 3 - CONDUCTOR DEAD END ASSEMBLIES, T-2 JUMPERS AND SPACERS	2				
NPPD TERM	115 KV T-2 CONDUCTOR LINE TERMINATION AT NPPD ST. LIBORY INCLUDING 3 - CONDUCTOR DEAD END ASSEMBLIES, NO JUMPERS	1				

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GRAND ISLAND TRANSMISSION LINE
CONSTRUCTION UNITS

UNIT NO.	NAME AND DESCRIPTION OF CONSTRUCTION UNIT	NO. OF UNITS	UNIT PRICE			EXTENDED PRICE - LABOR AND MATERIALS
			LABOR	MATERIALS	LABOR & MATERIALS	
	HARDWARE ASSEMBLY UNITS					
C5	CONDUCTOR DEAD END ASSEMBLY INCLUDING CONDUCTOR SPLICES AND OTHER MATERIAL REQUIRED TO EXTEND WIRE TO NEW STEEL POLE STRUCTURE. - 477 ACSR "HAWK" - Str. #30 East Side **	3				
C6-T2	115 KV JUMPER SUPPORT ASSEMBLY - T2 336.4 ACSR	3				
G1	STEEL POLE GROUNDING ASSEMBLY	133 or 6				
G2	CONCRETE POLE GROUNDING ASSEMBLY	0 or 127				
C9-5	12.5 KV UNDERBUILD TANGENT CROSSARM ASSEMBLY - 12' LONG ARM	15				
C7-10	12.5 KV UNDERBUILD DEADEND CROSSARM ASSEMBLY - 10' LONG ARM	8				
	CONDUCTOR INSTALLATION UNITS					
C-T2	T-2 336.4 KCMIL, 26/7 ACSR "T-2 Linnet", INSTALL **THREE PHASES** INCLUDING CONDUCTOR JUMPERS & COMPRESSION SPLICES - PER FOOT - TOTAL FEET = 3 x 44,560 Feet = 133,680 Feet	133,680				
48 OFGW	AFL FIBER OPTIC SHIELD WIRE (OFGW) 48 FIBER, INSTALL ONE CABLE PER FOOT - TOTAL FEET = 37,750 Feet	37,750				
7#7 AW	7 NO. 7 ALUMOWELD SHIELD WIRE, INSTALL ONE SHIELD WIRE INCLUDING JUMPERS AND CONNECTORS PER FOOT - TOTAL FEET = 1,000 FEET	1,000				
1/0 ACSR	1/0 AWG, 6/1 ACSR "RAVEN", INSTALL **THREE PHASESAND NEUTRAL** INCLUDING CONDUCTOR JUMPERS & COMPRESSION SPLICES - PER FOOT - TOTAL FEET = 4 x 5,400 Feet = 21,600 Feet	21,600				

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GRAND ISLAND TRANSMISSION LINE
CONSTRUCTION UNITS

UNIT NO.	NAME AND DESCRIPTION OF CONSTRUCTION UNIT	NO. OF UNITS	UNIT PRICE			EXTENDED PRICE - LABOR AND MATERIALS
			LABOR	MATERIALS	LABOR & MATERIALS	
	WOOD POLE STRUCTURE AND WIRE REMOVAL UNITS					
RST80	REMOVE 80' CLASS 1 TYPE ST DAVIT ARM TANGENT STRUCTURE COMPLETE *	24				
RST85	REMOVE 85' CLASS 1 TYPE ST DAVIT ARM TANGENT STRUCTURE COMPLETE *	3				
RVD80	REMOVE 80' CLASS 1 TYPE VD VERTICAL DEAD END STRUCTURE COMPLETE *	1				
RVF85	REMOVE 80' CLASS 1 TYPE VF VERTICAL ANGLE STRUCTURE COMPLETE *	2				
RDG	REMOVE DOWN GUYS, ANY TYPE*	12				
RA	REMOVE ANCHORS, ANY TYPE*	12				
SUBDE	REMOVE 477 KCM ACSR DEAD END ASSEMBLY WITH JUMPERS AT SUB "F"	3				
R477	REMOVE 477 KCM "HAWK" ACSR CONDUCTORS - PER FOOT*	21,200				
	*UNIT CONSISTS OF THE COMPLETE DISASSEMBLY AND REMOVAL OF ALL WOOD POLES, STEEL ARMS AND HARDWARE, GUYS, ANCHORS, CONDUCTORS AND SHIELD WIRE INCLUDING THE HAULING AWAY AND DISPOSING OF ALL POLES AND MATERIAL IN AN ENVIRONMETALLY ACCEPTABLE MANNER. TEMPORARY GUYING AND DEAD END MATERIALS FOR PERFORMING THIS WORK SHALL BE FURNISHED BY THE CONTRACTOR.					

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GRAND ISLAND TRANSMISSION LINE
CONSTRUCTION UNITS

UNIT NO.	NAME AND DESCRIPTION OF CONSTRUCTION UNIT	NO. OF UNITS	UNIT PRICE			EXTENDED PRICE - LABOR AND MATERIALS
			LABOR	MATERIALS	LABOR & MATERIALS	
	TRANSFER WIRE UNITS					
T477	TRANSFER 3 - 477 ACSR CONDUCTORS AT STRUCTURE #30 INCLUDING SPLICING IN ADDITIONAL CONDUCTOR AS REQUIRED TO TRANSFER TO NEW STEEL POLE. **Labor Only - Material Included in Hardware Assembly Units**	1				
TOFGW-1	TRANSFER 1- FOCAS 12 FIBER OPTICAL GROUND WIRE AND DOUBLE DEAD END AT TYPE ST LINE 1063A #2 **Labor Only - Material Included in Hardware Assembly Units**	1				
TOFGW-2	TRANSFER 1- FOCAS 12 FIBER OPTICAL GROUND WIRE TO NEW DOUBLE CIRCUIT STRUCTURE - **Labor Only - Material Included in Hardware Assembly Units**	20				
TOFGW-3	TRANSFER AND DOUBLE DEADEND 1- FOCAS 12 FIBER OPTICAL GROUND WIRE TO TYPE SDTD STRUCTURE #30 - **Labor Only - Material Included in Hardware Assembly Units**	2				
	EXISTING DISTRIBUTION CIRCUITS					
DISTL	LEAN OR PROVIDE AND INSTALL HOT ARMS AS REQUIRED FOR ANY EXISTING DISTRIBUTION CIRCUITS AS NEEDED TO OBTAIN CLEARANCES	LOT				
DISTR	REMOVE EXISTING SOUTHERN PUBLIC POWER DISTRICT CONDUCTORS AND DISTRIBUTION POLE STRUCTURES COMPLETE AS SHOWN ON THE DRAWINGS.	LOT				
DISTT	TRANSFER EXISTING SOUTHERN PUBLIC POWER DISTRICT CONDUCTORS TO NEW STRUCTURES AS SHOWN ON THE DRAWINGS.	LOT				
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					TOTAL, EXTENDED LABOR & MATERIALS	

GRAND ISLAND TRANSMISSION LINE
CONSTRUCTION UNITS

UNIT NO.	NAME AND DESCRIPTION OF CONSTRUCTION UNIT	NO. OF UNITS	UNIT PRICE			EXTENDED PRICE - LABOR AND MATERIALS
			LABOR	MATERIALS	LABOR & MATERIALS	
	ROADWAY TEMPORARY TRAFFIC CONTROL & PERMITS					
TTC	COST TO PROVIDE TEMPORARY ROADWAY TRAFFIC CONTROL AND PERMITS PER SPECIFICATION SECTION 01600 AS REQUIRED FOR THE PROJECT.	1				
	CONSTRUCTION DEMOBILIZATION & RE-MOBILIZATION UNITS					
STOPW	COST TO TEMPORARILY HALT THE WORK, AT THE CITY OF GRAND ISLAND'S REQUEST, AND DEMOBILIZE, THEN RE-MOBILIZE DUE TO LINE LOADING, WOOPING CRANES IN THE AREA OR OTHER CONDITIONS THAT MAY OCCUR. UNIT IS ONE (1) DEMOBILIZATION AND ONE (1) RE-MOBILIZATION.	1				
	PROVIDE FIBER OPTIC CABLE SPLICING AND TESTING					
FSPLICE	PROVIDE FIBER OPTIC CABLE SPLICING AND TESTING REQUIRED TO SPLICE FIBER OPTIC SHIELD WIRE AT NEW SPLICE POINTS AT STRUCTURES #44 AND #97 AND AT SUB "F" AND THE NPPD SUB PER SPECIFICATIONS. SHALL INCLUDE TESTING FIBER PATH FROM SUBSTATION "F" TO THE NPPD SUB.	LOT				
	PROVIDE RAILROAD PROTECTIVE LIABILITY INSURANCE					
RRINS	PROVIDE RAILROAD PROTECTIVE LIABILITY INSURANCE TO COVER ALL WORK DONE ON BNSF RAILROAD PROPERTY BETWEEN STRUCTURES #15 & #16. INSURANCE COVERAGE SHALL MEET UNION PACIFC RAILROAD REQUIREMENTS. UNIT TO ALSO INCLUDE ANY SAFETY TRAINING BNSF MAY REQUIRE.	LOT				

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GRAND ISLAND TRANSMISSION LINE
CONSTRUCTION UNITS

UNIT NO.	NAME AND DESCRIPTION OF CONSTRUCTION UNIT	NO. OF UNITS	UNIT PRICE			EXTENDED PRICE - LABOR AND MATERIALS
			LABOR	MATERIALS	LABOR & MATERIALS	
	PROVIDE GAS LINE PROTECTION FOR KINDER MORGAN GAS PIPELINE CROSSING					
GLPT	PROVIDE WHATEVER PROTECTIVE MEASURES REQUIRED BY KINDER MORGAN FOR GAS PIPE LINE CROSSINGS BETWEEN STRUCTURES #64 & #65, INCLUDING INSTALLING AND REMOVAL OF STEEL PLATES, CRUSHED ROCK, ADDITIONAL SOIL AS MAYBE REQUIRED TO PROTECT THE GAS PIPELINES. UNIT TO ALSO INCLUDE ANY SAFETY TRAINING KINDER MORGAN MAY REQUIRE.	LOT				
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					TOTAL, EXTENDED LABOR & MATERIALS	

GRAND ISLAND TRANSMISSION LINE
CONSTRUCTION UNITS

UNIT NO.	NAME AND DESCRIPTION OF CONSTRUCTION UNIT	NO. OF UNITS	UNIT PRICE			EXTENDED PRICE - LABOR AND MATERIALS
			LABOR	MATERIALS	LABOR & MATERIALS	
	115 KV LINE MAINTENANCE UNITS					
	DIRECT EMBEDDED STEEL POLE UNITS					
SP1M	TYPE SSTM 80'-H1 SINGLE CIRCUIT TANGENT STEEL POLE *	3 or 0				
SP2M	TYPE SSTM 85'-H1 SINGLE CIRCUIT TANGENT STEEL POLE *	1 or 0				
	DIRECT EMBEDDED CONCRETE POLE UNITS					
CP1M	TYPE SCTM 80'-H3 SINGLE CIRCUIT TANGENT CONCRETE POLE *	0 or 3				
CP2M	TYPE SCTM 85'-H3 SINGLE CIRCUIT TANGENT CONCRETE POLE *	0 or 1				
	* INCLUDES DIRECT EMBEDDED FOUNDATION WITH CONCRETE BACKFILL INSTALLATION. DUE TO THE HIGH WATER TABLE IN THE AREA, UNIT PRICES SHALL ALSO INCLUDE ANY DEWATERING OR THE INSTALLATION AND REMOVAL OF SHEET BARRELS REQUIRED TO HOLD THE HOLE OPEN.					
	HARDWARE ASSEMBLY UNITS					
OF-8	OFGW SUPPORT - SUSPENSION 12 FIBER SINGLE CIRCUIT POLE	4				
MAINT.-C1	CONDUCTOR SUSPENSION ASSEMBLY - 477 ACSR "HAWK' . CITY TO FURNISH PORCELAIN INSULATORS, CONTRACTOR TO FURNISH ALL OTHER ITEMS	12				
G1	STEEL POLE GROUNDING ASSEMBLY	4 or 0				
G2	CONCRETE POLE GROUNDING ASSEMBLY	0 or 4				
	WOOD POLE STRUCTURE AND WIRE REMOVAL UNITS					
RST80M	REMOVE 80' CLASS 1 TYPE ST DAVIT ARM TANGENT STRUCTURE COMPLETE	3				
RST85M	REMOVE 85' CLASS 1 TYPE ST DAVIT ARM TANGENT STRUCTURE COMPLETE	1				
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GRAND ISLAND TRANSMISSION LINE
CONSTRUCTION UNITS

UNIT NO.	NAME AND DESCRIPTION OF CONSTRUCTION UNIT	NO. OF UNITS	UNIT PRICE			EXTENDED PRICE - LABOR AND MATERIALS
			LABOR	MATERIALS	LABOR & MATERIALS	
	115 KV LINE MAINTENANCE UNITS					
	TRANSFER WIRE UNITS					
T477M	TRANSFER 3 - 477 ACSR CONDUCTORS AS REQUIRED TO NEW STRUCTURE. **Labor Only - Material Included in Hardware Assembly Units**	4				
TOFGWM	TRANSFER 1- FOCAS 12 FIBER OPTICAL GROUND WIRE TO NEW STRUCTURE **Labor Only - Material Included in Hardware Assembly Units**	1				
	ADDITIONAL 115 KV LINE MAINTENANCE UNITS					
STUBM	INSTALL NEW 50'-2 WOOD STUB POLE TO REPLACE EXISTING STUB POLE INCLUDING THE TRANSFER OF 4 - 3/8" OVERHEAD GUYS,AND INSTALLING 4 NEW - 3/8" EHS DOWN GUYS, GUY MARKERS AND REMOVING THE EXISTING. CITY TO FURNISH 50'-2 WOOD POLE LINE 1064B, STR # C-71 STUB	1				
HFPM-1	REPLACE ONE 80' - 1 POLE IN A TWO POLE H-FRAME TANGENT STRUCTURE TYPE TSA, CITY WILL FURNISH THE POLE. INCLUDING REMOVING EXISTING POLE AND INSTALLING NEW HARDWARE. LINE 1060, STR # D-4	1				
HFPM-2	REPLACE ONE 70' - 1 POLE IN A THREE POLE H-FRAME DEADEND STRUCTURE TYPE DESA, CITY WILL FURNISH THE POLE. INCLUDING REMOVING EXISTING POLE AND INSTALLING NEW HARDWARE. LINE 1093, STR # 47 INSIDE NPPD SUB	1				
HFARM	REPLACE H FRAME CROSSARM ASSEMBLY FOR TYPE TSA TANGENT STRUCTURE INCLUDING TRANSFERRING CONDUCTORS AND REMOVING EXISTING ARM AND INSTALLING NEW HARDWARE. CITY WILL FURNISH NEW CROSSARM ASSEMBLY LINE 1060, STR # D-47	1				
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GRAND ISLAND TRANSMISSION LINE
CONSTRUCTION UNITS

UNIT NO.	NAME AND DESCRIPTION OF CONSTRUCTION UNIT	NO. OF UNITS	UNIT PRICE			EXTENDED PRICE - LABOR AND MATERIALS
			LABOR	MATERIALS	LABOR & MATERIALS	
	ADDITIONAL 115 KV LINE MAINTENANCE UNITS					
INSM	REPLACE BROKEN OR DAMAGE INSULATORS IN PORCELAIN INSULATOR STRING ON TYPE ST DAVIT ARM TANGENT STRUCTURE. CITY WILL FURNISH INSULATORS. LINE 1064B, STR # C-72	1				
HARDM	INSPECT STRUCTURE AND TIGHTEN OR REPLACE LOOSE OR MISSING HARDWARE . BID UNIT IS PER STRUCTURE.	38				
GGM	INSTALL OR REPLACE MISSING OR DAMAGED GUY GUARDS / MARKERS. BID UNIT IS PER STRUCTURE.	27				
GUYM	INSPECT AND REPAIR OR REPLACE BROKEN, DAMAGED, RUSTY 3/8" EHS DOWN GUYS OR OVERHEAD GUYS. BID UNIT IS PER STRUCTURE.	4				
GWWM	INSPECT AND REPAIR OR REPLACE BROKEN OR DAMAGED WOOD POLE STRUCTURE #2 AWG COPPER GROUND WIRE ASSEMBLIES INCLUDING GROUND RODS TO BRING GROUND RESISTANCE TO 10 OHMS OR LESS. BID UNIT IS PER STRUCTURE.	47				
GWSM	INSPECTAND REPAIR OR REPLACE BROKEN OR DAMAGED STEEL POLE STRUCTURE GROUND WIRE ASSEMBLIES INCLUDING GROUND RODS TO BRING GROUND RESISTANCE TO 10 OHMS OR LESS. BID UNIT IS PER STRUCTURE.	12				
INSPM	PERFORM CLIMBING INSPECTION OF ENTIRE STRUCTURE ABOVE GROUND INCLUDING INSPECTING POLE CONDITION TO DETERMINE REPAIRS THAT ARE REQUIRED. INSPECTION TO INCLUDE MINOR REPAIRS - HARDWARE TIGHTENING, BROKEN GROUND REPAIRS, ETC. BID UNIT IS PER STRUCTURE.	15				
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					TOTAL, EXTENDED LABOR & MATERIALS	

CONTRACTOR'S PROPOSED STRINGING EQUIPMENT FOR -
T-2 336.4 ACSR 26/7 STRAND CONDUCTOR "T-2 Linnet"

The Contractor shall complete the following request for data covering the conductor stringing and tensioning equipment to be provided when stringing the T-2 336.4 Kcmil ACSR 26/7 strand conductor. All stringing sheaves and tensioning equipment used in the installation of the T-2 conductor shall meet the requirements of Section 02786 - Wire Stringing, and IEEE Standard 524 (latest revision) "IEEE Guide to the Installation of Transmission Line Conductors".

1.0 Stringing Sheaves

.1 Manufacturer and catalog number: _____
(Provide manufacturer's data sheets on proposed equipment)
.2 Quantities that would be provided: _____
.3 How would they be provided (own, purchase, rent): _____
.4 Outside sheave diameter (inches): _____
.5 Rim width (inches): _____
.6 Bottom of groove diameter (inches): _____
.7 Radius of bottom groove (inches): _____
.8 Lined sheaves proposed: Yes _____ No _____
If yes, what would the lining material be:
Neoprene: _____ Urethane: _____

2.0 Tensioning Equipment

.1 Manufacturer and catalog number: _____
(Provide manufacturer's data sheets on proposed equipment)
.2 How would tensioner be provided (own, purchase, rent): _____
.3 Tensioner type:
Offset bull wheels:_____Tilted bull wheels:_____
Inline bull wheels:_____"V" Groove bull wheels: _____
.4 Outside sheave diameter (inches): _____
.5 Rim width (inches): _____
.6 Bottom of groove diameter (inches): _____
.7 Radius of bottom groove (inches): _____
.8 Lined bull wheel proposed: Yes _____ No _____
If yes, what would the lining material be:
Neoprene: _____ Urethane: _____