

City of Springfield Public Improvement Project

Invitation to Bid for:

**P21101
Downtown Lighting – Phase 1**

The information provided is an abridged version of the complete Invitation to Bid and is provided for review and informational purposes only. To submit a bid for consideration, a complete set of bid documents is required.

A complete set of bid documents may be viewed or purchased at the address shown below:

**City of Springfield
Development and Public Works Department
225 Fifth Street
SE Quad
Springfield, OR 97477**

Contact: Terri White at 541-726-3628 or twhite@springfield-or.gov



City of Springfield
Community Development Division

SPECIFICATIONS
for

P21101

Downtown Lighting – Phase 1

PRE-BID MEETING

Date: July 22, 2014

Time: 9:30 a.m.

Location: City of Springfield
City Hall

Room: Jesse Maine Room
225 Fifth Street
Springfield, OR 97477

BID OPENING

Date: July 31, 2014

Time: 2:00 p.m.

Location: City of Springfield
City Hall

Room: Jesse Maine Room
225 Fifth Street
Springfield, OR 97477

The deadline for submission of project specific questions prior to bid opening is July 25, 2014 at 3:00 p.m. as specified in Section 3.3 of the Instruction to Bidders.

This Project is funded in full or in part by:

- State Funds
 Neither State nor Federal Funds

Please Take Note: All information required must be submitted as directed.

For your Bid to be considered responsive by the City of Springfield you must include all documents included in the Invitation to Bid with your Bid. Additionally, any addendums or revisions must be acknowledged and submitted with your Bid. *The only exception to this is any plans or drawings, which are not required to be submitted as a part of your Bid.*

All documents requesting information must be completed in full and signed where appropriate. *The only exceptions to this requirement are the sample Performance Bond, Payment Bond and Contract documents which are provided here as a reference. However, if you are awarded the Bid, you will be required to submit fully executed copies of these documents upon request.*

A complete description of submittal requirements can be found in the Instruction to Bidders document included in this request for bid under the heading; **5. Bid.**

**CITY OF SPRINGFIELD, OREGON
Invitation to Bidders**

Public Works Improvement Project

Sealed bids will be received at the office of the Finance Director, Robert Duey at the City of Springfield Finance Department, 225 Fifth Street, Springfield, OR 97477, until, but no later than, 2:00 p.m. local time, the 31st day of July, 2014 and opened at 2:05 p.m. the same day at the same location, for the construction of the following public works improvement project in the City of Springfield:

Project No. P21101 Title: Downtown Lighting – Phase 1

Description: Installation of decorative street lights on Main Street from Pioneer Parkway East to 6th Street and includes new poles and foundations, retrofitting used light fixtures with LED kits, removing and installing wire in existing and new conduits, horizontal directional drilling, and other work as needed to complete a fully functional product.

Bid documents are available from the Department of Development and Public Works, City of Springfield, 225 Fifth Street, Springfield, OR 97477, for a non-refundable fee of \$40.00 and are available for viewing at this location. Bid documents available on line at <http://www.springfield-or.gov/DPW/InvitationBid.htm> and those on file at plan centers are incomplete and cannot be used to submit bids. The 1994 edition, as most recently amended, of the City's Standard Construction Specifications, with subsequent revisions, are available for a fee of \$41.00 or can be viewed on-line at <http://www.springfield-or.gov/DPW/StandardConstructionSpecifications.htm>.

A pre-bid meeting will be held on July 22, 2014 at 9:30 a.m. local time in the Jesse Maine meeting room.

All questions should be addressed to Terri White, Engineering Assistant, at 541-726-3628 or twhite@springfield-or.gov. The deadline for submission of questions regarding this Invitation to Bid is July 25, 2014 at 3:00 p.m. local time. Contact with any other City officials may be grounds for disqualification of bid.

No Bid will be received or considered by the City unless the bidder has a current, valid certificate of registration issued by the Construction Contractor's Board as defined in ORS 701.005 and/or a valid landscape contractors license as defined in ORS 671.520 by the State Landscape Contractor's Board, as applicable, at the time the Bid is made and unless the bid contains a statement by the bidder as part of his/her bid that the provisions required by ORS 279C.838 through ORS 279C.870 shall be included in his/her contract. In accordance with ORS 279C.365, the City of Springfield will require that each bid must contain a statement as to whether the bidder is a resident bidder, as defined in ORS 279A.120.

The City of Springfield encourages contractors, sub-contractors and vendors who are minority, woman-owned and emerging small businesses to participate in City projects.

The City of Springfield may reject any or all bids not in compliance with all prescribed public bidding procedures and requirements, including the requirement to demonstrate the bidder's responsibility under ORS 279C.375, or waive minor irregularities not affecting substantial rights and may reject for good cause any or all bids upon a finding of the City of Springfield it is in the public interest to do so and accept such bids that in the opinion of the Springfield City Council are in the best interest of the City.

Bids will be accepted and awarded in accordance with the City of Springfield's document on general conditions and standard specifications for public works construction.

Note: If applicable to this project, the First-Tier Subcontractor Form must be completed in full and submitted by the specified deadline or the bid will be rejected.



ROBERT J. DUEY
Finance Director

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City of Springfield
 225 Fifth Street
 Springfield, OR 97477

Bid Submittal

Project No. P21101

Project Title: Downtown Lighting – Phase 1

Bid Items:

Item No.	Description	Approx. Quantity	Per	Unit Price	Total Price Extension
Construction Bid Items					
0060	Mobilization	1	L.S.		
0061	Temporary Traffic Control	1	L.S.		
0137	Remove and Replace 4-inch PC Sidewalk	200	S.F.		
0248	Install Decorative Street Light (LED)	26	EA		
0248b	Install Decorative Street Light on Existing Foundation	5	EA		
0401	Horizontal Directional Drill Conduit	300	L.F.		
0604	Install Junction Box	3	EA		
0605	Remove and Replace 200 amp Service Cabinet	1	EA		
0606	Remove and Replace 100 amp Service Cabinet	1	EA		
0656	Install THWN Conductors	1	L.S.		
0657	Remove Existing Conductors	1	L.S.		
Project Bid Item Total:				\$	

Terms, Declarations and Bid Submittal

Bidder's Understanding

Bidders shall determine for themselves all the conditions and circumstances affecting the projected cost of the proposed work by personal examination of the site, Contract documents, and by such other means they may deem to be necessary. It is understood and agreed that in the event the City has obtained information from data at hand regarding underground or other conditions or obstructions depicted in the Contract documents, there is no expressed or implied agreement that such conditions are fully or correctly shown, and the Bidder must take into consideration the possibility that conditions affecting the cost or quantity of work may differ from those indicated.

The Bidder is familiar with and is satisfied as to all federal, state and local laws and regulations that may affect cost, progress, and performance of the work.

Bid

The undersigned Bidder having examined the Specifications and Contractual Documents and having satisfied themselves as to all conditions to be encountered, hereby proposes to furnish all labor, material and equipment and perform all work necessary to complete Project No P21101 in accordance with this bid, the Contract Plans, City of Springfield Standard Construction Specifications, 1994 Edition, and all subsequent modifications, the Special Provisions, and all other Contractual Documents at the prices and on the terms herein contained.

The unit price bids are submitted with the understanding that the quantities stated are approximate and are given only as the basis of calculation for comparison of bids and determining that the unit prices are balanced and that final payment for all unit price bid items will be based on actual quantities.

It is understood that in the instance of a discrepancy between the unit price and the extension (total price extension) the unit price shall govern. The extension shall be determined by multiplying the unit price by the number of units (approximate quantity).

Bid Guarantee

As required by ORS 279C.365(4) each bid shall be accompanied by a Bid Bond, cash, or a certified or cashier's check written upon a bank in good standing and in a form acceptable to the City, payable to the Finance Director of the City of Springfield, Oregon, in an amount equal to at least 10 percent of the total amount of the Bid. Bid Bonds shall be issued by a surety company registered to issue bonds in the State of Oregon, and utilizing a bond form acceptable to the City. The City will accept AIA Document A310-2010. The Bid Bond may not be altered.

Such Bid Guarantee shall be forfeited and become the property of the City in case the Bidder shall fail or neglect to furnish a satisfactory Performance and/or Payment Bond issued by a viable bond company acceptable to the City as required by ORS 279C.380 and to execute the Contract within ten (10) days (Saturday, Sunday, and holidays excepted) after receiving Contract from the City for execution. For information regarding Performance and Payment Bond requirements see City of Springfield Contract document, Section 5. City Bonding.

Bid Acceptance Period

This bid will remain subject to acceptance for a period of 60 days after the bid opening, or for such longer period of time that the Bidder may agree to in writing upon request of the City.

Liquidated Damages

The City of Springfield and the Contractor agree that; (a) the amounts so fixed are reasonable forecasts of just compensation for the harm that is caused by the breach; (b) the harm that is caused by the breach is one that is incapable of or very difficult of accurate estimation; and, (c) the amount so fixed is not fixed as a penalty to coerce performance of the Contract but is rather intended to be a genuine pre-estimation of injury to the City of Springfield in lieu of performance within the contract time by the Contractor.

a. Delay

It is agreed by the City of Springfield and by the Contractor that the need exists for a damage provision in the event the Contractor fails to complete the work within the Contract time specified, or any extension thereof, by the City of Springfield. The City of Springfield and the Contractor further agree that the Contractor shall be liable to the City of Springfield for fixed, agreed and liquidated damages for each and every calendar day of delay in the amounts as follows: \$1,000.00 per day for failure to complete all work specified to be complete by September 10, 2014 in the Contract Time of Completion section which follows; \$400.00 per day for failure to complete all other work as specified in the Contract Time of Completion section which follows, in accordance with Subsection 108.07 of the Standard Construction Specifications.

b. Failure to Report Spills

The Contractor also agrees to liquidated damages in the amount of \$500.00 per incident for failure to report sewage spills plus an amount sufficient to reimburse the City for any civil and administrative penalties paid by the City as a result of the contractor's failure to report. Failure to report sewage spills may subject the City to (1) civil penalties of up to \$32,500.00 per day of violation pursuant to Section 309(d) of the Clean Water Act, 33 U.S.C. § 1319(d); (2) administrative penalties of up to \$11,000.00 per day for each violation, pursuant to Section 309(g) of the Clean Water Act, 33 U.S.C. § 1319(g); or (3) civil action in federal court for injunctive relief pursuant to Section 309(b) of the Clean Water Act, 33 U.S.C. § 1319(b).

Contract Time of Completion

The Contractor shall not begin work under this bid until written Notice to Proceed has been received. The Contractor shall complete all work under this bid within forty (40) consecutive working days from the date of actual commencement of work or the date occurring ten days after the date of the Notice to Proceed, whichever occurs first, or such other starting date as is fixed by the Notice to Proceed. Work to be completed

by September 10, 2014 - Luminaires, poles, foundations and wiring on Main Street from Pioneer Parkway East to Fourth Street and all supporting electrical work shall be complete and operational, including electrical inspections so that a public event to celebrate the lighting project by turning on the lights on the block may be safely done. Work to be completed within forty (40) consecutive working days from the date of the actual commencement of work or the date occurring ten days after the date of the Notice to Proceed, whichever occurs first, or such other starting date as is fixed by the Notice to Proceed shall include all work other than that specified to be complete by September 10, 2014 necessary for completion of a fully operational and functional project.

The Contractor shall apply for any extensions of time as specified in Subsection 108.06 of the Standard Construction Specifications.

Certifications

The undersigned hereby certifies that:

- 1.) If awarded the Contract, that they shall fully comply with all provisions regarding the prevailing wage rates as required by ORS 279C.800 to 279C.870 and/or 40 U.S.C. 2762 as applicable.
- 2.) The Contractor, Subcontractor, suppliers of materials or services, and others engaged by the contractors, shall comply at all times with and observe all such laws, ordinances, regulations, orders, and decrees; and shall hold harmless and indemnify the City of Springfield and its representatives against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree.
- 3.) In accordance with ORS 279C.505, the Contractor will;
 - a) Make payment promptly, as due, to all persons supplying to the Contractor labor or material for the performance of the work provided for in the Contract.
 - b) Promptly pay all contributions or amounts due the State Industrial Accident Fund, or private carrier of accident insurance, from such Contractor or Subcontractor incurred in the performance of the Contract. If a private carrier is used, the Contractor shall notify the Engineer as to the carrier's name and address before commencement of work.
 - c) Not permit any lien or claim to be filed or prosecuted against the state or a county, school district, municipality, municipal corporation or subdivision thereof, on account of any labor or material furnished.
 - d) Pay to the Department of Revenue all sums withheld from employees under ORS 316.167.
 - e) Have an employee drug testing program in place at the time of signing the contract and will maintain such drug testing program in place over the life of the Contract.
- 4.) In accordance with ORS 279C.530, the Contractor will;
 - a) Promptly, as due, make payments to any person, co-partnership, association or corporation, furnishing medical, surgical, and hospital care or other needed care and attention, incidental to sickness or injury, to the employees of such Contractor, of all sums which the Contractor agrees to pay for such services and all monies and sums which the Contractor:
 1. May or shall have deducted from the wages of his employees for such services pursuant to the terms of Oregon Revised Statutes and any contract entered in pursuant thereto; or
 2. Collected or deducted from the wages of his employees pursuant to any law, contract, or agreement for the purpose of providing or paying for such service; and
 3. All employers working under the Contract are either employers that will comply with ORS 656.017 or employers that are exempt under ORS 656.126.

- 5.) They have not, and will not, discriminate against a Subcontractor in the awarding of a subcontract because the Subcontractor is a minority, women or emerging small business enterprise certified under ORS 200.055 as required by ORS 279A.110.
- 6.) No Contractor, Subcontractor or any firm, corporation, partnership or association in which the Contractor or Subcontractor has a financial interest who appears on the *List of Contractors Ineligible to Receive Public Works Contracts*, as established by the Bureau of Labor and Industries, will perform work under this Contract, as specified in ORS 279C.860.
- 7.) No Contractor, Subcontractor or any firm, corporation, partnership or association in which the Contractor or Subcontractor has a financial interest who appears on the Construction Contractor's Board *Not Qualified to Hold Public Contracts* list, will perform work under this Contract, as specified in ORS 701.227(4).
- 8.) The Contractor shall have a current, valid certificate of registration issued by the Construction Contractor's Board as defined in ORS 701.005(2) and/or a valid landscape contractor's license as defined in ORS 671.520(2) by the State Landscape Contractor's Board, as applicable, in place at the time the bid is presented.
- 9.) All Subcontractors shall have a current, valid certificate of registration issued by the Construction Contractor's Board as defined in ORS 701.005(2) and/or a valid landscape contractors license as defined in ORS 671.520(2) by the State Landscape Contractor's Board, as applicable in place prior to performing any work under the Contract.
- 10.) The Contractor shall function as an independent contractor for the purposes of this Contract and shall not be considered an employee of the City of Springfield for any purpose. The Contractor shall assume sole responsibility for any debts or liabilities that may be incurred by the Contractor in fulfilling the terms of this Contract and shall be solely responsible for the payment of all federal, state, and local taxes which may accrue because of this Contract.

Bid Addenda

All Addenda issued are considered to be part of the specifications of the Invitation to Bid and, as such, are as incorporated into the Contract as specified in Section 104.02 of the Standard Construction Specifications.

By signing below, I acknowledge the receipt of the following Addenda documents and certify that the specifications contained in each have been considered and incorporated into the bid as presented. All Addenda must be included with the bid submitted.

Addenda Number	Addenda Date

Declarations

The undersigned Bidder declares that the only persons or parties interested in the bid are those named herein, that this bid is, in all respects, fair and without fraud, that it is made without collusion with any official of the City, and that the bid is made without any connection or collusion with any person submitting another bid on this project.

I have read, fully understand, and agree that as Bidder I, and all Subcontractors, will comply with all of the terms and conditions of the contract for which this bid is presented. By signing below I attest that I am an officer or a duly authorized representative of the business listed below and that I possess the legal authority to submit this bid for consideration.

Bidder's Signature _____

Bidder's Name *(Please Print)* _____

Title _____

Business Name _____

Business Address _____

City _____ State _____ Zip _____

Phone Number _____ Cell Phone _____

E-mail Address _____ Fax Number _____

Date _____

The award of this Contract shall be made to the responsible Bidder with the lowest responsive bid.

PREVAILING WAGE RATE INFORMATION

Prevailing Wage Rates information can be found at the following website:

http://www.oregon.gov/boli/WHD/PWR/Pages/pwr_oregon_2014.aspx

For the proper Prevailing Wage Rates applicable to this project please refer to the following publications:

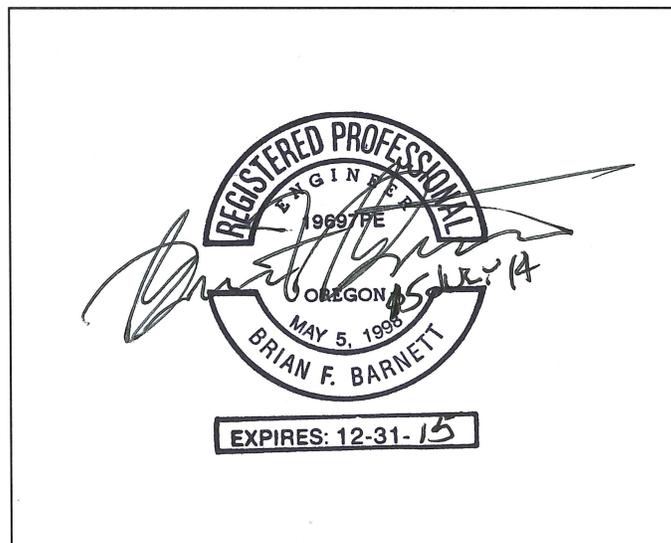
- 1.) *Prevailing Wage Rate Publication; Prevailing Wage Rates for Public Works Contracts in Oregon (subject only to state law) and State Apprenticeship Rates with an effective date of July 1, 2014.*
- 2.) *The following Amendments to the Prevailing Wage Rates for Public Works Contracts in Oregon also apply:*
 - a.) *N/A*



CITY OF SPRINGFIELD

Special Provisions for P21101 Downtown Lighting – Phase 1

Engineer's Seal



SPECIAL PROVISIONS

References to number of Divisions, Section, Sub-Section and the like shall mean the 1994 Edition of the Standard Construction Specifications, including all Addenda, Standard Drawings, and other Contractual Documents of the City of Springfield, Lane County, Oregon.

These Special Provisions supplement and amplify certain sections of the City of Springfield, Oregon, [Standard Construction Specifications](#). The Standard Construction Specifications shall apply except as modified herein. These Special Provisions and additional technical specifications may contain occasional requirements not pertinent to the project. However, these specifications shall apply in all particulars insofar as they are applicable to this project.

SECTION A – General Requirements

P21101 – Downtown Lighting – Phase 1

A1.1 Applicable Standard Specifications

The 1994 Edition of the Standard Construction Specifications of the City of Springfield, Oregon, Standard Construction Specifications (including all revisions at date of bid opening), shall apply to this Invitation to Bid and construction contract except as may be modified herein. In the case of discrepancy, unless noted otherwise herein, the more restrictive provisions shall apply.

A1.2 Form of Proposal

REPLACE SECTION 102.02 “FORM OF PROPOSAL” OF THE STANDARD CONSTRUCTION SPECIFICATIONS:

“The Proposal and the proposal guarantee in the form of a bid bond, certified check, or cashier’s check, shall be enclosed in a sealed, labeled and addressed envelope, as required in the Instructions to Bidders and filed as required therein. The outside of the envelope shall plainly identify: (1) The project name and (2) The bid opening date.

All Proposals must be clearly and distinctly typed or written with ink or indelible pencil.

All Proposals shall be on the form furnished by Owner, and in addition to necessary unit price items and total prices in the column of totals to make a complete Bid, all applicable blanks giving general information must be filled in and the Bids signed by an officer or duly authorized representative of the Bidder. Any statement accompanying and tending to qualify a Bid may cause rejection of such Bid, unless such statement is required, in a Proposal embracing alternate Bids. All bid documents except plans must be returned with the Bid.

Unless otherwise specified, Bidders shall bid on all Bid items included in the Proposal, and the low Bidder shall be determined as noted in Subsection 103.01 AWARD OF CONTRACT. Except as provided herein Proposals which are incomplete or fail to comply to all items required in the Proposal may be rejected.”

INSERT IN ITS PLACE THE FOLLOWING:

“**ALL BID DOCUMENTS, EXCEPT PLANS, MUST BE RETURNED WITH THE BID.** This includes all documents contained in the original bid book, whether they require the completion of information or not, and any addendum that may be issued pertaining to the bid in question. The

only exceptions to this are any plans or drawings, which are not required to be submitted as a part of your Bid.

The Bid Submittal, Bid Bond, Certified Check, or Cashier's Check shall be enclosed in a sealed and labeled envelope. The outside of the envelope shall plainly identify: (1) The project name and project number and (2) The Bid opening date. All Bids must be clearly and distinctly typed or written with ink or indelible pencil. Unless otherwise specified, Bidders shall bid on all Bid items, and must include in their Bid prices the entire cost of each item of work set forth in the Bid.

Sealed Bids shall be addressed to and received at the Office of the Finance Director, City Hall, 225 Fifth St. Springfield, Oregon, 97477 at, or before, the time and date noted on the Invitation to Bidders, after which time the Bids will be publicly opened and read aloud.

All Bids shall be on the form furnished by the City, and in addition to necessary unit price items and total prices in the column of totals to make a complete Bid, all applicable blanks giving general information must be filled in and the Bids signed by an officer or duly authorized representative of the Bidder. The only exceptions to this requirement are the Performance Bond, Payment Bond, Statutory Public Works Bond and the Contract documents which are provided here as a reference. However, if you are awarded the Bid, you will be required to submit fully executed copies of these documents upon request. Any statement accompanying and tending to qualify a Bid may cause rejection of such Bid, unless such statement is required in a Bid embracing alternate Bids.

If, in the opinion of the City, the items or prices in any Bid appear unbalanced, incomplete, or fail to comply with all the terms required, the Bid may be rejected."

A1.3 Proposal Guaranty and Organization

REPLACE SECTION 102.05 "PROPOSAL GUARANTY AND ORGANIZATION" OF THE STANDARD CONSTRUCTION SPECIFICATIONS:

"Each Bid must be accompanied by a Bid Bond, cash or a certified or cashier's check upon a bank in good standing, payable to the Finance Director of the City of Springfield, Oregon, in an amount equal to at least 10% of the total amount of the bid. Such Proposal guaranty shall be forfeited and become the property of the City in case the Bidder shall fail or neglect to furnish a satisfactory Performance Bond and Payment Bond and to execute the Contract within 10 days (Saturday, Sunday and holidays excepted) after receiving said Contract from the City for execution. Bid bonds submitted shall be on the form provided by the City in the Bid document."

INSERT IN ITS PLACE THE FOLLOWING:

"As required by ORS 279C.365(4) each Bid shall be accompanied by a Bid Bond, cash, or a certified or cashier's check written upon a bank in good standing and in a form acceptable to the City, payable to the Finance Director of the City of Springfield, Oregon, in an amount equal to at least 10 percent of the total amount of the Bid. Bid Bonds shall be issued by a surety company registered to issue bonds in the State of Oregon, and utilizing a bond form acceptable to the City. The City will accept AIA Document A310-2010 Bid Bond (sample form enclosed). The Bid Bond may not be altered.

Such Bid Guarantee shall be forfeited and become the property of the City in case the Bidder shall fail or neglect to furnish a satisfactory Performance and/or Payment Bond issued by a viable bond company acceptable to the City as required by ORS 279C.380 and to execute the Contract within ten (10) days (Saturday, Sunday, and holidays excepted) after receiving Contract from the City for execution. For information regarding Performance and Payment Bond requirements see City of Springfield Contract document, Section 5. City Bonding."

A1.4 Addenda to Contract Documents

REPLACE SECTION 102.08 "ADDENDA TO CONTRACT DOCUMENTS" OF THE STANDARD CONSTRUCTION SPECIFICATIONS:

"Any addenda issued by the Owner, which may include changes, corrections, additions, interpretations, or information, and issued 48 hours or more before the scheduled closing time for filing the Bids, Saturday, Sunday and legal holidays not included, shall be binding upon the Bidder. Owner shall supply copies of such addenda to all Contractors who have obtained copies of the Contract Documents for the purposes of bidding thereon. Failure of the Contractor to receive or obtain such addenda shall not excuse him from compliance therewith, if he is awarded the Contract."

INSERT IN ITS PLACE THE FOLLOWING:

"Any addenda issued by the City, which may include changes, corrections, additions, interpretations, or information issued 72 hours or more before the scheduled closing time for filing the Bids shall be binding upon the Bidder. Addenda will be posted to the City's website at www.springfield-or.gov/DPW/InvitationBid.htm. The Contractor should check the website frequently for new postings during the open quote period. The City shall make a reasonable effort to notify all individuals, firms, and corporations listed on the Plan Holders List and those individuals that attended the Pre-Bid Meeting and provided contact information on the sign-in sheet when addenda are issued. Failure of the Contractor to receive or obtain such addenda shall not excuse them from compliance, if they are awarded the Contract."

A1.5 Insurance

REPLACE SECTION 107.06 "INSURANCE" OF THE STANDARD CONSTRUCTION SPECIFICATIONS:

The Contractor shall provide and maintain general liability, auto liability, property, and workers' compensation insurance for life of this Contract.

General Liability Insurance

The Contractor shall maintain an ISO Commercial General Liability insurance policy (or an equivalent policy approved by Owner) with combined single limits of at least \$1,000,000 per occurrence for bodily injury, personal injury, and property damage and an aggregate limit of at least \$2,000,000. The policy shall include coverage for contractual liabilities.

Comprehensive Automobile Liability Insurance

The Contractor shall maintain an automobile liability insurance policy with combined single limits of at least \$1,000,000 per occurrence for bodily injury, personal injury, and property damage.

Additional Insured Endorsement

The general and automobile insurance policies specified above shall include endorsements naming as an additional insured "the City of Springfield, its agents, employees and officials all while acting within their official capacity as such."

Property Insurance

Depending on the nature of the construction contemplated under this contract, Owner may require Contractor to provide property insurance. Refer to Special Provisions section of this Contract.

Workers' Compensation Insurance

Contractor, its subcontractors, if any, and all employers working under this agreement are subject employers under the Oregon Workers' Compensation Law and shall comply with ORS 656.017, which requires them to provide workers' compensation coverage for all their subject workers.

Contractor is responsible for maintaining workers' compensation insurance for his employees and assuring that his subcontractors, if any, also maintain workers' compensation insurance. Contractor shall defend, indemnify, and hold Owner harmless from any liability for any workers' compensation claims costs, fines, or costs whatsoever arising from Contractor's or his subcontractors' failure to comply with ORS 656.017.

Additional Policies and Special Coverages

Refer to the Special Provisions section of this Contract for additional coverages that may be required.

Certificates of Insurance

Certificates of insurance evidencing all policies required by this Contract shall be delivered to the Owner prior to the commencement of any work. All certificates shall include a 30-day notice of cancellation clause and required additional insured endorsements. The Owner has the right to reject any certificate for unacceptable coverage and/or companies.

INSERT IN ITS PLACE THE FOLLOWING:

"INSURANCE

All insurance shall be approved by the City as to terms, conditions and form prior to beginning work.

Public Liability and Property Damage

The Contractor shall maintain in force for the duration of this Contract a Commercial General Liability insurance policy written on an occurrence basis with limits not less than \$2,000,000 per occurrence and \$3,000,000 in the aggregate. The policy will be endorsed with a "per project" aggregate endorsement. Automobile Liability (owned, non-owned, and hired) insurance with limits not less than \$1,000,000 per occurrence shall be maintained. The City, its employees, officials and agents will be named as Additional Insured's where operations are being conducted related to this Contract on the General and Automobile Liability policies as respects to work or services performed under this agreement to the extent that the death or bodily injury to persons or damage to property arises out of the fault of the Contractor or the fault of the Contractor's agents, representatives or subcontractors. The following statement will appear on the face of the certificate; "The City, its employees, officials and agents are all named as additional insured while acting in their capacity as such." The City's additional insured status for Products and Completed Operations hazards shall extend for at least one year beyond the acceptance of the project. This insurance shall be primary and shall be paid and applied first in its entirety prior to any application of insurance the City may carry on its own.

Workers' Compensation

The Contractor shall provide and maintain Workers' Compensation coverage with limits no less than \$500,000 for it employees, officers, agents, or partners, as required by applicable Workers' Compensation laws. If the Contractor is exempt from this coverage a written statement, signed by the Contractor, explaining the reason for the exemption will be provided to the City prior to commencement of any work.

Course of Construction and/or Installation Floater

The Contractor shall maintain in full force for the duration of this contract an All Risk insurance policy approved by the City as to terms, conditions and form covering the replacement cost of the work during the course of construction. The policy shall include the interests of the City and Architect/Engineer, as applicable, and the first two layers of Subcontractors. The amount of insurance shall equal the completed value of the Contract. The City, at its option, may elect to supply this coverage.

Asbestos Abatement (only applicable to Asbestos Specific Contracts)

If applicable to this Contract, the Contractor shall maintain in full force a Commercial General Liability policy approved by the City as to terms, conditions and form that is Asbestos Specific with a minimum limit of \$2,000,000 per occurrence and \$3,000,000 in the aggregate written on a form that meets the following criteria:

- a. A full occurrence form, or
- b. A limited occurrence form with at least a three-year (3) tail, or
- c. A claims made form with a three-year (3) tail.

Pollution Liability Coverage (only applicable to Pollution Specific Contracts)

If applicable to this Contract, the Contractor shall maintain in full force a Commercial General Liability policy approved by the City as to terms, conditions and form that is Pollution Specific with a minimum limit of \$2,000,000 per occurrence and \$3,000,000 in the aggregate written on a form that meets the following criteria:

- a. A full occurrence form, or
- b. A limited occurrence form with at least a three-year (3) tail, or
- c. A claims made form with a three-year (3) tail.

Professional Liability Coverage (only applicable to Contracts if specified)

If Professional Liability insurance is required, the City must approve the terms, conditions and limits prior to commencement of any work.

Additional Policies and Special Coverages

Refer to the Special Provisions section of this Contract for additional coverages that may be required.

Railroad Protective Liability Coverage

If work being performed under this Contract is near railroad tracks or a railroad right of way and the Railroad requires special insurance (for example: Railroad Protective Liability Coverage) Contractor will be responsible for meeting the Railroad insurance requirements before any work commences. Any insurance required to be purchased by the Railroad is in addition to the insurance required by the City.

Subcontractors

The Contractor shall require all Subcontractors to provide and maintain General Liability, Auto Liability and Workers' Compensation insurance and, as applicable, Professional, Asbestos and Pollution Liability with coverage's equivalent to those required of the General Contractor in this

Contract. The Contractor shall require certificates of insurance from all Subcontractors as evidence of coverage.

Additional Insured Endorsement

All certificates of insurance, with the exception of Professional Liability and Railroad Protective Liability, must include an endorsement which lists the City of Springfield as a named additional insured. The following statement will appear on the face of the certificate; "The City, its employees, officials and agents are all named as additional insured while acting in their capacity as such."

Evidence of Coverage and Notice of Cancellation or Material Change in Coverage

Evidence of the required coverages issued by a company satisfactory of the City shall be provided to the City by way of a certificate of insurance before any work or services commence. A 30-day notice of cancellation or material change in coverage clause shall be included.

If the approved insurance company will not provide this 30 day notice, it shall be the responsibility of the Contractor to provide written notice to the City within two (2) days of the Contractor becoming aware that their coverage has been cancelled or materially changed. The Contractor shall e-mail notification directly to Bob Duey, Finance Director at rduey@springfield-or.gov. Regardless of the circumstances causing the Contractor's insurance coverage to cease or be modified, it is the Contractor's responsibility to notify the City as described above.

Failure to maintain the proper insurance or provide notice of cancellation or material change shall, at the City's option, be grounds for immediate termination of this Contract.

(Contractor initials)

Equipment and Material

The Contractor shall be responsible for any loss, damage, or destruction of its own property, equipment, and materials used in conjunction with the work."

A1.6 Submission of Certified Payroll

REPLACE THE 2ND PARAGRAPH OF SECTION 109.07 OF THE STANDARD CONSTRUCTION SPECIFICATIONS:

Once before the first payment and each time the prevailing wage rates change, and once before final payment is made, Contractor shall supply and file with Owner a statement in writing under oath, in form prescribed by the State Labor Commission and which conforms with ORS Chapter 279, certifying the hourly rate of wages paid each classification of workman not exempt by statute who is employed upon such project and further certifying that no workman employed has been paid less than minimum prevailing wage rate. Each Subcontractor who performed work on the project during the period covered by the payment may be required to file with Owner a similar statement which covers its workmen.

INSERT IN ITS PLACE THE FOLLOWING:

It shall be the responsibility of the Contractor and any subcontractors to submit certified payroll statements to the City as to the wage rates paid to each worker as follows:

As specified in ORS 279C.845, the Contractor or the Contractor's surety and every Subcontractor or the Subcontractor's surety shall file certified statements with the public agency in writing, on a form prescribed by the Commissioner of the Bureau of Labor and Industries, certifying the hourly

rate of wage paid each worker whom the Contractor or the Subcontractor has employed upon the public works, and further certifying that no worker employed upon the public works has been paid less than the prevailing rate of wage or less than the minimum hourly rate of wage specified in the Contract. The certificate and certified statement shall be verified by the oath of the Contractor or the Contractor's surety or Subcontractor or the Subcontractor's surety that the Contractor or Subcontractor has read the certified statement and certificate and knows the contents thereof and that the same is true to the Contractor or Subcontractor's knowledge. Certified statements (also referred to as certified payroll reports) shall be submitted to the City no later than the 5th day of the following month for which the certified statement and certificate are being presented, regardless of whether any actual work is performed on the project or not. This information must be submitted to the City and also retained by the Contractor and Subcontractor(s) for three years.

Contracting agencies and general contractors are required to withhold 25% of amounts to Contractors if certified payrolls are not filed by the Contractor as required for work performed on projects subject to the prevailing wage rate law. Failure of Contractors to comply with the certified payroll filing requirements of the law, therefore, will result in a negative fiscal impact to those Contractors of up to 25% of their amount owed.

Each worker employed in the performance of this contract, either by the Contractor or Subcontractor or other person doing or contracting to do or contracting for the whole or any part of the work of the contract, must be paid not less than the specified minimum hourly rate of wage in accordance with ORS 279C.838 and 279C.840.

A1.7 Progress Payment

REPLACE THE 6TH PARAGRAPH OF SECTION 109.07 OF THE STANDARD CONSTRUCTION SPECIFICATIONS:

Progress payment will be made by the Owner on a monthly basis no later than the 20th day of the subsequent month of work performed, except that, additional days may be required when a payment is accompanied by one or more of the following: an extension of completion time, change order or extra bill. Payment may be made via use of checks or warrants at the option of the Owner for the amount of the approved estimate, less retainage.

INSERT IN ITS PLACE THE FOLLOWING:

"Progress payment will be made by the City on a monthly basis in the month subsequent to the work being performed, except that additional days may be required when the Contractor fails to submit complete and accurate certified payroll reports which are in compliance with ORS279C.845 when due, or a payment is accompanied by one or more of the following: an extension of completion time, change order or bill. If the Contractor fails to submit acceptable certified payroll reports when due, or one or more of the previously stated exceptions apply, the progress payment may be made up to fourteen (14) days after the date the certified payroll or other required information in question is received by the City.

The scheduled release of payment will depend upon the method of payment selected by the Contractor. If the Contractor elects to receive payment by check, payment will be released no later than the 20th day of the month. If the Contractor elects to receive payment by electronic Automated Clearing House (ACH) transfer, the funds will be transferred no later than the fourth Friday of the month. City will endeavor to honor Contractor's election to receive payment by ACH transfer, however, City reserves the right to make payment via use of check at the sole discretion of the City."

A1.8 Oregon Products

Contractor's attention is directed to the provisions of Oregon Law, ORS 279A.120 regarding the preference for products that have been manufactured or produced in Oregon. Contractor shall use Oregon-produced or manufactured materials with respect to common building materials such as cement, sand, crushed rock, gravel, plaster, etc., and Oregon-manufactured products in all cases where price, fitness, availability and quality are otherwise equal.

A1.9 Salvage and Debris

Unless otherwise indicated on the drawings or in the specifications, all castings, pipe, equipment, demolition debris, fences, trees, shrubs, spoil or any other discarded material or equipment shall become the property of the Contractor and shall be salvaged or disposed of in a manner compliant with applicable Federal, State and local laws and regulations governing disposal of such waste products. No burning of debris or any other discarded material will be permitted. The Contractor shall perform any demolition for the completion of this project and shall salvage and recycle all construction and demolition debris as is feasible and cost effective, in accordance with ORS 279C.510.

A1.10 Brand Name or Equal Specification

Brand Name or Equal Specification means a specification that uses one or more manufacturers' names, makes, catalog numbers or similar identifying characteristics to describe the standard of quality, performance, functionality or other characteristics needed to meet the contracting agency's requirements. The "Equal" product, component or process shall be the same or better than that named in function, performance, reliability, quality and general configuration. Determination of equal in reference to the project design requirements will be made by the Engineer, pursuant to Subsection 106.07. Unless otherwise specified, whenever a manufacturer's name brand or model is mentioned, it is to be understood that the phrase "approved equal" is assumed to follow thereafter, whether it does in fact or not. Such specification authorizes Contractors to offer goods or services that are equivalent or superior to those brands named or described in the specification.

END OF SECTION

SPECIAL PROVISIONS

SECTION B – Scope of Work and Measurement and Payment

P21101 – Downtown Lighting – Phase 1

B1. GENERAL

B 1.1 Scope of Work

All work shall be performed in accordance with the highest standard of practice in the industry and shall be furnished in conformance with all applicable codes, statutes or standards that apply to this work including, but not limited to, any applicable Federal, State or City of Springfield Codes, Standards and Ordinances.

The work to be performed under these specifications and drawings consist of the following:

Installation of decorative street lights on Main Street from Pioneer Parkway East to 6th Street and includes new poles and foundations, retrofitting used light fixtures with LED kits, removing and installing wire in existing and new conduits, horizontal directional drilling, and other work as needed to complete a fully functional product.

B 1.2 Work Hour Limitations

Construction Zone Work Hours: Unless otherwise directed by the Engineer, normal right-of-way construction work zones with active project operations are to be conducted between the hours of **8:15 am to 4:15 pm daily**. Other circumstances, such as holidays, special events, or other construction) may affect the work zone hours. Any deviation of these work zone hours must be approved by the Engineer prior to construction. Traffic signals or other traffic control devices that need to be turned off by City of Springfield personal shall be requested to the Engineer 48 hours in advance of this activity. Traffic signals that need to be 'reconfigured' due to construction activities that effect lane usage need to be coordinated with the Engineer 72 hours prior to any lane closures.

B 1.3 Vehicle Parking

The vehicles of the CONTRACTOR's and subcontractors' employees shall be parked in accordance with local parking ordinances.

B 1.4 Submittals

Traffic Control Plan: A traffic control plan must be submitted for all projects in the public right-of-way no later than three (3) working days before work begins. If this plan is not received and approved prior to starting, the Engineer reserves the right to shut down all work at the CONTRACTOR'S expense (with a written stop work order to follow within 24 hours) until a plan has been approved and implemented. No work shall be permitted until the area has been signed as per the approved traffic control plan. The signing shown on the traffic control plan is the minimum required signing. All signs, barricades, cones, flaggers, and other such "devices" to warn, safeguard, protect, guide, and inform the public and the workers during the life of the project shall be furnished, constructed, installed, maintained, moved and removed by the CONTRACTOR.

The devices to be furnished and used by the CONTRACTOR and their placement shall conform to the requirements indicated on the plans. Cases, conditions, and details not covered on the plans shall conform to the applicable provisions of Part IV of the Manual on Uniform Traffic Control Devices for Streets and Highways (M.U.T.C.D.), including the current Oregon Supplements. All temporary traffic control signs shall be constructed of '**Soft**' (fabric) type material. All signs shall be mounted on 'flexible' (spring-loaded) sign stands, and be crash proof approved. Hard signs (wood, metal, and plastic-card) may only be mounted on barricades or posts.

Business Access – CONTRACTOR shall take all reasonable steps to provide public street and sidewalk access to any business that is closed, partially closed, or difficult or confusing in any way for the traveling public due to operations of the CONTRACTOR. The CONTRACTOR shall provide adequate traffic control, including signs to clarify the alternate or existing access available to the business.

B 1.5 Bid Items

Bid Item 0060 – Mobilization - See Section 201 of the City of Springfield Standard Construction Specifications.

Payment for Mobilization shall be on a Lump Sum (L.S.) basis complete.

Bid Item 0061 - Temporary Traffic Control – Scope: This item shall include the submission of a traffic control plan for work within the public right-of-way during all phases of work. Work on Main Street shall conform to Oregon Department of Transportation (ODOT) requirements and may occupy parking along the curb without an ODOT permit. All work that occupies areas other than parking along the curb shall require the CONTRACTOR to obtain all required ODOT user permits. The plan shall show each individual phase of the project with a schedule and map showing placement and description of each temporary traffic control device. The plan shall comply with the Manual on Uniform Traffic Control Devices (including the Oregon Supplements) and the Oregon State Highway Division's "Signing and Flagging Standards for Short-Term Work Zones." The plan must illustrate changes in lane usage, locations and types of traffic control devices, and shall encompass advanced warning for all intersecting streets.

Payment shall be on a Lump Sum (LS) basis complete.

Bid Item No. 0137 - Remove and Replace 4-inch PC Sidewalk - Scope: This work shall include all materials and labor to remove and replace 4-inch PC sidewalk as shown on the plan and/or as directed by the Engineer.

The work shall include, but not be limited to:

- 1.) Removal and replacement of all necessary PC sidewalk panels as shown on the Plans and/or as required by the Engineer.
- 2.) All sidewalk area work shall be replaced in 'Full Panel' units and completed with a light broom finish.
- 3.) All environmental requirements to maintain and contain waste materials shall be in place. All waste materials shall be removed from the job site and disposed of by environmentally sound methods.

Payment shall be on a Square Foot (SF) basis for the removal and replacement of 4-inch PC sidewalk complete.

Bid Item No. 0248 - Install Decorative Street Light (LED) - Scope: This bid item shall include all materials and labor to install, test, and place in service **City Supplied** decorative street light units.

The City shall provide: (1) Aluminum, 'Wadsworth', 'SiteLink' pole, and a Holophane, 'Washington' luminaire, and LED retrofit kit. The size and type of lighting unit(s) shall be shown on the plan set and as specified in the 'Light Pole Table'.

The CONTRACTOR shall provide: The CONTRACTOR shall provide all other accessories and appurtenances required to complete this bid item, including but not limited to clamps, conduit and wire runs from the circuit trunk feed nearest the pole into the base and to the luminaire.

The work shall include, but not be limited to:

- 1.) Intercepting an existing electrical conduit, and sweep the conduit(s) into, and out of the pole foundation base as shown on the plan or as directed by the Engineer.
- 2.) Construct a pole foundation base as per City of Springfield Standard Drawing 5-24 with the 5/8 inch x 10 foot ground rod placed in the foundation.
- 3.) Install the luminaire and connect the illumination and receptacle circuit(s), and make all electrical connections at the pole base as per the plan, NEC requirements, and the manufacturer's recommendations.
- 4.) Label all circuits with an Engineer approved, weatherproof, yellow label and black permanent ink marker. Each label shall be marked as to e branch ('L1' - 'R1') line voltage (120/240 VAC), and the location of the power source. Labels shall be attached to the respective wire groups with plastic tie-straps.
- 5.) All sidewalk pavement removal and restoration work necessary to accomplish this bid item shall be considered as *incidental work*. All sidewalk work shall be replaced in 'Full Panel' units, and completed with a light broom finish.
- 6.) Assembly of the Washington Luminaire w/LED retrofit kit, and glass globe to provide a functional luminaire.
- 7.) Install luminaire arms.
- 8.) All environmental requirements to maintain and contain waste materials shall be in place. All waste materials shall be removed from the job site and disposed of by environmentally sound methods.

Payment shall be for the installation of Each (EA) Decorative Street Light complete in place.

Bid Item No. 0248b – Install Decorative Street Light on Existing Foundation - Scope: This work shall include all materials and labor to install, test, and place in service **City Supplied** decorative street light units on an existing pole foundation.

The City shall provide: (1) Aluminum, 'Wadsworth', 'SiteLink' pole, and a Holophane, 'Washington' luminaire and LED retrofit kit. The size and type of lighting unit(s) shall be shown on the plan set and as specified in the 'Light Pole Table'.

The CONTRACTOR shall provide: The CONTRACTOR shall provide all other accessories and appurtenances required to complete this bid item, including but not limited to clamps, conduit and wire runs from the circuit trunk feed nearest the pole into the base and to the luminaire.

The work shall include, but not be limited to:

- 1.) Intercepting an existing electrical conduit, and sweep the conduit(s) into, and out of the pole foundation base as shown on the plan or as directed by the Engineer.
- 2.) Remove the existing 30 foot Steel Street light pole, arm, and luminaire, and deliver to the City of Springfield Operations yard at 201 S. 18th Street.
- 3.) Cut off, and grind flat the four (4) 1-3/4 inch anchor bolts flush to the sidewalk grade but do not remove the ground rod. Remove any additional material(s) to create a level surface.
- 4.) Establish a new decorative pole, anchor bolt circle on the existing foundation base using an Engineer approved, drill and epoxy method, such as the Hilti System, to install the four (4) foundation anchor bolts, and install the decorative light unit.
- 5.) Connect the illumination and receptacle circuit(s), and make all electrical connections at the pole base as per the plan, NEC requirements, and the manufacturer's recommendations.
- 6.) Label all circuits with an Engineer approved, weatherproof, yellow label and black permanent ink marker. Each label shall be marked as to circuit branch ('L1' - 'R1') line voltage (120/240 VAC), and the location of the power source. Labels shall be attached to the respective wire groups with plastic tie-straps.
- 7.) All sidewalk pavement removal and restoration work necessary to accomplish this bid item shall be considered as *incidental work*. All sidewalk area work shall be replaced in 'Full Panel' units and completed with a light broom finish.
- 8.) All environmental requirements to maintain and contain waste materials shall be in place. All waste materials shall be removed from the job site and disposed of by environmentally sound methods.
- 9.) Provide and install poles using threaded rod and an epoxy anchoring system in accordance with manufactures specifications. Anchors shall be 3/4 inch diameter treaded rod with 10 threads per inch, stress area of 0.33 Sq. Inches, minimum yield strength of 55KSI, four bolts per pole and compatible bolts and washers. Epoxy shall be the Hilti HIT-RE 500 Epoxy Anchoring System installed per Hilti specification 3.2.5 HIT-RE 500 Epoxy Anchoring System. See Attachment 1.

Payment shall be for the installation of Each (EA) Decorative Street Light on Existing Foundation complete in place.

Bid Item No. 0401 - Horizontal Directional Drill Conduit - Scope: This work shall include all materials and labor to place conduit below the pavement (sidewalk/roadway) using horizontal direction drill (HDD) to provide a clean raceway for the electrical circuits listed on the plan or as directed by the Engineer.

The work shall include, but not be limited to:

- 1.) Install 1.5 inch Schedule 80 PVC Electrical conduit using the trenchless, horizontal directional drill (HDD) method. The HDD system shall have a steerable trenchless method of installing underground pipes, conduits and cables in a shallow arc along a prescribed bore path by using a surface-launched drilling rig, with minimal impact on the surrounding area.
- 2.) HDD operations shall be conducted with respect and cooperation for all effected businesses near drilling sites.
- 3.) Traffic control, including all required pedestrian closures or detour shall be in place prior to HDD operations.
- 4.) All environmental requirements to maintain and contain waste materials, including all drilling solids and fluids shall be in place prior to HDD operations. All waste materials shall be

removed from the job site and disposed of by environmentally sound methods.

Payment shall be on a Lineal Foot (LF) basis.

Bid Item No. 0604 – Install Junction Box - Scope: See City of Springfield Standard Specification 501.2.04.

Payment shall be for the installation of Each (EA) Junction Box complete in place.

Bid Item No. 0605 – Remove and Replace a 200amp Service Cabinet - Scope: This work shall include all materials and labor to remove an existing pole mounted service cabinet, and install, test, and place in service a 120/240VAC, Pad Mounted 200amp Service as shown on ODOT Standard Drawing TM485, and as described on the plans.

The work shall include, but not be limited to:

- 1.) Removal of the existing 120/240VAC, 100amp pole mounted service cabinet and meter base.
- 2.) Install a 120/240VAC, 200amp, Pad mounted service cabinet as shown on TM485, as recommended by the manufacture, and/or as directed by the Engineer.
- 3.) Re-direct the existing SUB power into the new service, and connect the illumination and receptacle circuits as shown on Plan Sheet SL6-6.
- 4.) The new service shall be inspected and approved for final use by the City Electrical inspector before SUB power is connected. The City of Springfield will obtain the electrical service permit.

Payment shall be for the installation of Each (EA) 200amp Service Cabinet complete in place.

Bid Item No. 0606 – Remove and Replace a 100amp Service Cabinet - Scope: This work shall include all materials and labor to remove an existing pole mounted service cabinet, and install, test, and place in service a 120/240VAC, Pole Mounted 100amp Service as shown on ODOT Standard Drawing TM485.

The work shall include, but not be limited to:

- 1.) Removal of the existing 120VAC, 70amp pole mounted service cabinet and meter base located on the southwest traffic signal pole at Main Street and 6th Street.
- 2.) Install a 120/240VAC, 100amp, pole mounted service cabinet as shown on TM485, as recommended by the manufacture, and/or as directed by the Engineer.
- 3.) Re-direct the existing SUB power into the new service, and connect the illumination and receptacle circuits as shown on Plan Sheet SL6-6.
- 4.) The new service shall be inspected and approved for final use by the City Electrical inspector before SUB power is connected. The City of Springfield will obtain the electrical service permit.

Payment shall be for the installation of Each (EA) 100amp Service Cabinet complete in place.

Bid Item No. 0656 - Install THWN Conductors - Scope: This work shall include all materials and labor to install various electrical wire conductors in new and/or existing conduit runs to provide power for the downtown lighting project.

The work shall include, but not be limited to:

- 1.) Installation of all THWN copper insulated conductors as shown on the plan of as directed by the Engineer.
- 2.) All connections at the service cabinet, junction boxes, pole bases, luminaires, and receptacles required to complete the circuits as shown on the Plans and/or as required by the Engineer.

Payment shall be on a Lump Sum (LS) basis for the installation of all THWN conductors by wire gages #6-10 (AGW) installed complete in place.

Bid Item No. 0657 - Remove Existing Conductors - Scope: This work shall include all materials and labor to remove electrical wire conductors in existing conduit runs and to provide clean and empty raceways to install the new circuits for the downtown lighting project.

The work shall include, but not be limited to:

- 1.) Removal of all insulated copper conductor(s) as shown on the Plans and/or as required by the Engineer, to provide a clean, empty raceway to install the new circuit wiring as shown on the Plans and/or as directed by the Engineer.
- 2.) All removed copper conductors shall be coiled and taped into manageable roll of 60lbs or less. The removed wire will become the property of the City and shall be delivered to the City of Springfield Operations yard at 201 S. 18th Street.

Payment shall be on a Lump Sum (LS) basis complete in place.

END OF SECTION

3.2.5 HIT-RE 500 Epoxy Adhesive Anchoring System

3.2.5.1 Product Description

3.2.5.2 Material Specifications

3.2.5.3 Technical Data

3.2.5.4 Installation Instructions

3.2.5.5 Ordering Information

Listings/Approvals

NSF/ANSI Std 61

certification for use in potable water

European Technical Approval

ETA-04/0027

ETA-08/0105



Independent Code Evaluation

LEED® Credit 4.1-Low Emitting Materials

The Leadership in Energy and Environmental Design (LEED®) Green Building Rating system™ is the nationally accepted benchmark for the design, construction and operation of high performance green buildings.

3.2.5.1 Product description

The Hilti HIT-RE 500 System is a high strength, two part epoxy adhesive.

The system consists of a side-by-side adhesive refill pack, a mixing nozzle, a HIT dispenser with refill pack holder, and either a threaded rod, rebar, HIS internally threaded insert or smooth epoxy coated bar. HIT-RE 500 is specifically designed for fastening into solid base materials such as concrete, grout, stone or solid masonry.

HIT-RE 500 is also suitable for use under exceptional conditions such as:

- Underwater Fastenings
- Oversized Holes
- Diamond Cored Holes

To meet specific handling requirements for those conditions, refer to instructions for use and/or contact Hilti for assistance.

Product features

- Superior bond performance
- Use in diamond cored or pneumatic drilled holes.
- Underwater applications down to 165 ft (50 m)
- Meets DOT requirements for most states. Contact Hilti Technical Services for more information.

- Meets requirements of ASTM C881-90, Type IV, Grade 2 and 3, Class A, B, C except gel times
- Meets requirements of AASHTO specification M235, Type IV, Grade 3, Class A, B, C except gel times
- Mixing tube provides proper mixing, eliminates measuring errors and minimizes waste
- Contains no styrene and virtually odorless
- May be installed in concrete with temperatures ranging from 23°F to 104°F (-5°C to 40°C) with no degrading of bond strength.
- May be installed in concrete with temperatures ranging from 23°F to 104°F (-5°C to 40°C) with no degrading of bond strength.
- Good bond strength in elevated service temperatures
- Excellent resistance to weathering
- Suitable for oversized holes

HIT-RE 500 Epoxy Adhesive Anchoring System 3.2.5

Guide specifications

Master format section:

Previous 2004 Format

03250 03 16 00 Concrete anchors

Related Sections:

03200 03 20 00 Concrete reinforcing

05050 05 50 00 Metal fabrications

05120 05 10 00 Structural metal framing

Injectable adhesive shall be used for installation of all reinforcing steel dowels or threaded anchor rods and inserts into existing concrete. Adhesive shall be furnished in side-by-side refill packs which keep component A and component B separate. Side-by-side packs shall be designed to compress during use to minimize waste volume. Side-by-side packs shall also be designed to accept static mixing nozzle which thoroughly blends component A and component B and allows injection directly into drilled hole. Only injection tools and static mixing nozzles as supplied by manufacturer shall be used. Manufacturer's instructions shall be followed. Injection adhesive shall be formulated to include resin and hardener to provide optimal curing speed as well as high strength and stiffness. Typical curing time at 68°F (20°C) shall be approximately 12 hours.

Injection adhesive shall be HIT-RE 500 as furnished by Hilti.

Anchor rods shall be end stamped to show the grade of steel and overall rod length. Anchor rods shall be manufactured to meet the following requirements:

1. ISO 898 Class 5.8
2. ASTM A193, Grade B7 high strength carbon steel anchor;
3. AISI 304 or AISI 316 stainless steel, meeting the requirements of ASTM F593 condition CW.

Special order length HAS Rods may vary from standard product.

Nuts and washers Shall be furnished to meet the requirements of the above anchor rod specifications.

3.2.5 HIT-RE 500 Epoxy Adhesive Anchoring System

3.2.5.2 Material specifications

Table 1 - Material properties of fully cured HIT-RE 500 adhesive

Bond Strength ASTM C882-91 ¹ 2 day cure 7 day cure	12.4 MPa 12.4 MPa	1,800 psi 1,800 psi
Compressive Strength ASTM D695-96 ¹	82.7 MPa	12,000 psi
Compressive Modulus ASTM D695-96 ¹	1,493 MPa	0.22 x 10 ⁶ psi
Tensile Strength 7 day ASTM D638-97	43.5 MPa	6,310 psi
Elongation at break ASTM D638-97	2.0%	
Heat Deflection Temperature ASTM D648-95	63°C	146°F
Absorption ASTM D570-95	0.06%	
Linear Coefficient of Shrinkage on Cure ASTM D2566-86	0.004	
Electrical resistance DIN IEC 93 (12.93)	6.6 x 10 ¹³ Ω/m	1.7 x 10 ¹² Ω/in.

1 Minimum values obtained as the result of tests at 23°F, 40°F and 60°F.

HAS-E carbon steel specifications

Carbon steel rods conform to ISO 898 class 5.8 with a minimum tensile strength of 72.5 ksi (500 MPa) and a minimum yield strength of 58 ksi (400 MPa).

HAS-E nuts conform to SAE J995 Grade 5

HAS-E washers conform to ASTM F884, HV, and ANSI B18.22.1 Type A Plain.

HAS-E rod, nut and washer has an electroplated zinc coating conforming to ASTM B633, SC 1

HAS Super high strength specifications

Carbon steel rods manufactured from ASTM A193, Grade B7, with a minimum tensile strength of 125 ksi (862 MPa) and a minimum yield strength of 105 ksi (724 MPa).

HAS Super nuts conform to SAE J995 Grade 5

HAS Super washers conform to ASTM F884, HV, and ANSI B18.22.1 Type A Plain.

HAS Super rods, nuts and washers, except the 7/8-in. diameter, have an electroplated zinc coating conforming to ASTM B633, SC 1
7/8-in. HAS Super rods, nuts and washers are hot-dip galvanized in accordance with ASTM A153

HAS-R 304 stainless steel specifications

3/8-, 1/2- and 5/8-in. rods manufactured from AISI Type 304 stainless steel conforming to ASTM F593 Condition CW with a minimum tensile strength of 100 ksi (689 MPa) and a minimum yield strength of 65 ksi (448 MPa).

3/4-, 1- and 1 1/4-in. rods are manufactured from AISI Type 304 stainless steel conforming to ASTM F593 Condition CW with a minimum tensile strength of 85 ksi (586 MPa) and a minimum yield strength of 45 ksi (310 MPa).

AISI Type 304 stainless steel nuts conform to ASTM F594

AISI Type 304 stainless steel washers conform to ASTM A240 and ANSI B18.22.1 Type A Plain.

HAS-R 316 stainless steel specifications

3/8-, 1/2- and 5/8-in. rods manufactured from AISI Type 316 stainless steel with a minimum tensile strength of 100 ksi (689 MPa) and a minimum yield strength of 65 ksi (448 MPa).

3/4-, 1- and 1 1/4-in. rods are manufactured from AISI Type 316 stainless steel conforming to ASTM F593 Condition CW or cold worked.

AISI Type 316 stainless steel nuts conform to ASTM F594

AISI Type 316 stainless steel washers conform to ASTM A240 and ANSI B18.22.1 Type A Plain.

HIS-N and HIS-NR internally threaded insert specifications

3/8-in. HIS-N is manufactured from 11MnPb30+C carbon steel conforming to DIN 10277-3 with a minimum tensile strength of 71.1 ksi (490 MPa) and a minimum yield strength of 59.5 ksi (410 MPa).

1/2-, 5/8- and 3/4-in. HIS-N is manufactured from 11MnPb30+C carbon steel conforming to DIN 10277-3 with a minimum tensile strength of 66.7 ksi (460 MPa) and a minimum yield strength of 54.4 ksi (375 MPa).

HIS-NR is manufactured from X5CrNiMo 17122 K700 stainless steel conforming to DIN EN 10088-3 with a minimum tensile strength of 101.5 ksi (700 MPa) and a minimum yield strength of 50.8 ksi (350 MPa).

HIT-RE 500 Epoxy Adhesive Anchoring System 3.2.5

3.2.5.3 Technical data

Table 2 - HAS rod installation specifications installed with HIT-RE 500 adhesive anchor system

Setting information	Symbol	Units	Nominal anchor diameter						
			3/8	1/2	5/8	3/4	7/8	1	1-1/4
Drill bit diameter ¹	d _o	in.	7/16	9/16	11/16	13/16	15/16	1-1/16	1-1/2
Standard effective embedment	h _{ef,std}	in. (mm)	3-1/2 (90)	4-1/4 (110)	5 (125)	6-5/8 (170)	7-1/2 (190)	8-1/4 (210)	12 (305)
Installation torque embedment ≥ h _{ef,std}	T _{inst}	ft-lb (Nm)	18 (24)	30 (41)	75 (102)	150 (203)	175 (237)	235 (319)	400 (540)
Installation torque embedment < h _{ef,std}	T _{inst}	ft-lb (Nm)	15 (20)	20 (27)	50 (68)	105 (142)	125 (169)	165 (224)	280 (375)
Minimum concrete member thickness	h _{min}	in. (mm)	h _{ef} +2 h _{ef} +51					h _{ef} +2-1/4 h _{ef} +57	h _{ef} +3 h _{ef} +76

1 Hole may be drilled with rotary hammer drill or Hilti DD EC-1 Diamond Coring System.

Table 3 - HIS-N and HIS-RN installation specifications with HIT-RE 500 adhesive anchor system

Setting information	Symbol	Units	Thread size			
			3/8-16 UNC	1/2-13 UNC	5/8-11 UNC	3/4-10 UNC
Outside diameter of insert	d	in.	0.65	0.81	1.00	1.09
Nominal bit diameter ¹	d _o	in.	11/16	7/8	1-1/8	1-1/4
Standard effective embedment	h _{ef,std}	in. (mm)	4-3/8 (110)	5 (125)	6-5/8 (170)	8-1/4 (210)
Bolt engagement	h _s	minimum	3/8	1/2	5/8	3/4
		maximum	15/16	1-3/16	1-1/2	1-7/8
Installation torque	T _{inst}	ft-lb (Nm)	18 (24)	30 (41)	75 (102)	150 (203)
Minimum concrete member thickness	h _{min}	in. (mm)	5.9 (150)	6.7 (170)	9.1 (230)	10.6 (270)

1 Hole may be drilled with rotary hammer drill or Hilti DD EC-1 Diamond Coring System.

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Table 4 - Rebar installation specifications with HIT-RE 500 adhesive anchor system

Setting information	Symbol	Units	Rebar size								
			No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Drill bit diameter ^{1,2}	d _o	in.	1/2	5/8	3/4	7/8	1	1-1/8	1-3/8	1-1/2	1-9/16

1 Rebar diameters may vary. Use the smallest diameter drill bit which will accommodate the rebar.

2 Hole may be drilled with rotary hammer drill or Hilti DD EC-1 Diamond Coring System.

Figure 1— HAS rod specifications

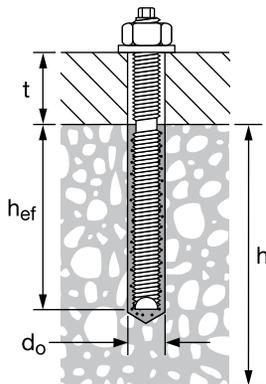
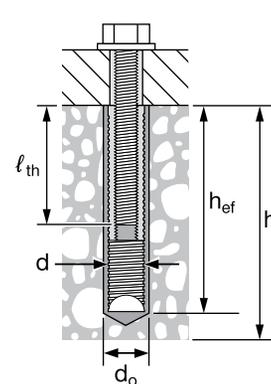


Figure 2— HIS-N and HIS-RN specifications



Combined shear and tension loading

$$\left(\frac{N_d}{N_{rec}} \right)^{5/3} + \left(\frac{V_d}{V_{rec}} \right)^{5/3} \leq 1.0$$

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Table 5 - HIT-RE 500 allowable and ultimate bond/concrete capacity for HAS rods in normal weight concrete^{1,2,3,4}

Nominal anchor diameter in.	Effective embedment in. (mm)	HIT-RE 500 Allowable bond/concrete capacity				HIT-RE 500 Ultimate bond/concrete capacity			
		Tensile		Shear		Tensile		Shear	
		$f'_c = 2000$ psi (13.8 MPa) lb (kN)	$f'_c = 4000$ psi (27.6 MPa) lb (kN)	$f'_c = 2000$ psi (13.8 MPa) lb (kN)	$f'_c = 4000$ psi (27.6 MPa) lb (kN)	$f'_c = 2000$ psi (13.8 MPa) lb (kN)	$f'_c = 4000$ psi (27.6 MPa) lb (kN)	$f'_c = 2000$ psi (13.8 MPa) lb (kN)	$f'_c = 4000$ psi (27.6 MPa) lb (kN)
3/8	1-3/4 (44)	645 (2.9)	1,095 (4.9)	1,510 (6.7)	2,135 (9.5)	2,580 (11.5)	4,370 (19.4)	4,530 (20.2)	6,405 (28.4)
	3-3/8 (86)	2,190 (9.7)	2,585 (11.5)	3,155 (14.0)	4,460 (19.8)	8,760 (39.0)	10,345 (46.0)	9,460 (42.1)	13,380 (59.5)
	4-1/2 (114)	2,420 (10.8)	2,585 (11.5)	4,855 (21.6)	6,860 (30.5)	9,685 (43.1)	10,335 (46.0)	14,560 (64.8)	20,580 (91.5)
1/2	2-1/4 (57)	1,130 (5.0)	1,965 (8.7)	2,510 (11.2)	3,550 (15.8)	4,530 (20.2)	7,860 (35.0)	7,525 (33.5)	10,640 (47.3)
	4-1/2 (114)	4,045 (18.0)	5,275 (23.5)	5,610 (25.0)	7,935 (35.3)	16,185 (72.0)	21,095 (93.8)	16,820 (74.8)	23,800 (105.9)
	6 (152)	4,775 (21.2)	5,380 (23.9)	8,635 (38.4)	12,210 (54.3)	19,095 (84.9)	21,520 (95.7)	25,900 (115.2)	36,620 (162.9)
5/8	2-7/8 (73)	1,690 (7.5)	3,045 (13.5)	5,245 (23.3)	7,420 (33.0)	6,770 (30.1)	12,175 (54.2)	15,735 (70.0)	22,250 (99.0)
	5-5/8 (143)	6,560 (29.2)	7,355 (32.7)	8,760 (39.0)	12,395 (55.1)	26,240 (116.7)	29,420 (130.9)	26,280 (116.9)	37,180 (165.4)
	7-1/2 (190)	7,320 (32.6)	7,515 (33.4)	13,615 (60.6)	19,080 (84.9)	29,290 (130.3)	30,060 (133.7)	40,480 (180.1)	57,240 (254.6)
3/4	3-3/8 (86)	2,310 (10.3)	4,515 (20.1)	7,335 (32.6)	10,370 (46.1)	9,250 (41.1)	18,065 (80.4)	22,000 (97.9)	31,108 (138.4)
	6-3/4 (172)	8,670 (38.6)	10,755 (47.8)	12,615 (56.1)	17,840 (79.4)	34,685 (154.3)	43,020 (191.4)	37,840 (168.3)	53,520 (238.1)
	9 (229)	10,385 (46.2)	12,995 (57.8)	19,430 (86.4)	27,470 (122.2)	41,535 (184.8)	51,985 (231.2)	58,280 (259.2)	82,400 (366.5)
7/8	4 (101)	3,005 (13.4)	5,665 (25.2)	7,795 (34.7)	11,020 (49.0)	12,030 (53.5)	22,670 (100.8)	23,375 (104.0)	33,050 (147.0)
	7-7/8 (200)	12,495 (55.6)	15,875 (70.6)	17,175 (76.4)	24,290 (108.0)	49,975 (222.3)	63,495 (282.4)	51,520 (229.2)	72,860 (324.1)
	10-1/2 (267)	14,705 (65.4)	16,185 (72.0)	26,440 (117.6)	37,390 (166.3)	58,820 (261.6)	64,730 (287.9)	79,320 (352.8)	112,160 (498.9)
1	4-1/2 (114)	3,945 (17.5)	8,440 (37.5)	10,035 (44.6)	14,190 (63.1)	15,790 (70.2)	33,765 (150.2)	30,104 (133.9)	42,565 (189.3)
	9 (229)	13,845 (61.6)	17,365 (77.2)	22,435 (99.8)	31,720 (141.1)	55,380 (246.3)	69,465 (309.0)	67,300 (299.4)	95,160 (423.3)
	12 (305)	17,935 (79.8)	17,935 (79.8)	34,535 (153.6)	48,830 (217.2)	71,740 (319.1)	71,740 (319.1)	103,600 (460.8)	146,480 (651.6)
1-1/4	5-5/8 (143)	5,760 (25.6)	12,815 (57.0)	14,760 (65.7)	20,870 (92.8)	23,045 (102.5)	51,270 (228.1)	44,280 (197.0)	62,610 (278.5)
	11-1/4 (286)	24,610 (109.5)	31,620 (140.7)	35,050 (155.9)	49,570 (220.5)	9,8430 (437.8)	126,480 (562.6)	105,140 (467.7)	148,710 (661.5)
	15 (381)	34,130 (151.8)	35,270 (156.9)	53,960 (240.0)	76,300 (339.4)	136,525 (607.3)	141,090 (627.6)	161,880 (720.1)	228,900 (1018.2)

- 1 Influence factors for spacing and/or edge distance are applied to allowable concrete/bond values above, and then compared to the steel value. The lesser of the values is to be used for the design.
- 2 Average ultimate concrete shear capacity based on Strength Design Method for standard and deep embedment and based on testing for shallow embedment.
- 3 All values based on holes drilled with carbide bit and installed per manufacturer's instructions. Ultimate tensile concrete/bond loads represent the average values obtained in testing.
- 4 For underwater applications with a maximum depth of 165 ft (50 m), reduce the tabulated concrete/bond values 30% to account for reduced mechanical properties of saturated concrete.

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Table 6 - Allowable steel strength for carbon steel and stainless steel HAS rods¹

Nominal anchor diameter in.	HAS-E ISO 898 Class 5.8		HAS Super ASTM A193 B7		HAS SS AISI 304/316 SS	
	Tensile	Shear	Tensile	Shear	Tensile	Shear
	lb (kN)	lb (kN)	lb (kN)	lb (kN)	lb (kN)	lb (kN)
3/8	2,640 (11.7)	1,360 (6.0)	4,555 (20.3)	2,345 (10.4)	3,645 (16.2)	1,875 (8.3)
1/2	4,700 (20.9)	2,420 (10.8)	8,100 (36.0)	4,170 (18.5)	6,480 (28.8)	3,335 (14.8)
5/8	7,340 (32.7)	3,780 (16.8)	12,655 (56.3)	6,520 (29.0)	10,125 (45.0)	5,215 (23.2)
3/4	10,570 (47.0)	5,445 (24.2)	18,225 (81.1)	9,390 (41.8)	12,390 (55.1)	6,385 (28.4)
7/8	14,385 (64.0)	7,410 (33.0)	24,805 (110.3)	12,780 (56.9)	16,865 (75.0)	8,690 (38.6)
1	18,790 (83.6)	9,680 (43.0)	32,400 (144.1)	16,690 (74.2)	22,030 (98.0)	11,350 (50.5)
1-1/4	29,360 (130.6)	15,125 (67.3)	50,620 (225.2)	26,080 (116.0)	34,425 (153.1)	17,735 (78.9)

¹ Steel strength as defined in AISC Manual of Steel Construction (ASD):

$$\text{Tensile} = 0.33 \times F_u \times \text{Nominal Area}$$

$$\text{Shear} = 0.17 \times F_u \times \text{Nominal Area}$$

Table 7 - Ultimate steel strength for carbon steel and stainless steel HAS rods¹

Nominal anchor diameter in.	HAS-E ISO 898 Class 5.8			HAS Super ASTM A193 B7			HAS SS AISI 304/316 SS		
	Yield lb (kN)	Tensile lb (kN)	Shear lb (kN)	Yield lb (kN)	Tensile lb (kN)	Shear lb (kN)	Yield lb (kN)	Tensile lb (kN)	Shear lb (kN)
3/8	4,495 (20.0)	6,005 (26.7)	3,605 (16.0)	8,135 (36.2)	10,350 (43.4)	6,210 (27.6)	5,035 (22.4)	8,280 (36.8)	4,970 (22.1)
1/2	8230 (36.6)	10,675 (47.5)	6,405 (28.5)	14,900 (66.3)	18,405 (79.0)	11,040 (49.1)	9,225 (41.0)	14,720 (65.5)	8,835 (39.3)
5/8	13110 (58.3)	16,680 (74.2)	10,010 (44.5)	23,730 (105.6)	28,760 (125.7)	17,260 (76.8)	14,690 (65.3)	23,010 (102.4)	13,805 (61.4)
3/4	19,400 (86.3)	24,020 (106.9)	14,415 (64.1)	35,120 (156.2)	41,420 (185.7)	24,850 (110.5)	15,050 (66.9)	28,165 (125.3)	16,800 (75.2)
7/8	26,780 (119.1)	32,695 (145.4)	19,620 (87.3)	48,480 (215.7)	56,370 (256.9)	33,825 (150.5)	20,775 (92.4)	38,335 (170.5)	23,000 (102.3)
1	35,130 (156.3)	42,705 (190.0)	25,625 (114.0)	63,600 (282.9)	73,630 (337.0)	44,180 (196.5)	27,255 (121.2)	50,070 (222.7)	30,040 (133.6)
1-1/4	56,210 (250.0)	66,730 (296.8)	40,035 (178.1)	101,755 (452.6)	115,050 (511.8)	69,030 (307.1)	43,610 (194.0)	78,235 (348.0)	46,940 (208.8)

¹ Steel strength as defined in AISC Manual of Steel Construction 2nd Ed. (LRFD):

$$\text{Yield} = F_y \times \text{tensile stress area}$$

$$\text{Tensile} = 0.75 \times F_u \times \text{nominal area}$$

$$\text{Shear} = 0.45 \times F_u \times \text{nominal area}$$

3.2.5

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Table 8 - HIT-RE 500 allowable bond or concrete capacity and steel strength for HIS-N and HIS-RN inserts¹

Thread size in.	Effective embedment in. (mm)	HIT-RE 500 allowable bond/concrete capacity ²		Steel bolt strength ²			
		Tensile (13.8 MPa) lb (kN)	Shear (13.8 MPa) lb (kN)	ASTM A325 carbon steel		ASTM F593 stainless steel	
				Tensile lb (kN)	Shear lb (kN)	Tensile lb (kN)	Shear lb (kN)
3/8-16 UNC	4-3/8 (110)	2,870 (12.8)	1,565 (7.0)	4,370 (19.4)	2,250 (10.0)	3,645 (16.2)	1,875 (8.3)
1/2-13 UNC	5 (127)	4,530 (20.1)	2,890 (12.9)	7,775 (34.6)	4,005 (17.8)	6,480 (28.8)	3,335 (14.8)
5/8-11 UNC	6-5/8 (168)	8,255 (36.7)	4,635 (20.6)	12,150 (54.0)	6,260 (27.8)	10,125 (45.0)	5,215 (23.2)
3/4-10 UNC	8-1/4 (210)	9,030 (40.1)	6,695 (29.8)	17,945 (77.8)	9,010 (40.1)	12,395 (55.1)	6,385 (28.4)

Table 9 - HIT-RE 500 ultimate bond or concrete capacity and steel strength for HIS-N and HIS-RN inserts¹

Thread size in.	Effective embedment in. (mm)	HIT-RE 500 ultimate bond/concrete capacity		Ultimate bolt strength ²			
		Tensile (13.8 MPa) lb (kN)	Shear (13.8 MPa) lb (kN)	ASTM A325 carbon steel		ASTM F593 stainless steel	
				Tensile lb (kN)	Shear lb (kN)	Tensile lb (kN)	Shear lb (kN)
3/8-16 UNC	4-3/8 (110)	11,480 (51.0)	6,260 (27.8)	9,935 (44.2)	5,960 (26.5)	8,280 (36.8)	4,970 (22.1)
1/2-13 UNC	5 (127)	18,115 (80.5)	11,565 (51.4)	17,665 (78.6)	10,600 (47.2)	14,720 (65.5)	8,835 (39.3)
5/8-11 UNC	6-5/8 (168)	33,025 (146.9)	18,550 (82.5)	27,610 (122.8)	16,565 (73.7)	23,010 (102.4)	13,805 (61.4)
3/4-10 UNC	8-1/4 (210)	36,125 (160.6)	26,775 (119.1)	39,760 (176.9)	23,855 (106.1)	28,165 (125.3)	16,900 (75.1)

1 Use lower value of either allowable bond/concrete capacity or steel strength. Minimum concrete compressive strength f'_c is 2,000 psi.

2 Steel values in accordance with AISC

ASTM A325 bolts $F_y = 92 \text{ ksi}$, $F_u = 120 \text{ ksi}$

ASTM F593 (AISI 304/316) $F_y = 65 \text{ ksi}$, $F_u = 100 \text{ ksi}$ for 3/8- through 5/8 in.

$F_y = 45 \text{ ksi}$, $F_u = 85 \text{ ksi}$ for 3/4-in.

Allowable load values **Ultimate load values**

Tension = $0.33 \times F_u \times A_{nom}$ Tension = $0.75 \times F_u \times A_{nom}$

Shear = $0.17 \times F_u \times A_{nom}$ Shear = $0.45 \times F_u \times A_{nom}$

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Table 10 - HIT-RE 500 ultimate bond capacity and steel strength for rebar in concrete

Rebar size	Effective embedment in. (mm)	Concrete compressive strength						Grade 60 rebar	
		$f'_c = 2000$ psi (13.8 MPa)			$f'_c = 4000$ psi (27.6 MPa)			Yield strength lb (kN)	Tensile strength lb (kN)
		Ultimate bond strength lb (kN)	Embed. to develop yield strength ¹ in. (mm)	Embed. to develop tensile strength ¹ in. (mm)	Ultimate bond strength lb (kN)	Embed. to develop yield strength ¹ in. (mm)	Embed. to develop tensile strength ¹ in. (mm)		
#3	3-3/8 (86)	10,105 (45.0)	2-1/4 (57)	3-3/8 (86)	10,810 (48.1)	2-1/8 (54)	3-1/4 (84)	6,600 (29.4)	9,900 (44.0)
	4-1/2 (114)	10,920 (48.6)			10,810 (48.1)				
#4	4-1/2 (114)	15,980 (71.1)	3-3/8 (86)	5-5/8 (143)	18,540 (82.5)	3 (76)	4-3/8 (111)	12,000 (53.4)	18,000 (80.1)
	6 (152)	18,830 (83.8)			18,655 (83.0)				
#5	5-5/8 (143)	20,630 (91.8)	5-1/8 (130)	8-7/8 (225)	27,790 (123.6)	3-7/8 (98)	5-3/4 (146)	18,600 (82.7)	27,900 (124.1)
	7-1/2 (191)	24,870 (110.6)			27,790 (128.6)				
#6	6-3/4 (171)	33,695 (149.9)	5-3/8 (136)	9-3/8 (238)	44,675 (198.7)	4 (102)	6 (152)	26,400 (117.4)	39,600 (176.2)
	9 (229)	38,960 (173.3)			44,870 (200.0)				
#7	7-7/8 (200)	40,525 (180.3)	7 (178)	12-3/8 (314)	59,340 (264.0)	4-7/8 (124)	7-1/4 (184)	36,000 (160.1)	54,000 (240.2)
	10-1/2 (267)	48,460 (215.6)			61,720 (274.6)				
#8	9 (229)	63,940 (284.4)	8-1/4 (210)	12-7/8 (327)	72,820 (323.9)	5-7/8 (149)	8-7/8 (225)	47,400 (210.9)	71,100 (316.3)
	12 (305)	69,610 (309.7)			72,950 (324.5)				
#9	10-1/8 (257)	72,245 (321.4)	8-1/2 (216)	13 (330)	81,235 (361.4)	7-1/2 (191)	12 (305)	60,000 (266.9)	90,000 (400.4)
	13-1/2 (343)	94,205 (419.1)			84,015 (373.7)				
#10	11-1/4 (286)	92,000 (409.3)	9-3/8 (238)	17-7/8 (454)	96,725 (430.3)	8-7/8 (225)	14 (356)	76,200 (339.0)	114,300 (508.5)
	15 (381)	95,850 (426.4)			97,070 (431.8)				
#11	12-3/8 (314)	118,615 (527.6)	9-7/8 (251)	18-3/4 (476)	123,120 (547.7)	9-1/2 (241)	16-1/2 (419)	93,600 (416.4)	140,400 (624.6)
	16-1/2 (419)	123,570 (549.7)			123,790 (550.7)				

1 Based on comparison of average ultimate adhesive bond test values versus minimum yield and ultimate tensile strength of rebar. For more information, contact Hilti.

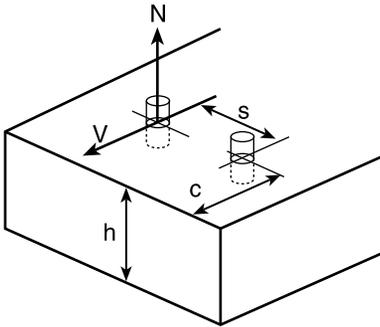
Table 11 - HIT-RE 500 ultimate tensile bond strength for smooth epoxy coated dowel bars in concrete¹

Dowel bar diameter in.	Nominal bit diameter in.	Embedment depth in. (mm)	Ultimate tensile load lb (kN)
1	1-1/8	9 (229)	40,385 (179.7)
1-1/4	1-3/8		
1-1/2	1-5/8		

1 Minimum concrete compressive strength is 2,400 psi.

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Figure 3 - Anchor spacing and edge distance in concrete



Anchor spacing adjustment factors

s = Actual spacing
 h_{ef} = Actual embedment
 $s_{min} = 0.5 h_{ef}$
 $s_{cr} = 1.5 h_{ef}$

Edge distance adjustment factors

c = Actual edge distance
 h_{ef} = Actual embedment
 $c_{min} = 0.5 h_{ef}$ Tension and shear
 $c_{cr} = 1.5 h_{ef}$ Tension
 $= 2.0 h_{ef}$ Shear
 \perp = Perpendicular to edge
 \parallel = Parallel to edge

Note: Tables apply for listed embedment depths. Reduction factors for other embedment depths must be calculated using equations below.

<p>Spacing tension/shear</p> $s_{min} = 0.5 h_{ef}$ $s_{cr} = 1.5 h_{ef}$ $f_A = 0.3(s/h_{ef}) + 0.55$ for $s_{cr} > s > s_{min}$
<p>Edge distance tension</p> $c_{min} = 0.5 h_{ef}$ $c_{cr} = 1.5 h_{ef}$ $f_{RN} = 0.3(c/h_{ef}) + 0.55$ for $c_{cr} > c > c_{min}$
<p>Edge distance shear \perp toward edge</p> $c_{min} = 0.5 h_{ef}$ $c_{cr} = 2.0 h_{ef}$ $f_{RV1} = 0.54(c/h_{ef}) - 0.09$ for $c_{cr} > c > c_{min}$
<p>Edge distance shear \parallel to or away from edge</p> $c_{min} = 0.5 h_{ef}$ $c_{cr} = 2.0 h_{ef}$ $f_{RV2} = 0.36(c/h_{ef}) + 0.28$ for $c_{cr} > c > c_{min}$

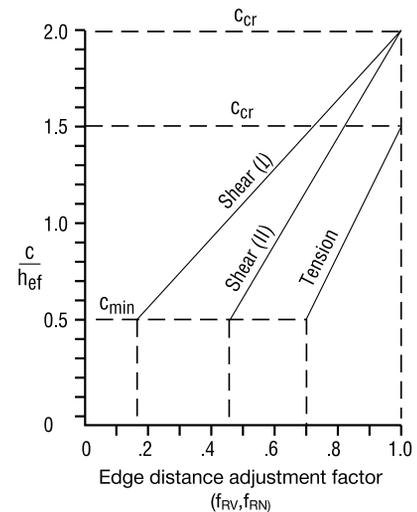
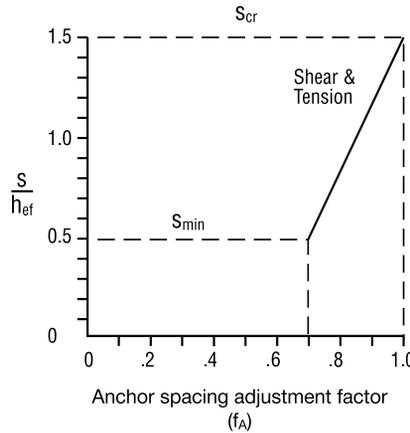


Table 12 - Load adjustment factors for 3/8-in. diameter anchors

Adjustment factor	3/8-in.												
	Spacing tension/shear f_A			Edge distance tension f_{RN}			Edge distance shear (\perp toward edge) f_{RV1}			Edge distance shear (\parallel to or away from edge) f_{RV2}			
Embedment depth, in.	1-3/4	3-3/8	4-1/2	1-3/4	3-3/8	4-1/2	1-3/4	3-3/8	4-1/2	1-3/4	3-3/8	4-1/2	
Spacing (s)/edge distance (c), in.	7/8	0.70		0.70			0.18			0.46			
	1	0.72		0.72			0.22			0.49			
	1 11/16	0.84	0.70	0.84	0.70		0.43	0.18		0.63	0.46		
	2	0.89	0.73	0.89	0.73		0.53	0.22		0.69	0.49		
	2 1/4	0.94	0.75	0.70	0.94	0.75	0.70	0.60	0.27	0.18	0.74	0.52	0.46
	2 5/8	1.00	0.78	0.73	1.00	0.78	0.73	0.72	0.33	0.23	0.82	0.56	0.49
	3		0.82	0.75		0.82	0.75	0.84	0.39	0.27	0.90	0.60	0.52
	3 1/2		0.86	0.78		0.86	0.78	1.00	0.47	0.33	1.00	0.65	0.56
	4		0.91	0.82		0.91	0.82		0.55	0.39		0.71	0.60
	5 1/16		1.00	0.89		1.00	0.89		0.72	0.52		0.82	0.69
	5 1/2			0.92			0.92		0.79	0.57		0.87	0.72
	6			0.95			0.95		0.87	0.63		0.92	0.76
	6 3/4			1.00			1.00		1.00	0.72		1.00	0.82
	8									0.87			0.92
	9									1.00			1.00

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Anchor spacing and edge distance guidelines in concrete

Table 13 - Load adjustment factors for 1/2-in. diameter anchors

Diameter	1/2-in.												
	Spacing tension/shear f_A			Edge distance tension f_{RN}			Edge distance shear (⊥ toward edge) f_{RV1}			Edge distance shear (to or away from edge) f_{RV2}			
Embedment depth, in.	2-1/4	4-1/2	6	2-1/4	4-1/2	6	2-1/4	4-1/2	6	2-1/4	4-1/2	6	
Load adjustment factors for 5/8-in. and 3/4-in. diameter anchors	1-1/8	0.70		0.70			0.18			0.46			
	1-1/2	0.75		0.75			0.27			0.52			
	1-3/4	0.78		0.78			0.33			0.56			
	2	0.82		0.82			0.39			0.60			
	2-1/4	0.85	0.70		0.85	0.70		0.45	0.18		0.64	0.46	
	2-1/2	0.88	0.72		0.88	0.72		0.51	0.21		0.68	0.48	
	3	0.95	0.75	0.70	0.95	0.75	0.70	0.63	0.27	0.18	0.76	0.52	0.46
	3-3/8	1.00	0.78	0.72	1.00	0.78	0.72	0.72	0.32	0.21	0.82	0.55	0.48
	4		0.82	0.75		0.82	0.75	0.87	0.39	0.27	0.92	0.60	0.52
	4-1/2		0.85	0.78		0.85	0.78	1.00	0.45	0.32	1.00	0.64	0.55
	5		0.88	0.80		0.88	0.80		0.51	0.36		0.68	0.58
	6		0.95	0.85		0.95	0.85		0.63	0.45		0.76	0.64
6-3/4		1.00	0.89		1.00	0.89		0.72	0.52		0.82	0.69	
7			0.90			0.90		0.75	0.54		0.84	0.70	
8			0.95			0.95		0.87	0.63		0.92	0.76	
9			1.00			1.00		1.00	0.72		1.00	0.82	
10									0.81			0.88	
11									0.90			0.94	
12									1.00			1.00	

Note: Tables apply for listed embedment depths. Reduction factors for other embedment depths must be calculated using equations below.

Spacing tension/shear
 $s_{min} = 0.5 h_{ef}$ $s_{cr} = 1.5 h_{ef}$
 $f_A = 0.3(s/h_{ef}) + 0.55$
 for $s_{cr} > s > s_{min}$

Edge distance tension
 $c_{min} = 0.5 h_{ef}$ $c_{cr} = 1.5 h_{ef}$
 $f_{RN} = 0.3(c/h_{ef}) + 0.55$
 for $c_{cr} > c > c_{min}$

Edge distance shear
 ⊥ toward edge
 $c_{min} = 0.5 h_{ef}$ $c_{cr} = 2.0 h_{ef}$
 $f_{RV1} = 0.54(c/h_{ef}) - 0.09$
 for $c_{cr} > c > c_{min}$

Edge distance shear
 || to or away from edge
 $c_{min} = 0.5 h_{ef}$ $c_{cr} = 2.0 h_{ef}$
 $f_{RV2} = 0.36(c/h_{ef}) + 0.28$
 for $c_{cr} > c > c_{min}$

Table 14 - Load adjustment factors for 5/8-in. and 3/4-in. diameter anchors

Diameter	5/8-in.												3/4-in.															
	Spacing tension/shear f_A			Edge distance tension f_{RN}			Edge distance shear (⊥ toward edge) f_{RV1}			Edge distance shear (to or away from edge) f_{RV2}			Spacing tension/shear f_A			Edge distance tension f_{RN}			Edge distance shear (⊥ toward edge) f_{RV1}			Edge distance shear (to or away from edge) f_{RV2}						
Embedment depth, in.	2-7/8	5-5/8	7-1/2	2-7/8	5-5/8	7-1/2	2-7/8	5-5/8	7-1/2	2-7/8	5-5/8	7-1/2	2-7/8	5-5/8	7-1/2	3-3/8	6-3/4	9	3-3/8	6-3/4	9	3-3/8	6-3/4	9	3-3/8	6-3/4	9	
Spacing (s)/edge distance (c), in.	1-7/16	0.70		0.70			0.18			0.46																		
	1-11/16	0.73		0.73			0.23			0.49			0.70			0.70			0.18						0.46			
	2	0.76		0.76			0.29			0.53			0.73			0.73			0.23						0.49			
	2-13/16	0.84	0.70		0.84	0.70		0.44	0.18		0.63	0.46		0.80		0.80			0.36						0.58			
	3-3/8	0.90	0.73		0.90	0.73		0.54	0.23		0.70	0.50		0.85	0.70	0.85	0.70		0.45	0.18				0.64	0.46			
	3-3/4	0.94	0.75	0.70	0.94	0.75	0.70	0.61	0.27	0.18	0.75	0.52	0.46	0.88	0.72	0.88	0.72		0.51	0.21				0.68	0.48			
	4-5/16	1.00	0.78	0.72	1.00	0.78	0.72	0.72	0.32	0.22	0.82	0.56	0.49	0.93	0.74	0.93	0.74		0.60	0.26				0.74	0.51			
	4-1/2		0.79	0.73		0.79	0.73	0.76	0.34	0.23	0.84	0.57	0.50	0.95	0.75	0.70	0.95	0.75	0.70	0.63	0.27	0.18		0.76	0.52	0.46		
	5-1/16		0.82	0.75		0.82	0.75	0.86	0.40	0.27	0.91	0.60	0.52	1.00	0.78	0.72	1.00	0.78	0.72	0.72	0.32	0.21	0.82	0.55	0.48			
	5-5/8		0.85	0.78		0.85	0.78	0.97	0.45	0.32	0.98	0.64	0.55		0.80	0.74		0.80	0.74	0.81	0.36	0.25	0.88	0.58	0.51			
	5-3/4		0.86	0.78		0.86	0.78	1.00	0.46	0.32	1.00	0.65	0.56		0.81	0.74		0.81	0.74	0.83	0.37	0.26	0.89	0.59	0.51			
	6-3/4		0.91	0.82		0.91	0.82		0.56	0.40		0.71	0.60		0.85	0.78		0.85	0.78	1.00	0.45	0.32	1.00	0.64	0.55			
	8-7/16		1.00	0.89		1.00	0.89		0.72	0.52		0.82	0.69		0.93	0.83		0.93	0.83	0.59	0.42			0.73	0.62			
	10-1/8			0.96			0.96		0.88	0.64		0.93	0.77		1.00	0.89		1.00	0.89	1.00	0.89	0.72	0.52	0.82	0.69			
	11-1/4			1.00			1.00		1.00	0.72		1.00	0.82						0.93			0.93	0.81	0.59	0.88	0.73		
	12									0.77			0.86						0.95			0.95	0.87	0.63	0.92	0.76		
	13-1/2									0.88			0.93						1.00			1.00	1.00	0.72	1.00	0.82		
	15									1.00			1.00										0.81	0.59	0.88	0.73		
16																						0.87	0.63	0.92	0.76			
18																						1.00	0.72	1.00	0.82			

3.2.5

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Anchor spacing and edge distance guidelines in concrete

Table 15 - Load adjustment factors for 7/8-in. diameter anchors

Diameter	7/8-in.												
	Spacing tension/shear f_A			Edge distance tension f_{RN}			Edge distance shear (⊥ toward edge) f_{RV1}			Edge distance shear (to or away from edge) f_{RV2}			
Embedment depth, in.	4	7-7/8	10-1/2	4	7-7/8	10-1/2	4	7-7/8	10-1/2	4	7-7/8	10-1/2	
Spacing (s)/Edge distance (c), in.	2	0.70			0.70			0.18			0.46		
	2-1/2	0.74			0.74			0.25			0.51		
	3	0.78			0.78			0.32			0.55		
	3-1/2	0.81			0.81			0.38			0.60		
	3-15/16	0.85	0.70		0.85	0.70		0.44	0.18		0.63	0.46	
	4-1/2	0.89	0.72		0.89	0.72		0.52	0.22		0.69	0.49	
	5	0.93	0.74		0.93	0.74		0.59	0.25		0.73	0.51	
	5-1/4	0.94	0.75	0.70	0.94	0.75	0.70	0.62	0.27	0.18	0.75	0.52	0.46
	6	1.00	0.78	0.72	1.00	0.78	0.72	0.72	0.32	0.22	0.82	0.55	0.49
	6-1/2		0.80	0.74		0.80	0.74	0.79	0.36	0.24	0.87	0.58	0.50
	7		0.82	0.75		0.82	0.75	0.86	0.39	0.27	0.91	0.60	0.52
	8		0.85	0.78		0.85	0.78	1.00	0.46	0.32	1.00	0.65	0.55
	10		0.93	0.84		0.93	0.84		0.60	0.42		0.74	0.62
	11-13/16		1.00	0.89		1.00	0.89		0.72	0.52		0.82	0.69
	12			0.89			0.89		0.73	0.53		0.83	0.69
	14			0.95			0.95		0.87	0.63		0.92	0.76
	15-3/4			1.00			1.00		1.00	0.72		1.00	0.82
	18									0.84			0.90
	20									0.94			0.97
	21									1.00			1.00

Note: Tables apply for listed embedment depths. Reduction factors for other embedment depths must be calculated using equations below.

Spacing tension/shear
 $s_{min} = 0.5 h_{ef}$ $s_{cr} = 1.5 h_{ef}$
 $f_A = 0.3(s/h_{ef}) + 0.55$
 for $s_{cr} > s > s_{min}$

Edge distance tension
 $c_{min} = 0.5 h_{ef}$ $c_{cr} = 1.5 h_{ef}$
 $f_{RN} = 0.3(c/h_{ef}) + 0.55$
 for $c_{cr} > c > c_{min}$

Edge distance shear
 ⊥ toward edge
 $c_{min} = 0.5 h_{ef}$ $c_{cr} = 2.0 h_{ef}$
 $f_{RV1} = 0.54(c/h_{ef}) - 0.09$
 for $c_{cr} > c > c_{min}$

Edge distance shear
 || to or away from edge
 $c_{min} = 0.5 h_{ef}$ $c_{cr} = 2.0 h_{ef}$
 $f_{RV2} = 0.36(c/h_{ef}) + 0.28$
 for $c_{cr} > c > c_{min}$

Table 16 - Load adjustment factors for 1-in. and 1-1/4-in. diameter anchors

Diameter	1-in.												1-1/4-in.															
	Spacing tension/shear f_A			Edge distance tension f_{RN}			Edge distance shear (⊥ toward edge) f_{RV1}			Edge distance shear (to or away from edge) f_{RV2}			Spacing tension/shear f_A			Edge distance tension f_{RN}			Edge distance shear (⊥ toward edge) f_{RV1}			Edge distance shear (to or away from edge) f_{RV2}						
Embedment depth, in.	4-1/2	9	12	4-1/2	9	12	4-1/2	9	12	4-1/2	9	12	4-1/2	9	12	5-5/8	11-1/4	15	5-5/8	11-1/4	15	5-5/8	11-1/4	15	5-5/8	11-1/4	15	
Spacing (s)/Edge distance (c), in.	2-1/4	0.70			0.70			0.18			0.46																	
	2-3/4	0.73			0.73			0.24			0.50					0.70			0.70			0.18					0.46	
	3	0.75			0.75			0.27			0.52					0.71			0.71			0.20					0.47	
	4	0.82			0.82			0.39			0.60					0.76			0.76			0.29					0.54	
	4-1/2	0.85	0.70		0.85	0.70		0.45	0.18		0.64	0.46			0.79			0.79			0.34						0.57	
	5	0.88	0.72		0.88	0.72		0.51	0.21		0.68	0.48			0.82			0.82			0.39						0.60	
	5-5/8	0.93	0.74		0.93	0.74		0.59	0.25		0.73	0.51			0.85	0.70		0.85	0.70		0.45	0.18					0.64	0.46
	6	0.95	0.75	0.70	0.95	0.75	0.70	0.63	0.27	0.18	0.76	0.52	0.46	0.87	0.71		0.87	0.71		0.49	0.20					0.66	0.47	
	6-3/4	1.00	0.78	0.72	1.00	0.78	0.72	0.72	0.32	0.21	0.82	0.55	0.48	0.91	0.73		0.91	0.73		0.56	0.23					0.71	0.50	
	7-1/2		0.80	0.74		0.80	0.74	0.81	0.36	0.25	0.88	0.58	0.51	0.95	0.75	0.70	0.95	0.75	0.70	0.63	0.27	0.18	0.76	0.52	0.46			
	8-1/4		0.83	0.76		0.83	0.76	0.90	0.41	0.28	0.94	0.61	0.53	0.99	0.77	0.72	0.99	0.77	0.72	0.70	0.31	0.21	0.81	0.54	0.48			
	9		0.85	0.78		0.85	0.78	1.00	0.45	0.32	1.00	0.64	0.55	1.00	0.79	0.73	1.00	0.79	0.73	0.77	0.34	0.23	0.86	0.57	0.50			
	10		0.88	0.80		0.88	0.80	0.51	0.36	0.28	0.94	0.61	0.53	0.99	0.77	0.72	0.99	0.77	0.72	0.70	0.31	0.21	0.81	0.54	0.48			
	11		0.92	0.83		0.92	0.83	0.57	0.41	0.32	1.00	0.64	0.55	1.00	0.79	0.73	1.00	0.79	0.73	0.77	0.34	0.23	0.86	0.57	0.50			
	12		0.95	0.85		0.95	0.85	0.63	0.45	0.32	1.00	0.64	0.55	1.00	0.79	0.73	1.00	0.79	0.73	0.77	0.34	0.23	0.86	0.57	0.50			
	13-1/2		1.00	0.89		1.00	0.89	0.72	0.52	0.32	1.00	0.64	0.55	1.00	0.79	0.73	1.00	0.79	0.73	0.77	0.34	0.23	0.86	0.57	0.50			
	14			0.90			0.90	0.75	0.54	0.32	1.00	0.64	0.55	1.00	0.79	0.73	1.00	0.79	0.73	0.77	0.34	0.23	0.86	0.57	0.50			
	16-7/8			0.97			0.97	0.92	0.67	0.32	1.00	0.64	0.55	1.00	0.79	0.73	1.00	0.79	0.73	0.77	0.34	0.23	0.86	0.57	0.50			
	18			1.00			1.00	1.00	0.72	0.32	1.00	0.64	0.55	1.00	0.79	0.73	1.00	0.79	0.73	0.77	0.34	0.23	0.86	0.57	0.50			
	20								0.81	0.32	1.00	0.64	0.55	1.00	0.79	0.73	1.00	0.79	0.73	0.77	0.34	0.23	0.86	0.57	0.50			
22-1/2								0.92	0.32	1.00	0.64	0.55	1.00	0.79	0.73	1.00	0.79	0.73	0.77	0.34	0.23	0.86	0.57	0.50				
24								1.00	0.32	1.00	0.64	0.55	1.00	0.79	0.73	1.00	0.79	0.73	0.77	0.34	0.23	0.86	0.57	0.50				
27									0.81	0.32	1.00	0.64	0.55	1.00	0.79	0.73	1.00	0.79	0.73	0.77	0.34	0.23	0.86	0.57	0.50			
30									0.92	0.32	1.00	0.64	0.55	1.00	0.79	0.73	1.00	0.79	0.73	0.77	0.34	0.23	0.86	0.57	0.50			

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Figure 4 - Resistance of HIT-RE 500 to chemicals

Chemical	Chemicals Tested	Resistant	Not Resistant
Alkaline	Concrete drilling mud (10%) pH=12.6	+	
	Concrete drilling mud (10%) pH=13.2	+	
	Concrete potash solution (10%) pH=14.0	+	
Acids	Acetic acid (10%) ¹		-
	Nitric acid (10%) ¹		-
	Hydrochloric acid (10%) 3 month -		-
	Sulfuric acid (10%)		-
Solvents	Benzyl alcohol		-
	Ethanol		-
	Ethyl acetate		-
	Methyl ethyl ketone (MEK)		-
	Trichlorethylene		-
	Xylene (mixture)	+	-
Chemicals used on job sites	Concrete plasticizer	+	
	Diesel oil	+	
	Oil	+	
	Petrol	+	
	Oil for form work (forming oil)	+	
Environmental chemicals	Salt water	+	
	de-mineralized water	+	
	salt spraying test	+	
	SO ₂	+	
	Environment/weather	+	

1 Concrete was dissolved by acid.

Samples of the HIT-RE 500 resin were immersed in the various chemical compounds for up to one year. At the end of the test period, the samples were analyzed. Any samples showing no visible damage and having less than a 25% reduction in bending (flexural) strength were classified as Resistant. Samples that were heavily damaged or destroyed were classified as Not Resistant.

Note: In actual use, the majority of the resin is encased in the base material, leaving very little surface area exposed.

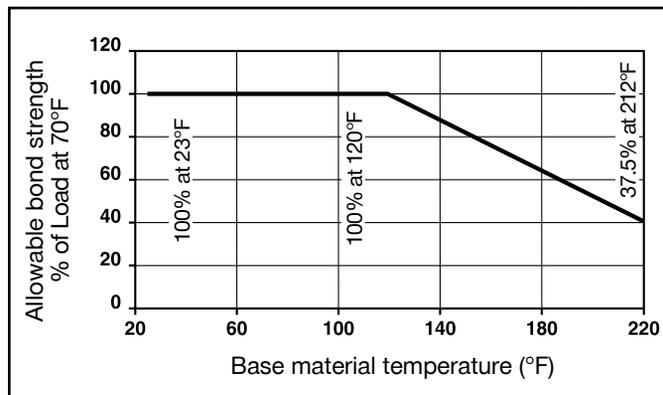
Table 17 - Full cure time

Base material temperature		Approximate full curing time
°F	°C	
23	-5	72 h
32	0	50 h
50	10	24 h
68	20	12 h
86	30	8 h
104	40	4 h

Table 18 - Initial cure time to develop 25% of bond strength

Base material temperature		Approximate initial cure time
°F	°C	
23	-5	36 h
32	0	25 h
50	10	12 h
68	20	6 h
86	30	4 h
104	40	2 h

Figure 5 - Influence of temperature on bond strength^{1,2}



- 1 Test procedure involves the concrete being held at the elevated temperature for 24 hours then removing it from the controlled environment and testing to failure.
- 2 Long term creep test in accordance with ICC-ES Acceptance Criteria AC58 is available; please contact Hilti Technical Services.

Table 19 - Gel time

Base material temperature		Approximate gel time
°F	°C	
23	-5	4 h
32	0	3 h
50	10	2 h
68	20	30 min
86	30	20 min
104	40	12 min

- 1 Minimum product temperature must be maintained above 41°F (5°C) prior/during installation.
- 2 Gel times and full cure times are approximate.

3.2.5

3.2.5 HIT-RE 500 Epoxy Adhesive Anchoring System

3.2.5.4 Installation instructions

Installation Instructions For Use (IFU) are included with each product package. They can also be viewed or downloaded online at www.us.hilti.com (US) and www.hilti.ca (Canada). Because of the possibility of changes, always verify that downloaded IFU are current when used. Proper installation is critical to achieve full performance. Training is available on request. Contact Hilti Technical Services for applications and conditions not addressed in the IFU.

HIT-RE 500 Volume

Table 20 - Threaded rod installation

Nominal anchor diameter in.	Nominal bit diameter in.	Adhesive volume required per Inch of embedment in ³
1/4	5/16	0.055
3/8	7/16	0.095
1/2	9/16	0.133
5/8	3/4	0.261
3/4	7/8	0.326
7/8	1	0.391
1	1-1/8	0.478
1-1/4	1-3/8	0.626

The useable volume of HIT-RE 500 refill cartridge is 16.5 in³ (270 ml)

The useable volume of HIT-RE 500 medium refill is 26.9 in³ (440 ml)

The useable volume of HIT-RE 500 medium refill is 81.8 in³ (1340 ml)

Example:

5/8-in. diameter rod with an embedment of 10 inches:

$$10 \text{ in.} \times 0.26 \text{ in}^3/\text{in.} = 2.6 \text{ in}^3/\text{fastening}$$

$$16.5 \text{ in}^3/\text{cartridge} \div 2.6 \text{ in}^3/\text{fastening} \approx 6 \text{ fastenings/cartridge}$$

$$81.8 \text{ in}^3/\text{cartridge} \div 2.6 \text{ in}^3/\text{fastening} \approx 31 \text{ fastenings/cartridge}$$

Table 21 - Rebar installation¹

Rebar Size	Nominal bit ¹ diameter in.	Adhesive volume required per Inch of embedment in ³
#3	1/2	0.110
#4	5/8	0.146
#5	3/4	0.176
#6	7/8	0.218
#7	1	0.252
#8	1-1/8	0.299
#9	1-3/8	0.601
#10	1-1/2	0.659
#11	1-3/4	1.037

¹ Rebar diameter may vary. Use smallest drill bit which will accommodate rebar.

HIT-RE 500 Epoxy Adhesive Anchoring System 3.2.5

3.2.5.5 Ordering information¹

Fastener components



HAS Threaded Rods



HIS-N Internally Threaded Inserts



Rebar supplied by contractor



Smooth, epoxy coated bar supplied by contractor



HIT RE Mixer



HIT-RE 500 11.1 oz (330 ml)



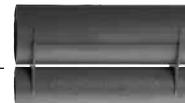
HIT-RE 500 16.9 oz (500 ml)



HIT-RE 500 47.3 oz (1400 ml)



Refill Pack Holder



Refill Pack Holder



HDE 500 Battery Dispenser



P3500 Dispenser



HDM 500 Manual Dispenser



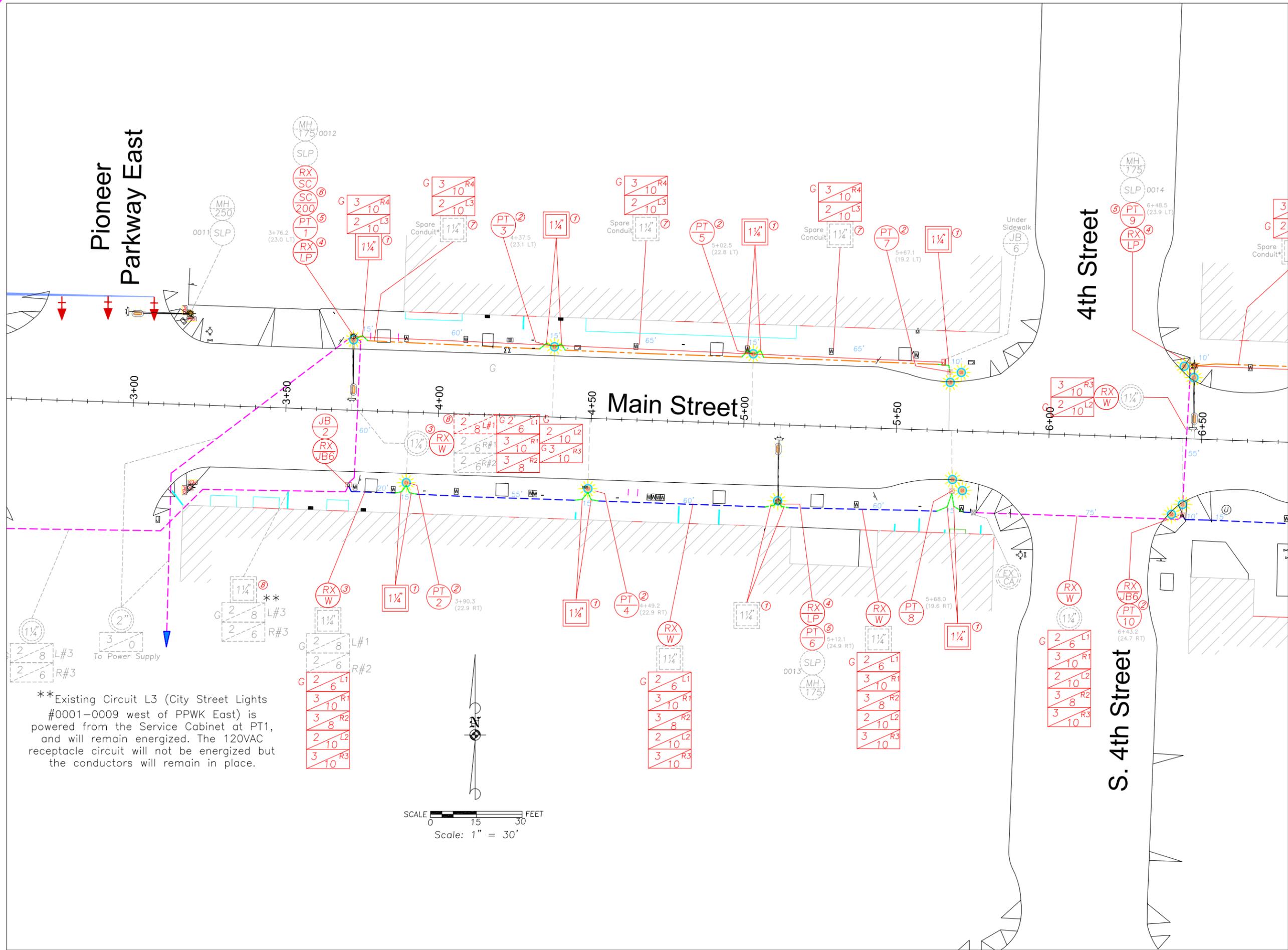
P8000D Dispenser

HIT-RE 500 Epoxy Adhesive

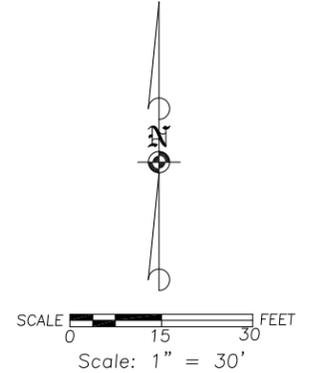
Order information

Description	Package contents	Qty of foil packs
HIT-RE 500 (11.1 fl oz/330 ml)	Includes (1) refill pack and (1) mixer with filler tube	1
HIT-RE 500 MC Master Carton (11.1 fl oz/330 ml)	Includes (25) refill packs and (25) mixer with filler tube	25
HIT-RE 500 (16.9 fl oz/500 ml)	Includes (20) refill packs and (20) mixer with filler tube	20
HIT-RE 500 (47.3 fl oz/1400 ml)	Includes (4) jumbo refill packs and (4) mixer	4

¹ For complete information about Hilti anchors, adhesive anchoring dispensers, drilled hole preparation and other adhesive anchoring accessories, see HIT-HY 200 Anchoring System, Section 3.2.3.5 Ordering Information.



**Existing Circuit L3 (City Street Lights #0001-0009 west of PPWK East) is powered from the Service Cabinet at PT1, and will remain energized. The 120VAC receptacle circuit will not be energized but the conductors will remain in place.



PROJ #	P21101	DATE BY APPR.	
SHEET #	SL1 -6	REVISION	
		NO	1
		SCALE: 1" = 30'	
		DATE: 7/7/14	
		DRAWN BY: DRB	
		DESIGNED BY: DRB	
		CHECKED BY: BFB	
		FILE:	P21101 Downtown Lighting Dean.dwg

ENGINEERS

STAMP

Engineering & Transportation Division Services

Downtown Lighting (Phase 1) P21101 Illumination Plan



NO	REVISION	DATE	BY	APPR.
1		6/14/14	DRB	BRB

SCALE: 1" = 30'

DATE: 7/7/14

DRAWN BY: DRB

DESIGNED BY: DRB

CHECKED BY: BRB

FILE: P21101 Downtown Lighting Dean.dwg

ENGINEERS

STAMP

EXPIRES: 12-31-15



PROJ # P21101

SHEET # SL2-6

Downtown Lighting
(Phase 1) P21101
Illumination Plan

MONTHLY SYSTEM ENERGY UTILIZATION			
CABINET C-100		1767 KWH @ 365 HR./MO.	
ROADWAY DESIGN VALUES**			
LOCATION	AVERAGE MAINTAINED ILLUMINANCE (fc)	UNIFORMITY (AVG/MIN)	
MAIN STREET	1.5	3:1	
MAIN STREET/4th STREET	2.2	3:1	
MAIN STREET/5th STREET	2.5	3:1	
MAIN STREET/6th STREET	2.2	3:1	
SOUTH 5th STREET	1.0	4:1	
6th STREET	0.8	6:1	
ROADWAY ACHIEVED VALUES			
MAIN STREET	2.0-2.4	2.0-3.0:1	
MAIN STREET/4th STREET	2.3	2.3:1	
MAIN STREET/5th STREET	2.2	2.4:1	
MAIN STREET/6th STREET	2.1	2.3:1	
SOUTH 5th STREET	1.3	3.3:1	
6th STREET	2.0	6.7:1	
SIDEWALKS			
	AVG. HORIZONTAL	MIN. VERTICAL	UNIFORMITY
DESIGN	0.7	0.4	4:1
ACHIEVED	0.7-1.2 (.85)	00	1.5-5.0:1 (2.68:1)

** - Design values calculated using 'Visual 2012' photometric lighting program. (Main Street Acad 2.vsl 6/10/2014)

LIGHT POLE TABLE												
POLE NO.	STATION		LUMINAIRE				POLE DATA					
			LAMP (Watts)	LINE VOLT	TYPE	COLOR TEMP	POLE HEIGHT (ft)	BASE TYPE	SHAFT SIZE	Bolt Circle & Orientation	OPTIONS	OPTIONS DESCRIPTION
1	3+76.2 (23.0 LT)	Main St.	100W LED	240V	M-C-III	4000K	12	F-Exist	SL4	18"	SL4-12-45 W/Epoxy Bolts	Steel Pole
2	3+90.3 (22.9 RT)	Main St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
3	4+37.5 (23.1 LT)	Main St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
4	4+49.2 (22.9 RT)	Main St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
5	5+02.5 (22.8 LT)	Main St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
6	5+12.1 (24.9 RT)	Main St.	100W LED	240V	M-C-III	4000K	12	F-Exist	SL4	STD-45	SL4-12-45 W/Epoxy Bolts	Steel Pole
7	5+67.1 (19.2 LT)	Main St.	100W LED	240V	M-C-III	4000K	16	F	SL5	Standard	Lum Arm 2'	XXXXX
			100W LED	240V	M-C-III	4000K					Lum Arm 2'	XXXXX
8	5+68.0 (19.6 RT)	Main St.	100W LED	240V	M-C-III	4000K	16	F	SL5	Standard	Lum Arm 2'	XXXXX
			100W LED	240V	M-C-III	4000K					Lum Arm 2'	XXXXX
9	6+48.5 (23.9 LT)	Main St.	100W LED	240V	M-C-III	4000K	16	F-Exist	SL5	STD-45	Lum Arm 2'	Steel Pole
			100W LED	240V	M-C-III	4000K					Lum Arm 2'	SL5-16-45 W/Epoxy Bolts
10	6+43.2 (24.7 RT)	Main St.	100W LED	240V	M-C-III	4000K	16	F	SL5	Standard	Lum Arm 2'	XXXXX
			100W LED	240V	M-C-III	4000K					Lum Arm 2'	
11	7+30.1 (22.9 LT)	Main St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
12	7+67.7 (24.4 RT)	Main St.	100W LED	240V	M-C-III	4000K	12	F-Exist	SL4	STD-45	SL4-12-45 W/Epoxy Bolts	Steel Pole
13	8+10.2 (23.0 LT)	Main St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
14	8+38.9 (22.8 RT)	Main St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
15	8+92.5 (19.2 LT)	Main St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
16	9+00.1 (19.6 RT)	Main St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
17	10+18.6 (23.0 LT)	Main St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
18	10+18.6 (23.1 RT)	Main St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
19	11+07.4 (24.2 RT)	Main St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
20	11+17.1 (23.1 LT)	Main St.	100W LED	240V	M-C-III	4000K	12	F-Exist	SL4	STD-45	SL4-12-45 W/Epoxy Bolts	Steel Pole
21	11+69.5 (23.0 RT)	Main St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
22	12+06.8 (23.1 LT)	Main St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
23	12+26.4 (18.9 RT)	Main St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
24	3+58.4 (27.0 LT)	S.5th St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
25	3+63.0 (27.8 RT)	S.5th St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
26	2+32.9 (21.8 RT)	6th St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
27	1+86.4 (22.6 LT)	6th St.	100W LED	240V	M-C-III	4000K	12	F	SL4	Standard		
28	1+69.2 (24.1 RT)	6th St.	100W LED	240V	M-C-III	4000K	12		SL4	Standard		
29	1+36.8 (22.3 LT)	6th St.	100W LED	240V	M-C-III	4000K	12	F-Exist	SL4	15"-45	SL4-19-12 W/Epoxy Bolts	Steel Pole

Springfield Downtown Lighting Project 21101
 Requirements Common to all Illumination Poles
 Pole Series: SiteLink
 Base: Wadsworth
 Material: Aluminum
 Tenon Size: P07, P08 on Poles 7-10
 Pole Mounts: ABG
 Color: Black
 Options: R138A (Receptacle Height 138" above Grade,
 0 Degrees orientation from hand hole-CCW)
 FGFUS-SBKH: Receptacle Type Small in Use.

LED = Light-Emitting Diode
 M-C-III = Medium-Cutoff-Type 3 light distribution
 F = Fixed Base
 Exist = Existing

DATE BY APPR.	
DATE BY DRB	6/14/DRB
DATE BY BFB	
NO.	1
SCALE: 1" = 30'	
DATE: 7/7/14	
DRAWN BY: DRB	
DESIGNED BY: DRB	
CHECKED BY: BFB	
FILE:	P21101 Downtown Lighting Dean.dwg

STAMP
ENGINEERS

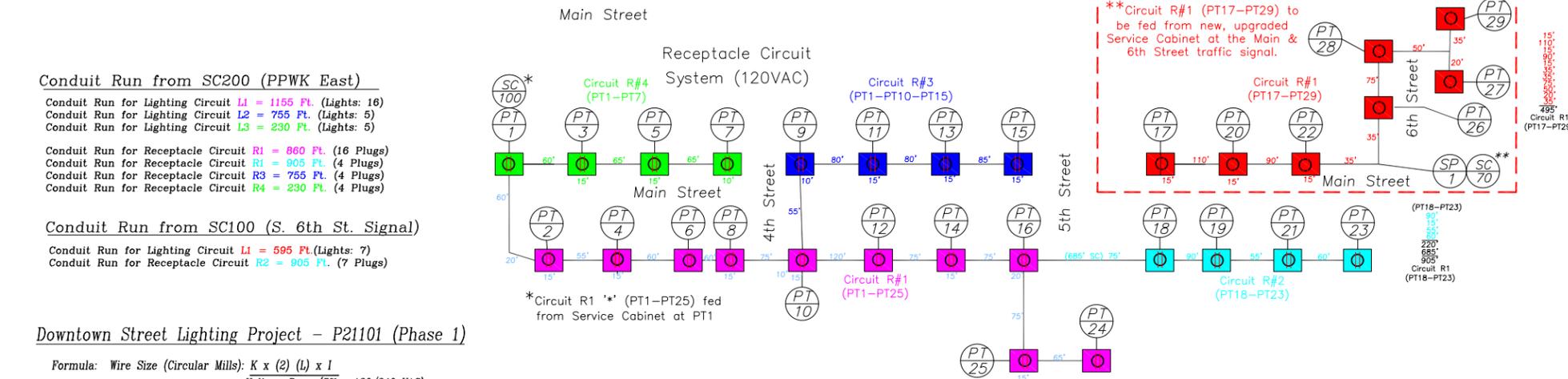
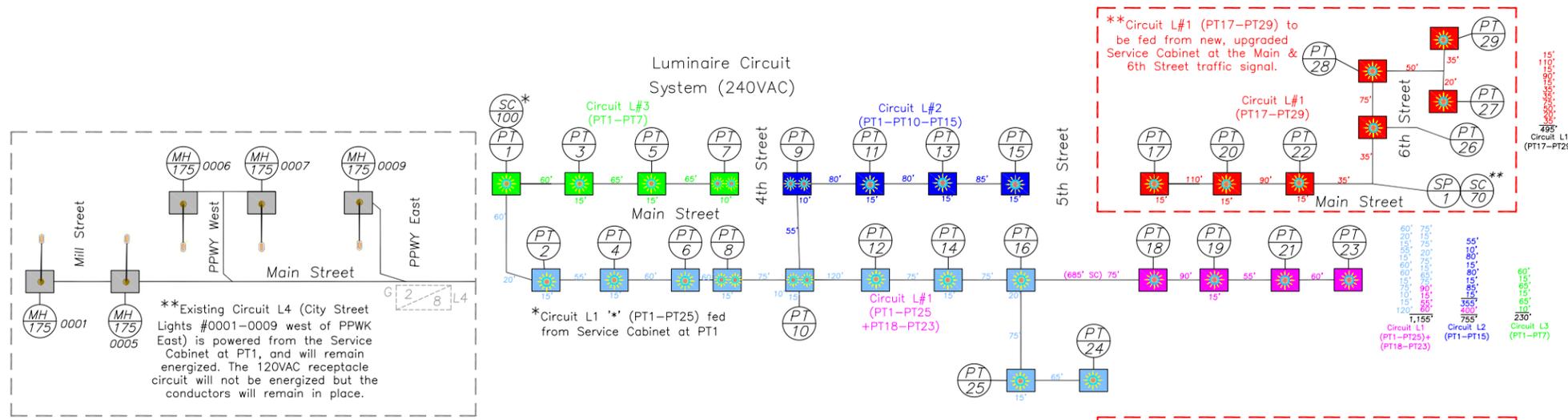


Engineering & Transportation
Division Services



Downtown Lighting
(Phase 1) P21101
Light Pole Table

PROJ #	P21101	SHEET #	SL5-6
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Conduit Run from SC200 (PPWK East)

- Conduit Run for Lighting Circuit L1 = 1155 Ft. (Lights: 16)
- Conduit Run for Lighting Circuit L2 = 755 Ft. (Lights: 5)
- Conduit Run for Lighting Circuit L3 = 230 Ft. (Lights: 5)
- Conduit Run for Receptacle Circuit R1 = 860 Ft. (16 Plugs)
- Conduit Run for Receptacle Circuit R2 = 905 Ft. (4 Plugs)
- Conduit Run for Receptacle Circuit R3 = 755 Ft. (4 Plugs)
- Conduit Run for Receptacle Circuit R4 = 230 Ft. (4 Plugs)

Conduit Run from SC100 (S. 6th St. Signal)

- Conduit Run for Lighting Circuit L1 = 595 Ft. (Lights: 7)
- Conduit Run for Receptacle Circuit R2 = 905 Ft. (7 Plugs)

Downtown Street Lighting Project - P21101 (Phase 1)

Formula: Wire Size (Circular Mills): $K \times (2) (L) \times I$
Voltage Drop (5% x 120/240 VAC)

Street Lighting Calculations: (K (10.4 Copper Wire) x (2) (L) x I Total Starting Amps over 5% Voltage Drop (12) Current: 100 Watt LED Holophane Starting Amps (100w/240V) = 0.53 (0.42 Continuous Amps x 1.25% NEC Factor)

Holophane Washington LED Glass Luminaire Model WSE1004KAS
100 Watt Holophane Washington LED = .53 / 240 VAC

Lumen package	Model (SEE SHOWN AS EXAMPLE)	Volts	Amps	Watts	Hz	Power Factor
100w version	WSE1004KAS	120	0.81	97.2	50/60	0.99
	WSE1004KAS	208	0.48	96.9	50/60	0.99
	WSE1004KAS	240	0.42	97.3	50/60	0.99
100w version	WSE1004KAH	277	0.38	98.3	50/60	0.99
	WSE1004KAH	347	0.27	93.3	50/60	0.99
	WSE1004KAH	480	0.20	93.3	50/60	0.99

K= 10.4 (Constant Value for Copper Wire)
L= Length of Total Wire Circuit Run
I= Starting Amps of Luminaire (Continuous Amps x 1.25)
5% Voltage Drop = 120 VAC - 6 Volts / 240 VAC - 12 Volts

Illumination Circuits L#1-3 (26 Lights)

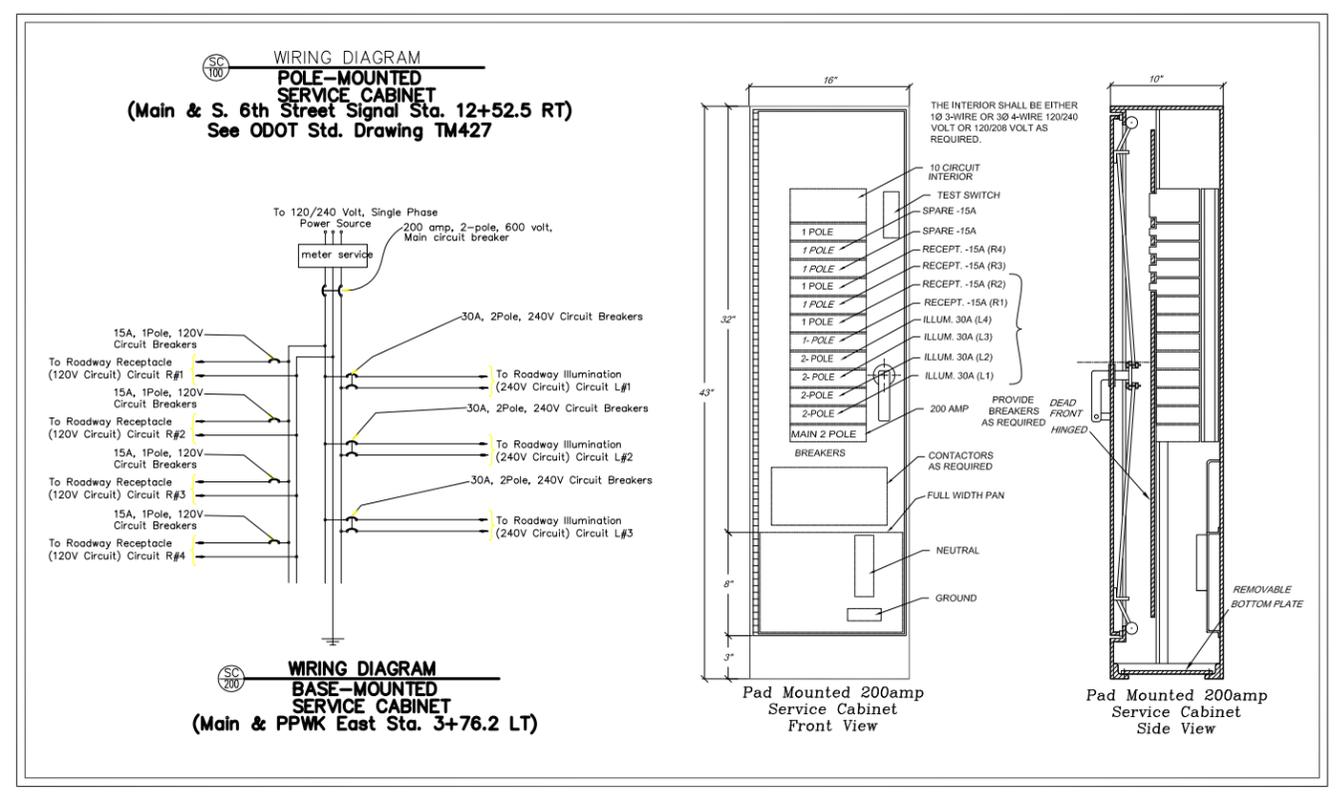
- Circuit L1** : 10.4 x 2310' (1155 x 2) x 0.53 amps x 16 Lights = 203,724 Circular Mills
203,724 / 12.0 (5% x 240 VAC) = 16,976 Circular Mills = 6 AWG Wire (26,240 CM) **2 x #6 Wires**
- Circuit L2** : 10.4 x 1510' (755 x 2) x 0.53 amps x 5 Lights = 41,616 Circular Mills
41,616 / 12.0 (5% x 240 VAC) = 3,468 Circular Mills = 14 AWG Wire (4,110 CM) **2 #10 Wires**
- Circuit L3** : 10.4 x 460' (230 x 2) x 0.53 amps x 5 Lights = 12,678 Circular Mills
12,678 / 12.0 (5% x 240 VAC) = 1,056 Circular Mills = 18 AWG Wire **2 #10 Wires**

Receptacle Circuits R#1-4 (22 Plugs)

- Circuit R1** : 10.4 x 1,720' (860 x 2) x 0.53 amps x 10 Plugs = 94,806 Circular Mills
94,806 / 6.0 (5% x 120 VAC) = 14,801 Circular Mills = 8 AWG Wire (16,510 CM) **3 x #8 Wires**
- Circuit R2** : 10.4 x 1,810' (905 x 2) x 0.53 amps x 4 Plugs = 39,907 Circular Mills
39,907 / 6.0 (5% x 120 VAC) = 6,651 Circular Mills = 10 AWG Wire (10,380 CM) **3 x #10 Wires**
- Circuit R3** : 10.4 x 1,510' (755 x 2) x 0.53 amps x 4 Plugs = 33,293 Circular Mills
33,293 / 6.0 (5% x 120 VAC) = 5,549 Circular Mills = 12 AWG Wire (6,530 CM) **3 x #10 Wires**
- Circuit R4** : 10.4 x 460' (230 x 2) x 0.53 amps x 4 Plugs = 10,142 Circular Mills
10,142 / 6.0 (5% x 120 VAC) = 1,690 Circular Mills = 16 AWG Wire (2,580 CM) **3 #10 Wires**

Illumination/Receptacle Circuits L#1 & R#1 (S. 6th St. Signal Service)

- Circuit L1** : 10.4 x 1190' (595 x 2) x 0.53 amps x 7 Lights = 45,914 Circular Mills
45,914 / 12.0 (5% x 240 VAC) = 3,826 Circular Mills = 14 AWG Wire (4,110 CM) **2 #10 Wires**
- Circuit R1** : 10.4 x 1190' (595 x 2) x 0.53 amps x 7 Plugs = 45,914 Circular Mills
45,914 / 6.0 (5% x 120 VAC) = 7,653 Circular Mills = 10 AWG Wire (10,380 CM) **3 #8 Wires**



NO	REVISION	DATE	BY	APPR.
1		6/14/14	DRB	BFB

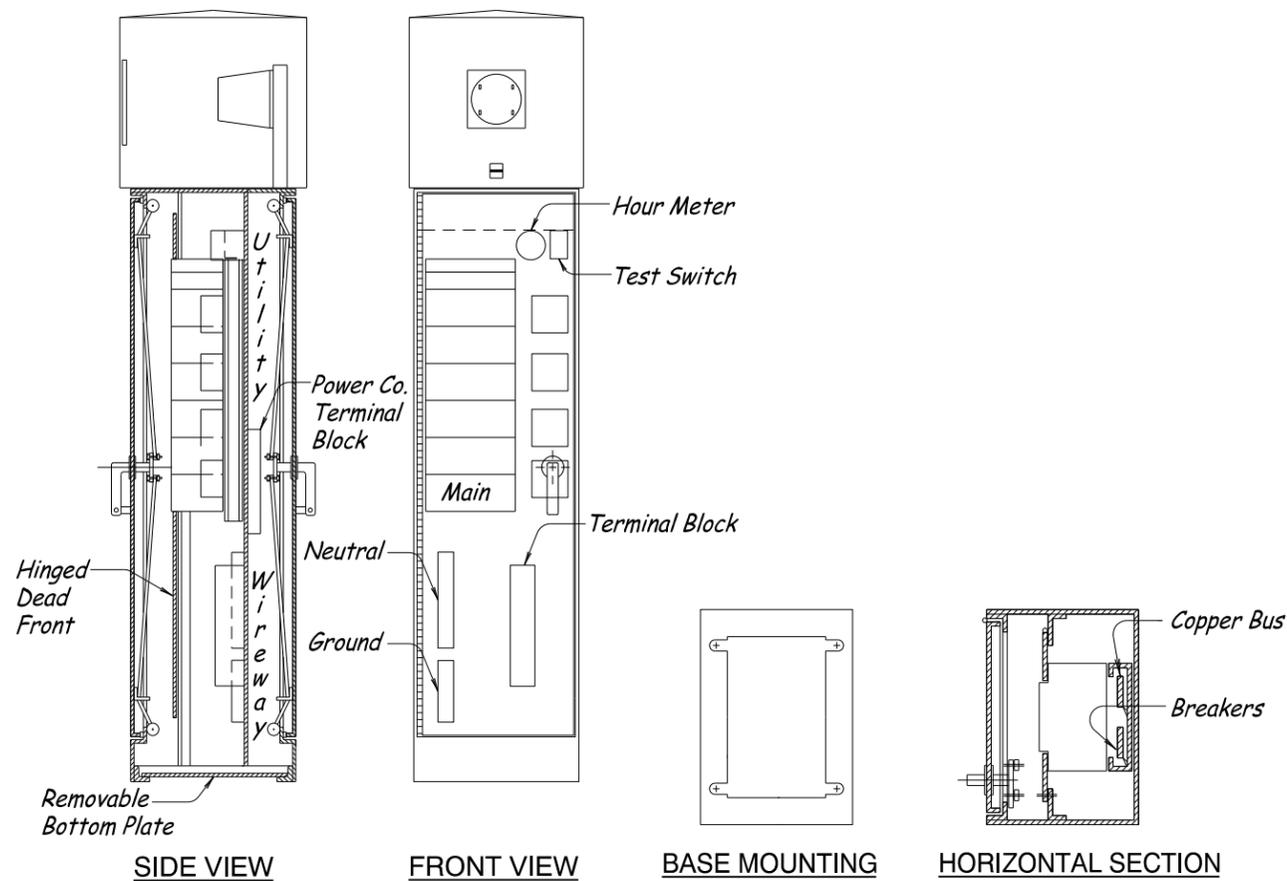
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DESIGNED BY: DRB
CHECKED BY: BFB

FILE: P21101 Downtown Lighting Dean.dwg



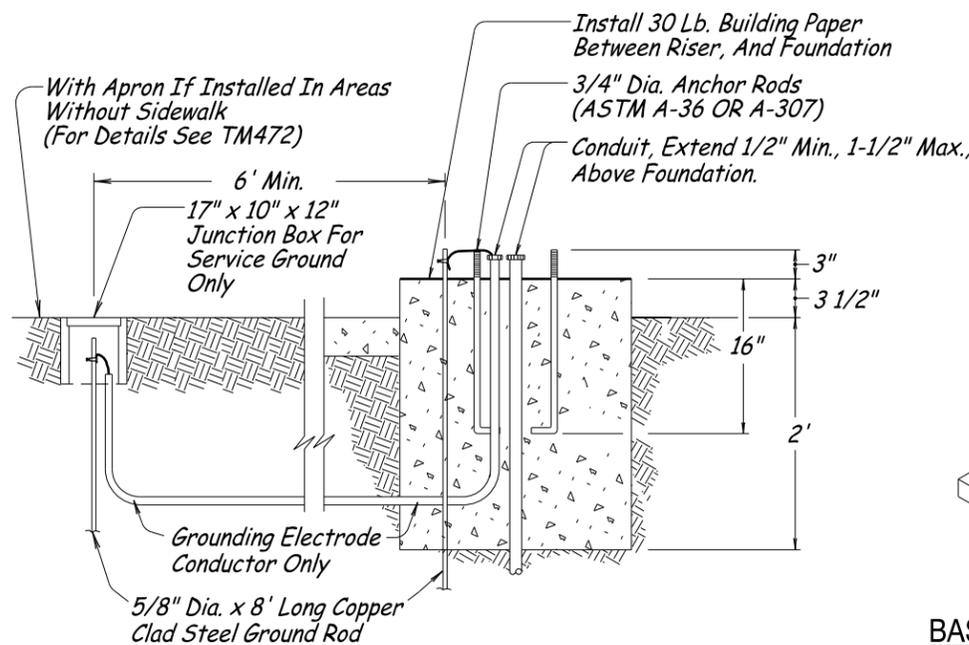
**Downtown Lighting
(Phase 1) P21101
Illumination
Circuits**

PROJ # P21101
SHEET # SL6-6

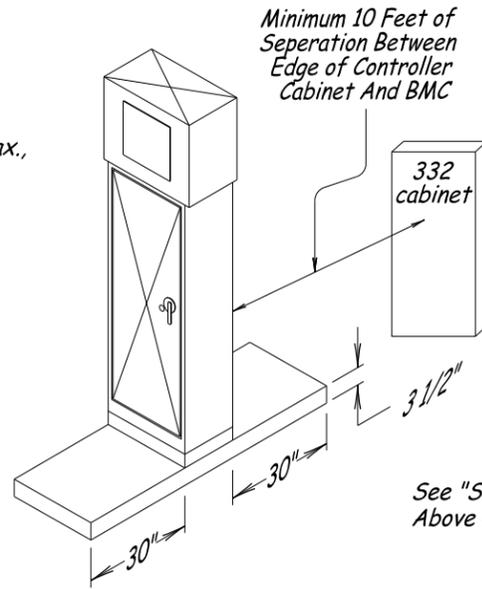


BASE MOUNTED SERVICE & CONTROL CABINET WITH METER

BASE MOUNTED SERVICE & CONTROL CABINET WITHOUT METER

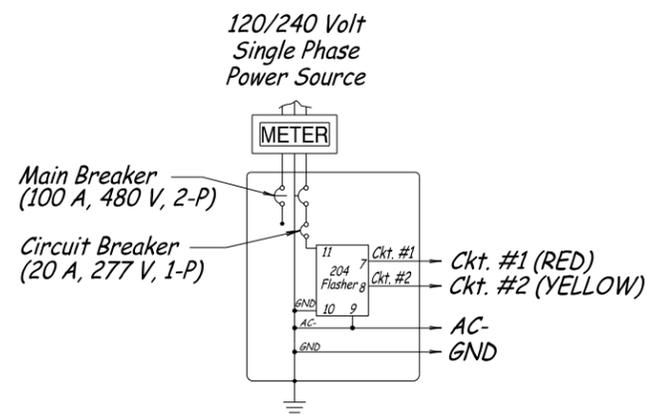


BASE MOUNTED SERVICE & CONTROL CABINET FOUNDATION

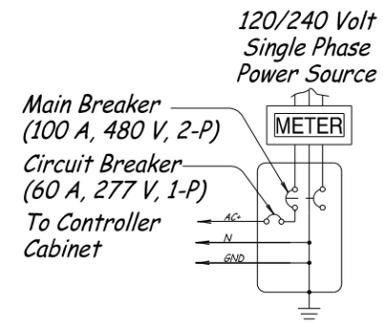


BASE MOUNTED CABINET FOUNDATION WITH LANDINGS

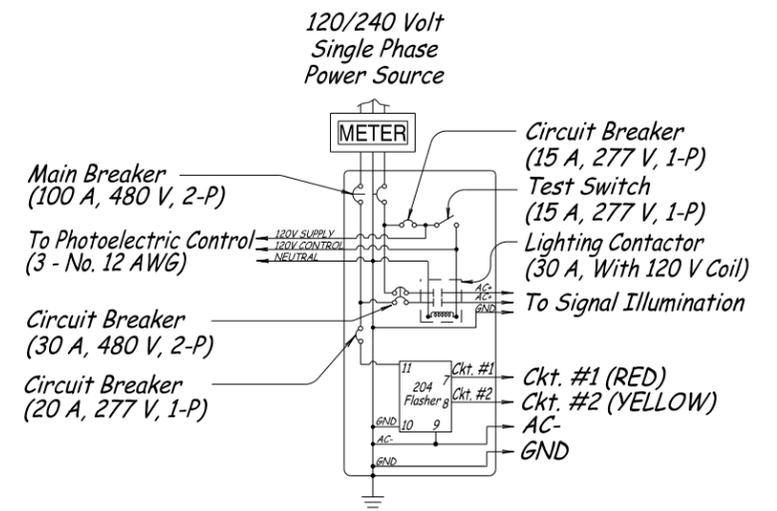
See "SERVICE CABINET WIRING" Details Above Right For Signal And Flasher Wiring



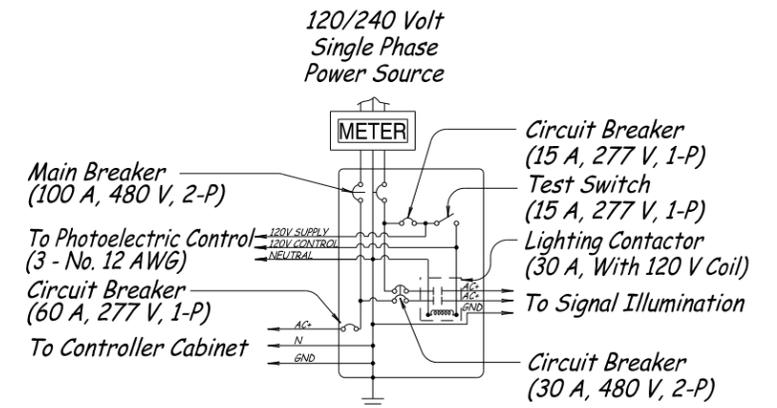
SERVICE CABINET WIRING WITH FLASHER BMCF



SERVICE CABINET WIRING FOR 120/240 VOLT SIGNAL SERVICE BMC



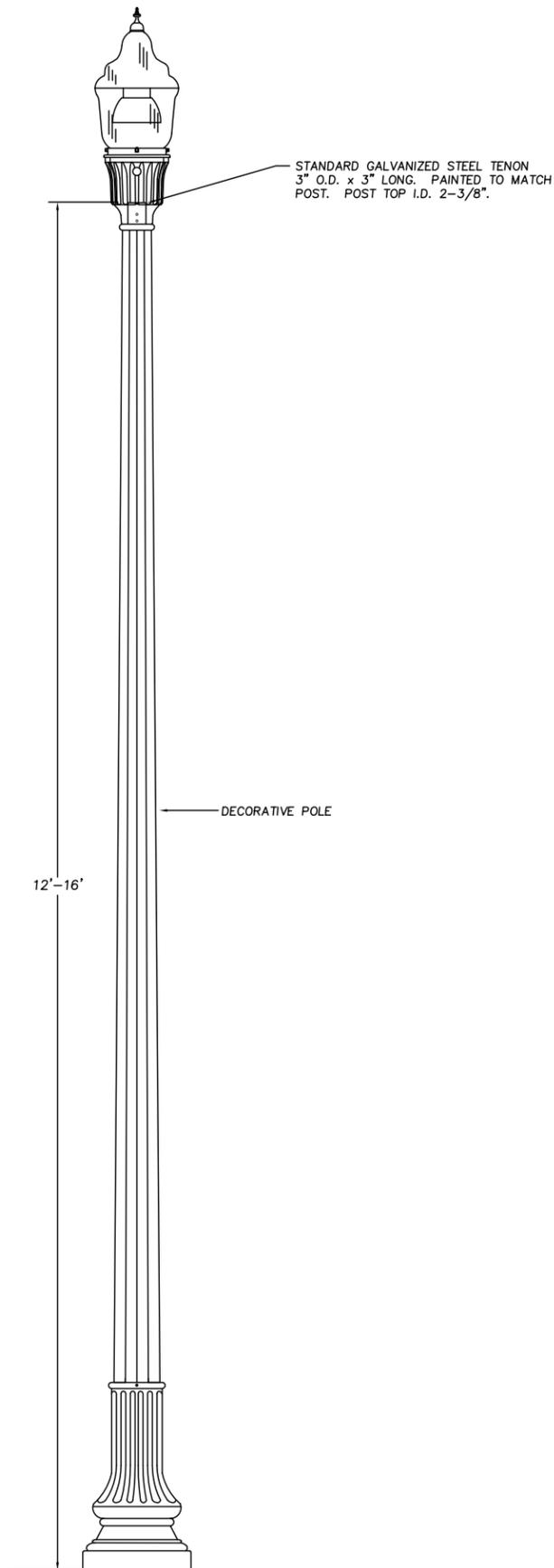
SERVICE CABINET WIRING WITH FLASHER & 240 VOLT ILLUMINATION BMCFL



SERVICE CABINET WIRING WITH 240 VOLT ILLUMINATION BMCL

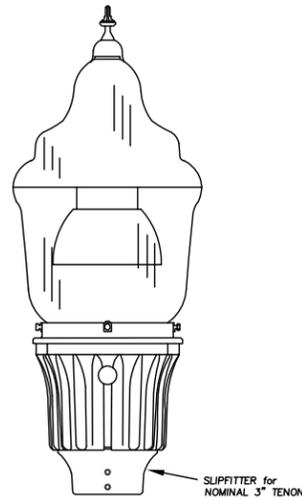
CALC. BOOK NO. <u>N/A</u>	BASLINE REPORT DATE <u>12-31-12</u>
ACCOMPANIED BY BASELINE REPORT	NOTE: All material and workmanship shall be in accordance with the current Oregon Standard Specifications
OREGON STANDARD DRAWINGS SERVICE CABINETS AND SERVICE CABINET WIRING DETAILS 2008	
REVISIONS	
DATE	DESCRIPTION
12 - 2009	CHANGED ANCHOR BOLT TO ANCHOR ROD
06 - 2011	REMOVED 2ND JUNCTION BOX, PUT GROUND ROD IN FOUNDATION
12 - 2011	MINOR TEXT REVISION
12 - 2012	UPDATED SERVICE CABINET WIRING, MINOR TEXT REVISIONS

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

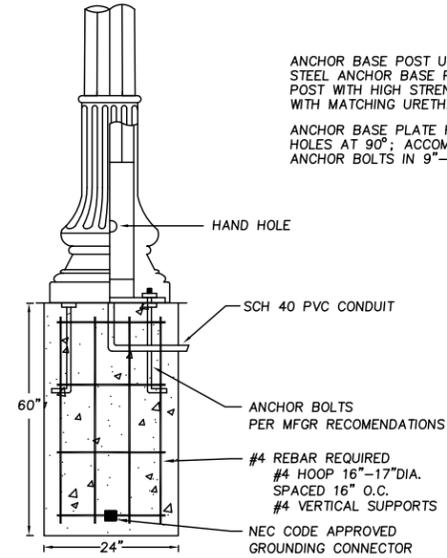


STANDARD GALVANIZED STEEL TENON
3" O.D. x 3" LONG. PAINTED TO MATCH
POST. POST TOP I.D. 2-3/8".

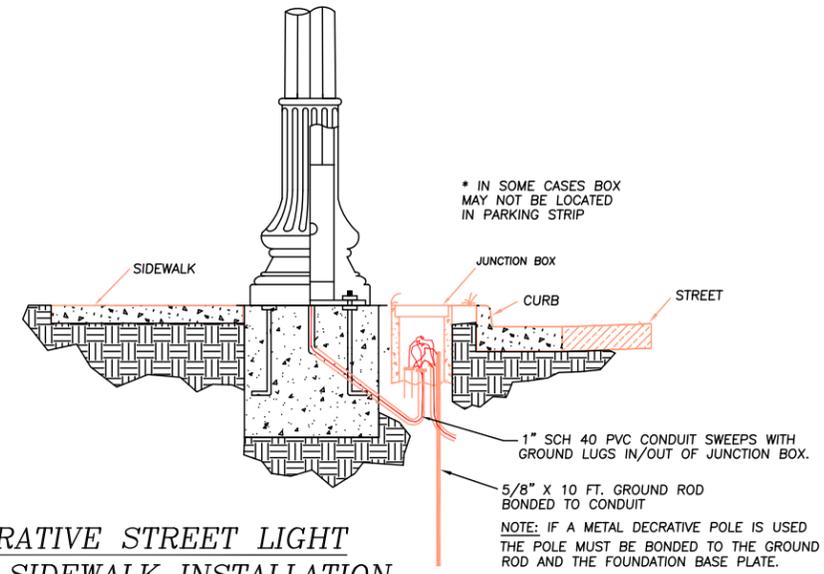
**HOLOPHANE WASHINGTON
LUMINAIRE**



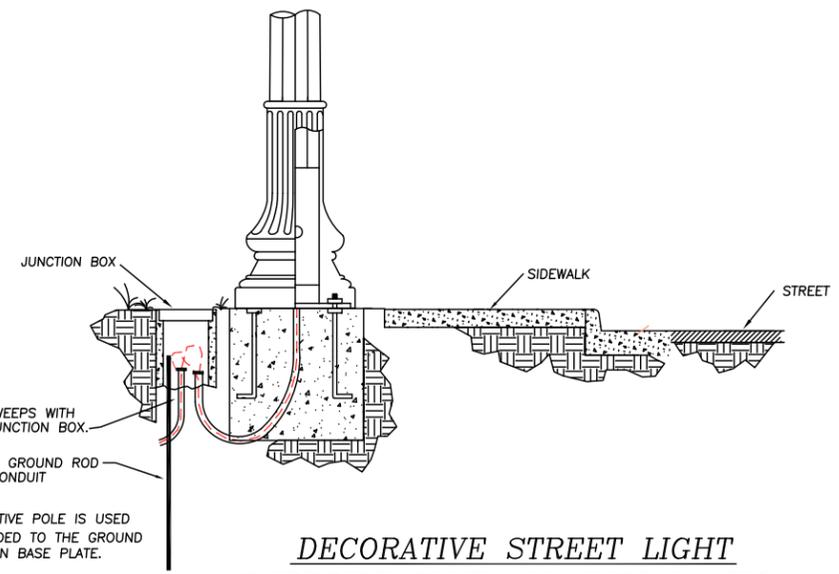
ANCHOR BASE POST USES ELECTRO-GALVANIZED
STEEL ANCHOR BASE PLATE, BONDED TO THE
POST WITH HIGH STRENGTH EPOXY AND COATED
WITH MATCHING URETHANE FINISH.
ANCHOR BASE PLATE HAS FOUR 2" x 1" SLOTTED
HOLES AT 90°; ACCOMMODATES 3/4" x 21" x 3"
ANCHOR BOLTS IN 9"-11" BOLT CIRCLE.



ANCHOR BASE ASSEMBLY



**DECORATIVE STREET LIGHT
SETBACK SIDEWALK INSTALLATION**



**DECORATIVE STREET LIGHT
CURBSIDE SIDEWALK INSTALLATION**

NOTE: DRAWING NOT TO SCALE
ALL EYEBOLTS, BOLTS, NUTS, AND WASHERS SHALL BE GALV.
STEEL UNLESS NOTED OTHERWISE, ALL SET SCREWS SHALL BE
MIN. DIA. 1/4" STAINLESS STEEL WITH ALLEN HEADS.

NO	REVISION	DATE	BY	APPR.
1	STD. DWG. 5-24	4/94	DRB	DRB
2	LUMINAIRE/POLE UPDATE	6/96	DRB	DRB
3	STD. DWG. UPDATE	7/01	D.D.	B.B.
4	S.U.B. UPDATE	10/03	D.D.	B.B.
5	CITY STANDARD UPDATE	6/05	D.D.	B.B.

CITY OF SPRINGFIELD
DEPT. OF PUBLIC WORKS
TRANSPORTATION DIVISION
225 FIFTH STREET
SPRINGFIELD, OR. 97477
(503) 726-3753



DECORATIVE STREET
LIGHT DETAIL

STANDARD
DRAWING
5-24