CITY OF GRAND JUNCTION
DEPARTMENT OF PUBLIC WORKS AND PLANNING
ENGINEERING DIVISION

BID DOCUMENTS

FOR

City of Grand Junction CNG Slow-Fill/Time-Fill Fueling Station Expansion Project

IFB-3893-14-DH

Responses Due:
August 26, 2014 prior to 2:30pm
250 N. 5th Street
City Clerk's Office, Room #111
Grand Junction, CO 81501

CITY OF Grand Junction COLORADO

July, 2014 Book No. ___

CITY OF GRAND JUNCTION
DEPARTMENT OF PUBLIC WORKS AND PLANNING
ENGINEERING DIVISION

BID DOCUMENTS
FOR

City of Grand Junction CNG Slow-Fill/Time-Fill Fueling Station Expansion Project

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BID INFORMATION

INVITATION TO BID

The City of Grand Junction will receive sealed bids at the Office of the City Clerk at City Hall, 250 North Fifth Street, Grand Junction, Colorado, 81501, prior to 2:30 p.m. on August 26, 2014 for City of Grand Junction CNG Slow-Fill/Time-Fill Fueling Station Expansion Project (IFB-3893-14-DH). All bids will be opened and read aloud at the City Auditorium immediately following the submittal deadline. The project generally consists of installation of 10 – time fill dispenser hose drops, a 40 hp compressor, site grading, equipment pads, fencing/barricades, telephone system, associated electrical and gas plumbing, alarm system and associated appurtenances.

Plans, Specifications and other Bid Documents may be reviewed at the Administration Office of the Department of Public Works and Planning at City Hall. Copies thereof may be obtained for a non-refundable sum of $75 per set.

The July 2010 edition of the "City Standard Contract Documents for Capital Improvements Construction" is also available for purchase.

For additional technical information, please contact Bret Guillory, PE, Utility Engineer at the Department of Public Works and Planning (970-244-1590).

For contractual information, please contact Duane Hoff Jr., Senior Buyer (970-244-1545).

An optional site visit/briefing meeting will be held at 1:00 p.m. on August 14, 2014, in the Facilities Conference Room, at 333 West Avenue, Building B, Grand Junction, CO. Attendance at the meeting is mandatory.

The City Clerk's Office will stamp the date and mark the time received on all bids. Bids not received prior to the date and time indicated on the Invitation to Bid will not be considered. The City is not responsible for delays occasioned by the U.S. Postal Service, the internal mail delivery system of the City, or any other means of delivery employed by the Bidder.

Each Bid shall be submitted on a form furnished by the City and must be accompanied by a certified check, cashier's check or Bid Bond in an amount not less than 5% of the amount of the Bid and made payable to the City of Grand Junction, Colorado. The successful Bidder will be required to furnish a Performance Bond and a Labor and Material Payment Bond, both in the amount of 100% of the total Contract amount, in conformity with the requirements of the Contract Documents and on forms provided by the City.

Contractors submitting bids over $50,000 must be prequalified in accordance with the City's "Rules and Procedures for Prequalification of Contractors." Bids received from non-prequalified contractors will not be opened. Application forms for prequalification are available at the Administration Office of the Department of Public Works and Planning (970-256-4126).

Contractors submitting bids shall also supply company information as described in Section 13 of the Instruction to Bidders.

CITY OF GRAND JUNCTION, COLORADO

_____

Duane Hoff Jr., Senior Buyer

Published: The Daily Sentinel - August 3, 2014 and August 6, 2014 and August 10, 2014

INSTRUCTIONS TO BIDDERS

The following instructions are given for the purpose of guiding Bidders in properly preparing their bids and constitute a part of the *Contract Documents* and shall be strictly complied with.

1. Definitions and Terms. See Article I, Section 3 of the General Contract Conditions in the *Standard Contract Documents for Capital Improvements Construction*.

2. Copies of *Bid Documents*. Complete sets of the *Bid Documents* may be reviewed at the Administration Office of the Department of Public Works and Utilities at City Hall, 250 North 5th Street, Grand Junction, Colorado 81501. Copies thereof may be obtained for the non-refundable sum stated in the Invitation to Bid.

   Complete sets of *Bid Documents* shall be used in preparing Bids; neither City nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of *Bid Documents*.

   City and Engineer in making copies of *Bid Documents* available on the above terms do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.

3. Prequalification of Bidders: Contractors submitting bids over $50,000 must be prequalified in accordance with the City's "Rules and Procedures for Prequalification of Contractors." Application forms for prequalification are available at the Administration Office of the Department of Public Works and Utilities. Contractors who are currently prequalified with the Colorado Department of Transportation (CDOT) will meet the requirements for prequalification by the City, unless the City has information or basis to the contrary. Application forms for Contractor prequalification are available at the Administration Office of the Department of Public Works and Utilities, City Hall, 250 North 5th Street, Grand Junction, CO, 81501.

4. Liquidated Damages for Failure to Enter Into Contract. Should the Successful Bidder fail or refuse to enter into the Contract within ten Calendar Days from the issuance of the Notice of Award, the City shall be entitled to collect the amount of such Bidder's Bid Guaranty as Liquidated Damages, not as a penalty but in consideration of the mutual release by the City and the Successful Bidder of all claims arising from the City's issuance of the Notice of Award and the Successful Bidder's failure to enter into the Contract and the costs to award the Contract to any other Bidder, to re-advertise, or otherwise dispose of the Work as the City may determine best serves its interest.

5. Time of Completion. Time is of the essence with respect to the time of completion of the Project and any other milestones or deadline which are part of the Contract. It will be necessary for each Bidder to satisfy the City of its ability to complete the Work within the Contract Time set forth in the Contract Documents.

6. Examination of Contract Documents and Site. Before submitting a Bid, each Bidder shall:

   a. Examine the *Contract Documents* thoroughly;

   b. Visit the site to familiarize itself with local conditions that may in any manner affect cost, progress, or performance of the Work;

   c. Become familiar with federal, state, and local laws, ordinances, rules, and regulations that may in any manner affect cost, progress or performance of the Work;

   d. Study and carefully correlate Bidder's observations with the *Contract Documents*, and;

   e. Notify the Engineer of all conflicts, errors, ambiguities or discrepancies in or among the *Contract Documents*

   On request, the City will provide each Bidder access to the site to conduct such investigations and tests as each Bidder deems necessary for submission of a Bid. It shall be the Bidder's responsibility to make or obtain any additional examinations, investigations, explorations, tests and studies and obtain any additional information and data which pertain to the physical conditions (including without limitation, surface, subsurface and underground utilities) at or contiguous to the site or otherwise which may affect cost, progress or performance of the work and which the Bidder deems necessary to determine its Bid for performing the work in accordance with the time, price and other terms and conditions of the Contract Documents. Location of any excavation or boring made by Bidder shall be subject to prior approval of City and applicable agencies. Bidder shall fill all holes, restore all pavements to match the existing structural section and shall clean up and restore the site to its former condition upon completion of such exploration. The City reserves the right to require the Bidder to execute an access agreement with the City prior to accessing the site.

   The lands upon which the Work is to be performed, rights of way, and access thereto, and other lands designated for use by Contractor in performing the Work, are identified on the Drawings.

   Information and data reflected in the *Contract Documents* with respect to underground utilities at or contiguous to the site are based upon information and data furnished to the City and the Engineer by the owners of such underground utilities or others, and the City does not assume responsibility for the accuracy or completeness thereof, unless it is expressly provided otherwise in the *Contract Documents*.

By submission of a Bid, the Bidder shall be conclusively presumed to represent that the Bidder has complied with every requirement of these Instructions to Bidders, that the *Contract Documents* are not ambiguous and are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.

7. Interpretations. All questions about the meaning or intent of the *Contract Documents* shall be submitted to the Purchasing Supervisor in writing.

   Written comments or questions must be received by the Engineer at least forty-eight (48) hours (excluding Saturdays, Sundays, and Holidays) prior to the time set for Bid Opening.

   If questions received by the Engineer or Purchasing Supervisor are deemed to be sufficiently significant and received sufficiently in advance of the Bid opening, an Addendum to the *Bid Documents* may be issued. Otherwise, a written copy of the question and decision or interpretation will be posted in the Engineer's office. It shall be the responsibility of each Bidder to make itself aware of all such posted questions and decisions or interpretations and, by submitting a Bid, each Bidder shall be conclusively be deemed to have such knowledge. After Bid Opening, all Bidders must abide by the decision of the Engineer as to all such decisions or interpretations. Bidders may not rely upon oral interpretations of the meaning of the plans, specifications or other bid documents and any oral or other interpretations or clarifications will be without legal force or effect.

8. Quantities of Work. Materials or quantities stated as unit price items in the Bid are supplied only to give an indication of the general scope of the Work. The City does not expressly or by implication agree that the actual amount of Work or material will correspond therewith, and reserves the right after award to increase or decrease the quantity of any unit item of the Work without a change in the unit price except as set forth in Article VIII, Section 70 of the *General Contract Conditions*. The City also reserves the right to make changes in the Work (including the right to delete any bid item in its entirety or add additional bid items) as set forth in Article VIII, Sections 69 through 71 of the *General Contract Conditions*.

9. Substitutions. The materials, products and equipment described in the *Bid Documents* shall be regarded as establishing a standard of required performance, function, dimension, appearance, or quality to be met by any proposed substitution. No substitution will be considered prior to receipt of Bids unless the Bidder submits a written request for approval to the Engineer at least ten (10) days prior to the date for receipt of Bids. Such requests for approval shall include the name of the material or equipment for which substitution is sought and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for evaluation, including samples if requested. The Bidder shall set forth changes in other materials, equipment, or other portions of the Work including changes of the work of other contracts, which incorporation of the proposed substitution would require to be included. The Engineer’s decision of approval or disapproval of a proposed substitution shall be final. If the Engineer approves a proposed substitution before receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.

10. Bid Guaranty. Each Bid shall as a guaranty of good faith on the part of the Bidder be accompanied by a Bid Guaranty consisting of: a certified or cashier's check drawn on an approved national bank or trust company in the State of Colorado, and made payable without condition to the City; or a Bid Bond in the form set forth in the *Bid Documents* executed by an approved corporate surety in favor of the City. The amount of the Bid Guaranty shall not be less than 5% of the total Bid amount.

Once the City issues a Notice of Award, the apparent Successful Bidder has ten (10) Calendar Days to enter into a Contract in the form prescribed and to furnish the required Performance and Payment Bonds. Failure to do so will result in forfeiture of the Bid Guaranty to the City as Liquidated Damages.

Bid Guaranties for all except the three lowest qualified Bids shall be returned within five (5) Working Days of Bid Opening. When the Successful Bidder files satisfactory Performance and Payment Bonds and Certificates of Insurance, the Bid Guaranties of the three lowest Bidders shall be returned.

Each bidder shall guaranty its total bid price for a period of sixty-five (65) Calendar Days from the date of the bid opening. Except for forfeiture due to reasons discussed above, Bid Guaranties of all Bidders shall be returned to them within sixty-five (65) Calendar Days from the date of Bid Opening.

11. Bid Form. The Bid Form, provided by the City, must be completed in ink or by typewriter.

The Bidder shall specify a unit price in figures for each pay item for which a quantity is given and shall provide the products (in numbers) of the respective unit prices and quantities in the Extended Amount column. The total Bid price shall be equal to the sum of all extended amount prices. When an item in the Bid Schedule provides a choice to be made by the Bidder, Bidder's choice shall be indicated in accordance with the specifications for that particular item and thereafter no further choice shall be permitted.

Where the unit of a pay item is lump sum, the lump sum amount shall be shown in the "extended amount" column and included in the summation of the total Bid.

All blank spaces in the Bid Form must be properly filled out.

Bids by corporations must be executed in the corporate name by the president or vice president or other corporate office accompanied by evidence of authority to sign. The corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

Bids by partnerships must be executed in the partnership name and signed by a partner whose title must appear under the signature and the official address of the partnership must be shown below the signature.

All names must be typed or printed below the signature.

The Bid shall contain an acknowledgement of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.

The address to which communications regarding the Bid are to be directed must be shown.

12. Irregular Bids. A Bid will be considered irregular and may be rejected for the following reasons:

    a. Submission of the Bid on forms other than those supplied by the City;

    b. Alteration, interlineation, erasure, or partial detachment of any part of the forms which are supplied herein;

    c. Inclusion of unauthorized additions conditional or alternate Bids or irregularities of any kind which may tend to make the Bid incomplete, indefinite, or ambiguous as to its meaning;

    d. Failure to acknowledge receipt of any or all issued Addenda;

    e. Failure to provide a unit price or a lump sum price, as appropriate, for each pay item listed except in the case of authorized alternative pay items;

    f. Failure to list the names of Subcontractors used in the Bid preparation as required in the Bid Form;

    g. Submission of a Bid that in the opinion of the Purchasing Manager is unbalanced so that each item does not reasonably carry its own proportion of cost or which contains inadequate or unreasonable prices for any item;

    h. Tying of the Bid with any other bid or contract; and

    i. Failure to calculate Bid prices as described herein.

13. Submission of Bids. The completed Bid Form and Bid Guaranty shall be submitted at the time and place indicated in the Invitation to Bid and must be in a ten-inch by thirteen-inch opaque sealed envelope marked SEALED BID with the project title and the name and address of the Bidder.

    Each Bidder submitting a sealed bid shall submit a second sealed envelope containing the following information:

    i. Equipment costs for the following items:

        1) Electric Switch Gear and Lighting
        2) Gas Compressor
        3) Gas Dryer/Filtration Unit
        4) Time Fill Assemblies

    ii. Minimum working experience including the following:

1) Five (5) CNG Stations of similar size (up to 500 SCFM) within the past 3 (three) years.
2) List of names and addresses for material suppliers for project being bid.

iii. Buy America Certification

This information shall be supplied at the time the bidder submits their bid for the project; in a ten-inch by thirteen-inch opaque sealed envelope marked MINIMUM WORK EXPERIENCE, EQUIPEMENT COSTS, & BUY AMERICA CERTIFICATION. The envelope shall also display the project title and the bidder name and address.

14. Modification and Withdrawal of Bids Before Opening. Bids may be modified or withdrawn by an appropriate document duly executed and delivered to the place where Bids are to be submitted at any time prior to Bid Opening.

15. Opening of Bids. Bids will be opened and read aloud at the time and place stated in the Invitation to Bid. All Bidders, their representatives, and other interested parties are encouraged to attend the Bid Opening.

Within five (5) Working Days after Bid Opening, all Bids will be tabulated and copies sent to all Bidders. The bid tabulation sheet(s) will be available to the public.

16. Disqualification of Bidders. A Bid will not be accepted from, nor shall a Contract be awarded to, any person, firm, or corporation that is in arrears to the City, upon debt or contract, or that has defaulted, as surety or otherwise, upon any obligation to the City, or that is deemed irresponsible or unreliable.

Bidders may be required to submit satisfactory evidence that they are responsible, have a practical knowledge of the project bid upon and that they have the necessary financial and other resources to complete the proposed Work.

Either of the following reasons, without limitation, shall be considered sufficient to disqualify a Bidder and Bid:

a. More than one Bid is submitted for the same Work from an individual, firm, or corporation under the same or different name; and

b. Evidence of collusion among Bidders. Any participant in such collusion shall not receive recognition as a Bidder for any future work of the City until such participant has been reinstated as a qualified bidder.

17. Withdrawal of Bids After Opening. No Bid may be withdrawn by any bidder for sixty-five (65) Calendar Days after the Bid Opening.

18. Evaluation of Bids and Bidders. The City reserves the right to:
- reject any and all Bids,
- waive any and all informalities,
- negotiate final terms with the Successful Bidder, and
- disregard any and all nonconforming, nonresponsive or conditional Bids.

Discrepancies between words and figures will be resolved in favor of words. Discrepancies between Unit Prices and Extended Prices will be resolved in favor of the Unit Prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. The corrected extensions and totals will be shown in the tabulation of Bids.

The City may consider the qualifications and experience of Subcontractors and other persons and organizations (including those who are to furnish the principal items of material or equipment) proposed for those portions of the work as to which the identity of Subcontractors and other persons and organizations must be submitted. Operating costs, maintenance considerations performance data, and guarantees of materials and equipment may also be considered by the City.

The City will conduct such investigations as deemed necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of the Bidders, proposed Subcontractors and other persons and organizations to do the Work in accordance with the *Contract Documents* to the City's satisfaction within the Contract Time.

The Bidder shall furnish the City all information and data requested by the City to determine the ability of the Bidder to perform the Work. The City reserves the right to reject the Bid if the evidence submitted by, or investigation of such Bidder fails to satisfy the City that such Bidder is properly qualified to carry out the obligations of the Contract and to complete the Work contemplated therein.

By submitting a Bid, each Bidder authorizes the City to perform such investigation of the Bidder as the City deems necessary to establish the responsibility, qualifications and financial ability of the Bidder and, by its signature thereon, authorizes the City to obtain reference information concerning the Bidder and releases the party providing such information and the City from any and all liability to the Bidder as a result of such reference information so provided.

The City reserves the right to reject the Bid of any Bidder who does not pass any evaluation to the City’s satisfaction.

If the Contract is to be awarded, it will be awarded to the Bidder who, by evaluation, the City determines will best meet the City's interests.

The City reserves the right to accept or reject the Work contained in any of the Bid Schedules or alternates, either in whole or in part.

19. Award of Contract. Unless otherwise indicated, a single award will be made for all the bid items in an individual bid schedule. In the event that the Work is contained in more than one Bid Schedule, the City may award Schedules individually or in combination. In the case of two Bid Schedules which are alternative to each other, only one of such alternative Schedules will be awarded. Within forty-five (45) Calendar Days of Bid Opening, the City will issue a Notice of Award to the Successful Bidder which will be accompanied by four (4) unsigned copies of the Contract and the Performance and Payment Bond forms. Within ten (10) Calendar Days thereafter, the Successful Bidder shall sign and deliver four (4) copies of the Contract, Performance Bond, Payment Bond and Certificates of Insurance to the City. Within ten (10) Calendar Days thereafter, the City will deliver two (2) fully executed counterparts of the Contract to the Contractor. No contract shall exist between the Successful Bidder and the City and the Successful Bidder shall have no rights at law or in equity until the Contract has been duly executed by the City.

    The Successful Bidder's failure to sign and submit a Contract and other documents set forth in this Paragraph within the prescribed time shall be just cause of annulment of the award, and forfeiture of the Bid Guaranty. The award of Contract may then be made to the next qualified Bidder in the same manner as previously prescribed.

20. Insurance. The Contractor shall secure and maintain such insurance policies as will provide the coverage and contain other provisions specified in the General Contract Conditions, or as modified in the Special Contract Conditions.

    The Contractor shall file four (4) copies of the policies or Certificates of Insurance acceptable to the City with the Purchasing Supervisor within ten (10) Calendar Days after issuance of the Notice of Award. These Certificates of Insurance shall contain a provision that coverage afforded under the policies shall not be canceled unless at least thirty (30) Calendar Days prior written notice has been given to the City.

21. Sales and Use Taxes. The Contractor and all Subcontractors are required to obtain exemption certificates from the Colorado Department of Revenue for sales and use taxes in accordance with the provisions of the General Contract Conditions. Bids shall reflect this method of accounting for sales and use taxes on materials, fixtures and equipment.

22. Affirmative Action. In executing a Contract with the City, the Contractor agrees to comply with Affirmative Action and Equal Employment Opportunity regulations presented in the General Contract Conditions.

23. Preconstruction Meeting. Prior to the commencement of construction activities, a preconstruction meeting shall be held which shall include the Contractor, representatives of the City, utility companies and others effected by or involved in the project. Attendance by the Contractor is mandatory.

24. Pre-Bid Meeting. See the Special Conditions for details of pre-bid meeting (if any).

BID FORMS

CITY OF GRAND JUNCTION
DEPARTMENT OF PUBLIC WORKS AND PLANNING
ENGINEERING DIVISION

BID FORM
FOR

City of Grand Junction CNG Slow-Fill/Time-Fill Fueling Station Expansion Project

TO: The City of Grand Junction
250 North Fifth Street
Grand Junction, Colorado 81501-2668

The undersigned Bidder, having thoroughly examined the Construction Drawings, Specifications, and other Bid Documents; having investigated the location of, and conditions affecting the proposed work, and being acquainted with and fully understanding the extent and character of the Work covered by this Bid; and all other factors and conditions affecting or which may be affected by the Work:

HEREBY PROPOSES and agrees, if this Bid is accepted, to enter into a Contract with the City on the form included in the *Contract Documents* and to furnish all required materials, tools, equipment, and plant; to perform all necessary labor and superintendence; and to undertake and complete the Work or approved portions thereof, in full accordance with and in conformity with the Construction Drawings, Specifications, and all other Contract Documents hereto attached or by reference made a part hereof, and for the following prices.

BID PRICE & SCHEDULE OF VALUES:

Pricing shall be all inclusive to include, but not be limited to: all labor, equipment, materials, supplies, mobilization, freight/shipping, permits, fees, notices, overhead & profit, etc.

Contractor shall provide a Schedule of Values with a Lump Sum Total Price for successful completion of this project:

Item No.	Description	Total Price
1	All labor, equipment, materials, supplies, mobilization, freight/shipping, permits, fees, notices, overhead & profit, etc. required to successfully complete the project, as per the solicitation documents.	

Total Bid Price Written:

_____

By signing below, the Undersigned agree to comply with all terms and conditions contained herein.

Company: _____

Authorized Signature: _____

Title: _____

The undersigned Bidder hereby agrees to execute the Contract in conformity with this Bid, to have ready and furnish the required Payment and Performance Bonds, executed by a Surety acceptable to the City and provide Certificates of Insurance evidencing the coverage and provisions set forth in Contract within ten (10) Calendar Days of the City's issuance of a Notice of Award.

The _____, a corporation of the State of _____, is hereby proposed as Surety on said Performance and Payment Bonds. If such Surety is not approved by the City, another and satisfactory Surety will be proposed.

Enclosed herewith is a Bid Guaranty as defined in the attached Instructions to Bidders in the amount of _____which Bid Guaranty the undersigned Bidder agrees to be paid to and become the property of the City, as Liquidated Damages and not as a penalty should the Bid be accepted, the Contract Notice of Award issued, and should the Bidder fail or refuse for any reason to enter into the Contract in the form prescribed. The Bidder shall furnish the required Bonds and Insurance Certificates within ten (10) Calendar Days of issuance of the Notice of Award.

The following persons, firms or corporations are interested as joint ventures, partners or otherwise with the undersigned Bidder in this proposal:

Name: _____

Address: _____

Name: _____

Address: _____

If there are no such persons, firms or corporations, please so state in the following space. _____

_____

The undersigned Bidder proposes to subcontract the following portion of Work:

Name & address of Sub-Contractor	Description of work to be performed	% of Contract

The undersigned Bidder acknowledges the right of the City to reject any and all Bids submitted and to waive informalities and irregularities therein in the City's sole discretion.

By submission of the Bid, each Bidder certifies, and in the case of a joint Bid each party thereto certifies as to his own organization, that this Bid has been arrived at independently, without collusion, consultation, communication, or agreement as to any matter relating to this Bid with any other Bidder or with any competitor.

The Work shall be completed within the Contract Time as specified in the Special Conditions.

Bidder hereby acknowledges receipt of Addenda Numbers: ___, ___, ___, ___.

By submission of a Bid, the Bidder shall be conclusively presumed to represent that the Bidder has complied with every requirement of the "Instructions to Bidders".

Bidder, by his signature hereon, hereby authorizes the obtaining of reference information containing the Bidder's qualifications, experience and general ability to perform the work and hereby releases the party providing such information and the City from any and all liability to Bidder as the result of such reference information being provided. Bidder further waives any right to receive copies of information so provided to the City.

Bidder agrees to perform all Work described in the Contract Documents for the unit prices or the lump sum as shown on the Bid Form, and acknowledges that the quantities shown on the Bid Schedule are approximate only and are intended principally to serve as guides for the purpose of comparing and evaluating Bids.

It is further agreed that any quantities of work to be performed at unit prices and material to be furnished may be increased or decreased as may be considered necessary in the opinion of the City, to complete the Work fully as planned and contemplated, and that all quantities of Work, whether increased or decreased, are to be performed at the unit prices set forth in the Bid, except as otherwise provided for in the Contract Documents.

It is further agreed that any lump sum prices may be increased to cover additional work ordered by the City, but not shown on the Plans or required by the Specifications, in accordance with the provisions of the Contract Documents. Similarly, they may be decrease to cover deletions of work so ordered.

By submitting a Bid, the Bidder acknowledges that the bid process is solely intended to serve the public interest in achieving the highest quality of services and goods at the lowest price, and that no right, interest or expectation shall inure to the benefit of the Bidder as the result of any reliance or participation in the process.

The undersigned Bidder further grants to the City the right to award this Contract on the basis of any possible combination of base bids and alternate(s) (if any) that best suit the City's needs.

Dated this _____ day of _____, 20___.

Bidder: _____

Address: _____

_____

Signature: _____

Name printed: _____

Title: _____

If a corporation:

State of incorporation: _____

Attest: _____ (seal)

BID BOND

KNOW ALL MEN BY THESE PRESENTS,

that we, _____ (___ an individual, ___ a partnership, ___ a corporation incorporated in the State of _____) as Principal, and _____ (incorporated in the State of _____) as Surety, are held and firmly bound unto the City of Grand Junction, Colorado, (hereinafter called "City") in the penal sum of _____ _____ dollars ($ _____), lawful money of the United States, for the payment of which sum we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that WHEREAS the Principal has submitted the accompanying Bid dated _____for construction of _____ _____ (the Project) for the City and

WHEREAS, the City has required as a condition for receiving said Bid that the Principal deposit with the City either a cashier's check or a certified check equivalent to not less than five percent of the amount of said Bid or in lieu thereof furnish a Bid Bond for said amount conditioned that in event of a failure to execute the proposed Contract for such construction and to provide the required Performance and Payment Bonds and Insurance Certificates if the Contract be awarded to the Bidder, that said sum be paid immediately to the City as Liquidated Damages and not as a penalty for the Principal's failure to perform.

NOW, THEREFORE, if the Principal shall, within the period specified therefore, on the attached prescribed forms presented to the Bidder for signature, enter into a written Contract with the City in accordance with said Bid as accepted, and give Performance and Payment Bonds with good and sufficient Surety, or Sureties, as may be required upon the forms prescribed by the City, for the faithful performance and the proper fulfillment of said Contract, provide Certificates of Insurance as required by said Contract, and provide all other information and documentation required by the Contract Documents, then this obligation shall be void and of no effect, otherwise to remain in full force and effect. In the event suit is brought upon this bond by the City and the City prevails, the principal and surety shall pay all costs incurred by the City in such suit, including reasonable attorneys' fees and costs to be fixed by the Court.

IN WITNESS WHEREOF, the above bound parties have executed this instrument under their several seals the name and corporate seal of each corporate party being hereto affixed and duly signed by its undersigned representative pursuant to authority of its governing board.

Dated this _____ day of _____, 20___.

Principal: _____

Address: _____

_____

Signed: _____ (seal)

Title: _____

Surety: _____

Address: _____

_____

Signed: _____ (seal)

Title: _____

INSTRUCTIONS FOR COMPLETING BID BOND

1. The full legal name and residence of each individual executing this Bond as Principal must be inserted in the first paragraph.

2. If the Principal is a partnership, the full name of the partnership and all individuals must be inserted in the first paragraph which must recite that individuals are partners composing the partnership, and all partners must execute the Bond as individuals.

3. The State of incorporation of each corporate Principal or Surety to the Bond must be inserted in the first paragraph and the Bond must be executed under the corporate seal of said party attested by its secretary or other appropriate officer.

4. Attach a copy of the power-of-attorney for the Surety's agent.

SPECIAL CONDITIONS

CITY OF GRAND JUNCTION
DEPARTMENT OF PUBLIC WORKS AND PLANNING
ENGINEERING DIVISION

City of Grand Junction CNG Slow-Fill/Time-Fill Fueling Station Expansion Project

SPECIAL CONDITIONS

The performance of the Work for this Project shall conform to the General Contract conditions presented in the City of Grand Junction's *Standard Contract Documents for Capital Improvements Construction,* March 2010, except as specifically modified or supplemented herein or on the Construction Drawings.

SC-1 **Project Description:** The project generally consists of the installation of, 10 – time fill dispenser hose drops, site grading, equipment pads, fencing/barricades, telephone system, associated electrical and gas plumbing, alarm system and associated appurtenances.

SC-2 **Project Engineer:** The Project Engineer for the Project is Bret Guillory, who can be reached at (970) 244-1590 All notices, letters, submittals, and other communications directed to the City shall be addressed and mailed or delivered to:

City of Grand Junction
Department of Public Works and Planning
Attn: Bret Guillory PE, Utility Engineer
250 North Fifth Street
Grand Junction, CO 81501

SC-3 **Optional Site Visit/Briefing Meeting:**
There will be a Site Visit/Briefing meeting for this project. The site visit/briefing meeting is **optional** and will be held at 1:00 p.m. on Thursday, August 14, 2014, at the City Facilities Conference Room, 333 West Avenue, Building B, Grand Junction, CO.

SC-4 **Affirmative Action:** The Contractor is not required to submit a written Affirmative Action Program for the Project.

SC-5 **Time of Completion:** The scheduled time of Completion for the Project is **60 Calendar Days** from the starting date specified in the Notice to Proceed. The 60 calendar days does not include product/equipment ordering lead time.

Completion is achieved when site clean-up and all punch list items (resulting from the final inspection) have been completed. Completion shall have the meaning set forth in Article I, Section 3 (Definitions and Terms) of the General Contract Conditions.

The anticipated schedule for the Project is as follows:

Invitation For Bids Available	August 1, 2014
Site Visit/Briefing	August 14, 2014
Inquiry Deadline, no questions after this date	August 18, 2014
Final Addendum Posted	August 20, 2014
Submittal Deadline for Bids	August 26, 2014
City Council approval:	September 17, 2014
Notice of Award:	September 18, 2014
Contractor delivers Contract, Bond and Insurance Cert.	September 26, 2014
Notice to Proceed (dated for September 16, 2014)	September 26, 2014
Preconstruction meeting:	September 29, 2014
Begin work:	September 30, 2014
Final Completion:	60 Calendar Days from starting date specified in Notice to Proceed (reference Section SC-5)

- City observed holidays during construction period:
  Veterans Day — November 11, 2014

SC-6 Liquidated Damages:

If the Contractor does not achieve Final Completion by the required date, whether by neglect, refusal or any other reason, the parties agree and stipulate that the Contractor shall pay liquidated damages to the City for each such day that final completion is late. As provided elsewhere, this provision does not apply for delays caused by the City. The date for Final Completion may be extended in writing by the Owner.

The Contractor agrees that as a part of the consideration for the City's awarding of this Contract liquidated damages in the daily amount of **$500.00** is reasonable and necessary to pay for the actual damages resulting from such delay. The parties agree that the real costs and injury to the City for such delay include hard to quantify items such as: additional engineering, inspection and oversight by the City and its agents; additional contract administration; inability to apply the efforts of those employees to the other work of the City; perceived inefficiency of the City; citizens having to deal with the construction and the Work, rather than having the benefit of a completed Work, on time; inconvenience to the public; loss of reputation and community standing for the City during times when such things are very important and very difficult to maintain.

The Contractor must complete the Work and achieve final completion included under the Bid Schedule in the number of consecutive calendar days after the City gives is written Notice to Proceed. When the Contractor considers the entire Work ready for its intended use, Contractor shall certify in writing that the Work is substantially complete. In addition to the Work being substantially complete, Final Completion date is the date by which the Contractor shall have fully completed all clean-up, and all items that were identified by the City in the inspection for final completion. Unless otherwise stated in the Special Conditions, for purposes of this liquidated damages clause, the Work shall

not be finished and the Contract time shall continue to accrue until the City gives its written Final Acceptance.

If the Contractor shall fail to pay said liquidated damages promptly upon demand thereof after having failed to achieve Final Completion on time, the City shall first look to any retainage or other funds from which to pay said liquidated damages; if retainage or other liquid funds are not available to pay said liquidated damages amounts, the Surety on the Contractor's Performance Bond and Payment Bond shall pay such liquidated damages. In addition, the City may withhold all, or any part of, such liquidated damages from any payment otherwise due the Contractor.

Liquidated damages as provided do not include any sums to reimburse the City for extra costs which the City may become obligated to pay on other contracts which were delayed or extended because of the Contractor's failure to complete the Work within the Contract Time. Should the City incur additional costs because of delays or extensions to other contracts resulting from the Contractor's failure of timely performance, the Contractor agrees to pay these costs that the City incurs because of the Contractor's delay, and these payments are separate from and in addition to any liquidated damages.

The Contractor agrees that the City may use its own forces or hire other parties to obtain Substantial or Final Completion of the work if the time of completion has elapsed and the Contractor is not diligently pursuing completion. In addition to the Liquidated Damages provided for, the Contractor agrees to reimburse the City for all expenses thus incurred.

SC-7 **Working Days and Hours:** The working days and hours shall be as stated in the General Contract Conditions, Section VI, or as mutually agreed upon in the preconstruction meeting.

SC-8 **Permits:**

The following permits are required for the Project and will be obtained by the City at no cost to the Contractor:

- *None*

The following permits are required for the Project and shall be obtained and paid for by the Contractor, with the costs included in the total bid price for the Project:

- Mesa County Building Permit

SC-9 **Insurance Limits:** The minimum insurance limits for the Project are as stated in the General Contract Conditions.

SC-10 **City Furnished Materials:** The City will furnish the following materials for the Project:

AutoCAD site drawings, if necessary, for survey stake-out

SC-11 **Project Newsletters:** Project news letters will not be required for this project.

SC-12 **Project Sign:** Project signs, if any, will be furnished and installed by the City.

SC-13 **Authorized Representatives of the City:** Those authorized to represent the City shall include engineers and inspectors employed by the City, only.

SC-14 **Uranium Mill Tailings:** It is anticipated that radioactive mill tailings will not be encountered on this project.

SC-15 **Fugitive Petroleum or Other Contamination:** It is anticipated that soil contamination from fugitive petroleum or other contaminants will not be encountered with the Project.

SC-16 **Traffic Control:** The Contractor shall provide and maintain traffic control in accordance with the approved Traffic Control Plan and the *Manual on Uniform Traffic Control Devices*.

SC-17 **Work Location Schedules:**

1. The Contractor will be allowed to work on any day with exception of weekends or City observed holidays.

SC-18 **Stormwater Management Plan:**

Existing curbside storm drain inlet basins are located along the Riverside Parkway, each inlet that may receive storm water runoff from the disturbed site shall receive stormwater protection in the form of a "Silt Sack" or "Filter Sock" before digging in the area begins. The inlet basin stormwater protection devices shall remain in place until the Contractor has completed the site work operations and the street has been swept clean. The Contractor shall also be responsible for maintaining the inlet basin protection device throughout construction and periodically inspecting the inlet basin protection device during construction. In addition, after every rainfall and/or snowmelt event the Contractor shall inspect all inlet basin protection devices on the project. The Contractor shall be responsible for either cleaning or replacing the inlet basin protection device when the capacity of the protection device has reached 50% of its full capacity. The Contractor shall take into account the associated maintenance cost in the specific pay item.

Street sweeping shall be periodically completed in the traffic lanes where material from the construction site has been tracked by vehicles. The street sweeping machine shall be capable of both sweeping and vacuuming up the roadway dirt. A machine that only sweeps will not be accepted and will not be paid for. The Contractor shall submit for approval a description of the street cleaning machine to be used prior to cleaning the street. Street sweeping will be paid for by the hour as shown in the Bid Schedule.

The Contractor shall provide an acceptable method of mitigating sediment transport from excavation spoil piles in the event of a rainstorm and/or snow melt event.

All vehicle and equipment maintenance and fueling shall be performed in a designated area within the construction area that will not interfere with roadway traffic operations unless traffic control is provided. The fueling area shall exhibit Best

Management Practices in order to minimize and/or eliminate the potential of fuel spillage. Any spillage of fuel onto the ground shall be immediately cleaned up and any contaminated soil disposed of properly at the Mesa County Landfill. Documentation of spills, leaks and overflows that result in the discharge of pollutants, including logging and reporting of the spill is required to the Water Quality Control Division at their toll-free 24-hour environmental emergency spill reporting line – 1-877-518-5608.

The Contractor shall clear the site of all on-site waste daily, including scrap from construction materials.

Concrete trucks will be required to wash out in a portable concrete washout pool supplied by the Contractor or the concrete truck can wait to washout back at the concrete batching facility. The Contractor will be responsible for maintaining the washout pool. The washout pool shall be cleaned out and/or replaced when the washout pool reaches 50% of total capacity. The concrete washout pool needs to be dynamic and durable in its ability to be moved with the progress of construction.

The Contractor shall clear the site of all trash and litter daily. Portable toilets will be maintained (cleaned and emptied) by a local supplier.

SC-19 **Construction Equipment Storage:**
During construction the Contractor will be allowed to store construction equipment and/or construction materials within the fenced area adjacent to the site.

SC-20 **Schedule of Submittals:**
The Contractor shall provide these specific submittals at the preconstruction meeting:

- Hourly rate table for labor and equipment to be used on this project.
- Construction Schedule
- Equipment – Electric Switch Gear, Lighting, Gas Meter, Time Fill Assemblies.
- Fittings/connectors
- Electrical Panel
- Concrete Washout Facility
- Base course gradation, Proctor Curve (Class 6)
- Concrete mix design, Class B

SC-21 **Discrepancy between Bid Schedule and Construction Notes:** In the event of a discrepancy between a Pay Item description in the Bid Schedule and the description for the same Pay Item in the drawings/construction notes; the language in the Bid Schedule shall govern or supersede that found elsewhere.

SC-22 **Existing Utilities and Structures:** The location of existing utilities and structures shown on the Plans are approximate. It is the responsibility of the Contractor to locate and protect all structures and utilities in accordance with General Contract Condition Section 37. The Contractor shall coordinate with the utility companies any necessary relocation of utilities and schedule his work accordingly.

SC-23 **Incidental Items:** Any item of work not specifically identified or paid for directly, but which is necessary for the satisfactory completion of any paid items of work, will be considered as incidental to those items, and will be included in the cost of those items.

SC-24 **Pricing:** Pricing shall be all inclusive to include, but not be limited to: all labor, equipment, materials, supplies, mobilization, freight/shipping, permits, fees, notices, overhead & profit, etc. **Contractor shall provide a Schedule of Values with a Lump Sum Total Price for successful completion of this project.**

SC-25 **Freight/Shipping:** All freight/shipping shall be F.O.B. Destination – Freight Pre-Paid and Allowed to 333 West Avenue, Building C, Grand Junction, CO 81501.

SC-26 **Warranty:** Contractor shall provide a minimum 1 year Contractors warranty.

SC-26 **Project Experience/References:** Bidder shall provide a minimum of five (5) projects/references with their names, addresses, phone numbers, and e-mail addresses (to include detailed project descriptions) that can attest to your experience in projects of similar scope and size.

SPECIAL PROVISIONS

CITY OF GRAND JUNCTION
DEPARTMENT OF PUBLIC WORKS AND PLANNING
ENGINEERING DIVISION

City of Grand Junction CNG Slow-Fill/Time-Fill Fueling Station Expansion Project
SPECIAL PROVISIONS

GENERAL:

The descriptions of the pay items listed in the Bid Schedule for this Project may not agree with those listed in the Standard Specifications. Payment for all Work performed, as required in the Contract Documents, will be in accordance with the items and units listed in the Bid Schedule.

STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION:

The ***City of Grand Junction Standard Specifications for Road and Bridge Construction*** are hereby modified or supplemented for this Project by the following modifications to ***The Standard Specifications for Road and Bridge Construction***, State Department of Highways, Division of Highways, State of Colorado:

SP-1 TIME FILL POSTS

General:
Materials for the Time Fill Posts shall be as described in Section 2.4 of the Technical Specifications included in Appendix B, and appropriate plan sheets.

Method of Measurement – By Each

Basis for Payment - Includes all work and materials needed for installation of the time fill posts, hose breakaways, twin-hose assembly, fueling nozzle, isolation and bleed valves, and system connections, required to provide a complete working unit as described in the, Standard Contract Documents, Technical Specifications, and Project Plan Set.

SP-2 REMOTE SYSTEM NOTIFICATION

General:
Materials for the Remote System Notification shall be as described in Section 2.5 of the Technical Specifications included in Appendix B, and appropriate plan sheets.

Method of Measurement – By Lump Sum

Basis for Payment - Includes all work and materials needed for installation of the auto dialer to allow remote notification of station shutdowns as described in the Standard Contract Documents, Technical Specifications, and Project Plan Set.

SP-3 INSTRUMENTATION & CONTROLS, PIPING / TUBING

Clarification:
Instrumentation and Controls, Piping / Tubing materials that are needed for various equipment shall conform to sections 2.6 and 2.7 of the Technical Specifications included in Appendix B, and as identified on appropriate Plan Sheets.

Method of Measurement – There will be no separate measurement for these items.

Basis for Payment - There will be no separate payment for these items. Payment shall be included in the other bid schedule items as applicable.

SP-4 COMPRESSION UNIT

General:
Materials for the Natural Gas Compression Unit shall be as described in Section 2.2 of the Technical Specifications included in Appendix B, and appropriate plan sheets.

Method of Measurement – By Lump Sum

Basis for Payment - Includes all work and materials needed for installation of the natural gas compression unit, electric motors, system connections, required to provide a complete working unit as described in the Standard Contract Documents, Technical Specifications, and Project Plan Set.

SP-5 METHANE DETECTION SYSTEM

General:
Materials for the Methane Detection System shall be as described in Section 16700 of the Technical Specifications included in Appendix B, and appropriate Plan Sheets.

Method of Measurement – By Lump Sum

Basis for Payment - Includes all work and materials needed for installation of the Methane Detection System for both the time fill station and shop bay upgrades to allow control of electrical components, and remote notification of station shutdowns as described or shown in the Standard Contract Documents, Technical Specifications, and Project Plan Set.

SP-6 SITE WORK

General:
Materials for the site work shall be as described on the Plan Sheets and shall meet all requirements of the Mesa County Building Code, City of Grand Junction Standard Contract Documents, Technical Specifications included in Appendix B, and appropriate Plan Sheets.

Method of Measurement – By Lump Sum

Basis for Payment - Includes all work and materials needed for grading, concrete flat work, fencing, barricades, bollards, gates, light poles & luminaires, motion lights, outlets, conduits, distribution gear, electrical panels, described or shown in the Standard Contract Documents, Technical Specifications, and Project Plan Set.

STANDARD SPECIFICATIONS FOR CONSTRUCTION OF WATER LINES, SANITARY SEWERS, STORM DRAINS, UNDERDRAINS AND IRRIGATION SYSTEMS

The City of Grand Junction ***Standard Specifications for Construction of Water Lines, Sanitary Sewers, Storm Drains, Underdrains and Irrigation Systems*** are hereby modified for this Project as follows:

No Change

Appendix A
Project Submittal Form

PROJECT SUBMITTAL FORM

PROJECT: City of Grand Junction CNG Slow-Fill/Time-Fill Fueling Station Expansion Project

CONTRACTOR:

Project Engineer: Bret Guillory

Description	Date Received	Re-submittal Requested	Re-submittal Received	Date Accepted
SITE CONSTRUCTION				
Base course gradation, Proctor curve (Class 6)				
Concrete mix design, Class B				
METERING & FILL STATION CONSTRUCTION				
Gas Filtration Unit				
Gas Compressor Unit				
Gas Meter				
Gas Dispensing Equipment				
Bill of Materials				
Gas Detection Control System				
Overhead & Man Doors				
Motors/ Operators for Overhead Door				
Conduit materials (all sizes)				
EROSION CONTROL / STORMWATER MANAGEMENT				
Inlet Basin Protection				
Concrete Washout				

PERMITS, PLANS, OTHER				
Mesa County Building Permit				

Appendix B
Technical Specifications & Site Photographs

DIVISION 2 – SITE WORK SECTION

02110 – SITE CLEARING

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK:

A. Extent of site is shown on drawings.

B. Site clearing work includes:

1. Demolition of existing paving, walks and curbs as required.

2. Removal of concrete, as required.

3. Removal of vegetation as required.

4. Clearing and grubbing.

5. Removal of all debris.

C. In general, remove all existing objects, except those designated to remain or to be relocated, described in the Drawings and in this Section of the Specifications.

D. Dispose of all debris in a legal manner.

E. Excavation, grading and filling are specified in Section 02210- Earthwork.

1.2 JOB CONDITIONS:

A. Traffic: Conduct site clearing operations to ensure minimum interference with driveways, walks, and other adjacent occupied or used facilities. Do not close or obstruct driveways, walks, or other occupied or used facilities without permission from the Owner.

B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.

C. Restore damaged improvements to their original condition, as acceptable to Owner.

1.3 DESIGNATED DISPOSAL AREAS

A. All waste materials resulting from the process of clearing and construction shall be disposed of as follows:

1. All refuse and debris, combustible and incombustible, resulting from the processes of construction, shall be removed from the Owner's property. The Contractor shall not use any refuse container belonging to Owner.

B. Do not burn or bury rubbish or waste materials on the Owner's premises.

C. During construction, maintain property free from accumulations of waste materials and rubbish. Dispose of such waste, rubbish and debris at reasonable intervals off the Owner's Property.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 SITE INSPECTION:

A. Prior to all work of this section, carefully inspect the entire site and designate all objects to be removed and to be preserved. Call the local one-call underground alert service prior to any excavation.

B. Locate all existing utility lines traversing the site and determine the requirements for their protection and/or relocation.

C. Notify Owner's Representative of all intended work.

3.2 CLARIFICATION

A. The drawings provided by Owner do not show all objects existing on the site.

B. Before commencing the work of this section, verify with the Owner's Representative all objects to be removed and all objects to be preserved, including trees, if any.

3.3 DUST PALLIATION

A. Keep work wetted to minimize dust. Provide hoses and water main or hydrant connections for this purpose.

3.4 PROTECTION OF UTILITIES:

A. Utilities to be preserved or relocated shall be in operating condition after preserving or relocating.

3.5 SITE CLEARING:

A. General: Coordinate with Owner's Representative prior to removal of obstructions interfering with installation of new construction. Remove such items elsewhere off site or on the premises as specifically indicated.

3.6 DEMOLITION AND REMOVAL:

A. Demolish and remove all curbing, asphaltic concrete paving, etc., utility lines not required, and all other items within the limit of work, necessary to be removed prior to construction of work.

3.7 DISPOSAL OF WASTE MATERIALS:

A. Burning on Owner's Property: Burning is not permitted on Owner's property.

B. Removal from Owner's Property: Remove waste materials from Owner's property and dispose of off site in a legal manner.

END OF SECTION

DIVISION 2 – SITE WORK

SECTION 02210 – EARTHWORK

PART 1 – GENERAL

1.1 CODES AND STANDARDS:

A. All compaction expressed in percentages in this section refers to the maximum dry density as determined by American Society for Testing and Materials (ASTM) D-1557.

1.2 DEFINITIONS:

A. Fill: All soil or soil-rock materials placed to backfill excavation or to achieve the grade as specified on the plans.

B. On-Site Material: Soil material that is obtained from the required excavation on the site.

C. Imported Material: Soil material that is hauled in from offsite areas.

D. Select Material: Imported material that is approved by the Owner's Representative for use as engineered fill.

E. Engineered Fill: Select fill placed in six inches (6") layers and each layer compacted to 95% according to ASTM D-1557.

1.3 NOTIFICATION:

A. Call the local one-call underground alert service prior to any excavation.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 EXCAVATION:

A. Remove and recompact 12 inches of the existing soil. Excavate for foundations, pits, trenches, footings, concrete walks, curbs, paving, etc., to the lines and levels required, shown on the drawings and/or specified herein, and provide any and all shoring, bracing, cribbing, pumping, and planking required. The bottoms of all trenches shall be level, tamped firm, clean and free from all debris or foreign matter. Include the watering of footing trenches for settlement as may be directed by the Owner's Representative.

B. Over-depth excavations shall be corrected by filling with concrete, except when the Owner's Representative may permit backfilling with engineered fill

compacted to dry density in excess of 95% of maximum dry unit weight as determined by the Owner's Representative. No additional payment will be made for correction of unauthorized over-depth excavations.

C. Excavations shall be kept free from water at all times. Pumping shall be stopped only when authorized. Adequate dewatering equipment shall be maintained at the site to handle emergency situations.

D. Excavated earth material which is suitable for engineered fill or backfill, as determined by the Owner's Representative, shall be conditioned for reuse at the site and properly stockpiled for filling and backfilling operations. Conditioning shall consist of spreading in layers not to exceed eight inches (8") and raking free of debris and rubble. All rocks and aggregate, exceeding four inches (4") in the largest dimension, and deleterious material shall be removed from the site and disposed.

3.2 SUBGRADE PREPARATION AND ENGINEERED FILL:

A. Removal of Unsuitable Soils: Remove and recompact 12 inches of the existing soil. In addition to stripping and grubbing, all unsuitable soils shall be excavated and removed to the extent and depth shown on drawings.

B. Preparation of Subgrade: After stripping and grubbing and removing of unsuitable soils under areas to receive concrete, the underlying exposed soils shall be compacted to dry density in excess of 95% of maximum dry unit weight as determined by the Owner's Representative.

C. Select Material: All material used for engineered fill shall be approved by the Owner's Representative. Fill material shall be an inert, granular soil (less than 50% passing a No. 200 U.S. Standard Sieve) with a PI of less than 12, free from vegetable matter and other deleterious substances, and shall be of such quality that it will compact thoroughly without the presence of excessive voids when watered and rolled. Fill materials shall not contain rocks or lumps over four inches (4") in greatest dimension. All fill material to be used under the slabs, pavement, and structures shall be on-site and/or imported material conforming to the above. No material shall be placed without the approval of the Owner's Representative.

D. Placing and Compacting: Select material shall be spread uniformly in layers not to exceed six inches (6") in depth before compaction. Fill soils from on-site sources shall be placed at or near optimum moisture content. Material that does not contain sufficient moisture to compact properly shall be sprinkled with water; if it contains excess moisture it shall be aerated or permitted to dry to the proper water content. Select material and water shall then be thoroughly mixed before being compacted. Each layer of spread select material shall be compacted to at least 95% of the maximum dry density under the equipment foundations, slabs and paved areas, including embankments.

E. Recompaction of Fill in Trenches, and Compaction of Fill Adjacent to Walls: Where trenches must be excavated in compacted fill, these trenches shall be backfilled with the fill materials excavated. The backfill shall be placed in six-inch (6") layers and each layer compacted with pneumatic tampers to provide dry densities as specified above. Backfill placed adjacent to walls shall be placed in a similar manner to that specified for backfill in excavated trenches.

F. Control of Compaction: Control of the fill shall consist of field inspection and testing to determine that each layer has been compacted to the required density and to ensure that the optimum moisture is being obtained. Any layer or portion of a layer that does not attain the compaction required shall be scarified and recompacted until the required density is obtained. Contractor shall prevent erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

G. Surplus Excavated Material: Surplus excavated material, if any, may be used for grade change fill if approved for such use by the Owner's Representative, or may be dispersed on the site if approved by the Owner's Representative and as directed by the Owner's Representative, if such material is clean. Material which contains stone larger than four inches (4"), broken concrete or masonry, wood, asphalt or other such debris, shall be disposed of off the site.

3.3 SAND CUSHION:

A. A protection sand cushion shall be placed over the vapor barrier damp proofing under concrete slabs. A sand cushion shall also be placed under the vapor barrier to prevent puncture from the aggregate drainage fill. Sand cushions shall consist of fine, clean, river-run sand and shall be placed in thickness shown on drawings. Where not shown, minimum thickness shall be one inch (1") each layer.

3.4 BACKFILLING:

A. Backfill shall not be placed against footings or building walls until approved by the Owner's Representative.

B. Backfill material shall consist of select materials as specified herein before specified for engineered fill.

C. Backfill shall be placed in six inch (6") layers, leveled, rammed, and tamped in place. Excessive puddling will not be permitted. Compaction of all layers shall be as required in Paragraph 3.2 E. of this Section.

END OF SECTION

DIVISION 2 – SITE WORK

SECTION 02222 – EXCAVATION

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Site excavation.

B. Shoring excavations.

1.2 RELATED WORK

A. Section 02225 – Trenching and Backfilling.

1.3 PROTECTION

A. Protect bench marks, fences, sidewalks, paving, and curbs from equipment and vehicular traffic.

B. Protect above and below grade utilities that are to remain.

C. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.

D. Notify the Owner of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

E. Grade excavation top perimeter to prevent surface water run-off into excavation.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Subsoil: Excavated material, graded free of lumps larger than 6 inches, rocks larger than 3/4 inches, and debris.

PART 3 – EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Identify known underground utilities. Stake and flag locations.

C. Identify and flag surface and aerial utilities.

D. Notify Owner's Representative to remove or relocate utilities.

E. Maintain and protect existing utilities remaining that pass through work area.

3.2 EXCAVATION

A. Hand-trim excavation and leave free of loose matter.

B. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume. Remove larger material.

C. Correct unauthorized excavation at no cost to the Owner.

D. Fill over-excavated areas.

E. Stockpile excavated material in area designated on site and remove excess subsoil not being reused, from site.

3.3 FIELD QUALITY CONTROL

A. Provide for visual inspection of bearing surfaces.

END OF SECTION

DIVISION 2 – SITE WORK

SECTION 02225 – TRENCHING AND BACKFILLING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Trench excavation for required utilities and conduits.

B. Compacted bedding and compacted backfill to subgrade elevations.

1.2 RELATED SECTIONS

A. Section 02222 – Excavation

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. Test Method for "Density of Soil in Place by Sand-Cone Method" (ASTM D1556-82).

2. Test Methods for "Moisture-Density Relations of Soils and Soil-Aggregate Mixture Using 10 lb. Hammer and 18 inch Drop" (ASTM D1557-78).

3. Test Methods for "Density of Soil in Place by Nuclear Methods" (ASTM D2922-81).

1.4 DEFINITIONS

A. Relative Compaction: Ratio, expressed as a percentage, of field dry density as compacted to maximum dry density of representative sample of the same material determined by ASTM Test Method D1 557(c).

PART 2 – PRODUCTS

2.1 BEDDING AND SELECT BACKFILL MATERIALS

A. Bedding Material: Natural river or bank sand; washed, free of silt, clay, loam, friable or soluble materials, and organic matter; graded as follows:

U. S. Series Sieve Size	Percent Passing Sieve (Dry Weight Composition)
No. 4	100
No. 200	5 maximum

B. Select Backfill Material:

U.S. Series	Percentage Passing Sieve
1 inch	100
No. 4	50-100
No. 200	15 maximum

The minus 200 portion of the material expressed as a percentage multiplied by the Plasticity Index shall not exceed 100.

2.2 AGGREGATE BASE MATERIALS

A. Aggregate Base: Class 2; R-value 78 minimum, 3/4-inch maximum size; meeting requirements of CSS Section 26.

2.3 ACCESSORIES

A. Detectable Tape: 5.5 mil composition film containing metallized foil laminated between layers of inert plastic film; highly resistant to alkalis and acids found in soil. Tape, when buried 4 feet deep, shall be detectable by buried pipe or cable locating equipment and bear a continuous printed message warning of the type of utility buried beneath it.

PART 3 – EXECUTION

3.1 PREPARATION

A. Underpin adjacent structures that may be damaged by excavation work, including utilities.

B. Maintain trench crossings for vehicular and pedestrian traffic at street crossings, driveways, and fire hydrants

C. Maintain uninterrupted flow of storm water in gutters and drainage channels.

D. Prevent surface water run-off into excavation.

E. In asphalt concrete paved areas, neatly sawcut pavement along limits of excavation. If edge of pavement is located within 30 inches of limit of excavation, remove pavement to existing edge.

F. In Portland Cement concrete paved areas, sawcut existing concrete over trench to a minimum depth of 1-1/2 inches in straight lines either parallel to or at right angles to alignment of curb or sidewalk. No section to be replaced shall be smaller than 30 inches in either length or width. If sawcut falls within 30 inches of a construction joint, expansion joint, or edge, or within 12 inches of a score mark, remove concrete to joint, edge, or mark.

G. Call the local one-call underground alert service prior to any excavation.

3.2 EXCAVATION

A. Excavate trenches sufficiently wide to enable installation of utilities and allow inspection.

1. In no case shall free working space on each side of pipe barrel be less than six inches.

B. Remove pavement over trenches between sawcuts or existing joints and dispose of legally off jobsite.

C. Remove all material excavated and not usable for backfilling; dispose of legally off jobsite.

D. The maximum length of open trench shall be 300 feet or the distance necessary to accommodate the amount of pipe installed in a single day-whichever is greater. No trench shall be left open at end of day.

3.3 PIPE BEDDING

A. Bedding Excavation: Excavate trenches below grade of pipe bottom to the following minimum depths:

B. Stabilization of Trench Bottom: When trench is unstable due to wet or spongy foundation, stabilize trench bottom with gravel or crushed rock.

C. Placement of Bedding Material: Place sufficient bedding material in trench bottom up to grade of bottom of pipe. Relative compaction of tamped material shall not be less than 90 percent relative compaction. Place and compact additional bedding material to provide uniform bearing under the full length of the pipe to a minimum width of 60 percent of its external diameter.

3.4 BACKFILLING

A. General:

1. Ponding or jetting of backfill is not permitted for major trenching.

2. Proceed with backfilling as soon as possible after placing pipe; however, place no backfill until all required inspections and tests have been made. Contractor shall arrange for all required inspections and notify the Owner's Representative a minimum of three working days prior to backfilling.

B. Initial Backfill:

1. Prior to trench backfill, the Owner's Representative will observe condition of trench.

2. Place and compact select backfill material in four inch lifts to at least one foot, but not less than one-half the outside diameter of pipe, above top of pipe or conduit using hand tamping methods to achieve minimum 90 percent relative compaction.

C. Detectable Tape: In trenches containing nonmetallic pipes, place detectable tape on top of the initial backfill; except with reinforced concrete pipe the tape shall be placed 12 inches above top of pipe. For underground conduits underground warning tape shall be by Terra Tape Extra Strength 540 labeled with the words "Caution Electric Line Buried Below."

D. Subsequent Backfill:

1. Above initial backfill, place and compact approved fill material as specified for backfilling. Fill soils from on-site sources should be placed at or near optimum moisture content.

2. Place backfill material in layers not exceeding 6 inches in loose depth, and compact each layer before succeeding layers are placed.

3. Compact backfill to relative compaction in trenches to requirements specified in Section 02210, except the relative compaction shall be not less than 95 percent within 18 inches of finished subgrade beneath foundations or paved areas. Compaction shall be in accordance with the Standard Specifications for Public Works Construction.

3.5 TRENCH SURFACING

A. General: In unimproved areas, restore trench surface to its original condition.

B. Temporary surfacing shall be provided in areas to be reopened to traffic prior to final surfacing.

1. Temporary surfacing shall be 1-1/2 inches minimum asphalt concrete on 4 inches of Class 2 Aggregate Base.

2. Lay temporary surfacing within one day after backfilling.

3. Before opening trenching area to traffic, remove all excess dirt, rock, and debris, and sweep street surface clean.

4. Maintain a smooth, regular wearing surface. Prevent surface from settling more than one inch below pavement grade.

END OF SECTION

DIVISION 3 – CONCRETE

SECTION 03100 – CONCRETE FORMWORK

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Providing all concrete formwork shown or specified.

1.2 REFERENCES

A. Perform the work of this Section in accordance with the following standards as modified and supplemented herein:

1.	ACI 318	Building Code Requirements for Reinforced Concrete
2.	ACI 347	Recommended Practice for Concrete Formwork

1.3 QUALITY ASSURANCE

A. Tolerances for construction of formwork shall be as necessary to provide completed concrete structures within the concrete tolerances specified in Section 03300.

B. Provide positive means of adjustment to maintain tolerances before and during concrete placement.

1.4 SUBMITTALS

A. Submit in accordance with the General Conditions.

B. Formwork Drawings: Design and construction of all forms and form supports, shoring and bracing methods, and their adequacy shall be the responsibility of the Contractor. Show the forms to be used indicating form construction, type and location of form ties, reveal strips, chamfer, drip, groove, pattern for exposed textured concrete, and method of sealing forms against grout leakage. Lay out form ties in regular, symmetrical patterns.

PART 2 – PRODUCTS

2.1 FORM MATERIALS

A. Form Materials: Plywood, steel fiberglass reinforced plastic, or any material that will produce concrete with the required finish and within the specified tolerances.

B. Minimum for material for surfaces indicated to receive smooth form finish, any rubbed finish: BB plyform, Class 1, conforming to U.S. Product Standard PS-1 or paint; minimum thickness 5/8-inch; free of raised grain, torn surfaces, worn edges, patches, or other defects which would impair the appearance of the concrete surface; high density overlaid or provided with an equivalent smooth form liner. Wood form materials shall be new at the start of the work and may be reused subject to the approval of the Owner.

C. Form Liners:

1. Burke Co., #601 Splitface, keyed edges, textured with splitface block pattern, 3/4 to 1 1/8-inch thick, Greenstreak, Scofield, or equal.

D. Form Sealer: Chemstop Manufacturing Company "Chemstop,"

E. Form release agent shall contain no petroleum solvents and shall be non-staining; Nox-Crete Company "Nox-Crete Form Coating", Industrial Synthetics Corporation "Synthex," or equal.

F. Form ties shall be "Burke B/A Penta-Tie," Richmond "Snap-Tys," or equal.

G. Porous form material shall be sealed to prevent absorption of water from the concrete.

H. Use of aluminum form materials in contact with concrete is prohibited.

PART 3 – EXECUTION

3.1 CONSTRUCTION OF FORMS

A. Design, construct and maintain formwork in accordance with ACI 347.

B. Construct forms mortar-tight and in a manner to permit removal without damaging the concrete.

C. Verify that all sleeves and other openings, offsets, recesses, channel chases, anchors, ties and inserts are in place before concrete is placed.

D. Do not use earth or rock cuts for forms except where specifically indicated or permitted. When earth or rock form is indicated or permitted, dimensions of excavation shall be a minimum of one inch outside the concrete lines indicated in the plans.

E. Provide blockouts for mechanical and electrical work wherever necessary, even though not shown on the Drawings.

F. Provide 3/4-inch chamfers for all external corners.

3.2 MAINTENANCE OF FORMWORK

A. Provide positive means of adjustment, such as wedges and jacks, or shores and struts. Adjust formwork before and during concrete placement to achieve the specified tolerances.

B. Thoroughly clean forms prior to reuse.

3.3 REMOVAL OF FORMWORK

A. Members: Members shall not be subjected to loads of any kind until 28-day strength is achieved.

B. Remove forms in a manner that will not damage concrete. Remove slab shoring only after minimum concrete strength relative to design strength has been achieved.

C. It shall be the Contractor's responsibility to limit construction loads at all times to those which can be carried safely by the developed strength of the structure at time of loading and by formwork and shoring in-place at time of loading.

END OF SECTION

DIVISION 3 – CONCRETE

SECTION 03200 – CONCRETE REINFORCEMENT

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Providing all Concrete Reinforcement Work shown or specified.

1.2 1.2 REFERENCES

A. Perform the work of this Section in accordance with the following standards as modified and supplemented herein:

1.	ACI 117	Standard Tolerances for Concrete Reinforcement
2.	ACI 315	Manual of Standard Practice for Detailing Reinforced Concrete Structures
3.	ACI 318	Building Code Requirements for Reinforced Concrete
4.	AWS D1.4	Structural Welding Code, Reinforcing Steel
5.	WCRSI	Manual of Standard Practice by the Western Concrete Reinforcing Steel Institute
6.	CRSI	Placing Reinforcing Bars

1.3 SUBMITTALS

A. Submit shop drawings to the Owner for review showing complete fabrication and placing details of all reinforcement before beginning fabrication or delivery of material to the building site. Shop drawings shall conform to ACI 315 and shall be prepared with sufficient detail to clearly delineate the reinforcement to be installed.

B. Submit all data required to evaluate proposed mechanical splices.

C. Submit manufacturer's certified mill test reports on each lot of reinforcing steel delivered, showing physical and chemical analysis before placing any reinforcement.

PART 2 – PRODUCTS

2.1 REINFORCING MATERIALS

A. Steel Bars: ASTM A615, Grade 60, deformed billet bars for #5 and larger, Grade 40 for #4 and smaller. Where ASTM A706 steel is specified, a certified weldable grade of ASTM A615 of the appropriate yield strength may be substituted. In special cases galvanized or epoxy coated bars may be called for on the drawings; coated bars will be galvanized to ASTM A767 or epoxy coated in accordance with ASTM A775.B – Steel Wire and Spiral Reinforcing: Cold drawn, plain, ASTM A82 or deformed, ASTM A496, as indicated.

B. Welded Steel Wire Fabric: Plain, ASTM A185 or deformed, ASTM A497, as indicated.

C. Concrete Anchors and Dowels: Flux-filled deformed bar anchors welded to structural steel as shown; Nelson D2L, or equal.

D. Reinforcing Steel Mechanical Connectors: "Non-Slip Coupler" (standard type), manufactured by Bar Splice Products, Inc., Fox-Howlett Industries, Inc., or Lenton reinforcing steel couplers or approved equal capable of developing 125% of the specified minimum yield strength of the reinforcing steel.

2.2 ACCESSORIES

A. Tie Wire: Minimum 16-gage black annealed wire

B. Supports and Spacers for Reinforcing Bars:

1. Supports for reinforcing bars for concrete cast against earth shall be concrete blocks of sufficient strength, size and spacing to support the bars in proper locations.

2. Supports for reinforcement over concrete, metal or wood shall be plastic coated or tipped steel chairs of a type acceptable to the Owner and of sufficient strength and spacing to support the bars without indenting forming material. Bar supports shall conform to current ACI and CRSI standards.

3. Supports adjacent to sandblasted surfaces of concrete shall not be in contact with the formed surfaces

2.3 FABRICATION

A. Fabricate reinforcement in accordance with ACI 315. Where welding is indicated or proposed, weld reinforcing bars in accordance with AWS D1.4.

PART 3 – EXECUTION

3.1 PLACEMENT

A. Surface Condition of Reinforcement: Before placing concrete, clean reinforcement of loose scale, dirt, grease and other substances that would impair bond with concrete. Remove rust by vigorous rubbing with burlap cloth, wire brushing, or sandblasting.

B. Place reinforcement in accordance with the Drawings and the CRSI "Recommended Practice for Placing Reinforcing Bars."

1. Steel bars shall be of size and length indicated, accurately bent or formed to shapes detailed or scheduled by experienced shops by methods that will not injure the materials. Reinforcing bars shall be shop fabricated to lengths and bends shown on the drawings. Fabrication tolerance shall be in accordance with the requirements of ACI 315.

2. Reinforcing bars shall be as long as possible with a minimum number of joints.

3. Steel reinforcement shall not be bent or straightened in a manner that will injure the material or the embedding concrete. Bars with kinks or bends not shown on the Drawings shall not be used. Heating of reinforcement for bending will not be permitted.

4. Reinforcement shall be tagged with suitable identification to facilitate sorting and placing.

C. Place reinforcing bars accurately as to spacing and clearance and securely tie at intersections and supports with wire and in such a manner as will preclude displacement during pouring of concrete. Placing tolerances shall be in conformance with the requirements of ACI 117.

D. Place and secure reinforcement to maintain the proper distance and clearance between parallel bars and from the forms. Provide vertical steel with metal spreaders to maintain steel properly centered in the forms. Horizontal reinforcement shall be supported at proper height on concrete blocks, chairs or transverse steel bars.

E. After placing, maintain bars in a clean condition until completely embedded in concrete.

F. Bars shall not be spaced closer than 1-1/2 diameters of the largest of two adjacent bars, 1-1/2 times the maximum aggregate size, nor one inch, except at bar laps. Where reinforcement in members is placed in two layers, the clear distance between layers shall be not less than one inch or more than 1-1/2 inches unless

otherwise noted on the drawings. The bars in the upper layer shall be placed directly above those in the bottom layer unless otherwise detailed.

G. Coverage of bars shall be as shown and scheduled.

H. Where obstruction prevents the intended placement of reinforcement, provide additional reinforcement as directed by the Owner around the obstruction.

I. Splice bars as indicated by lapping and securely wiring together. Splices at locations other than those indicated are subject to the approval of the Owner and, if permitted, shall conform to the requirements of ACI 318. Splices of reinforcement shall not be made at the point of maximum stress. Splices shall provide sufficient lap to transfer the stress between bars by bond and shear. Bars shall be spread the minimum distance specified. Stagger splices of adjacent bars where possible.

J. Reinforcing bars shall not have welded joints unless indicated on the Drawings or unless required by the Owner. All welding, if required, shall conform to the requirements of the American Welding Society, and before any field welding is commenced, shall have the prior review of the Owner. Welds shall be made only by welders who have been properly certified in accordance with AWS D1.4. Equipment shall supply proper current and voltage and shall be adjustable to suit arrangement and thickness of base metal. Electrodes shall be low hydrogen, or size and type as recommended by manufacturer for base metal material and thickness. AWS D1.4 shall apply to workmanship and quality of welds, and all welding shall be continuously inspected by the testing agency. The Contractor shall give the Owner two (2) days notice before welding operations are performed.

3.2 FIELD INSPECTION

A. Reinforcing bars secured in place shall be subject to review by the Owner before doubling up or closing in forms. Contractor shall notify the Owner at least 24 hours before doubling up forms to permit this review. Concrete placed in violation of this requirement may be subject to rejection and removal. Review shall not relieve the Contractor from responsibility for conformance with the Drawings and Specifications and adequate strength and safety of all formwork including falsework and shoring.

END OF SECTION

DIVISION 3 – CONCRETE

SECTION 03300 – CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Material, labor, equipment and services for the installation of all concrete work. The work shall include, but not necessarily be limited to the following:

1. Furnishing and placing of all concrete.

2. Furnishing and installation of rock base, vapor barrier and sand cover under slabs-on-grade.

3. Installation of inserts, sleeves, anchor bolts, grounding cable and other items embedded in concrete, but furnished under other sections.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

A. Section 02225 – Trenching & Backfilling

B. Section 03100 – Concrete Formwork

C. Section 03200 – Concrete Reinforcement

1.3 REFERENCES (Latest Edition)

A. American Concrete Institute (ACI)

1.	ACI 301	Specifications for Structural Concrete for Buildings
2.	ACI 305	Recommended Practices for Hot Weather Concreting
3.	ACI 306	Recommended Practices for Cold Weather Concreting
4.	ACI 308	Curing Concrete
5.	ACI 318	Building Code Requirements for Reinforced Concrete
6.	ACI 347	Recommended Practices for Concrete Formwork
7.	ACI 614	Recommended Practices for Measuring, Mixing, and Placing Concrete

B. American Society for Testing and Material (ASTM)

1.	ASTM C 31	Making and Curing Concrete Test Specimens in the Field
2.	ASTM C 33	Concrete Aggregates
3.	ASTM C 42	Obtaining and Testing Drilled Coves and Sawed Beams of Concrete
4.	ASTM C 70	Test Methods for Surface Moisture in Fine Aggregate
5.	ASTM C 94	Ready-Mixed Concrete
6.	ASTM C 125	Definitions of Terms Relating to Concrete and Concrete Aggregate
7.	ASTM C 127	Test Methods for Specific Gravity and Absorption of Coarse Aggregate
8.	ASTM C 128	Test Methods for Specific Gravity and Absorptions of Fine Aggregate
9.	ASTM C 136	Methods for Sieve Analysis of Fine and Coarse Aggregate
10.	ASTM C 150	Portland Cement
11.	ASTM C 156	Test Method for Water Retention by Concrete Curing Materials
12.	ASTM C 171	Sheet Materials for Curing Concrete
13.	ASTM C 172	Sampling of Freshly Mixed Concrete
14.	ASTM C 260	Air-Entraining Admixtures for Concrete
15.	ASTM C 309	Liquid Membrane-Forming Compounds for Curing Concrete
16.	ASTM C 330	Lightweight Aggregates for Structural Concrete
17.	ASTM C 494	Chemical Admixtures for Concrete
18.	ASTM C 618	Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete

19.	ASTM C 881	Epoxy – Resin – Base Bonding Systems for Concrete
20.	ASTM C 994	Preformed Expansion Joint Filler for Concrete (Bituminous Types)
21.	ASTM D 2103	Polyethylene Film and Sheeting

C. American Association of State Highway and Transportation Officials (AASHTO)

1.	M182-60	Burlap Cloth Made for Jute or Kelat

D. United States Army Corps of Engineers (COE):

1.	CRD - C572	74 - Polyvinyl Chloride Waterstop

1.4 SUBMITTALS

A. Submit design mix and information on admixtures for the Owner's review at least ten days prior to the scheduled start of concrete placement operations. Submit test reports of thermal tests required for design mix to be used in concrete sections over three feet thick, for the Owner's review as required herein.

B. Submit certification that the ready-mix plant complies with the requirements of ASTM C94, Ready Mix Concrete.

C. Submit placement drawings, showing location of construction joints, if the location of construction joints will be different than shown on the construction drawings.

D. Product Data: Provide data on concrete admixtures curing material, bonding materials, waterstops, joint materials and devices, attachments, accessories and other embedded items.

E. Samples: Submit twelve-inch long samples of expansion/contraction joint, waterstops and control joint.

F. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent work.

G. Submit the following:

1. Certified test reports

2. Certificates of compliance

3. Batch tickets

4. Project record documents

5. Field samples

H. Submit samples of concrete materials requested by the Owner.

1.5 PROJECT RECORD DOCUMENTS

A. The Contractor shall accurately record actual locations of constructed items and embedded utilities and components, which are concealed from view.

1.6 QUALITY ASSURANCE

A. Sampling and testing

1. Contractor shall furnish all required samples and perform all other required testing at his expense.

2. Methods of sampling and testing shall be as specified in ACI 301, "Specifications for Structural Concrete for Buildings," and in other referenced standards.

B. The following tests and inspections shall be performed by the Contractor's testing agency as follows:

1. Concrete Mixes: Testing laboratory shall, under direction of its registered Professional Civil Engineer, perform precise design of all concrete mixes. Each mix design shall bear the signature, seal, and registration expiration date of the engineer directing the design mix work.

2. Aggregates: The Contractor shall supply the testing agency adequate samples of the several sizes of aggregates to be used.

3. The testing agency will check all aggregates for compliance with the specifications, general suitability, and the following properties in accordance with the referenced ASTM standards:

a. Sieve Analysis (ASTM C136);

b. Specific Gravity (ASTM C127, ASTM C128);

c. Absorption (ASTM C127, ASTM C128);

d. Moisture content (ASTM C70);

e. Unit Weight (ASTM C125);

f. Fineness Modules (ASTM C125); and such test as the agency may require to verify the soundness, durability, resistance to abrasion, etc., of the aggregates.

4. Cement: The Contractor shall supply adequate samples for testing and mix design.

5. One grab sample of approximately five pounds shall be taken of cement and shall be stored in an airtight container at the Laboratory to be tested if directed by the Owner.

6. The extent of proportioning of fine and coarse aggregates to be used in the mix shall be determined by the testing agency and reviewed by the Owner.

C. Certificates of Compliance: Acceptability of the following materials will be based upon documentation furnished by the manufacturer identifying each batch of material and certifying compliance with the requirements specified:

1. Portland cement

2. Admixtures

D. Certified laboratory test reports: Before delivery of materials, certified copies of the reports of all tests required in referenced publications or otherwise specified here shall be submitted. The testing shall have been performed by an independent laboratory approved by the Owner within one year of submittal of test reports for approval. Test reports on a previously tested material shall be accompanied by notarized certificates from the manufacturer certifying that the previously tested material is of the same type, quality, manufacture and make as that proposed for use in this project. Certified test reports are required for the following:

1. Cement

2. Aggregates

3. Admixtures and curing materials

4. Ready-mixed concrete

E. Tolerances

1. Formed surfaces: Tolerances on formed surfaces shall be as specified in Article 3.3 of ACI 347, "Recommended Practices for Concrete Formwork".

F. Evaluation and acceptance of concrete and concrete structures will be in accordance with ACI 301, "Specifications for Structural Concrete for Buildings."

G. Conform to ACI 305R, "Recommended Practices for Hot Weather Concreting," when concreting during hot weather.

H. Conform to ACI 306R, "Recommended Practices for Cold Weather Concreting," when concreting during cold weather.

PART 2 – PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: Portland cement, ASTM C 150, Type II. Cement from only one cement mill shall be used throughout.

B. Aggregate for standard Weight Concrete: ASTM C33, except as modified herein. Hard, durable material from established sources with proven record of successful use in producing concrete with minimum shrinkage.

1. Combined Aggregates: The exact proportions of the fine aggregates and coarse aggregates to be used in the mix shall be determined by the mix design.

C. Water: Mixing water shall be clean, potable and free from deleterious material.

2.2 ADMIXTURES

A. All admixtures used shall be compatible and shall be used only if specifically approved in advance by the Owner.

B. Concrete shall contain an air entrainment admixture conforming to ASTM C260, to produce an air content of approximately 4.5%. All exposed concrete shall contain an air entrainment admixture conforming to ASTM C260, to produce an air content of approximately 4.5%.

C. Other admixtures conforming to ASTM C494 if approved by the Owner. The use of calcium chloride is prohibited.

D. Mineral Admixtures: ASTM C618, fly ash or natural pozzolans including the requirements for reduction in mortar expansion. Submit a certificate of compliance for each lot of pozzolan used. Do not use mineral admixtures when uniform color of concrete is required.

2.3 EXPANSION JOINTS

A. Shall be formed by premolded bituminous joint material, non-extruding conforming to ASTM C944, or premolded joint fillers conforming to ASTM D175.1. Waterstops shall conform to the minimum dimensions shown on the plans and shall be manufactured either from neoprene or from polyvinyl chloride. Neoprene shall conform to the requirements of Section 51-1.14 of Caltrans Standard Specifications. Polyvinyl Chloride waterstops shall conform to the Corps of Engineers Specification Number CRD-C572 and shall conform to the ozone resistance as required for neoprene waterstops.

2.4 ACCESSORIES

A. Curing Compounds: ASTM C309, Type I, clear or translucent without dye, Type 1-D, clear or translucent with fugitive dye or Type 2, white pigmented and which will not discolor concrete or affect bonding of other finishes applied thereover, and which restricts loss of water to not more than 0.500 grams per square centimeter of surface when tested per ASTM C156, "Test Method for Water Retention by Concrete Curing Materials."

B. Slab Curing Membrane: Membrane conforming to ASTM C171, non-staining.

C. Burlap Sheet: AASHTO M182, class 3 or 4.

D. Surface Hardener: Lapidolith, Hornolith, Kemi-Kal Liquid or equal.

E. Rock Base: Clean, hard and durable gravel or crushed rock conforming of the following gradation requirements:

SIEVE SIZE	PERCENT PASSING (by dry weight)
1-1/2"	100
3/4"	90-100
No. 4	0-5

F. Vapor Barrier: ASTM D2103, "Polyethylene Film and Sheeting."

G. Sand Cover: Uniformly graded, clean sand free from excessive fines, organic materials or other deleterious substances.

H. Form Tie Cone Hole Plugs: Burke Co., Grey, Recessed, Jumbo Cone, "Snaplug", or equal (no known equal) with waterproof adhesive.

I. Filter drains such as behind concrete walls: Type A drain rock or prefabricated drain manufactured with polyethylene stranded or molded core and a geotextile fabric bonded to one side. Filter drains shall be manufactured by Mirafi, Exxon or equal approved by the Owner's Representative.

J. Embedded Reglets and Dovetail Anchor Slots: 1.2 mm galvanized steel.

2.5 CONCRETE MIXES

A. All concrete mixes of each class and strength shall be designed by the Contractor’s testing laboratory.

Mix designs shall be submitted to the Owner for review at least ten (10) calendar days before placing concrete.

B. The proportions of the concrete mixes shall be such as to produce concrete of the required strengths, slumps and aggregate sizes, of low shrinkage, and of a consistency that will allow thorough compaction of the concrete into corners and around reinforcing without excessive puddling, spading, or vibration, and without permitting the materials to segregates or free water to collect on the surface. The maximum size and grading of aggregates shall be such that it will produce dense and uniform concrete free from rock pockets, honeycomb, and other irregularities.

C. Determination of the amount of water in the batch shall include water contained in the aggregates. Water shall be added in the proportions established by the testing laboratory.

D. The Contractor shall review and approve the proposed concrete mix design for compatibility with his placing requirements to insure that the concrete as designed can be placed in accordance with the drawings and Specifications.

E. Use accelerating admixtures in cold weather only when approved by the Owner. Use of admixtures will not relax cold weather placement requirements.

F. Use of calcium chloride is prohibited.

G. Use set retarding admixtures during hot weather only when approved by the Owner.

H. Add air entraining agent to normal weight concrete mix for work exposed to exterior.

I. For concrete exposed to special exposure conditions the maximum water-cement ratio shall not exceed 0.5.

J. Concrete Classes

		Maximum Size of Aggregates (inches)	Maximum Slump (inches)	Minimum 28-day Strength (psi)	Cement per cu.yd. (sacks)
1.	Footings and Grade beams	3/4	4	3,000	5.25
2.	Slabs on Grade	3/4	3	3,000	5.50
3.	Lean Concrete Fill of over excavated areas	1-1/2	5	1,500	3.0

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify requirements for concrete cover over reinforcement.

B. Verify that anchor bolts, embedded plates, reinforcement, sleeves and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.2 INSPECTION

A. Cast-in-place concrete shall be subject to the following inspections and tests by the Owner's testing agency during the project construction.

1. Inspect mixing plant, equipment and transit mix trucks and verify that the transit mixers and measuring facilities at the plant conform to ASTM C94, "Ready Mix Concrete." The agency shall obtain from the ready-mix plant a current Certificate of Conformance from the National Ready Mix Association covering all facilities to be used at the plant, prior to delivery of any concrete.

2. Take a set of three specimens at the job of each class of concrete for each 100 cubic yards or fraction thereof placed each day for standard 6-inch x 12-inch cylinder tests in accordance with ASTM C31, "Making and Curing Concrete Test Specimens in the Field." A record of the location of each concrete batch shall be kept and noted on the specimen. Storage and transportation of test specimens shall be by the agency. The agency shall coordinate this phase of the work so that costs of transportation shall be kept to a minimum. Standard compression tests of the cylinders shall be made, one at seven days and one at 28 days in accordance with ASTM

C39. The third standard cylinder shall be kept for further test, if required. Cylinder tests requested by the Contractor shall be at the cost of the Contractor.

3. Slump tests shall be made at the time of taking test cylinders, and/or at one-hour intervals during placing of concrete in accordance with ASTM C143. Temperature and air content tests may be made by the testing agency at the time that test cylinders are made.

4. The Contractor shall furnish composite samples in accordance with ASTM C172, "Sampling of Freshly Mixed Concrete," for testing by the Owner as specified above. Furnish the samples from batches of concrete selected by the Owner.

5. Should the concrete fail to meet the minimum specified 28 day strength for the class of concrete tested (as determined by test on both the regular and spare cylinders), core samples at least four inches in diameter shall be taken from the work in representative locations as directed by the Owner. Cores shall be taken in accordance with the requirements of ASTM C42, "Obtaining and Testing Drilled Cores and Sawed Beams of Concrete," and shall be tested as required for cylinders. Should these cores fail to meet the specified strength for the particular class of concrete, the concrete shall be deemed defective and shall be removed and replaced. The Contractor shall bear the entire cost of such testing, removal, redesign, and replacing of defective concrete.

B. Review by the Owner or the testing agency shall not relieve the Contractor from responsibility for conformance with the Subcontract Documents.

3.3 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush or sandblasting and applying bonding agent in accordance with manufacturer's instruction.

B. In locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with epoxy grout.

C. Foundation surfaces against which concrete is to be placed must be free from standing water, mud and debris. Surfaces shall be clean and free from oil, objectionable coatings, and loose or unsound material.

D. All surfaces of forms and embedded items shall be free of grout before placing concrete.

E. Install joint fillers and waterstops in accordance with manufacturer's instructions.

F. Install 1/2-inch thick joint filler to separate slabs on grade from vertical surfaces. Extend joint filler from bottom of slab to within 1/4-inch of finished slab surface.

G. Install joint devices in accordance with manufacturer's instructions.

H. Install joint device anchors. Maintain correct position to allow joint cover flush with floor finish.

I. No concrete shall be placed until all subgrade, formwork, reinforcing steel, embedded items and surfaces against which concrete is to be placed have been accepted by the Owner.

J. Location of construction joints shall be as shown on the structural drawings.

1. Joints not indicated on the drawings shall be made and located so as not to impair the strength of the structure. Location shall be acceptable to the Owner.

2. All horizontal and vertical construction joints shall be cleaned and roughened by steel brush, sandblasting, waterblasting, or wet sandblasting. Extend reinforcing continuously through the construction joints. Provide keys as detailed. Bond all construction joints using concrete bonding agent in accordance with manufacturer's recommendations.

3. Construction joints in all horizontal framing shall be located in the middle third of span in joints, beams, and/or as directed by the Owner. Keys shall be provided across all vertical joints in joists, beams, slabs, walls, etc., as detailed on the structural drawings.

3.4 MIXING CONCRETE

A. All concrete shall be ready-mixed concrete and shall be mixed and transported in accordance with ASTM C94, "Specification for Ready-Mixed Concrete."

B. All concrete shall be mixed with quantities and ingredients conforming to testing laboratory mix designs. Ingredients shall be proportioned by weight.

C. Mixed concrete shall be homogeneous in distribution of material and uniform in consistency and color. Concrete shall be mixed for at least ten minutes after all ingredients have been added, three minutes of this time must be immediately prior to discharging at the job site. The rate of delivery, haul time, mixing time and hopper capacity shall be such that all mixed concrete delivered shall be placed in forms within 90 minutes from the time of the introduction of cement and water into the mixer. No water shall be added after transit mixer leaves the batching plant without the approval of the Owner.

3.5 CONCRETE WORKMANSHIP

A. Construction practices and workmanship shall conform to ACI 318, "Building Code Requirements for Reinforced Concrete," and ACI 301, "Specifications for Structural Concrete for Buildings," and these specifications.

B. All aggregates shall be measured by weight or an equivalent accurate method and the proportion of water to cement shall be accurately controlled. The slump of the concrete at time of placing shall not be more than 12 mm greater than specified. Cement and aggregate shall be stored in such a manner as to prevent their deterioration or the intrusion of foreign matter. Any material which has deteriorated or which has been damaged shall not be used for concrete. Fine and coarse aggregate shall be stored and measured separately.

C. All finished concrete surfaces shall be protected from damage caused by construction equipment, methods of handling materials, rain or running water. Concrete shall be placed in such a manner as to prevent staining or splattering of completed work. Self-supporting structures shall be protected from mechanical disturbances and shall not be loaded in such a manner as to overstress the concrete.

D. No concrete shall be placed under water except by permission of the Owner.

E. During hot weather, steps shall be taken in conformance with ACI 305, "Recommended Practices for Hot Weather Concreting," to reduce concrete temperature and water evaporation by proper attention to the ingredients, production methods, handling, placing, protection and curing.

F. Pipes or conduits passing through structural concrete shall be sleeved. Adjacent pipes or conduits, passing through foundation grade beams, shall be spaced not less than three diameters on center, unless acceptable to the Owner. No pipes except electrical conduit one inch or less in diameter, shall be embedded in structural concrete work.

3.6 TRANSPORTING

A. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods, which shall prevent the separation or loss of the ingredients. It shall be deposited as nearly as practicable in its final position to avoid rehandling or flowing. Concrete shall not be dropped freely where reinforcing bars will cause segregation, nor shall it be dropped more than four feet. Spouts, elephant trunks or other acceptable means shall be used to prevent segregation.

B. At the Contractor's option, concrete may be pumped from the transit mixer to place of deposit provided that mix design adjustments by the testing laboratory, equipment data and procedures are submitted by and at the expense of the Contractor and entire operation is acceptable to the Owner in advance. Pumps shall be adequate for the mix, aggregate size, and slump; and pump operators shall be experienced.

C. Concreting, once started, shall be carried on as a continuous operation until the section of acceptable size and shape is completed. Construction joints must be of acceptable detail and location.

D. Concrete shall be so deposited as to maintain, until the completion of the unit, a plastic surface approximately horizontal. No concrete shall be deposited that has started to set or stiffen. The remixing of concrete grout which has begun to set will not be permitted.

E. Concrete shall not be dropped freely more than four feet. Schedule of placing shall be such that no concrete shall take initial set before next layer is poured unless a regular construction joint is made.

F. Contractor shall take extreme care not to displace reinforcing, inserts, anchor bolts, welding plates, or any other items called for to be embedded in concrete.

G. Conveyors, trucks or buggies must be thoroughly cleaned after each placement. Any concrete spilled on forms or reinforcing steel, in portions of structure not immediately concreted, shall be completely removed before concrete sets.

H. Any interruption in placing of more than 60 minutes will be cause for shutting down the work and the wasting of any remaining mixed concrete in hoppers or mixers. In case such interruption occurs, the Contractor shall provide construction joints, where and as directed, and cut concrete back to such line, cleaning forms and reinforcing as herein specified.

I. A record shall be kept of the time and date of placing the concrete in each portion of the structure. Such reports shall be kept until the completion of the structure and shall be open to the inspection of the Owner.

3.7 COMPACTION

A. Concrete shall be thoroughly compacted by puddling with suitable tools during placing, and thoroughly worked around the reinforcement, around embedded fixtures and into the corners of the forms. In addition to manual spading and tamping, all concrete shall be internally vibrated with high speed mechanical vibrators operated under experienced supervision. A mechanical vibrator shall be employed at each point of dump and a standby vibrator in good working order, but not in use, shall be kept on the job until all concrete is placed.

B. Vibration shall be only sufficient to minimize honeycombs and accomplish consolidation of concrete. Over-vibration and resulting loss of entrained air or excess of fines at the surface will not be allowed. Concrete will not be transported by use of vibrators.

C. Along the faces of the forms, suitable tools shall be used during the placement to force large particles away from the forms and bring mortar to the surface of the forms in order to obviate voids and air pockets. The responsibility for providing fully filled out, smooth, clean and properly aligned surfaces shall rest entirely with the Contractor.

3.8 CONCRETE FINISHES

A. Standard Smooth Finish:

1. Provide standard smooth finish for all concrete formed surfaces that are to be exposed to view, or that are to be covered with a coating material applied directly to the concrete or a covering material bonded to the concrete such as waterproofing, dampproofing, painting or other similar systems. Standard smooth finish shall be the as-cast concrete surface as obtained with the form facing material; with the defective areas repaired and patched as specified, and all fins and other projections on the surface completely removed and smoothed.

B. As-Cast Finish:

1. Smooth surfaces without texturing, remove fins and other projections.

2. Location: All surfaces not specified otherwise.

C. Float Finish:

1. Apply float finish to monolithic slab surfaces that are to receive trowel finish and other finishes as hereinafter specified, and as shown on the drawings or in schedules.

2. After placing concrete slab, do not work the surface further until ready for floating. Begin floating when the surface water has disappeared or when the concrete has stiffened sufficiently to permit the operation of a power-driven float, or by hand-floating if area is small or inaccessible to power units. Check and level the surface plane to a tolerance not exceeding 1/4-inch in ten feet when tested with a ten foot straightedge placed on the surface in not less than two different angles from a zero reference point. Cut down high spots and fill low spots. Uniformly slope surfaces to drains where shown on drawings. Immediately after leveling, refloat the surface to a uniform smooth, granular texture.

D. Trowel Finish:

1. Apply a light, smooth trowel finish to monolithic slab surfaces that are exposed to view, are receiving an epoxy finish, or are receiving liquid hardener treatment.

2. After floating, begin the first trowel finish operation using a power driven trowel if area to be troweled is sufficiently large. Consolidate the concrete surface by the final hand troweling operation, free of trowel marks uniform in texture and appearance and with a surface plane tolerance not exceeding 1/8-inch in ten feet when tested with a ten-foot straightedge from a zero reference point.

E. Broom Finish:

1. After concrete has received floating finish specified above, provide light brushing perpendicular to traffic flow, or as directed by the Owner.

2. Location: Walkways, sidewalk pavements, and exterior slabs shall have rounded edges with 1/8-inch radius and 8-inch smooth wood float boarders.

F. Sandblast Finish:

1. Perform sandblasting at concrete surfaces immediately after removal of forms. Blast with suitable equipment and silica sands on hard angular sands to remove not more than 1/32-inch to 1/16-inch of the cement surface as necessary to achieve uniform texture.

2. Location: All locations

G. Textured Finish:

1. Form: Liner textured concrete. Repair concrete surfaces as needed with epoxy mortar compound. Repair shall not interrupt textured pattern.

H. Slope all surfaces exposed to weather for drainage.

I. No finish is required beyond screeding on uniformed surfaces to be covered by fill material.

3.9 CURING AND PROTECTION

A. Wheeling, working and walking on concrete shall be avoided for at least 24 hours after casting. Protect concrete from sun and rain. Do not permit concrete to become dry during curing period. Concrete shall not be subjected to any loads until concrete is completely cured, and until concrete has attained its 28-day strength.

B. Protect concrete during and after curing from damage during subsequent building construction operations.

C. Cover traffic areas with plywood or other suitable means for as long as necessary to protect concrete from damage.

D. Slabs: Immediately upon completion of finishing operation, surface of slab shall be sealed against moisture loss by the application of a waterproof curing membrane with edges lapped and sealed with tape, and paper weighted down. Tears and rips in curing membrane shall be repaired immediately during curing period. Curing shall be maintained for a minimum of 7 days.

E. For concrete sections over three feet thick except lean concrete

1. Ten (10) calendar days before placing concrete, the results of thermal test performed by the Contractor will be submitted to the Owner for approval. Thermal tests shall consist of a three-foot test cube of the design mix for the thick section instrumented with thermocouples by the Contractor's testing agency and monitored to determine whether the heat of hydration exceeds 150°F. If the temperature exceeds 150°F, the mix design will be revised or standard aggregate cooling utilized and a second test cube cast and tested at no additional cost to the Owner.

2. The temperature gradient between the center and the surface of the section must not exceed 20°F during the first ten days of the controlled curing period. Thermocouples shall be installed by the Contractor's testing agency in the center and six inches from the surface at a maximum of twenty-foot intervals and at the corners. The thermocouples are to be monitored continuously by the Contractor's testing agency and, if the temperature gradient reaches 15°F, insulating blankets of sufficient thickness to limit the temperature gradient to 20°F shall be placed over the surfaces. On surfaces with protruding reinforcing, such as the top of a wall, loose insulation will be used.

3.10 DEFECTIVE CONCRETE AND REPAIRS

A. Immediately after removing forms all concrete surfaces shall be examined by the Owner for surface defects.

B. Concrete shall be considered defective for the following reasons:

1. Failure of finished concrete profiles, and dimensional tolerances, to conform to the requirements specified for Formwork of this Specification.

2. Failure to meet the specified cylinder strength requirements set forth in Paragraph 16.5.1 of ASTM C94, "Ready Mix Concrete."

3. Concrete showing cracks, pour joints, rock pockets, voids, spalls, honeycomb or defects that adversely affect the structural adequacy of the concrete.

C. All defective concrete shall be subject to removal and replacement by the Contractor, at his expense, unless it is determined by the Owner that it can be patched as specified below or that the location of this defective concrete is not detrimental to the function and the appearance of the structure. Shore defective concrete where necessary during repairs as directed by the Owner.

3.11 REPAIR OF SURFACES

A. Repair all formed concrete surfaces that contain defects, which adversely affect the quality and appearance of the concrete. Defective areas shall be removed down to sound concrete, minimum of one inch, with the edges perpendicular to

the surface. Repaired surfaces must match adjacent concrete in form, texture and color. Test samples should be made prior to repairing concrete and accepted by the Owner. Remove and replace the concrete having defective surfaces if the defects cannot be repaired to the satisfaction of the Owner. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets and holes left by tie rods and bolts, fins and other discolorations that cannot be removed by cleaning.

B. All form tie holes in all concrete surfaces shall be plugged, using the specified plugs set in waterproof adhesive to effectively seal form tie metal from moisture.

3.12 ROCK BASE

A. A free-draining rock base is required under all concrete slabs-on-grade of a depth as shown on the drawings but not less then four inches.

3.13 FIELD QUALITY CONTROL

A. In addition to the information specified in ASTM C94, "Ready Mix Concrete," to be provided on each delivery ticket, provide the following on the same ticket:

1. Reading of the revolution counter at the first addition of aggregate to the mixer.

2. Times of day at which cement and aggregates are first intermingled and at which water is added.

3. Signature or initials of the ready mix representative.

4. Type, brand and amount of cement.

5. Amount of water added at the batch plant.

6. Weights of fine and coarse aggregate.

7. Amount of water added, if any, at the jobsite.

8. Maximum size aggregate.

B. Clean up

1. Remove from the site all debris resulting from the work of this Section.

END OF SECTION

DIVISION 9 – FINISHES

SECTION 09910 – PAINTING

PART 1 – GENERAL

1.1 DESCRIPTION

A. These specifications include painting bare metal surfaces (except stainless steel) such as piping, pipe bollards, supports, and vents.

1.2 COLORS AND SAMPLES SUBMITTAL

A. Samples: Before beginning work, prepare for Owner's approval a sample of each color and finish required. Such approved samples shall constitute standards for color and finish for acceptance or rejection of completed work. All work shall match the approved colors and samples.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Manufacturers: Materials are specified by brand names to establish a standard of quality, or by performance requirements, appearance, and general description of product. Materials shall be Fuller-O'Brien, Kelley-Moore, Glidden, or equal. The term "paint" as used herein includes enamels, paints, stains, varnishes, emulsions, lacquers and sealers. The term "painting" as used herein means the application of such materials.

B. List of Materials: Submit a complete list of all materials proposed for use, together with manufacturer's specifications.

C. Unsuitability of Specified Products: No claim by the Contractor concerning the unsuitability of any material specified or inability to produce first class work with same will be entertained unless such claim is made in writing to the Owner's Representative before the work is started.

D. Color and Life of Film: Colors of all surfaces finished under this section shall, at the end of one (1) year, have remained free from serious fading, and variations, if any, shall be uniform. All materials shall have their original adherence at the end of one (1) year and there shall be no evidence of blisters, running, peeling, scaling, chalking, streaks or stains at the end of this period. Washing with alkali-free soap and water shall remove surface dirt without producing any deteriorating effects.

E. All paint and priming products, whether shop or field applied, shall be lead, chromium, and cadmium free. In addition, these products and all other material

used shall comply with local, regional, state, and Federal air quality rules and regulations especially those of the local air quality management district.

PART 3 – EXECUTION

3.1 DELIVERY AND STORAGE

A. All painting materials shall be delivered to the site in the manufacturer's original containers with labels intact and seals unbroken. They shall be kept in a locked, well-ventilated storage place assigned for this purpose. Receiving, opening, and mixing of all paint materials shall be done in this room. Storage space shall be kept clean and neat. Oily rags shall be removed and disposed of each day and all other necessary precautions shall be taken to avoid danger of fires.

3.2 WEATHER AND TEMPERATURE

A. Surfaces shall be painted only when they are free from moisture. No painting on exterior surfaces shall be done less than 72 hours of actual drying weather after a rain, nor during periods of dew or fog. Receiving surfaces shall be properly dried out before proceeding with the work. No painting shall be done when temperature is below 50°F, except when specifically directed otherwise in writing by the Owner's Representative. Clear sealer shall not be applied when air temperature is less than 70°F.

3.3 SCAFFOLDING, DROP CLOTHS AND PROTECTION OF WORK

A. Furnish, maintain and remove all scaffolding, ladders and planks required for this work and all drop cloths for the protection of concrete walks, floors, prefinished materials, fixtures, etc. Painted and finished surfaces subject to damage or defacement due to other work shall be properly protected and covered. Contractor shall be responsible for any and all damage to painted work and to that of other work caused by operations under this section.

3.4 PREPARATION OF SURFACES

A. No painting or finishing shall be started until the surfaces to be painted or finished are in proper condition in every respect. Surfaces that cannot be properly prepared for finishing shall not be painted or finished until they are rectified, unless otherwise instructed by the Owner's Representative.

B. Surfaces to be painted shall be clean and free of dirt, dust and any other substances, which might interfere with the functioning of the painting system. All surfaces to be painted shall be in proper condition to accept and assure the proper adhesion and functioning of the particular painting system or coating specified. Concrete surface shall be hydroblasted prior to painting.

C. All steel and ferrous metal surfaces to be painted shall be primed before installation. Bolts, welds and places prime coat has been damaged shall be wire-brushed to remove all loose paint, rust and scale and then given one (1) coat of Ferrous Metal Primer.

D. Prime coats and finish coats for any one-paint system shall be the products of the same manufacturer.

E. All surface defects and all cracks more than 1/16-inch wide shall be filled to match adjacent areas.

3.5 WORKMANSHIP AND APPLICATION

A. All painting shall be done by skilled and experienced personnel. All workmanship shall be of the highest quality and to the complete satisfaction of the Owner's Representative.

B. All materials shall be applied in accordance with the manufacturer's directions, and materials shall be thinned only for proper workability and in compliance with the manufacturer's specifications. All material shall be evenly brushed or smoothly flowed on without runs or sagging and free from drips, ridges, laps and brush marks. Insure that all coats are thoroughly dry before applying succeeding coats. Sand surfaces between coats as necessary to produce a smooth finish.

C. Painting shall include all exposed surfaces of every member. Parts to paint, which are inaccessible after installation, shall be painted before installation. Priming shall include all sides, edges and cut ends.

D. Completed painted surfaces shall be free of blistering, running, peeling, scaling, streaks and stains and the colors of all surfaces shall remain free from fading.

E. Spray painting is not permitted unless prior written approval by the Owner's Representative is obtained.

3.6 EXTERIOR PAINTING

A. Bare Metal Surface

Prime Coat:	Metal primer (2 coats)
Finish Coat:	Alkyd Enamel, Semi-Gloss (2 coats)

3.7 APPROVAL OF FINAL COLORS AND FINISHES

A. Final coat of paint shall not be applied until the colors and finishes have been approved by the Owner's Representative.

3.8 CLEANING AND TOUCH-UP

A. Upon completion of the painting work, Contractor shall remove from the premises and dispose of all scaffolding and equipment, surplus material, empty containers, and other debris resulting from these operations. The station and surrounding areas shall be left clean and neat in all respects.

B. Contractor shall clean and retouch this work as necessary for a first class job acceptable to the Owner's Representative.

C. Contractor shall leave all floors and walks, hardware, and any other surface clean and free from any paint, spattering, smears, or smudges which are the result of this operation.

3.9 WEATHERING OF EXTERIOR WORK

A. The Contractor shall give special attention to the quality of exterior paints and their application, insuring that weathering of such work shall not cause dripping, bleeding, running, leeching, or any other such undesirable effects which cause staining and defacement of adjacent surfaces.

3.10 MAINTENANCE SUPPLIES

A. Furnish Owner with one (1) gallon of each kind and color of finish coats used in the project. Furnish such paint in fully labeled and identified one (1) gallon containers as necessary to make a thoroughly complete job in every respect.

END OF SECTION

DIVISION 11 - EQUIPMENT

SECTION 11500 – CNG VEHICLE FUELING EQUIPMENT

PART 1 – GENERAL

1.1 WORK INCLUDED

A. This specification covers design, manufacture, and delivery of the following:

1. Single electric motor driven compressor,
2. Time-fill meter and communications panel,
3. Ten single-hose type time-fill posts.

1.2 CODES AND STANDARDS

A. All equipment shall comply with the latest revisions of applicable codes and standards in effect at the time of bid. All materials shall be new (i.e., not previously used and manufactured within six months of equipment delivery). As a minimum, the equipment shall comply with the following codes and standards:

1. American National Standards Institute (ANSI)

a.	ANSI/NGV 1	Standard for Compressed Natural Gas Vehicle Fueling Connection Devices
b.	ANSI/NGV 4.1	NGV Dispensing Systems
c.	ANSI/NGV 4.2	Hoses for Natural Gas Vehicles and Dispensing Systems
d.	ANSI/NGV 4.4	Breakaway Devices for Natural Gas Dispensing Hoses and Systems
e.	ANSI/NGV 4.6	Manually Operated Valves for Natural Gas Dispensing Systems
f.	ANSI/NGV 4.7	Automatic Pressure Operated Valves for Natural Gas Dispensing Systems
g.	ANSI/NGV 4.8	NGV Fueling Station Reciprocating Compressor Guidelines
h.	ANSI Z535.2	Environmental and Facility Signs

2. American Petroleum Institute (API)

a. API Recommended Practice 520 – Sizing, Selection, and Installation of Pressure Relieving Devices in Refineries

3. American Society of Mechanical Engineers (ASME)

   a. Boiler and Pressure Vessel (B&PV) Code

      i Section V – Nondestructive Examination

      ii Section VIII, Division I – Pressure Vessels

      iii Section IX – Welding and Brazing Qualifications

   b. ASME A13.1 Scheme for the Identification of Piping Systems

   c. ASME B16 Standards for Valves, Flanges, Fittings, Gaskets, and Valve Actuators

   d. ASME B31.3 Process Piping Code

4. American Society for Nondestructive Testing (ASNT)

   a. SNT-TC-1A Recommended Practice

5. American Welding Society (AWS)

   a. A5.1 Covered Carbon Steel Arc Welding Electrodes

   b. A5.5 Low Alloy Steel Covered Arc Welding Electrodes

6. International Code Council (ICC)

   a. International Building Code

   b. International Fire Code with local amendments

   c. International Fuel Gas Code

   d. International Mechanical Code

   e. International Plumbing Code

7. National Fire Protection Association (NFPA)

   a. NFPA 52 Vehicular Fuel Systems Code

   b. NFPA 54 National Fuel Gas Code

c. NFPA 70 National Electrical Code

d. NFPA 704 Identification of the Hazards of Materials for Emergency Response

8. Society of Automotive Engineers (SAE)

a. J1616 Recommended Practice for CNG Vehicle Fuel

9. Underwriters Laboratories Inc. (UL)

a. UL 508 Industrial Control Equipment

b. UL 508A Industrial Control Panel

c. UL 1604 Electrical Equipment for Use in Class I and II, Division 2, and Class III Hazardous (Classified) Locations

10. U.S. Department of Labor (OSHA)

a. Title 29 CFR Part 1910 – Occupational Health and Safety Standards

1.3 QUALITY ASSURANCE

A. All equipment shall be permanently affixed and accessible for maintenance and operation in accordance with all code requirements. Supports for all equipment shall conform to International Building Code seismic requirements.

B. The Contractor shall notify the Owner's Representative no later than 10 working days prior to factory testing of the compressor systems to allow the Owner's Representative the option to witness the test prior to shipment. Witnessing of the testing does not relieve the Contractor of the responsibility to comply with the specifications.

C. All paint and priming products, whether shop or field applied shall be lead, chromium, and cadmium free. In addition, these products and all other materials used shall comply with local, regional, state and federal air quality rules and regulations, especially those of the local air quality management district.

D. All materials and surfaces exposed to the exterior, unless otherwise pre-finished or otherwise treated with a corrosion-resistant finish, shall receive a three-coat shop-applied paint system.

E. The compressor and time-fill meter panel shall certified by a Nationally Recognized Testing Laboratory for compliance with Class 1, Division 2 hazardous areas as defined in NFPA 70. Certification by the third party inspection

firm shall be evidenced by the submittal of the inspection report and the application of a sticker on the equipment.

1.4 SUBMITTALS

A. Within four (4) weeks of receipt of the Notice to Proceed, submit four copies of the following drawings and data for review. Submittal drawings and data shall be certified by the respective equipment manufacturer that the drawing(s) and data accurately represent the final product/system in all respects.

1. For each equipment system or assembly: general arrangement drawing, process and instrumentation diagram, mechanical fabrication/assembly drawing, electrical elementary diagram, wiring diagram, electrical control assembly drawing, and installation instructions. Equipment arrangement drawings shall clearly identify the precise location, number, and size of customer connections, weight of equipment, and anchor bolt size and pattern for attachment of equipment to foundation.

2. Complete mechanical and electrical bills of material.

3. All pressure-relief valve-sizing calculations stamped and signed by a licensed Professional Engineer.

B. No fabrication or material purchase shall start until drawings are reviewed and accepted by the Owner's Representative. Individual equipment systems may be released for fabrication upon Owner's Representative's acceptance of their corresponding, certified shop drawings.

C. Submit equipment record drawings as described in Article 3.6.

D. Submit operating and maintenance manuals as described in Article 3.7.

1.5 PROJECT CONDITIONS

A. Natural Gas

1.	Specific Gravity	: 0.6
2.	Temperature	: 40-60^{o}F
3.	Heating Value	:950 – 1,100 BTU/SCF
4.	Moisture Content	:7 lb/MMSCF max.
5.	Typical Gas Composition	:93% C1
		:4% C2
		:1%C3+

:1% N2

:1% CO2

(Note: Actual gas composition may vary)

B. Electric Service

1. An existing electric panel shall provide 120 VAC, 1- phase, 60 hertz service.

C. Design Conditions

1. Site Conditions:

a.	Elevation	: 4,600 ft amsl
b.	Ambient Temperatures	: 20-110°F

2. Compression System:

a.	Maximum Inlet Gas Temperature	: 80ºF
b.	Discharge Pressure	: 4,500 psig
c.	New Compressor Unit Flow Rate	: 56 scfm
d.	Total Number of Compressor Units	: Four (1 new compressor, 3 existing compressors)
e.	Total Compression Flow Rate	: 232 scfm

3. All equipment and structures shall be designed, fabricated, and supported to comply with the latest edition of the International Building Code and seismic requirements.

PART 2 – PRODUCTS

2.1 GENERAL

A. The fueling equipment shall be designed for continuous operation and shall meet vehicle fueling needs upon user demand around the clock. The operation of the fueling system shall be automatic (shall start-up and stop automatically) with provisions for manual operation/intervention. In the event of an alarm or emergency shutdown, on-site manual intervention shall be required to reset the compressor.

B. Natural gas shall be used for pneumatic controls for the CNG fueling equipment and for activation of the station inlet shutoff valve.

C. All materials shall be non-combustible or fire-rated.

D. Sufficient access shall be provided to perform major work on the compressor, including the removal of driver. All electric panels shall have the necessary clearances in front of openings as required by code. Sufficient access may be provided by removal of all or part of the compressor enclosure(s).

E. All equipment mounting shall comply with design requirements of appropriate sections of IBC. Equipment skids and mounts shall be of welded steel construction and shall have lifting lugs. Skids and equipment mounts shall accommodate anchoring to a concrete foundation using an adhesive-filled, drilled in-place anchor system.

F. All gas containing components shall be protected by pressure relief valves set at or below each component's maximum allowable working pressure.

G. All electrical controls shall be pre-wired to a single terminal strip in a junction box. The terminal strip shall be clearly labeled, ready for field termination. The junction box shall have skid edge conduit connections.

H. All drain connections shall be piped to the skid edge and plugged.

I. Gas inlet and outlet lines shall be terminated at the skid edge.

J. All non-stainless steel components shall be primed and painted.

2.2 PACKAGED COMPRESSOR UNIT

A. Natural Gas Compressor System

1. Acceptable Packager/Manufacturer

   a. P.C. McKenzie/Ingersoll Rand Model 20H40NGSX

   b. Or approved equal

2. The system shall be a self-contained electric-driven package, consisting of two electric motor driven compressors, controls, auxiliary systems, and safety devices. The compressor shall be designed specifically to compress natural gas. No converted gas engine or air compressor shall be used.

3. Compressor shall have individually flanged bolted compression and guide cylinders to facilitate servicing the cast-iron piston rings on all four stages.

4. Compressor shall be designed for smooth operation by the aluminum double-acting piston on the first and second stages balancing with the third stage steeple piston and fourth stage self-aligning piston.

5. Splash lubrication shall be provided with a low crankcase oil level switch.

6. A thermostatically controlled crankcase heater shall maintain the correct oil viscosity.

7. Compressor shall have single piece connecting rods, mechanical oil seal on drive shaft, and a precision balanced overhung crankshaft with replaceable crankpin bushing.

8. Air cooled finned tube intercoolers and aftercooler shall be provided.

9. Compressor inlet train shall include pulsation tank, coalescing filter, solenoid valves, and individual manual isolation valves. Discharge train shall include coalescing filter.

10. The closed loop recovery system shall include an ASME rated tank, ASME relief valve, pressure gauge, and manual drain valve.

11. Compressor system shall have an automatic condensate drain system collected by separators. Condensate shall drain into the recovery tank.

12. Electric shutdown controls shall be provided for the following: low/high inlet pressure, high discharge pressure, discharge control pressure, high fourth stage discharge temperature, excessive motor starts, low crankcase oil level, main motor/starter overload, emergency shutdown switch.

13. A Frank W. Murphy Mfr or approved equal control panel shall be provided for automatic start/stop operation with alternating lead/lag control. Control panel shall be weather-tight and suitable for use in Class 1, Division 2, Group D locations. Control panel shall include an LCD annunciator panel and switchgauges.

B. Electric Motor

1. Motor shall be 460VAC, 3 phase, 60 Hz, totally enclosed fan cooled, and suitable for use in Class 1, Division 2, Group D locations.

2. Motor shall have V-belt drive, belt tightener, full-voltage motor starter, and totally enclosed metal belt guard with antistatic belts.

C. Additional Requirements

1. Compressor shall transmit remote alarm notifications to the existing RACO Guard-It autodialer.

2. Refer to Articles 2.5 and 2.6 for additional requirements for piping/tubing and instrumentation/controls, respectively.

2.3 TIME-FILL METER AND COMMUNICATIONS PANEL

A. Acceptable Manufacturer

1. ANGI Energy

2. Or approved equal

B. General

1. Provide electronic time-fill meter panel for metering the total gas flow to four new time-fill posts (3,600 psig fill).

2. Provide communications hardware and software to transmit meter data to the Owner's building via hard-wired connection.

C. Meter Panel Requirements

1. Panel shall be NEMA 3R with front swing door and include mounting posts and external vent lines. Panel shall be affixed to posts. Mounting posts shall be suitable for anchorage to concrete pedestals using post-installed ICC-evaluated anchor systems. The outlet of high-pressure vent lines shall terminate a minimum ten-feet above finish grade. Vent lines shall be provided with panel.

2. Panel tubing and mechanical components shall be rated at 5,000 psig minimum. Panel shall be suitable for use in Class 1, Division 2 locations.

3. Ball valves (1/2" FNPT) shall be provided outside the panel for inlet and outlet isolation.

4. Panel shall include one MicroMotion CNG050 mass flow meter with transmitter or approved equal.

5. Panel shall include electronic fill system with actuated valve to shutoff fill upon target fill completion referenced at 3,600 psig and 70 degrees F (no dome load valve shall be used).

6. Panel shall include pressure gauge located on side panel of enclosure.

D. Communications

1. Provide hardware, firmware, and software to transmit meter data to and access meter data at the existing Maintenance Building via hardwired connection as shown in the plans.

2. Provide software to allow Owner to access meter data in diesel gallon equivalent per day. Meter data shall represent the total gas flow dispensed from the last four (4) new time-fill posts each evening.

3. Equipment located in the vicinity of the time-fill field and the existing Maintenance Building shall be suitable for location in Class 1, Division 2 and general-purpose areas, respectively.

2.4 TIME-FILL POSTS

A. Acceptable Manufacturer

1. ANGI Energy

2. Or approved equal

B. General

1. Provide ten (10) single-hose posts with mounting sleeve suitable for embedding in concrete pedestals. Each post shall include a manually operated isolation valve, bleed valve, breakaways (one on each supply and vent hose), twin-type fill hoses (supply and vent), hose retractor, and fill nozzle.

C. Fill Post Requirements

1. Vent gas shall exit at the top of the post. Top of installed post shall be a minimum of ten (10) feet above grade.

2. Hose breakaways for CNG supply and vent lines shall be in-line type.

3. Each fill hose shall consist of a twin-hose assembly (supply and vent hoses) rated at 5,000 psig and shall be electrically conductive. Hose assembly shall be a minimum 25 feet in length. Hoses shall be distinctly marked either by the manufacturer's permanently attached tag or by distinct markings indicating the manufacturer's name or trademark, natural gas service, and working pressure.

4. Fueling nozzle shall be a 3,600 psig Type 2, NGV-1 compatible coupling by OPW or approved equal.

5. Point of connection to each fill post shall be 3/8" stainless steel tubing. Each post shall include a manually operated isolation and bleed valves.

2.5 INSTRUMENTATION AND CONTROLS

A. All pressure gauges shall conform to the following requirements:

1. All gauges shall read at least 1.2 times the system design pressure (NFPA 52).

2. Accuracy, including hysteresis, shall ± 0.5% of full scale or better.

3. Rear blowout protection shall be provided.

4. All gauges shall be waterproof and oil-filled.

5. The dial shall have a minimum diameter of 2-1/2 inches.

B. All temperature gauges shall conform to the following requirements:

1. Accuracy shall be within ± 1% of the full scale or better.

2. The dial shall have a minimum diameter of 2-1/2 inches.

C. All instrument components interfacing with natural gas shall be made of material compatible with odorized natural gas. No copper metal or alloys containing more than 70% copper shall be used in natural gas service.

D. All gauges and manually-operated valves shall be located no higher than five (5) feet above grade except gas dryer regeneration inlet valve

2.6 PIPING / TUBING FOR EQUIPMENT SYSTEMS

A. Piping and tubing systems shall be rated for the maximum pressure and temperature to which they will be subjected under normal operating conditions and be properly supported and protected to prevent damage from vibration during shipment, operation, and maintenance. Piping and tubing systems shall be installed in a neat and orderly arrangement, adapting to the contours of the skid package. Piping and tubing systems shall not obstruct access openings. Where practical, piping and tubing shall be installed beneath the skid deck. Supports shall not be welded directly to piping or tubing.

B. Piping design, inspection, and testing shall be in accordance with ANSI/ASME B31.3. Piping shall be seamless and conforming to ASTM A106, Gr.B. Cast iron or semi-steel piping shall not be used. Testing shall be pneumatic.

C. Spacing for piping, tubing, and conduit supports shall be as follows:

1. Piping: Every 5-feet maximum

2. Tubing: Every 5-feet maximum and within 8-inches of a tube bend.

3. Conduit: Every 5-feet maximum.

D. Tubing and tube fittings shall be stainless steel. All tubing and tube fittings shall be rated for at least 6,000 psig working pressure. All tubing fittings used

throughout the station system shall be Swagelok 316 stainless steel, or approved equal. Different mixed brands of tubing and fitting shall not be used with equipment.

E. Stainless steel tubing shall be seamless and bright annealed, ASTM SA-269, type 316. The maximum hardness of the stainless steel tubing shall be no more than Rockwell hardness of 80. Where the following nominal OD tubing is used, the corresponding minimum wall thickness shall be:

Nominal OD	Minimum Wall Thickness
1/4“	0.049”
3/8“	0.065”
1/2“	0.083”
3/4”	0.109”

F. Carbon steel piping shall be primed and painted in accordance with manufacturer’s standards.

G. Personnel installing tubing and tube fittings shall be trained and certified by the tube-fitting manufacturer. All tubing shall be installed neatly and in a workmanlike manner. All tubing shall be properly anchored, supported, and/or pitched. All tubing shall run true to the vertical and horizontal axes of the skid. All valves shall be accessible for easy operation and maintenance. Teflon paste and Teflon tape impregnated with nickel shall be used to seal tube fitting pipe thread connections.

H. All piping, tubing, fittings, and other piping components between the ASME storage vessel and the first shutoff valve shall be designed for the full range of pressures, temperatures, and loadings to which they may be subjected with a factor of safety of at least eight (8) based on the specified minimum tensile strength (SMTS) at room temperature. All other pipe, tubing, fittings, and other piping components shall be suitable for the full range of pressures, temperatures, and loadings to which they may be subjected with a factor of safety of at least four (4) based on SMTS.

I. All drain lines shall be brought to skid edge and allow draining into a container placed on the ground next to the skid.

PART 3 – EXECUTION

3.1 EQUIPMENT INSTALLATION – GENERAL REQUIREMENTS

A. CNG equipment shall be installed in accordance with the Contract Documents and the manufacturer’s installation instructions. In the event of a conflict, the Contractor shall notify the Owner of the conflict and the most stringent requirement shall prevail. The Contractor shall refer to the other Bid Document

specifications in addition to the CNG fueling station plans and specifications to install the CNG equipment.

B. CNG equipment shall be installed in compliance with the codes and standards listed in Article 1.2 and all applicable state and local codes and requirements from the authorities having jurisdiction.

C. The Contractor, prior to bidding, shall visit the job site to become acquainted with the existing conditions related to his work and shall include in the bid proposal all labor and materials required for the installation to be complete and operative.

D. Not all underground utilities and substructures are shown. Those shown are for reference only. Prior to any trenching, the Contractor shall verify the location of all existing underground utilities. Any damage to the existing underground utilities shall be repaired or replaced at the Contractor's expense.

E. Contractor shall provide all equipment, structures, and materials unless noted otherwise.

F. The Contractor shall be responsible for securing all required permits and inspections. Contractor shall make arrangements for all required parties to be present at inspections and tests.

G. All changes shall be reviewed and approved by the Owner prior to any changes being made. A stamped revised set of drawings approved by the Owner shall be kept on site at all times.

H. Install equipment on concrete foundations or pads in accordance with the equipment manufacturer’s installation instructions and Contract Documents including but not limited to the Division 3 Concrete specifications and structural sheets. The surface finish and slope (if any) of the concrete foundation shall be as specified by the equipment manufacturer’s instructions. All post-installed anchors shall be ICC evaluated and approved. Installation of post-installed anchors shall be inspected and approved in accordance with Chapter 17 of the IBC.

I. The Contractor shall complete all equipment connections and provide a fully operational system. Flexible connectors rated for the intended service shall be provided for all piping and conduit connections to vibrating equipment.

J. Bare carbon steel surfaces (piping, vents, etc.) shall be primed and painted in accordance with the Contract Documents. Color shall comply with ASME A13.1.

3.2 INTERCONNECTING (OFF-SKID) PIPING/TUBING INSTALLATION

A. Piping and tubing systems for interconnection of CNG equipment shall be rated for the maximum pressure and temperature to which they will be subjected under normal operating conditions and be properly supported and protected to prevent damage from vibration during operation and maintenance. Piping and tubing

systems shall be installed in a neat and orderly arrangement, adapting to the contours of the skid package. Piping and tubing systems shall not obstruct access openings. Supports shall not be welded directly to piping or tubing.

B. Unless noted otherwise, piping design, inspection, and testing shall be in accordance with ANSI/ASME B31.3. Non-destructive examination shall be as specified in the Piping Plan. Piping shall be seamless and conforming to ASTM A106, Gr.B. Cast iron or semi-steel piping shall not be used. Testing shall be pneumatic.

C. Unless noted otherwise, a) threaded gas pipe connections may be used on 1-1/2 inch nominal pipe size and smaller for piping systems with a design pressure no greater than 200 psig (otherwise, such piping shall be socket- or butt-welded) and b) piping larger than 1-1/2 inch nominal pipe size shall be butt-welded.

D. Tubing and tube fittings shall be stainless steel. All tube fittings shall be rated for at least 6,000 psig working pressure. All tubing fittings used throughout the station system (dispensers, storage, and inter-skid connections) shall be Swagelok 316 stainless steel, or approved equal. Different mixed brands of tubing and fitting shall not be used with equipment. Contractor may use stainless steel pipe and socket-welded stainless steel fittings in lieu of stainless steel tubing and compression-type fittings except where disassembly is required for maintenance.

E. Stainless steel tubing shall be seamless and bright annealed, ASTM SA-269, type 316. The maximum hardness of the stainless steel tubing shall be no more than Rockwell hardness of 80. Where the following nominal OD tubing is used, the corresponding minimum wall thickness shall be:

Nominal OD	Minimum Wall Thickness
1/4”	0.049”
3/8”	0.065”
1/2”	0.083”
3/4”	0.109”

F. Piping shall be primed and painted in accordance with the Contract Documents.

G. Personnel installing tubing and tube fittings shall be trained and certified by the tube-fitting manufacturer. All tubing shall be installed neatly and in a workmanlike manner. All tubing shall be properly anchored, supported, and/or pitched. All tubing shall run true to the vertical and horizontal axes of the skid. All valves shall be accessible for easy operation and maintenance. Teflon paste and Teflon tape impregnated with nickel shall be used to seal tube fitting pipe thread connections.

H. All piping, tubing, fittings, and other piping components between the ASME storage vessel and the first shutoff valve shall be designed for the full range of pressures, temperatures, and loadings to which they may be subjected with a

factor of safety of at least eight (8) based on the specified minimum tensile strength (SMTS) at room temperature. All other pipe, tubing, fittings, and other piping components shall be suitable for the full range of pressures, temperatures, and loadings to which they may be subjected with a factor of safety of at least four (4) based on SMTS.

I. All drain lines shall be brought to skid edge and allow draining into a container placed on the ground next to the skid.

J. Spacing for piping, tubing, and conduit supports shall be as follows:

1. Piping: Every 5-feet maximum.

2. Tubing: Every 5-feet maximum and within 8-inches of a tube bend.

3. Conduit: Every 5-feet maximum.

3.3 ELECTRICAL INSTALLATION

A. The complete electrical installation shall be in accordance with the California Electrical Code, all applicable state and local codes issued by authorities having jurisdiction, and Contract Documents.

B. Drawings are diagrammatic, field design of conduit and wiring systems is required.

C. Galvanized rigid steel conduit shall be used for all conduit installed above grade. Conduit installed below grade shall be PVC schedule 40. Underground PVC conduit runs intended to stub-up and terminate at above-grade equipment, boxes and cabinets shall be transitioned to galvanized rigid steel conduit or PVC coated rigid steel conduit below grade, in the horizontal conduit run. Conduit seal fittings shall be installed in accordance with the NEC. Drawing details are diagrammatic and do not necessarily show all required seals. Contractor shall be required to provide all seals in accordance with the NEC.

D. Connections to motors and other devices or equipment that may be subject to vibration shall be made with flexible conduit in accordance with NEC requirements for the area classification. Drawing details are diagrammatic and do not necessarily show all required flexible conduit.

E. Unless otherwise indicated, the minimum size of conduit shall be 3/4" diameter for above grade installations and 1" diameter for below grade installations. All conduit ends shall have bushings. Galvanized rigid steel (GRS) conduits shall have grounding bushings. Conduits shall meet NEC requirements for Class 1, Division 1 and Class 1, Division 2 in classified areas.

F. Unless otherwise indicated, the minimum size of conductors shall be #12 AWG THWN copper only.

G. Green insulated ground conductors shall be installed in all feeder and branch circuit wiring.

H. All ground connectors shall be manufactured by Erico, OZ Gedney, Burndy, or approved equal. Use thermal weld ground connections below grade. Above grade ground connections may be thermal weld or mechanical type.

I. Provide equipment/circuit identification nameplate and labels on all equipment and devices. Labels shall be self-adhesive phenolic type with white letters on black background.

J. The Contractor shall provide typewritten directories for all electrical panels involved in this project. The panel directories shall reflect the as built circuits. One copy of the schedule shall be secured to the inside of the panel door, and one copy shall be submitted to the engineer as an "as-built" drawing.

K. Electrical equipment and feeders shall be supported and/or anchored in accordance with IBC seismic requirements.

3.4 ONSITE FACILITY PRESSURE TEST

A. The Contractor shall be responsible for arranging and performing all tests of the CNG fueling system as required by the applicable codes, regulatory agencies and this specification. All testing shall be done in the presence of the Contractor, Owner's Representative, and regulatory agencies (if necessary).

B. A pressure test in accordance with ASME B31.3 Paragraph 345.5.5 shall be performed on the completed interconnecting piping and tubing system prior to tying to the gas meter. A minimum test pressure as shown on the drawings shall be maintained for at least four hours. Nitrogen shall be used as the pressure test fluid.

C. Pressure tests of the piping system shall be recorded on a pressure recording device (e.g., chart recorder) in the presence of the Owner's Representative. Proof of pressure recording device calibration within six (6) months prior to the test is required. The Owner's Representative must initial all Pressure Test records and witness all Pressure Tests.

D. The testing, to the extent the schedule permits, shall be organized to minimize the number of separate tests. If possible, the entire system shall be tested as a single testing segment.

E. Upon completion of any test, all test records shall become the property of the Owner. The Contractor shall forward to the Owner's Representative copies of test records indicating that all piping has been strength- or pressure-tested. Test records shall be signed and dated by the Owner's Representative upon witnessing and verifying said test. It is the responsibility of the Contractor to ensure that all representatives of the permitting agencies that may be required to witness testing

are given at least one (1) week written notice prior to any testing of the CNG Fueling Station.

F. If a tested section fails to maintain the specified test pressure, the Contractor shall determine the location of the leakage or failure. The contractor shall remove the defective section and install, with new material, a replacement section prior to reinitiating the test. The section shall be retested in its entirety for at least four hours. The defective section shall remain the property of the Owner.

G. The system, after completion of the required leak or strength test, shall remain pressurized until the Owner's Representative is on site. Depressurization of the system shall only commence after authorization from the Owner's Representative. If the system fails to maintain pressure during the period subsequent to the test, damage to the system must be suspected and the system must be retested.

H. The Owner shall not be held liable for any additional costs associated with damages, repair, retesting, investigation, etc., arising from failures due to inferior workmanship, and/or materials furnished by the Contractor, which prove to be defective until testing.

I. Once the facilities are successfully pressure-tested, the Contractor shall not perform any maintenance or further work on the facilities without the express written permission of the Owner's Representative.

3.5 ONSITE SYSTEM STARTUP, TESTING, AND TRAINING

A. Prior to shipment, the CNG compressor shall be operated for a minimum of four (4) continuous hours and functionally tested. The test shall include, but not be limited to, operation of the compressor, all control, safety shutdown and alarming systems, etc.

B. The installed fueling equipment shall undergo a witnessed system test. At least two (2) weeks prior to the system test, the Contractor shall submit to the Owner's Representative draft Maintenance and Operating Manuals. During the testing of the mechanical, instrumentation and electrical equipment by the Contractor, the Contractor shall make available representatives of the manufacturers of all of the major equipment or other qualified persons who shall instruct the Owner's personnel in the operation and maintenance thereof. Natural gas shall be used for the system test. Piping and tubing shall be purged with nitrogen prior to introducing natural gas. The tests shall include, but not be limited to, the items listed below

1. Test new compressor including integration with CNG station fast-fill and time-fill operation.

2. Test new time-fill system including meter panel.

3. Test meter data communications and reporting system.

4. Any discrepancies found as a result of these inspections and tests shall be corrected by the Contractor at no cost to the Owner (including the cost for making all the corrections and repeating the tests within two (2) weeks.)

C. Acceptance by the Owner's Representative of the fueling stations and associated items furnished by Contractor under this specification shall occur only after the following requirements have been met:

1. It has been demonstrated to the satisfaction of the Owner Representative that the fueling station as a whole, meets and conforms to the requirements of the Contract Documents.

2. All testing required by the Contract Documents have been successfully completed and have been accepted by the Owner's Representative.

3. The date of acceptance of the fueling station shall be the date of the written notice of its acceptance by the Owner's Representative to Contractor. All warranties and/or guarantees referred to or implied in the Contract Documents shall commence on that acceptance date.

4. Acceptance by the Owner's Representative of the witnessed test shall not release Contractor from any of its warranty obligations, or any other obligation, under the Contract Documents.

D. Contractor shall provide two (2) formal training classes in equipment operation, service, and maintenance. Factory service representatives shall instruct the Owner's designated operating and maintenance personnel in the operation, adjustment, and maintenance of all equipment and systems. Training shall include classroom and "hands-on" activities. The basis of instruction shall be the station operating and maintenance manual.

3.6 RECORD DRAWINGS

A. The Contractor shall update the equipment shop fabrication drawings to reflect all field modifications subsequent to delivery from the factory. The latest revision of the shop fabrication drawings shall be incorporated into the station operating and maintenance manuals. Drawings shall be provided in both hard copy and electronic PDF file formats.

B. The Contractor shall submit red-line markups of the station installation drawings that reflect all field modifications.

3.7 OPERATING AND MAINTENANCE MANUALS

A. All product data and related information appropriate for Owner's maintenance and operation of all products and systems provided under this Contract shall be compiled into an integrated CNG fueling station operating and maintenance manual. The manual shall include written test reports documenting performance

and operational data. Any PLC program listing shall be included in the manual. Submit copies of the draft manual for review by the Owner's Representative. Submit copies of the final manual after acceptance by the Owner's Representative.

3.8 WARRANTY SERVICE

A. Contractor shall provide a one-year warranty covering parts and labor. The warranty period shall begin upon acceptance of the station by the Owner.

END OF SECTION

DIVISION 16 – ELECTRICAL

SECTION 16020 – BASIC ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Extent: The Contractor shall furnish all services, skilled and common labor, and apparatus and materials required for the complete installation as shown and within the intent of the Drawings and these Specifications.

B. Work includes, but is not limited to, the following:

1. Furnish and Install:

a. Complete distribution systems for power, controls and communications including pullboxes, conduit and wire for new equipment

b. Conduit sealing fittings

c. Grounding system for new equipment

d. All necessary cutting, patching, trenching and backfilling

e. Test the completed work. Correct any deficiencies to the satisfaction of the Owner's Representative

1.2 EXAMINATION OF SITE

A. The Contractor shall examine the site and become familiar with all conditions that may affect the work covered by the design drawings and this Division of the Specifications to assure a conclusive bid is submitted. Failure of the Contractor to assess the requirements shall not lessen the Contractor's responsibility or entitle them to additional compensation for work omitted from the initial bid.

1.3 RULES AND REGULATIONS

A. Drawings: If any part of the Drawings or these Specifications are not clear or definite, the Contractor shall request the Owner's Representative to apply to the Engineer for an interpretation or clarification. The Contractor shall obtain all interpretations or clarifications prior to proceeding with the work.

B. Manufacturer's Directions: The Contractor shall follow the manufacturer's directions covering points not shown on the drawings or specified in the specifications. Should the manufacturer's directions conflict with the drawings or

specifications, the Contractor shall contact the Owner's Representative for clarification before proceeding.

C. Protection of Equipment:

1. Due care shall be exercised during construction to avoid damage or disfigurement of any kind. All equipment shall be protected from dust and moisture prior to and during construction.

2. Where required or directed, construct temporary protection for equipment and installations so as to protect them from dust and debris caused by the construction.

3. All protection shall be substantially constructed with the use of clean canvas, heavy plastic, visqueen or plywood as required, and made tight and dust proof as directed.

4. The Contractor shall repair by spray or brush painting, after properly preparing the surface, all scratches or defects in the finish of the equipment. Only identical paint furnished by the equipment manufacturer shall be used for this purpose.

5. Failure of the Contractor to protect the equipment as outlined herein shall be grounds for rejection of the equipment or its installation.

1.4 REVIEW OF MATERIALS

A. Materials and Equipment: All materials and equipment shall be new. All materials and equipment, for which the Underwriters Laboratories, Inc. have established tests, shall be approved by that body and shall bear its label of approval.

1. In lieu of being listed by the Underwriters Laboratories, Inc., consideration will be given to certified test reports of an adequately equipped, recognized independent test laboratory, competent to perform the testing, attesting to the product's conformance with all the applicable requirements of the Underwriters Laboratories, Inc., standards.

2. Unless otherwise approved by the Owner, the materials to be furnished under this Specification shall be the standard products of manufacturers regularly engaged in the production of such equipment equal to or superior to the material specified, and shall be the manufacturer's latest standard design that complies with the Specification requirements.

B. Approval of Materials:

1. A complete list of materials and equipment proposed shall be submitted to the Owner's Representative for approval. The list shall include for each

item: the manufacturer's name, the manufacturer's catalog number, type or class, the rating, capacity, size, etc.

2. The Contractor shall submit a brochure containing catalog cuts or Drawings and data.

3. Before installation of the equipment, the Contractor shall submit detailed construction Drawings of the electrical equipment to the Owner's Representative for approval. All Drawings shall be to scale, fully dimensioned, and shall provide sufficient detail to clearly indicate the arrangement of the equipment and its components.

4. Installation of any approved substituted equipment is the Contractor's responsibility, and any changes required to work included under other Divisions for installations of approved substituted equipment must be made to the satisfaction of the Owner and without change in the contract price. Approval by the Owner of substituted equipment or dimensioned Drawings does not waive these requirements.

1.5 QUALITY ASSURANCE

A. All electrical work under this contract shall be performed by a qualified contractor holding a valid C-10 license and all other licenses and permits required by the authorities having legal jurisdiction over the work.

PART 2 – PRODUCTS

2.1 GENERAL

A. In addition to material and equipment specified, the Contractor shall also provide incidental materials required to effect a complete installation. Such incidental materials include solders, tapes, caulkings, mastics, gaskets, equipment supports, brackets, anchors and similar items.

B. Materials and equipment shall be uniform throughout the installation. Equipment of the same type shall be of the same manufacturer. All materials and equipment shall be new. Materials and equipment, for which the Underwriters Laboratories, Inc. have established tests, shall have been approved by that body, or an equivalent testing firm and shall bear its label of approval.

PART 3 – EXECUTION

3.1 TESTS

Upon completion of the electrical construction work the Contractor shall perform tests and provide test reports to the Owner's Representative as specified in this and other Sections of this Division.

A. The Contractor shall provide the Owner with a minimum of two (2) weeks advance notice of all field tests to be performed.

B. All tests shall be performed in the presence of the Owner's Representative. The request for interruption of power shall be scheduled and coordinated through the Owner's Representative.

C. The Contractor shall submit to the Owner's Representative three (3) copies of all test results, certified in writing, witnessed, signed and dated, immediately upon completion of the test. Any unsatisfactory condition revealed by the test results, unsatisfactory methods of testing, or inadequate performance of the testing equipment, shall be corrected by the Contractor to the satisfaction of the Owner's Representative.

D. The Owner's Representative reserves the right to require the Contractor to perform or repeat any tests that are deemed necessary to complete or verify the tests or the certified records of the Contractor at any time during the course of the project. The Contractor shall correct any unsatisfactory portion of the work revealed by the tests.

3.2 EQUIPMENT IDENTIFICATION

A. Equipment: The Contractor shall properly identify all circuit breakers and other devices on switchboards, and other apparatus used for operation of, or control of the circuits, appliances or equipment by means of 3/32-inch thick white laminated phenolic nameplate with a black core. The engraved characters shall be a minimum of 3/16-inch in size for the device numbers, using Helvetica style font. The nameplates shall be attached using self-tapping stainless steel machine screws.

B. Conductors: All wires installed shall be marked to clearly identify the phase and circuit identification.

1. All conductors shall be color-coded and provided with plastic circuit identification labels. For directions regarding the color-coding of low voltage conductors, see Section 16120, Part 2.1.

2. Feeder circuit cables shall have permanently attached plastic labels with _-inch characters for identification. Feeder circuits shall be identified with the circuit number as stipulated in the Drawings.

3. Branch circuit identification shall be by use of plastic sleeve labels such as those manufactured by Raychem, Panduit, or equal. Labels shall be placed on conductors at all outlets, panelboards, junction boxes, relays, and controls. Branch circuit conductors shall be identified with the circuit number.

3.3 NOISE AND VIBRATION

A. The Contractor shall cooperate with the Owner's Representative in reducing objectionable noise or vibration. If the noise or vibration is the result of the material or improper installation, the condition(s) shall be corrected at no additional expense to the Owner.

3.4 GENERAL INSTALLATION METHODS

A. Cutting, Patching, and Core Drilling:

1. Provide cutting, patching, and core drilling required for the installation of the material and equipment specified in this division.

2. Do not cut, core, or drill structural members without the prior consent of the Owner's Representative.

B. Seismic Mounting: All electrical material and equipment, including the floor mounted equipment, shall be installed with the bracing or anchoring necessary to comply with the latest edition of the International Building Code.

C. The contract drawings are based on preliminary information provided by equipment manufacturers and suppliers prior to completion of bidding documents. Contractor shall be responsible for coordinating final equipment installation requirements with the manufacturer, including making necessary adjustments to conduit stub-up locations, at no additional cost to the Owner.

D. Waterproof Construction:

1. Maintain the waterproof integrity at the penetration points of materials intended to be waterproof. Membrane clamps shall be provided at penetrations points of waterproof membranes.

2. Provide waterproof NEMA 3R enclosures for all equipment or devices mounted outside or otherwise exposed to the weather.

END OF SECTION

DIVISION 15 – MECHANICAL

SECTION 15190 – MECHANICAL IDENTIFICATION

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Identification of mechanical piping and all mechanical equipment and components installed under the work of the project.

1.2 RELATED SECTIONS

A. Section 09900 – Painting

1.3 REFERENCES

A. The following documents form a part of these specifications to the extent stated herein. Unless otherwise indicated, use the issue in effect on the date of request for quotation. Bring any conflicts between specifications, drawings, and the referenced documents to the attention of the Owner in writing, for resolution before taking any related action. Where differences exist between codes and standards, the one affording the greatest protection shall apply.

1. American Society of Mechanical Engineers (ASME)

a. ASME A13.1 Scheme for the Identification of Piping Systems

1.4 SUBMITTALS

A. Submit product data and manufacturer's installation instructions under provisions of the General Conditions.

B. Submit list of wording, symbols, letter size, and color-coding for mechanical identification.

C. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Seton

B. Or approved equal

2.2 MATERIALS

A. Color Coding: ASME – A13.1 unless specified otherwise.

B. Plastic Nameplates: Laminated two-layer plastic with engraved black letters on light, contrasting background color.

C. Plastic Tags: Laminated three-layer (double-sided) plastic with engraved black letters on light, contrasting background color. Tag size at least 1-1/2 inch diameter.

D. Stencils: With clean-cut symbols and letters of following size:

OUTSIDE DIAMETER INSULATION OR PIPE	COLOR FIELD LENGTH	LETTER HEIGHT
3/4" - 1-1/4	8"	1/2"
1-1/2" - 2"	8"	3/4"
over 2-1/2"	12"	1-1/4"
Equipment	---	2-1/2"

E. Stencil Paint: Semi-gloss enamel; in accordance with Section 09900.

PART 3 – EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive of identification materials.

B. Prepare surfaces in accordance with Section 09900 for stencil painting.

3.2 INSTALLATION

A. Plastic Nameplates: Install with corrosion-resistant mechanical fasteners, or adhesive.

B. Plastic Tags: Install with corrosion-resistant chain.

C. Stencil Painting: Apply in accordance with Section 09900.

3.3 IDENTIFICATION SCHEDULE

A. Equipment: Identify with plastic nameplates. Small devices, such as in-line pumps, may be identified with plastic tags.

B. Controls: Identify control panels and major control components outside of panels with plastic nameplates.

C. Valves: Identify valves in main and branch piping with tags.

D. Identify piping with stenciled painting. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not more than ten (10) feet apart on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

DIVISION 16 – ELECTRICAL

SECTION 16050 – BASIC MATERIALS AND METHODS

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Conduit, conduit seals and fittings

B. Wireways and fittings

C. Pull and outlet boxes

D. Cable and wire

E. Pulling cable and wire

F. Wiring devices and connections

G. Supporting devices

H. Acceptance tests

1.2 RELATED SECTIONS

A. See the following Specification Sections for work related to the work in this Section:

1.	Section 16020	Basic Electrical Requirements
2.	Section 16110	Conduit
3.	Section 16120	Wire and Cable
4.	Section 16130	Boxes
5.	Section 16385	Underground Electrical Construction
6.	Section 16451	Grounding

1.3 APPLICABLE STANDARDS

A. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to the work of this Section.

1.4 SUBMITTALS

A. Manufacturer's literature, drawings and published data.

PART 2 – PRODUCTS

2.1 CONDUIT, CONDUIT SEALS AND FITTINGS

A. See Section 16110 Conduit

2.2 PULL AND OUTLET BOXES

A. See Section 16130 Boxes

2.3 CABLE AND WIRE

A. See Section 16120 Wire and Cable

2.4 PULLING CABLES

A. When cable pulling lubrication is required it shall be a compound specifically prepared for cable pulling and shall not contain petroleum or other products which have a deteriorating effect on the cable jacket or insulation. Cable pulling lubricants shall be approved by the wire and cable manufacturer specifically for use with their products and shall be manufactured by: Y-Er-Eas, Mineralic, Ideal, or equal.

2.5 WIRING DEVICE AND CONNECTIONS

A. 600 Volt or Less Wiring Connections

1. Terminal Strip Connectors:

a. All Sizes: Crimp type, solderless lugs and connectors as manufactured by Burndy, Thomas and Betts, or equal.

b. Pressure connectors furnished as an integral part of equipment shall be used for conductors of any size.

2. Circuit wiring connectors to fixture wire shall be of the insulated spring connector type as manufactured by: 3M, Ideal, or equal.

3. Splices:

a. No. 6 and larger splices shall be made up with crimp type splice sleeves as manufactured by 3M, Ideal, or equal and taped.

b. No. 8 and smaller splices shall be made up with insulated spring connectors as manufactured by 3M, Ideal or equal.

4. All connections requiring taping shall use the appropriate type as manufactured by 3M, Hysol, or equal.

2.6 RECEPTABLES FOR HAZARDOUS LOCATIONS

A. Receptacles shall be Crouse-Hinds Feraloy type CPS (or equal), angle type, suitable for use in Class 1, Division 1 and 2, Group C and D hazardous locations and wet locations. Receptacles shall have a delayed action mechanism, ensuring arcs are extinguished in the contact chamber prior to allowing the plug to be withdrawn. The receptacles shall be rated for 20A, 125-250V AC, 2-wire, 3-pole, 60Hz. One (1) matching type CPP plug will be provided with each receptacle.

PART 3 – EXECUTION

3.1 CONDUIT AND WIREWAYS

A. Conduit shall be installed for all conductors of all systems unless specifically noted otherwise on the drawings. Refer to Section 16110 - Conduit.

3.2 PULL AND OUTLET BOXES

A. Mount with supporting means independent of conduits. Machine bolts shall be used for fastening to structural steel and machine screws and expansion anchors shall be used for fastening to concrete or solid masonry.

B. Pull boxes shall be of the size and type to accommodate the electrical classification of the location, structural conditions, size and number of raceways, conductors or cables entering and leaving, and device or fixture for which required.

C. Locations of outlets and pull boxes on drawings are diagrammatic unless dimensioned. When necessary and with the approval of the Engineer, outlets and pull boxes shall be relocated to avoid interference with other work.

3.3 SECONDARY WIRE AND CABLE

A. All wiring shall be in conduit except as specifically noted.

B. The entire wiring system shall be installed with identified neutrals and color-coded phase wires. All branch circuits shall have individual neutral conductors installed in the same raceway. Each branch circuit shall have a properly sized ground conductor.

C. All conduits shall be swabbed until all moisture and dirt has been removed before any wire or cable is installed.

D. All cables and wires shall have the same identification at all termination and splice points and at all pull boxes, outlet boxes, conduit bodies and wireways in which they are installed. Allow at least 6-inch of tails packed in the outlet boxes after splices or terminations are made.

E. All cable and wire in equipment enclosures shall be grouped and laced with plastic bands. The cables and wires shall be systematically and symmetrically arranged and so formed to avoid strain at terminal points.

F. No splices shall be made in conduits or conduit fittings (condulets). Splices shall be made in outlet, junction or pull boxes only.

G. Cable splices and terminations shall be installed in accordance with the cable manufacturer's recommendations. Terminations shall be made with crimp-type solderless lugs and connectors or use pressure connectors furnished as an integral part of equipment. Splices for #6 and larger shall be made up with crimp type splice sleeved and taped. The splice shall be wrapped with electrical tape in a manner and with material approved for the circuit voltage. Splices for #8 and smaller shall be made up with insulated spring connectors.

H. Cable pulling methods and materials shall only be those recommended by the cable manufacturers. Cable shall not be pulled through more than one intermediate manhole or pull box on one pull. Cables shall be lubricated with approved pulling lubricant during pulling operations. All cable ends shall be sealed against moisture after pulling.

3.4 SUPPORTING DEVICES

A. Refer to Section 16020, Basic Electrical Requirements, Part 3.04.B - Seismic Mounting for equipment seismic restraint requirements.

B. Do not cut or weld to any structural steel without written permission from the Engineer. Devices shall be securely and safely supported in accordance with the requirements of the latest edition of the IBC.

C. Unistrut, Kindorf or equal type channel shall be used for the support of miscellaneous electrical devices, conduit, equipment, or fixtures as may be suitable for the conditions.

D. Machine bolts shall be used for fastening to structural steel. Machine screws and expansion anchors shall be used for fastening to concrete or solid masonry.

3.5 ACCEPTANCE TESTS

A. An insulation resistance test shall be performed on all cabling and wiring installed by the Contractor that is rated at 600V or less. All insulation tests shall be made with a direct reading megohmeter (megger) having a minimum voltage rating of 500V DC. Test readings shall be recorded and results submitted as specified in Section 16020, Basic Electrical Requirements.

B. The minimum acceptable resistance shall not be less than one megohm from conductor phase to phase and phase to ground using a potential of 500V DC applied for thirty (30) seconds.

C. After insulation tests have shown the cable and wiring installation to be satisfactory the cable and wiring may be energized and tested for proper voltage and phase rotation. Test readings shall be recorded and the results submitted as detailed in Section 16020, Basic Electrical Requirements.

D. The Contractor shall furnish all instruments required for the tests.

END OF SECTION

DIVISION 16 – ELECTRICAL

SECTION 16110 – CONDUIT

PART 1 – GENERAL

1.1 WORK INCLUDED

A. The work covered in this Section consists of furnishing all labor, supervision, tools, materials, equipment and performing all work necessary to furnish and install complete raceway systems suitable for receiving wire and cable. Systems shall be complete with all couplings, bushings, other fittings and support. Work shall include provision of:

1. Rigid metal conduit and fittings

2. Flexible metal conduit and fittings

B. Work associated with the installation of underground conduit systems shall be provided in accordance with Section 16385, Underground Electrical Construction.

1.2 RELATED SECTIONS

A. See the following Specification Sections for work related to the work in this Section:

1.	Section 16020	Basic Electrical Requirements
2.	Section 16120	Wire and Cable
3.	Section 16130	Boxes
4.	Section 16385	Underground Electrical Construction
5.	Section 16451	Grounding

1.3 APPLICABLE STANDARDS

Raceway systems and all related components shall be designed, manufactured and tested in accordance with the latest applicable revision of the following standards and codes:

A. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

1.	ANSI C80.1	Rigid Steel Conduit, Zinc Coated

B. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

1.	NEMA FB 1	Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies

2. NEMA TC 2 — Electrical Polyvinyl Chloride (PVC) Tubing and Conduit

3. NEMA TC 3 — PVC Fittings for Use with Rigid PVC

C. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

1. NFPA 70 National Electrical Code (NEC)

D. FEDERAL SPECIFICATIONS (FS)

1. FS A-A-55810 — Flexible Metal Conduit

E. UNDERWRITERS LABORATORIES, INC. (UL)

1. UL 6 — Rigid Metal Electrical Conduit

2. UL 514B — Conduit, Tubing and Cable Fittings

3. UL 651 — Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings

1.4 SUBMITTALS

A. All submittals shall be made in accordance with the General Conditions. Supplier shall furnish six (6) sets of submittals containing the following information for Owner's approval:

1. The Contractor shall submit manufacturer's product data for the materials and equipment proposed for use.

1.5 QUALITY ASSURANCE

A. Products for which the Underwriters Laboratories, Inc., have established tests, shall have been approved by that body, or an equivalent testing firm, acceptable to the Owner, and shall bear its label of approval.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered to the site in unopened cartons or bundles as appropriate, clearly identified with the manufacturer's name, Underwriters Laboratories, Inc. or other approved label, grade or identifying number.

PART 2 – PRODUCTS

2.1 RIGID METAL CONDUIT AND FITTINGS

A. Rigid Steel Conduit: Schedule 40 pipe, hot-dip galvanized or sherardized, conforming to ANSI C80.1 and UL 6, with threaded ends, protected both inside and out, "Sheraduct," "GE White," "Galvite," or equal.

B. Fittings and Conduit Bodies: threaded type, material to match the conduit, and product listed for intended location. Fittings, couplings and connectors shall conform to the requirements of UL 514B.

C. Watertight Expansion and Deflection Fittings: O-Z Electric Co. Type DX, Crouse-Hinds, or equal, capable of accommodating not less than a 3/4-inch displacement from the normal condition in any direction including the longitudinal (conduit centerline) direction.

D. Conduit Seals: Crouse-Hinds Type EYS or equal, suitable for Class 1, Division 1 or 2 application, in vertical or horizontal mounting position as required. Provide fiber dam and sealing compound as recommended by the manufacturer for use with the conduit seals provided.

E. Bonding Bushings: O-Z Electric Co. Type "BLG", Thomas and Betts Co., Inc., or equal.

F. Insulating Bushings: O-Z Electric type "A", Thomas and Betts Co., Inc., or equal.

G. All rigid conduit threaded joints shall have thread lubricant applied, Crouse-Hinds STL or HTL, or equal.

2.2 FLEXIBLE METAL CONDUIT AND FITTINGS

A. Conduit: For unclassified areas, use liquid-tight, interlocking single-strip type with overall molded jacket to exclude moisture, "Sealtite," Condu-Flex, or equal. Unless otherwise specified, use the following for classified areas, Crouse-Hinds, EC Couplings, Appleton EX Flexible Coupling, or equal.

B. Fittings and Conduit Bodies: NEMA FB 1, (steel), screw-in type.

C. Flexible Conduit Connectors: Thomas and Betts, Appleton Electric Co. or equal, galvanized steel with integral insulating throat.

2.3 POLYVINYL CHLORIDE CONDUIT AND FITTINGS (PVC)

A. Schedule 40 PVC conduit conforming to NEMA TC 2 and UL 651. Fittings, NEMA TC 3, and solvent cement as recommended by the manufacturer.

2.4 SUPPORTS AND ATTACHMENTS

A. Conduit Clamps, Straps, and Supports: Steel or malleable iron.

B. Concrete Drilled Anchors: USM Corp., "Parabolt", Langford Tool and Drill Co., "Kwik-Bolt", or equal.

C. Self-Drilling and Self-Tapping Bolts: Atlas Corp., "Teks 2", or equal.

D. Sheet-metal Screws: Parker-Kalon, American, or equal, self-tapping, hardened steel, cadmium plated, binding head or countersunk flat head to suit application.

E. Hanger Rods: 1/4-inch minimum, hot dip galvanized Unistrut Corp., Super Strut Corp., or equal, applied as shown. Use channel nuts, hex nuts, saddle type and flat washers and similar accessory items, each best suited to the specific application:

1. Channel section, 12-gage, 1-5/8 x 2-7/16-inches: P5500

2. Studs, nuts and similar items: of sizes and types noted and compatible with the channel section to which they are being applied.

3. Flat plate, angle, shaped and special fittings and beam clamps, of types noted and compatible with the channel section to which they are being applied.

4. Conduit straps: P2580-10 to P2553-40, two-hole

5. Conduit straps: Appleton, Steel City, or equal, one-hole, sheet steel, for 1/2-inch and 3/4-inch conduits only

6. "U" bolts: Schedule 40 pipe sizes with threaded legs and nuts

7. Universal pipe clamps, 1/2-inch to 2-inch conduits: P2911 to P2917

8. I.P.S. type pipe hangers, as shown

PART 3 – EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. All wires shall be installed in conduit or wiring raceways. Size raceways in accordance with NEC requirements, unless specified on the drawings.

B. Provide separate raceway systems for each of the following wiring categories:

1. 480Y/277 volt normal power.

2. 208Y/120 volt normal power.

3. Control Wiring

4. Instrument Wiring

C. Unless otherwise indicated, conduits installed underground shall be PVC Schedule 40, installed as specified in Section 16385, Underground Electrical Construction. Make all joints and connections using fittings designed for the purpose, bonded permanently and watertight using solvent cement. Comply with manufacturer's recommendations for bending and cutting.

3.2 CONDUIT SIZE, ARRANGEMENT, AND SUPPORT

A. The minimum conduit size shall be 3/4-inch trade size unless noted otherwise on the plans.

B. Conduit systems shall be worked into complete, integrated arrangements, with like elements to present an orderly, neat, and professional appearance as specified herein.

C. Run all conduit, raceways, and junction boxes exposed, except as shown or noted otherwise. Exposed conduits or raceways shall be run parallel with walls or structural elements.

D. Vertical runs shall be plumb and horizontal runs level and parallel with structure. Groups shall be racked together neatly with both straight runs and bends parallel and uniformly spaced.

E. All conduits shall be securely fastened in place at intervals not exceeding those specified in the NEC, with approved and suitable clamps or fastener types. All vertical conduits shall be properly supported to present a mechanically rigid and secure installation.

F. Maintain, at a minimum, a 6-inch clearance between conduit and piping.

G. No conduit shall be fastened to other conduits or pipes, or installed so as to prevent the ready removal of other pipes for repairs.

H. Space conduit, supported directly from the concrete structure, out at least 1/4-inch using one-hole malleable straps with pipe spacers or, if three (3) or more conduits are located in a parallel run, they shall be spaced out from the wall approximately 5/8-inch to 1-inch by means of framing channel.

I. Secure conduit racks to concrete walls by means of cast-in-place anchors, die-cast, rustproof alloy expansion shields, or cast flush anchors. Wooden plugs, plastic inserts, or gunpowder driven inserts shall not be used as a base to secure conduit supports. Conduit shall be supported immediately on each side of a bend and not more that 3-feet from an enclosure where a straight run of conduit ends.

J. Welding, brazing, or other heating of the conduit is not permitted.

K. Clearance: Do not obstruct spaces required by Code in front of electrical equipment, access doors, etc.

L. Conduit of 2-inch trade size or smaller O.D., but not larger than one-third the concrete thickness, may be installed in structural concrete between the steel and the bottom of the slab only where permitted by the Owner's Representative. Conduit may be in contact with reinforcing or other conduit where crossing at a right angle, but maintaining a minimum spacing of three times the O.D. elsewhere.

M. The interior of all raceways shall be thoroughly clean and free from cement, paint, grease, plaster, and dirt.

N. Empty conduit, in which wire is to be installed by others, including telephone, communications, instrument, or data conduits, shall have pull lines installed. The pull line shall be 3/32-inch nylon or polyolefin having not less than a 200-pound tensile strength. No less than 24-inches of slack shall be left at each end of the pull line. Attach Patrick and Co. Size 2, Type 11-172, Dennison Co., or equal, cloth or plastic tags to the ends of the pull lines with nylon string. Tags shall be marked with indelible ink indicating the location of the other end of the pull line and the service for which the conduit is provided.

3.3 CONDUIT INSTALLATION

A. Drawings do not necessarily indicate, generally, routes of all branch circuits. All runs to panels are indicated as starting from the nearest outlet. Provide conduits to panels as though routes were indicated in their entirety.

B. The Contractor shall not commence installation of the conduits until all the conduit runs have been accounted for and properly planned.

C. Pull boxes and splice boxes shall be installed where shown and where otherwise required to facilitate the installation of conductors and to comply with code requirements. Different types of conduits shall not be intermixed in any run.

D. Conduits shall be installed to be free of traps where condensation water could accumulate wherever possible.

E. When required for ease of cable pulling and as necessary to meet Code, provide malleable conduit fittings or pull boxes even though not shown. Turns shall consist of malleable fittings or symmetrical bends.

F. Install conduit seals in accordance with NEC requirements and as shown on the drawings. Conduit seals shall be provided within 18 inches of each conduit entry into explosion-proof enclosures and wherever conduits transition from a hazardous rated location to a non-hazardous location. Each conduit routed underground from, or through, a hazardous location to a non-hazardous location shall have conduit seals provided, above grade, at each end of the conduit run within 12 inches of the point the conduit enters/leaves the ground. All conduit seals shall be filled with sealing compound in accordance with the manufacturer's recommendations.

G. Bends and offsets shall be avoided where possible, but where necessary, shall be made with approved hickey or a conduit-bending machine. Make bends and offsets of as large a radius as construction will permit so as not to injure the conduit in any way. Conduit bends shall not be kinked and shall not be flattened more than 5% of the outside diameter of the conduit. Where exposed conduits are run in groups, all bends shall have a common center, with a minimum inner radius of eight times the inside diameter of the conduit. Standard ells will not be allowed at these locations.

H. Use flexible metal conduit for final connection to vibrating equipment. The length of any size or type of flexible conduit shall not exceed 6-feet. An equipment-grounding conductor shall be installed in all conduit runs having a length of flexible metallic conduit, flexible liquid-tight conduit, non-metallic conduit or duct as any part of the run. Flexible liquid-tight conduit shall be used in damp or wet locations requiring flexible conduit. Provide explosion-proof flexible couplings for final connection to vibrating equipment within classified areas. Use of flexible couplings and flexible metal conduit for other than connections to vibrating equipment shall be subject to prior approval by the Engineer.

I. Plug or cap all unused conduit openings with a suitable device designed for the purpose. Caulking compound shall not be used for plugging conduit openings.

J. Rigid Metal Conduit: Connect with threaded ends, threaded couplings, thread into integrally cast hubs or use double locknuts and insulating bushings.

K. Keep conduits closed and moisture-tight during construction.

L. Where rigid steel conduit and fittings are installed in contact with earth and/or concrete, they shall be wrapped with 20-mil PVC tape, 50% overlap.

3.4 GROUNDING

A. Permanently and effectively ground all conduit systems in accordance with Section 16451.

B. A separate ground conductor shall be run in each conduit and shall be connected to each junction box using a grounding screw in each box. An equipment-bonding jumper shall be used to connect all grounding type receptacles to the grounded box. The use of looped wires under grounding screws shall not be permitted.

END OF SECTION

DIVISION 16 – ELECTRICAL

SECTION 16120 – WIRE AND CABLE

PART 1 – GENERAL

1.1 WORK INCLUDED

A. The work covered in this Section consists of furnishing all labor, supervision, tools, materials, equipment and performing all work necessary to furnish and install complete wire and cable systems required for power distribution, lighting, equipment and system grounding, and station monitoring, controls and instrumentation. Work shall include:

1. Wire and cable – Power Systems
2. Wire and cable – Monitoring and Control Systems
3. Wiring and cable – Grounding Systems
4. Wiring connections and terminations

1.2 RELATED SECTIONS

A. See the following Specification Sections for work related to the work in this Section:

1.	Section 16020	Basic Electrical Requirements
2.	Section 16110	Conduit
3.	Section 16130	Boxes
4.	Section 16385	Underground Electrical Construction
5.	Section 16451	Grounding

1.3 APPLICABLE STANDARDS

Work and materials shall be in compliance with the latest applicable revision of the following standards and codes:

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

1.	ASTM B3	Specification for Soft or Annealed Copper Wire
2.	ASTM B8	Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard or Soft

B. INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

1.	ATS	Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems

C. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

1.	NEMA WC 5	Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

D. NATIONAL FIRE PROTECTION ASSOICATION (NFPA)

1.	NFPA 70	National Electrical Code (NEC)

E. UNDERWRITERS LABORATORIES, INC. (UL)

1.	UL 44	Thermoset-Insulated Wires and Cables
2.	UL 83	Thermoplastic-Insulated Wires and Cables
3.	UL 510	Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape

1.4 SUBMITTALS

A. Supplier shall furnish six (6) sets of submittals containing the following information for Owner’s approval:

1. Shop drawings and product data.

1.5 QUALITY ASSURANCE

A. Products for which the Underwriters Laboratories, Inc., have established tests, shall have been approved by that body, or an equivalent testing firm acceptable to the Owner, and shall bear its label of approval.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered to the site in unopened cartons, reels, or bundles as appropriate, clearly identified with the manufacturer's name, Underwriters Laboratories, Inc., or other approved label, grade and identifying number.

PART 2 – PRODUCTS

2.1 WIRE AND CABLE – GENERAL

A. Conductors: General Cable Corp., Okonite Co., Southwire, or equal, copper No. 12 AWG minimum for lighting and power circuits, and No. 14 AWG minimum for control circuits. Unless specifically noted otherwise herein, conductors shall be Class B stranded soft drawn copper, conforming to ASTM B8.

B. Splices and Terminations in Copper Conductors:

1. Splices in No. 8 AWG and smaller: Where not otherwise specified, provide Scotchlok, Buchanan, or equal, spring type, insulated connectors unless otherwise specified.

2. Terminate No. 10 AWG and smaller conductors on screw terminals or pressure connectors furnished as part of the devices unless otherwise specified.

3. For splices and terminations in No. 6 AWG and larger stranded conductors use mechanically die-compressed connectors except where connectors of special form, such as on molded case circuit breakers, are furnished as an integral part of equipment. Compression die shall deform both connector and conductor to provide a homogeneous mass in compressed volume. Connectors and installation tools shall be products of the same manufacturer. Use Thomas and Betts, Burndy, Square D, or equal.

4. Where splices in underground power cable runs are specifically shown on the drawings or approved, provide either resin-filled in-line splice kit or sealant-coated, heatshrink, flame-retardant, heavy-wall tubing to provide a water-tight seal over in-line cable splices. Resin-filled splice kits shall be 3M Scotchcast, or equal. Heatshrink tubing shall be Raychem type FCSM, or approved equal.

5. Use Erico Products, Inc., Cadweld, Burndy Thermoweld, or equal, for splices, "T" and "X" connections in bare grounding conductors, for connections to building steel members, and where grounding conductor connections are required.

6. Tape: Scotch No. 33+, Okonite, or equal, vinyl plastic applied in not less than two half-lapped layers where other insulating methods are not specified.

7. Identify the conductors in the outlets, pull boxes, panelboards, and similar locations where conductors are accessible with Thomas and Betts, Brady, or equal, printed plastic adhesive tapes to show the circuit number. Wrap the tapes at least two turns around the conductor. Mark the panel identification number with a permanent felt tip pen on Patrick and Co., Size 1, Type 11-172, Dennison Co., or equal, cloth or plastic tag and attach it to the entering conductors with a nylon string. Use numbered adhesive tapes, tags or insulation color to permit identification of the individual wire or cable for communication, alarm, and control conductors.

C. Color Codes

1. Color-code the power conductors of the wiring systems by means of colored insulation for sizes No. 8 AWG, and smaller. Color-code larger conductors with 1-inch wide cloth or plastic colored adhesive tape:

	480Y/277 System	208Y/120V System
Phase A	Brown	Black
Phase B	Yellow	Red
Phase C	Purple	Blue
Neutral	Gray	White

2. Equipment Grounding: Any conductor intended solely for equipment grounding purposes shall be bare or green in color. Conductors having white covering shall be used only for grounded neutral conductors. This requirement applies to all lighting, power, and control circuits.

3. Wrap the tape no less than two full turns around the conductor.

D. Conductor Lubricant: Wireze, Minerallac No. 100, or equal, for installation of conductors in conduits, except that no lubricant will be permitted on conductors of ground isolated circuits.

E. Conductors in Enclosures: Provide neat and professional installation with conductors trained and secured with T&B Ty-Rap, Virginia Plastics, or equal, nylon wire ties in panelboards, terminal cabinets, switchboards, gutters, equipment enclosures and similar locations.

2.2 WIRE AND CABLE – LIGHTING AND POWER SYSTEM

A. Power and lighting conductors shall be 600 volt, Type THHN/THWN, having thermoplastic insulation with an overall outer nylon cover per UL 83. Conductors shall be rated 90° C for dry locations and 75° C for wet locations, and shall be applied at their 75° C ampacity rating.

B. Each branch circuit shall have its own neutral conductor, if applicable. Shared neutral conductors are not acceptable.

2.3 WIRE AND CABLE – MONITORING AND CONTROL SYSTEMS

A. Conductors for Class 1 remote control and signal circuits and Class 2 power-limited circuits shall comply with NFPA 70.

B. Twisted shielded pair (TSP) cable shall be #16 AWG stranded, tinned copper, twisted pairs, 2-inch or shorter lay, with 100% foil shielding. Conductors shall have PVC insulation with a nylon overcoat and an overall 90C PVC jacket and shall be suitable for use in wet locations. Insulation shall be 600-volt rated.

C. Resistance Temperature Detector and gas sensor wiring shall be 3-conductor, #16 AWG, stranded tinned copper conductors, with 100% foil shielding and overall PVC jacket. Insulation shall be rated for 300-volts.

2.4 WIRE AND CABLE – GROUNDING SYSTEMS

A. Equipment Grounding: Bonding and grounding conductors shall be ASTM B8 Class B stranded copper.

PART 3 – EXECUTION

3.1 INSTALLATION OF WIRE AND CABLE

A. All wiring shall be installed in compliance with the National Electrical Code (NEC) and all other applicable codes and standards as indicated in these specifications and on the contract drawings.

B. Unless otherwise indicated, all wiring shall be continuous, without splices, from terminal to terminal.

C. Clean all raceways prior to the installation of wire and cable.

D. All wiring shall be identified with permanent wire labels, using alphanumeric designations. All terminations shall be identically labeled for the same wire (i.e., common conductors terminated in multiple locations). Wire labels shall agree with the wire designations provided on the as-built termination diagrams and interconnection diagrams.

E. All wiring, except wiring inside enclosures, shall be cabled with a thermoplastic insulation jacket, with a voltage rating exceeding the voltage of any power in proximity to the wiring.

F. All signal and power wiring shall be fully enclosed in appropriate conduit, unless explicitly accepted by the Owner's Representative. Wiring within enclosures shall be neatly bundled and strapped or fastened to sub-panels or enclosure surfaces. Wiring connected to hinged doors shall be bundled and sleeved in a flexible plastic tubing to permit opening and closing of the door without straining wiring and without abrasion of the wire insulation.

G. No wiring shall be installed, other than in conduit, except with specific written approval of the Owner's Representative.

3.2 INTERFACE WITH OTHER SYSTEMS

A. Identify each conductor with its circuit number or other designation indicated on Drawings.

3.3 INSPECTION AND TESTS

A. General: The electrical installation shall be inspected and tested to ensure safety to the operating personnel and compliance with Code requirements and with the Contract documents. Field tests shall be performed in conformance with the National Electrical Testing Association (NETA) Standards.

B. Insulation resistance test all power and control wiring installed by, or altered by, the Contractor. Insulation resistance test all equipment installed under this Contract.

1. The insulation resistance of each circuit phase-to-phase and phase-to-ground shall be measured. For circuits rated less than 600-volts, a 1-megohm resistance will be the acceptable minimum.

2. Applied potential shall be 500 volts DC for 300 V rated cable and 1000 volts DC for 600 V rated cable. Test duration shall be one minute.

C. Resistance of each ground rod to earth. This shall be made with a Biddle Null Earth Megger tester, and results reported to the Owner.

D. Test readings shall be recorded and submitted as required by Section 16020.

3.4 SPARE CONDUCTORS

A. The Contractor shall install at least two additional conductors, or an additional 10% beyond the number required, whichever is greater as spares in all control and instrumentation conduits. Spare conductors shall be the same size as the largest conductor in the conduit.

END OF SECTION

DIVISION 16 – ELECTRICAL

SECTION 16130 – BOXES

PART 1 – GENERAL

1.1 WORK INCLUDED

A. The work covered under this Section consists of furnishing all labor, supervision, tools, materials, equipment and performing all work necessary to furnish and install above-grade pull and junction boxes.

1.2 RELATED SECTIONS

A. See the following Specification Sections for work related to the work in this Section:

1.	Section 16020	Basic Electrical Requirements
2.	Section 16110	Conduit
3.	Section 16120	Wire and Cable
4.	Section 16451	Grounding

1.3 APPLICABLE STANDARDS

Work and materials shall be in compliance with the latest applicable revision of the following standards and codes:

A. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

1.	NEMA FB 1	Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies
2.	NEMA OS 1	Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports
3.	NEMA OS 2	Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports
4.	NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)

B. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

1.	NFPA 70	National Electrical Code (NEC)

C. UNDERWRITERS LABORATORIES, INC. (UL)

1. UL 50 Standard for Enclosures for Electrical Equipment

1.4 SUBMITTALS

A. Supplier shall furnish six (6) sets of submittals containing the following information for Owner's approval:

1. Shop drawings and product data.

1.5 QUALITY ASSURANCE

A. Products for which the Underwriters Laboratories, Inc., have established tests, shall have been approved by that body, or an equivalent testing firm acceptable to the Owner, and shall bear its label of approval.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered to the site in unopened cartons clearly identified with manufacturer's name, Underwriters Laboratories, Inc., or other approved label, grade, and identifying number.

PART 2 – PRODUCTS

2.1 PULL AND JUNCTION BOXES

A. Boxes: For unclassified areas, provide UL 50 listed, screw-cover type, Square D Co., Circle A-W Products, or equal, machine screw attached covers. Unless otherwise specified, provide an explosion-proof type for classified areas, Crouse-Hinds, Appleton, or equal.

B. Surface Mounted Boxes: Equipped with covers of the same size as box.

C. Pull Boxes: Provide boxes where shown. Provide additional boxes as required to comply with the National Electrical Code for the conduit routes selected by the Contractor to accommodate the conditions which influenced the routes.

D. Hinged Access Doors: Provide where the boxes would otherwise be inaccessible.

PART 3 – EXECUTION

3.1 COORDINATION OF BOX LOCATIONS

A. Install the electrical boxes as required for splices, taps, wire pulling, and equipment connections in accordance with the regulatory requirements.

B. Electrical box locations shown on the Drawings are approximate unless dimensioned.

C. Locate and install boxes to avoid conflicts with other equipment and in a manner that results in a neat appearance.

D. Provide knockout closures for the unused openings.

3.2 PULL AND JUNCTION BOX INSTALLATION

A. Support pull and junction boxes independent of the conduit.

3.3 GROUNDING

A. Permanently and effectively ground all boxes in accordance with Section 16451.

END OF SECTION

DIVISION 16 – ELECTRICAL

SECTION 16385 – UNDERGROUND ELECTRICAL CONSTRUCTION

PART 1 – GENERAL

1.1 WORK INCLUDED

A. This section includes the furnishing, construction, and installation of pull boxes, hand holes, and duct lines to form a complete underground raceway system. Underground duct lines, pull boxes, and hand holes shall be located at the approximate locations shown on the drawings with due consideration given to the location of the other utilities, grades, and paving.

1.2 RELATED SECTIONS

A. See the following Specification Sections for work related to the work in this Section:

1.	Section 16020	Basic Electrical Requirements
2.	Section 16050	Basic Materials and Methods
3.	Section 16110	Conduit

1.3 APPLICABLE STANDARDS

Work and materials shall be in compliance with the latest applicable revision of the following standards and codes:

A. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

1.	ANSI C2	National Electrical Safety Code

B. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

1.	NEMA TC 2	Electrical Polyvinyl Chloride (PVC) Tubing and Conduit

C. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

D.	NFPA 70	National Electrical Code (NEC)

E. UNDERWRITERS LABORATORIES, INC. (UL)

1.	UL 6	Standard for Electrical Rigid Metal Conduit – Steel
2.	UL 514B	Conduit, Tubing and Cable Fittings

3. UL 651 Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings

1.4 SUBMITTALS

A. Supplier shall furnish six (6) sets of submittals containing the following information for Owner's approval:

1. A complete material list of proposed items to be provided under this section.

2. Manufacturer's published product data

3. Manufacturer's shop drawings of pull boxes and hand holes.

1.5 QUALITY ASSURANCE

A. Products for which the Underwriters Laboratories, Inc., have established tests, shall have been approved by that body, or an equivalent testing firm acceptable to the Owner, and shall bear its label of approval.

PART 2 – PRODUCTS

2.1 CONDUITS

A. Conduits (Concrete Encased): PVC, Schedule 40, concrete encased, shall meet or exceed the current requirements of NEMA TC-2, UL 514B and UL 651. Rated for 90oC cable.

B. Conduits (Direct-Burial):

1. Plastic Duct: PVC, direct burial: Suitable for direct burial, Schedule 40 (min.).

2. Rigid Metal Conduit: UL-6 galvanized rigid steel: Where metal conduit is shown on the drawings, or hereinafter specified to be installed underground or in contact with concrete, the conduit shall have a coating of 20 mil bonded PVC, or shall be protected from corrosion by applying 20-mil thick PVC tape (Scotchrap 51, or equal), half-lapped, over the entire surface in contact with earth or concrete, and extended a minimum of 6 inches above grade or top of concrete where conduits penetrate foundations and pads. Bends shall be no less than 36-inches in radius for conduits with a 4-inches or larger diameter.

2.2 PRECAST CONCRETE PULL BOXES AND HAND HOLES

A. Precast concrete pull boxes and hand holes shall conform to the requirements of Section 16020, Basic Electrical Requirements.

PART 3 — EXECUTION

3.1 DUCT BANKS

A. Duct banks required to be concrete encased shall be provided with supporting rebar, spacers, and grounding. Install a metallic warning tape approximately 12-inches above the top of the duct bank. The concrete color shall be red.

B. Ducts shall be sloped to drain towards maintenance holes and handholes and away from building and equipment entrances. The pitch shall be no less than 4-inches in 100-feet. Curved sections in the duct lines shall consist of long sweep bends with a minimum radius of 50-feet in the horizontal or vertical directions unless noted otherwise. The use of manufactured bends is limited to building entrances and stub-ups to the equipment.

3.2 PULL BOXES AND HAND HOLES

A. Precast pull boxes and hand holes shall be installed approximately where indicated on the drawings. The exact location shall of each box shall be determined after careful consideration has been given to the location of other utilities, grading, and paving. All boxes shall be installed in accordance with the requirements of Section 16020, Basic Electrical Requirements.

B. All precast pull boxes and hand holes shall be installed with a minimum 6” thick crushed rock or sand bedding.

C. Paved Areas: Precast boxes located in areas to be paved shall be installed such that the top of the cover will be flush with the finished surface of the paving.

D. Unpaved Areas: In unpaved areas, the top of the box shall be approximately 2 above finished grade.

3.3 CONDUIT STUB-UPS AT EQUIPMENT

A. All underground PVC conduit runs intended to stub-up and terminate at above-grade equipment, boxes, and cabinets shall be transitioned to galvanized rigid steel conduit or PVC coated rigid steel conduit below grade, in the horizontal conduit run. Provide galvanized rigid steel or PVC coated rigid steel elbow at stub-up location for final conduit run to above-grade equipment.

B. All conduits originating, terminating, or passing beneath classified locations shall be provided with conduit seals at each end of the conduit run.

C. Provide PVC coated rigid steel conduit, or approved PVC corrosion protection tape wherever metallic conduit is installed below grade or in contact with concrete.

END OF SECTION

DIVISION 16 – ELECTRICAL

SECTION 16451 – GROUNDING

PART 1 – GENERAL

1.1 WORK INCLUDED

A. The work covered in this Section consists of furnishing all labor, supervision, tools, materials, equipment and performing all work necessary to furnish and install complete grounding systems required for electrical service equipment, system grounding, power distribution, lighting, and equipment grounding system systems. Work shall include:

1. Electrical power system grounding

2. Electrical equipment and raceway grounding and bonding.

1.2 RELATED SECTIONS

A. See the following Specification Sections for work related to the work in this Section:

1.	Section 16020	Basic Electrical Requirements
2.	Section 16120	Wire and Cable
3.	Section 16130	Boxes

1.3 APPLICABLE STANDARDS

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

1.	ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

B. BUILDING INDUSTRY CONSULTING SERVICES INTERNATIONAL (BICSI)

1.	BICSI TDMM	Telecommunications Distribution Methods Manual

C. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

1.	IEEE 81	Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

2. IEEE 142 Recommended Practice for Grounding of Industrial and Commercial Power Systems

D. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

1. NFPA 70 National Electrical Code (NEC)

1.4 SYSTEM DESCRIPTION

A. Ground each separately-derived system neutral in accordance with the requirements of the National Electrical Code.

B. Provide communications system grounding conductor in accordance with NFPA 70 at the point of service entrance and connect it to a separate grounding electrode that is bonded to the power system grounding electrodes.

C. Bond together exposed non-current carrying metal parts of the electrical equipment, metal raceway systems, grounding conductor in the raceways and cables, and plumbing systems in accordance with the National Electrical Code.

1.5 SUBMITTALS

A. All submittals shall be made in accordance with the General Conditions. Supplier shall furnish six (6) sets of submittals containing the following information for Owner's approval:

1. The Contractor shall submit manufacturer's product data for the materials and equipment proposed for use.

2. The results of the electrical continuity and ground resistance tests, performed on the installed grounded grid and its components, shall be submitted to the Owner for review.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Products for which the Underwriters Laboratories, Inc., have established tests, shall be approved by that body, or an equivalent testing firm, acceptable to the Owner, and shall bear a label of approval.

B. Ground conductors shall be bare or insulated, stranded, soft-drawn copper, securely connected and sized as shown on the drawings and as required by the National Electrical Code.

C. System neutral conductors shall have 600-volt insulation.

D. Ground System Devices:

1. Ground Rods: Copper-clad steel rods, sectional, 3/4’ diameter x 20’-0” long minimum size (unless otherwise noted), with pointed end.

2. Ground Rod Connectors: Accessible, Burndy, Copperweld, or equal.

3. Cable Connectors: Accessible, O.Z./Gedney, Burndy, or equal.

4. Ground Rod and Cable Connectors: Not Accessible, Cadweld, Thermoweld, or equal.

5. Grounding Bushings: O.Z. Type BL, Burndy, or equal.

6. Pipe Connectors: O.Z. Type ABG, Burndy, or equal.

7. Enclosure Connectors: O.Z. Type QG or KG, Burndy, or equal.

8. Feed-through Lug: Burndy Type Q2B, O.Z./Gedney, or equal.

9. Copper Mechanical Grounding Connector for Copper Cable to Flat Bus Bar: Burndy Type KC Servit Post, or equal.

10. Ground Rod Boxes: Precast concrete, 13-inch interior diameter, with cast iron traffic lid, Christy Concrete Products, or equal.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Grounding conductors shall be installed from each raceway system, current-consuming device, panelboard, cabinet, motor controller, switch, etc., to the station ground grid to form a continuous grounding system.

B. Provide a separate, insulated, equipment-grounding conductor in all feeder and branch circuits. Terminate each end on a grounding lug, bus, or bushing.

C. Equipment, not shown grounded on the drawings but for which a ground connection is required by the National Electrical Code, shall be grounded.

D. System neutrals shall be grounded by connection to the ground bus at one point only.

E. Lighting fixtures shall be grounded in accordance with the National Electrical Code.

F. Metal enclosures for all electrical equipment (switches, switchgear, panels, etc.) shall be grounded at two places.

3.2 FIELD QUALITY CONTROL

A. Inspect the grounding and bonding system conductors and connections for tightness and proper installation.

3.3 FIELD TESTING

Inspections and field tests shall be performed in accordance NETA ATS, the manufacturer's recommendations, and with the following:

A. Visual and mechanical inspections shall include:

1. Verify ground system is in compliance with the drawings, specifications, and the National Electrical Code.

2. Inspect ground system for physical and mechanical damage.

B. Electrical Tests:

1. Perform point-to-point tests to verify continuity and determine resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or other derived points.

C. Contractor shall secure the services of an independent, third-party testing organization to perform field tests specified herein that are not specified elsewhere to be performed by the manufacturer's authorized representative(s). The third-party testing organization shall function as an unbiased testing authority, professionally independent of the manufacturers, suppliers, and installers of the equipment and systems being evaluated. The testing organization shall have full membership classification issued by the NETA and shall submit appropriate documentation demonstrating compliance with these requirements.

D. Technicians performing these electrical tests and inspections shall be trained and experienced concerning the apparatus and systems being evaluated. These individuals shall be capable of performing the tests in a safe manner and with complete knowledge of the hazards involved. They must evaluate the test data and make a judgment on the serviceability of the specific equipment. Technicians shall be certified in accordance with ANSI/NETA ETT-2000, Standard for Certification of Electrical Testing Personnel.

E. At the completion of testing, the third-party testing organization shall submit written certification that all equipment and systems tested have been properly adjusted and set, are in satisfactory condition, and are suitable for placing in operation.

END OF SECTION

PROJECT PLANS FOR
2014 CNG STATION EXPANSION
MUNICIPAL SERVICE CENTER
333 WEST AVE., GRAND JUNCTION, COLORADO 81501

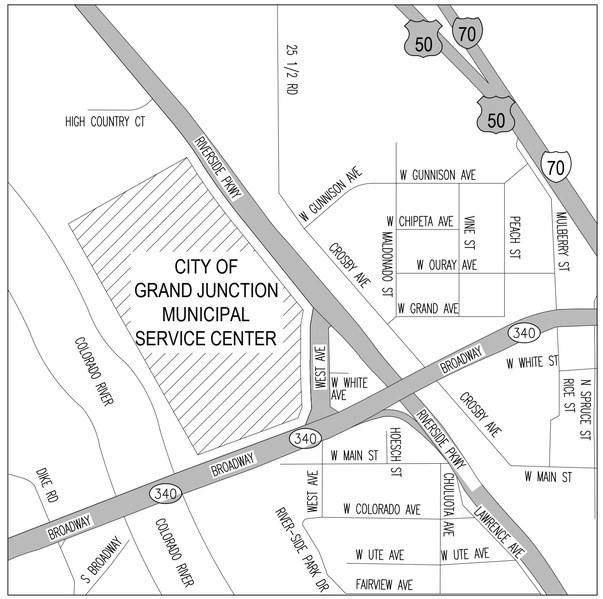
INDEX OF SHEETS

DRAWINGS BY RAYMUNDO ENGINEERING

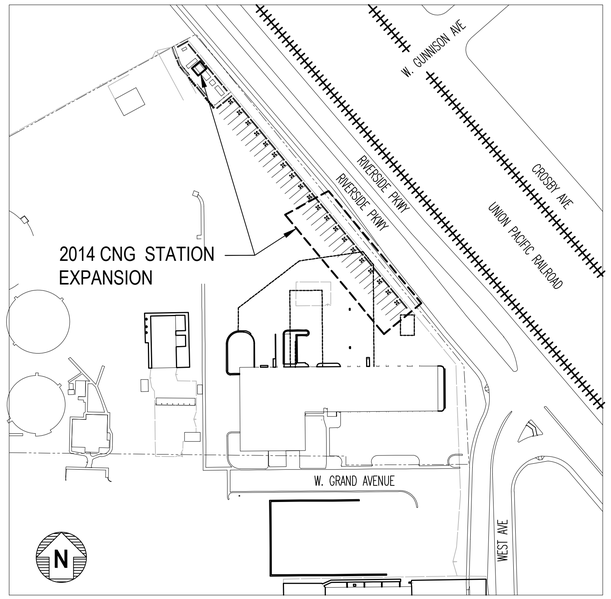
REFERENCE DRAWINGS
DRAWING NO.

PROJECT PLANS FOR CNG SLOW–FILL STATION BY RAYMUNDO ENGINEERING, BIG HORN CONSULTING ENGINEERS, AND SOUDER MILLER & ASSOCIATES (2010 BID SET)

PROJECT PLANS UPGRADE FOR FAST–FILL TO EXISTING CNG STATION BY GAS EQUIPMENT SYSTEMS (2011 AS–BUILTS SET)



VICINITY MAP



PLOT – PLAN

PROJECT OBJECTIVES

EXPAND CNG TIME–FILL SYSTEM FROM TEN FILL–HOSES TO TWENTY FILL–HOSES & ADD 4TH CNG COMPRESSOR AND COALESCING FILTER TO THE EXISTING COMPRESSOR STATION. CNG FUEL FROM FOUR NEW FILL–HOSES SHALL BE METERED AS A SINGLE AGGREGATE QUANTITY USING A NEW METER PANEL. THE CONCRETE PAD FOR NEW COMPRESSOR D WAS INSTALLED DURING THE ORIGINAL CONSTRUCTION OF THE CNG STATION IN 2010. THE EXISTING ONSITE NATURAL GAS AND ELECTRICAL UTILITIES ARE ADEQUATE TO ACCOMMODATE THE ADDITION OF COMPRESSOR D.

BUILDING CODE INFORMATION

OCCUPANCY CLASSIFICATION: UTILITY AND MISCELLANEOUS – GROUP U

NO FACILITIES IN THIS PROJECT ARE ENCLOSED FOR OCCUPANCY OR HAVE PERMANENT OCCUPANCY. ARCHITECTURAL CODE REVIEW IS NOT INCLUDED IN THESE DOCUMENTS.

NOTICE

CONTRACTOR SHALL ORGANIZE AND PERFORM WORK SO THAT EXISTING FACILITIES IN VICINITY OF PROJECT SITE REMAIN IN OPERATION DURING CONSTRUCTION.

SPECIAL INSPECTION

INSTALLATION OF CONCRETE AND ANCHOR BOLTS IN CONCRETE ARE SUBJECT TO SPECIAL INSPECTION IN ACCORDANCE WITH THE IBC. SPECIAL INSPECTION REPORT SHALL BE SUBMITTED TO THE LOCAL BUILDING DEPT.

FIELD VERIFICATION

CONTRACTOR SHALL VISIT THE JOB SITE AND VERIFY ALL CONDITIONS, LOCATIONS, AND DIMENSIONS PRIOR TO STARTING WORK.

CONTACTS:

PROJECT MANAGER
BRET GUILLORY, PE; CFM
UTILITY ENGINEER
250 N. 5TH STREET
CITY OF GRAND JUNCTION, CO 81501
PHONE: (970) 244–1590
EMAIL: bretg@ci.grandjct.co.us

PROJECT ENGINEER
JIM DONG
RAYMUNDO ENGINEERING
390 N.WIGET LANE, STE 150
WALNUT CREEK, CA 94598
PHONE: (925) 988–8678
EMAIL: jd@raymundo.com

CONSTRUCTOR
TO BE DETERMINED

THIS FACILITY SHALL CONFORM TO THE FOLLOWING CODES, STANDARDS & SPECIFICATIONS:

NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 52 VEHICULAR GASEOUS FUEL SYSTEMS CODE	2013
INTERNATIONAL BUILDING CODE	2012
INTERNATIONAL FIRE CODE WITH AMENDMENTS	2012
NATIONAL ELECTRICAL CODE	2011
PROJECT SPECIFICATIONS	

07–14–14

COLORADO LICENSED
JAMES DONG
38738
PROFESSIONAL ENGINEER

Exp. 10–15–15

DRAWING NO.:	REFERENCE DRAWINGS:		REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
			0	07–14–14	ISSUED FOR BID	CRL	JD		

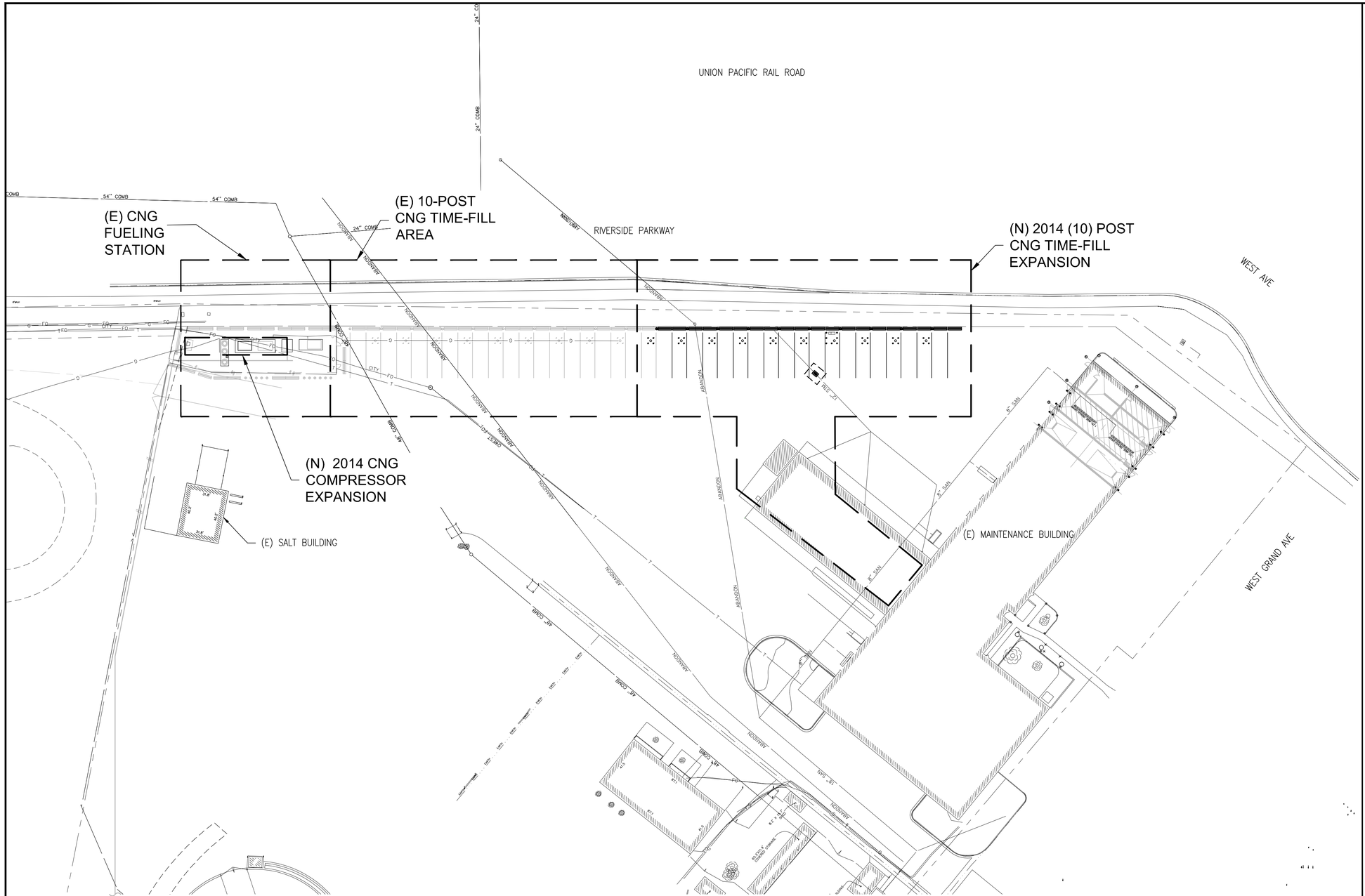
RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME:	A100.dwg
PROJECT NO.:	
DATE DRAWN:	02–26–14
DRAWN BY:	CRL
CHECKED BY:	JD

CITY OF GRAND JUNCTION

COVER SHEET
2014 CNG STATION EXPANSION
MUNICIPAL SERVICE CENTER
333 WEST AVE., GRAND JUNCTION, COLORADO

SCALE:	DRAWING NO.:	REV.:
NTS	A100	0



SITE PLAN

1"=40'-0"

GRAPHIC SCALE

40' 0 20' 40' 80'

SCALE 1"=40'

NOTES:

1. THIS DRAWING IS INTENDED TO SHOW THE PROJECT AREA BOUNDARY AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.
2. THIS DRAWING DOES NOT SHOW NEW ABOVEGROUND & UNDERGROUND CONDUITS & LINES THAT ARE TO BE INSTALLED BY CONTRACTOR TO INTERCONNECT THE NEW CNG SURFACE EQUIPMENT. SEE ELECTRICAL, PIPING, & CIVIL PLANS FOR ALL NEW ABOVEGROUND & UNDERGROUND FACILITIES.
3. NOT ALL EXISTING UNDERGROUND DUCTS & LINES ARE SHOWN. THE EXACT ROUTING & LAYOUT OF EXISTING UNDERGROUND DUCTS AND LINES MUST BE VERIFIED IN THE FIELD BEFORE EXCAVATION & PROJECT EXECUTION.

LEGEND:

(E) EXISTING

(N) NEW

07-14-14

COLORADO LICENSED JAMES D. DAVIS 38738 PROFESSIONAL ENGINEER

Exp. 10-15-15

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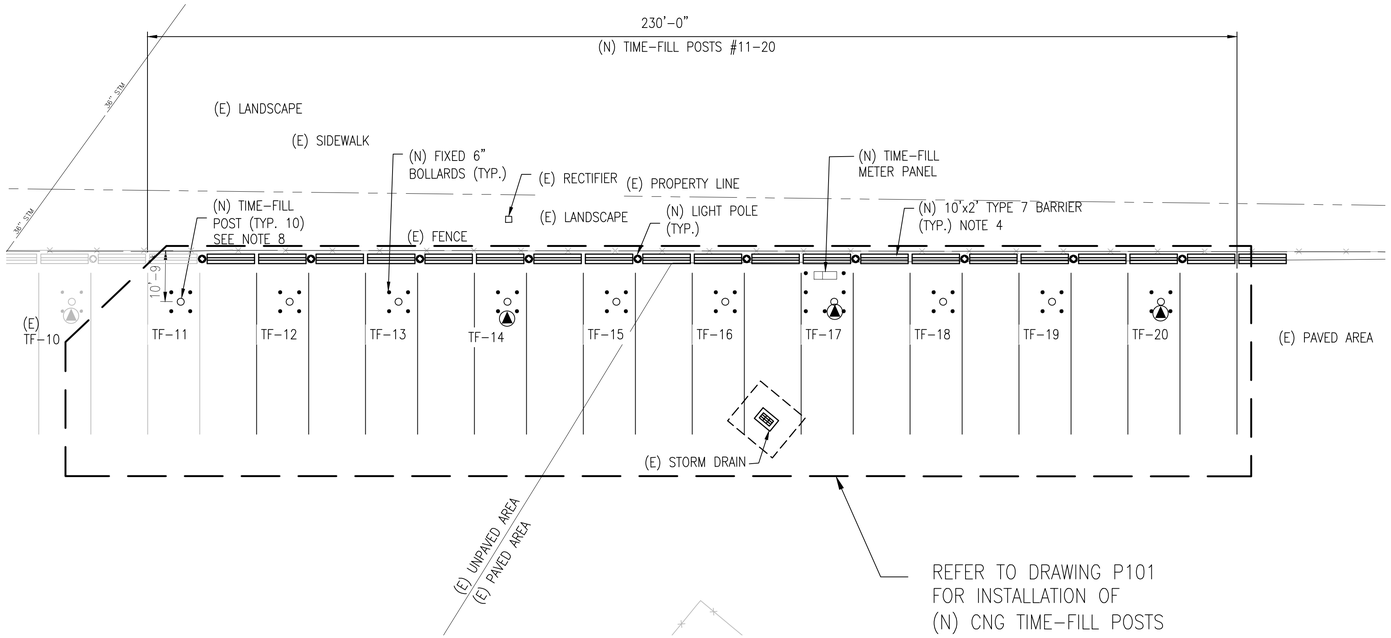
RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME: A101.dwg
PROJECT NO.:
DATE DRAWN: 02-27-14
DRAWN BY: CRL
CHECKED BY: JD

CITY OF GRAND JUNCTION

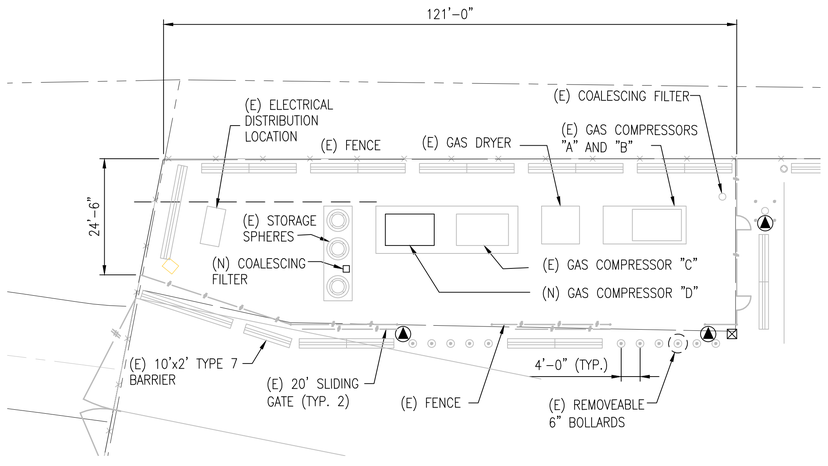
SITE PLAN
2014 CNG STATION EXPANSION
MUNICIPAL SERVICE CENTER
333 WEST AVE., GRAND JUNCTION, COLORADO

SCALE: AS SHOWN
DRAWING NO.: A101
REV.: 0



ENLARGED (N) TIME-FILL AREA PLAN

SCALE: 1/16"=1'-0"



ENLARGED CNG COMPRESSOR AREA PLAN

SCALE: 1/16"=1'-0"

NOTES:

1. CNG EQUIPMENT SHALL BE LOCATED IN COMPLIANCE WITH THE INTERNATIONAL FIRE CODE AND THE NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 52 – VEHICULAR GASEOUS FUEL SYSTEMS CODE.
2. NOT ALL UNDERGROUND UTILITIES AND SUBSTRUCTURES ARE SHOWN. THOSE SHOWN ARE FOR REFERENCE ONLY. EXACT ROUTING AND LAYOUT OF EXISTING LINES AND SUBSTRUCTURES SHOULD BE VERIFIED IN THE FIELD BEFORE EXCAVATION AND PROJECT EXECUTION.
3. CONTRACTOR SHALL PROVIDE ALL EQUIPMENT, STRUCTURES, AND MATERIAL DESIGNATED AS "NEW" (N) UNLESS SPECIFIED OTHERWISE.
4. CONTRACTOR SHALL ANCHOR ALL TYPE 7 BARRIERS.
5. STRIPING FOR TIME-FILL STALLS IS SHOWN FOR ILLUSTRATIVE PURPOSES ONLY.
6. CONTRACTOR SHALL PROVIDE BOLLARDS AS SHOWN IN ACCORDANCE WITH SHEET C2 PREPARED BY SOUDER MILLER DATED 6-4-10.
7. CONTRACTOR SHALL PROVIDE TIME-FILL PEDESTALS AS SHOWN IN ACCORDANCE WITH SHEET S2 PREPARED BY SOUDER MILLER DATED 6-7-10.
8. CONTRACTOR SHALL COORDINATE FINAL LOCATION OF TIME-FILL POSTS WITH OWNER.

LEGEND:

(E)	EXISTING
(N)	NEW
TF-#	(N) TIME-FILL POST (11 THRU 20)
-×-×-	(E) FENCE
▲	(N) ESD EMERGENCY SHUTDOWN PUSHBUTTON & FIRE EXTINGUISHER (20-B:C MIN) W/ WEATHER-PROOF ENCLOSURE SUITABLE FOR BOLLARD/FENCE MOUNTING.

07-14-14

COLORADO LICENSED JAMES L. DAVIS 38738 PROFESSIONAL ENGINEER

Exp. 10-15-15

REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
0	07-14-14	ISSUED FOR BID	CRL	JD		

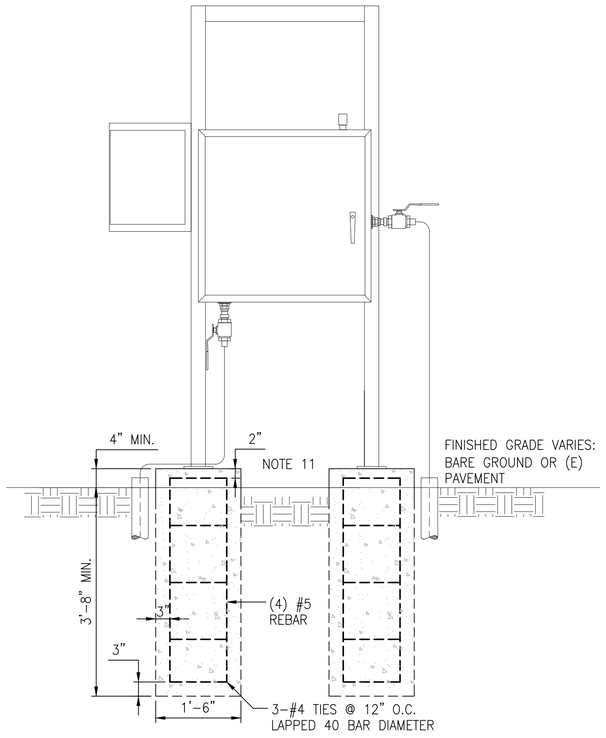
DRAWING NO.: | REFERENCE DRAWINGS:

FILENAME: A102.dwg
PROJECT NO.: 120
DATE DRAWN: 02-27-14
DRAWN BY: CRL
CHECKED BY: JD

CITY OF GRAND JUNCTION

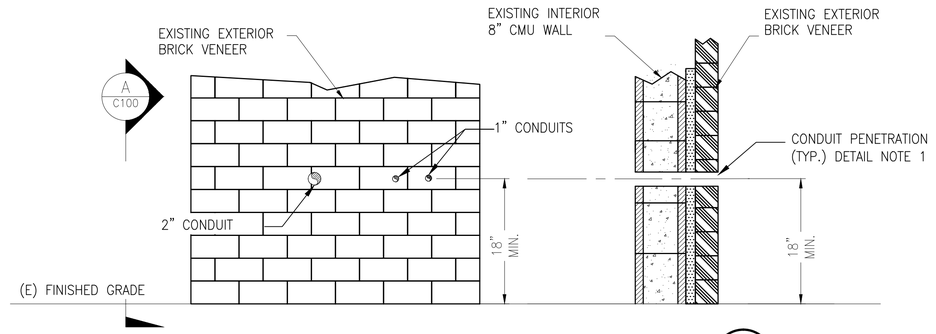
ENLARGED – CNG SITE PLAN
2014 CNG STATION EXPANSION
MUNICIPAL SERVICE CENTER
333 WEST AVE., GRAND JUNCTION, COLORADO

SCALE: AS SHOWN | DRAWING NO.: A102 | REV.: 0



DETAIL 1 / C100 — NTS — P103

TIME-FILL PANEL SUPPORT FOOTINGS



SECTION A / C100 — NTS

DETAIL 2 / C100 — NTS — E101

CONDUIT WALL PENETRATION

DETAIL NOTE:

1. CORE DRILL EXTERIOR BRICK VENEER WALL AND INTERIOR CMU WALL TO ALLOW PENETRATION OF (1) 2" AND (2) 1" CONDUITS. ACTUAL LOCATION OF PENETRATIONS TO BE COORDINATED BY CONTRACTOR WITH OWNER.

NOTES:

1. ALL WORKMANSHIP & MATERIAL SHOWN ON THIS DRAWING SHALL COMPLY WITH ALL APPLICABLE CODES, STANDARDS, & REGULATIONS.
2. ALLOWABLE SOIL BEARING CAPACITY IS 1,500 PSF BASED ON THE 2012 INTERNATIONAL BUILDING CODE.
3. CONCRETE WORK SHALL BE IN ACCORDANCE WITH THE 2012 INTERNATIONAL BUILDING CODE (IBC) & LATEST AMERICAN CONCRETE INSTITUTE (ACI) STANDARD 318.
4. CONCRETE SHALL BE PLACED ON FIRM UNDISTURBED MATERIAL OR BACKFILL COMPACTED TO 95% OF MAXIMUM DENSITY. MAXIMUM DENSITY & IN-PLACE DENSITY SHALL BE DETERMINED IN ACCORDANCE WITH ASTM D-1556 & D-1557, RESPECTIVELY.
5. EXCAVATION SHALL BE DONE AS NEATLY AS POSSIBLE TO MINIMIZE EARTH REMOVED -- DO NOT OVER EXCAVATE.
6. CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI IN 28 DAYS. PERFORM COMPRESSIVE STRENGTH TESTS AS REQUIRED BY OWNER. THE INSTALLATION IS SUBJECT TO SPECIAL INSPECTION IN ACCORDANCE WITH CHAPTER 17 OF THE 2012 IBC.
7. CONCRETE COVER FOR FOUNDATION REINFORCING BARS SHALL BE AS FOLLOWS:
   - 3" AT UNDERSIDE OF FOUNDATION
   - 3" AT SIDE OF FOUNDATION CONTACT WITH GROUND
   - 2" AT FORMED SURFACES
8. REINFORCING BARS SHALL CONFORM TO ASTM 615, GRADE 60 FOR #5 AND LARGER, AND GRADE 40 FOR #4 AND SMALLER.
9. MINIMUM LAP OF REINFORCING STEEL SHALL BE 40 BAR DIAMETER, UNLESS OTHERWISE NOTED. STAGGER SPLICES OF ADJACENT BARS A MINIMUM OF 5 FEET.
10. ANCHOR SYSTEM SHALL BE HILTI KWIK BOLT TZ STAINLESS STEEL ANCHORS. CONTRACTOR SHALL INSTALL ANCHORS PER MANUFACTURER'S INSTRUCTIONS. THE INSTALLATION IS SUBJECT TO SPECIAL INSPECTION IN ACCORDANCE WITH ICC-ES REPORT ESR-1917.
11. CONTRACTOR SHALL VERIFY SUPPORT SPACING, ANCHOR SIZE, LENGTH, PROJECTION, & LOCATION FROM EQUIPMENT SUPPLIER'S CERTIFIED SHOP DRAWINGS. CONTRACTOR SHALL ANCHOR EQUIPMENT PER MANUFACTURER'S INSTRUCTION INCLUDING BUT NOT LIMITED TO COMPRESSOR, COALESCING FILTER, AND TIME-FILL PANEL.
12. CONTRACTOR SHALL BOND THE COPPER GROUND CABLE TO EQUIPMENT, REBAR, & STATION GROUND GRID BY METAL FUSING PER DRAWINGS. GROUND CABLE SHALL BE PROTECTED WITH PVC PIPE WHERE IT EMERGES THE FOUNDATION. PVC PIPE & GROUND CABLE SHOULD BE SECURED PRIOR TO POURING CONCRETE SO THAT THEY EMERGE PLUMBED. CONTRACTOR SHALL SEAL THE SPACE BETWEEN PVC PIPE & CABLE WITH SILICONE SEALANT TO PREVENT ACCUMULATION OF WATER.

07-14-14

COLORADO LICENSED
JAMES D. DAVIS
38738
PROFESSIONAL ENGINEER

Exp. 10-15-15

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		0	07-14-14	ISSUED FOR BID	CRL	JD		

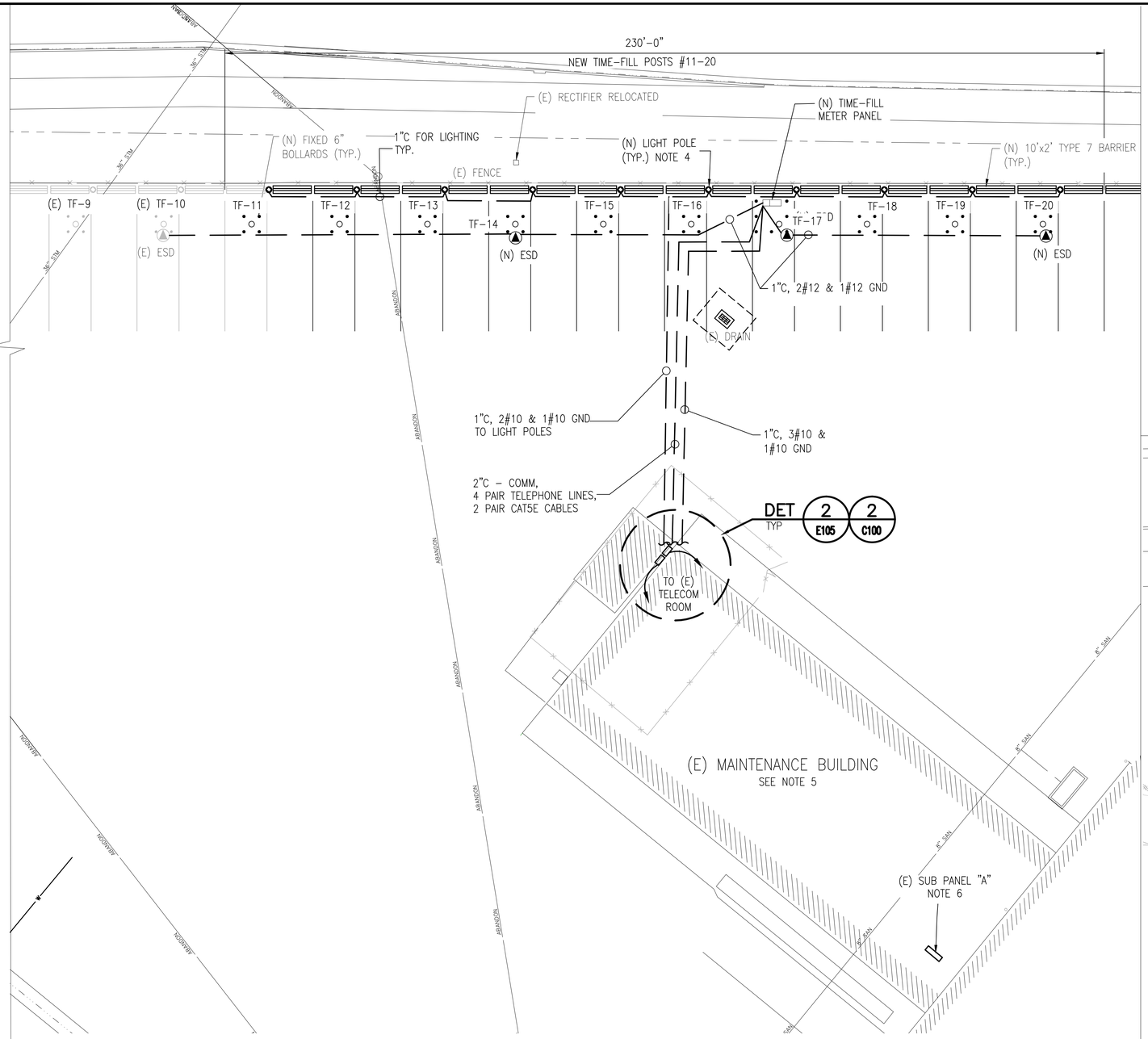
RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME: C100.dwg
PROJECT NO.:
DATE DRAWN: 04-28-14
DRAWN BY: CRL
CHECKED BY: JD

CITY OF GRAND JUNCTION

FOUNDATION DETAILS
2014 CNG STATION EXPANSION
MUNICIPAL SERVICE CENTER
333 WEST AVE., GRAND JUNCTION, COLORADO

SCALE: AS SHOWN
DRAWING NO.: C100
REV.: 0



ENLARGED TIME-FILL AREA PLAN

SCALE 1/16"=1'-0"

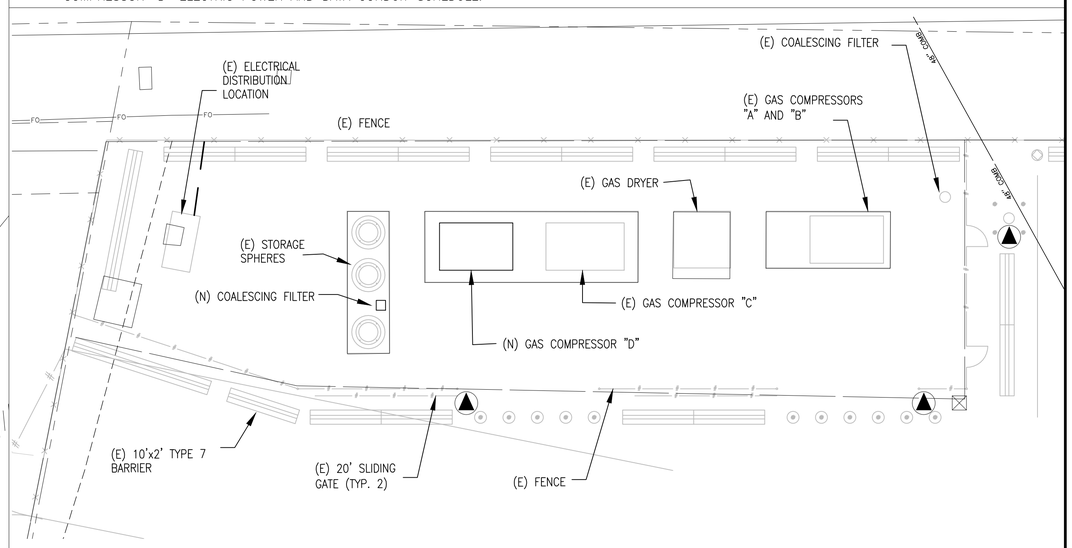
SCALE: 1/16"=1'-0"

NOTES:

1. CNG COMPRESSION, DRYING, AND DISPENSING EQUIPMENT SHALL BE LOCATED IN COMPLIANCE WITH THE INTERNATIONAL FIRE CODE AND THE NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 52 – VEHICULAR GASEOUS FUEL SYSTEMS CODE.
2. NOT ALL UNDERGROUND UTILITIES AND SUBSTRUCTURES ARE SHOWN. THOSE SHOWN ARE FOR REFERENCE ONLY. EXACT ROUTING AND LAYOUT OF EXISTING LINES AND SUBSTRUCTURES SHOULD BE VERIFIED IN THE FIELD BEFORE EXCAVATION AND PROJECT EXECUTION.
3. CONTRACTOR SHALL PROVIDE ALL EQUIPMENT, STRUCTURES, AND MATERIAL DESIGNATED AS "NEW" (N) UNLESS SPECIFIED OTHERWISE.
4. CONTRACTOR SHALL PROVIDE LIGHTING AND PEDESTAL AS SHOWN IN ACCORDANCE WITH SHEET ES1-1 & E1-3 PREPARED BY BIG HORN CONSULTING ENGINEERS DATED 6-24-2010.
5. THE AREA 18" FROM FLOOR & CEILING ARE CLASS 1 DIVISION 2 HAZARDOUS LOCATION. RIGID STEEL CONDUITS SHALL BE USED FOR INSTALLATION IN THE AREA. CONDUIT SEAL SHALL BE INSTALLED WHEN CONDUITS LEAVE HAZARDOUS LOCATION.
6. CONTRACTOR SHALL PROVIDE (2) 20/1P BRANCH CIRCUIT BREAKERS AT SUB PANEL "A" CIRCUIT SPACES #25 & #27 TO FEED METER PANEL AND OUTDOOR LIGHTING. THE NEW CIRCUIT BREAKERS SHALL MATCH THE EXISTING.
7. REFER TO SHEET E-100 OF THE 2011 FAST-FILL PROJECT PLANS FOR COMPRESSOR "D" ELECTRIC POWER AND DATA CONDUIT SCHEDULE.

LEGEND:

(E)	EXISTING
(N)	NEW
-x-	(E) FENCE
	ESD EMERGENCY SHUTDOWN PUSHBUTTON (CROUSE-HINDS EDS2184S769 OR APPROVED EQUAL) & FIRE EXTINGUISHER (20-B:C MIN) W/ WEATHER-PROOF ENCLOSURE SUITABLE FOR BOLLARD/FENCE MOUNTING.
POC	POINT OF CONNECTION



ENLARGED CNG COMPRESSOR AREA PLAN

3/32"=1'-0"

07-14-14

COLORADO LICENSED JAMES L. DARLING 38738 PROFESSIONAL ENGINEER

Exp. 10-15-15

REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
0	07-14-14	ISSUED FOR BID	CRL	JD		

DRAWING NO.: | REFERENCE DRAWINGS:

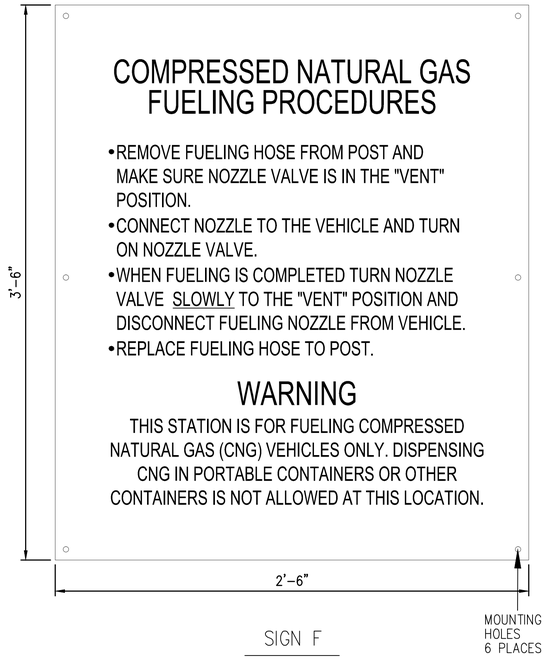
RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME: E101.dwg
PROJECT NO.:
DATE DRAWN: 03-21-14
DRAWN BY: CRL
CHECKED BY: JD

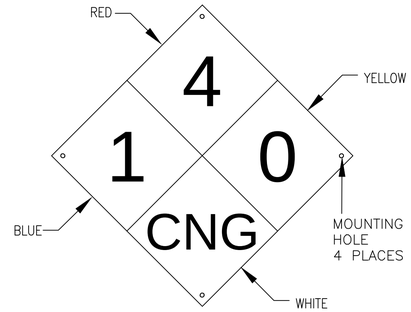
CITY OF GRAND JUNCTION

ENLARGED - CNG ELECTRICAL PLAN
2014 CNG STATION EXPANSION
MUNICIPAL SERVICE CENTER
333 WEST AVE., GRAND JUNCTION, COLORADO

SCALE: AS SHOWN | DRAWING NO.: E101 | REV.: 0



SIGN F



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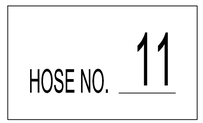


SIGN H

SIGN SCHEDULE "A"

I.D.	HEADING (1)	MESSAGE (1)	OSHA GRAPHIC	SIZE WxH	MATL. (2) (3)	REF. CAT. # (4) (5)
A	SEE DETAIL			10"x 7"	AL	
B	SEE DETAIL			10"x 7"	AL	
C	SEE DETAIL			10"x 7"	AL	
D	SEE DETAIL			10"x 7"	AL	
E	SEE DETAIL			10"x 7"	AL	
F	SEE DETAIL		NO	2'-6"x 3'-6"	AL	
G	SEE DETAIL		NO	7½"x7½"	AL	SETON M8818
H	SEE DETAIL		NO	4"x8"	AL	SETON
I	CAUTION	BURIED GAS LINE BELOW	NO	6" WIDE	PET	SETON 37237
J	CAUTION	BURIED ELECTRIC LINE BELOW	NO	6" WIDE	PET	SETON 37236
K		FIRE EXTINGUISHER	YES	9"x12"	AL	SETON 21999

NOTES:

(1) ALL SIGNS EXCEPT SIGN "G", SHALL BE IN ACCORDANCE WITH OSHA SPECIFICATIONS 1910.145 AND ANSI SPECIFICATIONS Z535. SIGN "G" SHALL BE IN ACCORDANCE WITH NFPA 704.

(2) ALL SIGNS SHALL BE SUITABLE FOR OUTDOOR USE.

(3) MATERIAL CODE: PRESSURE-SENSITIVE VINYL (PSV); ALUMINUM (AL); POLYETHYLENE TAPE (PET); VINYL (VYL)

(4) VENDORS LISTED ARE ONLY FOR ESTABLISHING STANDARDS OF QUALITY AND PERFORMANCE. OTHER MANUFACTURERS MAY BE SUBSTITUTED IF APPROVED AS EQUAL BY THE ENGINEER.

(5) THIS LIST OF SIGNS IS NOT NECESSARILY ALL INCLUSIVE OR 100% COMPLETE. CONTRACTOR SHALL SUPPLY ALL EQUIPMENT AND MATERIALS NECESSARY FOR A COMPLETE SYSTEM.

SIGN SCHEDULE "B"

LOCATION (NOTE 5)	REQUIRED (N) SIGNS AND QUANTITY (EACH LOCATION)
(N) EMERGENCY STATION SHUTDOWN PB	(2)B, (2)C, (2)K
(N) EVERY 50' OF PERIMETER FENCE @ CNG TIME-FILL AREAS	(1)A, (1)C, (1)G
(N) BURIED GAS LINE	(ENTIRE LENGTH) I
(N) BURIED ELECTRIC LINE	(ENTIRE LENGTH) J
(E) CNG STATION FENCE FACING TIME-FILL PANEL (NOTE4)	(1)A, (1)D, (1)E
(N) TIME-FILL POST (10 POSTS)	(1)A, (1)D, (1)E, (1)G, (1)H,
(E) TIME-FILL POST (10 POSTS) (NOTE 4)	(1)A, (1)D, (1)E, (1)G
(E) FAST-FILL ISLAND (NOTE 4)	(2)A, (2)D, (2)E,

NOTES:

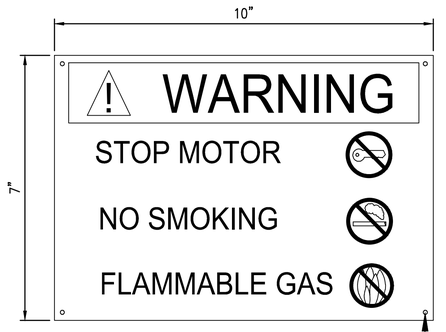
(1) ALL SIGNS SHALL BE PROVIDED BY CONTRACTOR. CONTRACTOR SHALL PROVIDE ALL BRACKETS, SUPPORTS, AND OTHER HARDWARE TO SECURELY MOUNT SIGNS IN PLACE. ALL METALLIC MOUNTING HARDWARE SHALL BE GALVANIZED STEEL. FOR POLE MOUNTING, USE STRAPS. FOR FENCE MOUNTING, USE MOUNTING HOLES.

(2) ALL EQUIPMENT, DEVICES, AND VALVES SHALL BE TAGGED AND ALL LINES SHALL BE IDENTIFIED TO MEET ANSI/ASME A13.3.

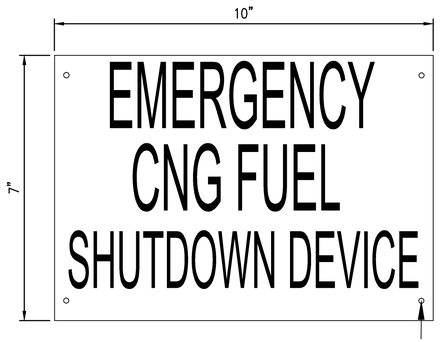
(3) SEE A102 AND 2010 & 2011 PROJECT PLANS FOR FACILITY LAYOUT.

(4) CONTRACTOR SHALL PROVIDE (N) SIGNS AS INDICATED AND REMOVE CORRESPONDING SIGNAGE

(5) CONTRACTOR SHALL COORDINATE INSTALLATION AND REMOVAL OF SIGNAGE WITH OWNER.

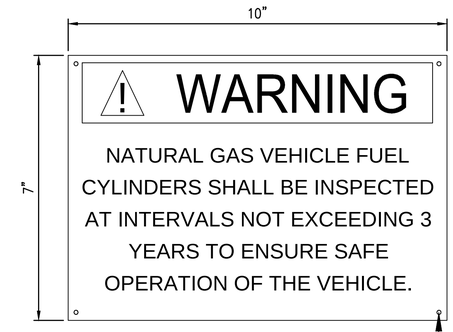


SIGN A



SIGN B

SIGN C



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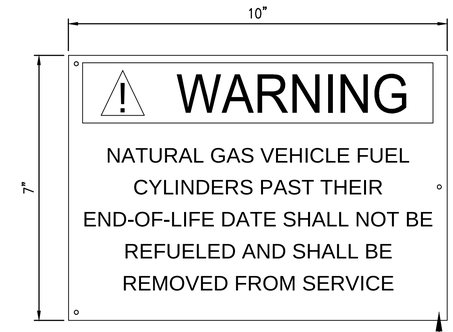
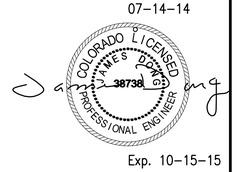


SIGN E

07-14-14



Exp. 10-15-15

DRAWING NO.:	REFERENCE DRAWINGS:		REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
			0	07-14-14	ISSUED FOR BID	CRL	JD		

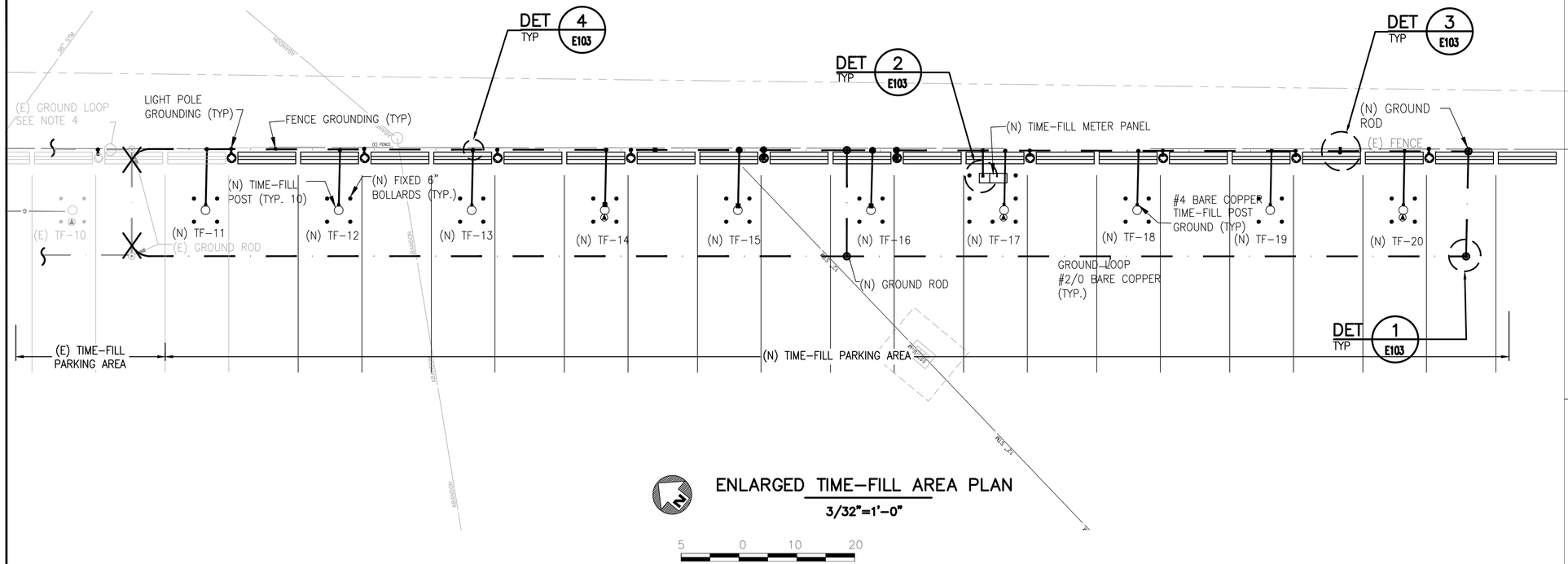
RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

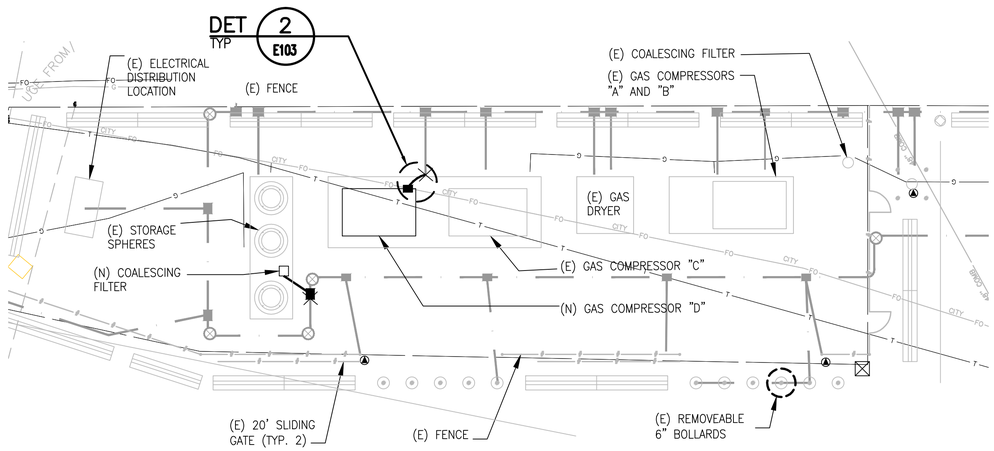
FILENAME: A103.dwg
PROJECT NO.:
DATE DRAWN:
DRAWN BY: CRL
CHECKED BY:

CITY OF GRAND JUNCTION

SIGN – REQUIREMENTS
2014 CNG STATION EXPANSION
MUNICIPAL SERVICE CENTER
333 WEST AVE., GRAND JUNCTION, COLORADO

SCALE: NTS
DRAWING NO.: A103
REV.: 0





NOTES:

1. CNG COMPRESSION, DRYING, AND DISPENSING EQUIPMENT SHALL BE LOCATED IN COMPLIANCE WITH THE INTERNATIONAL FIRE CODE AND THE NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 52 – VEHICULAR GASEOUS FUEL SYSTEMS CODE.
2. NOT ALL UNDERGROUND UTILITIES AND SUBSTRUCTURES ARE SHOWN. THOSE SHOWN ARE FOR REFERENCE ONLY. EXACT ROUTING AND LAYOUT OF EXISTING LINES AND SUBSTRUCTURES SHOULD BE VERIFIED IN THE FIELD BEFORE EXCAVATION AND PROJECT EXECUTION.
3. CONTRACTOR SHALL PROVIDE ALL EQUIPMENT, STRUCTURES, AND MATERIAL DESIGNATED AS "NEW" (N) UNLESS SPECIFIED OTHERWISE.
4. CONTRACTOR SHALL PROVIDE GROUNDING SYSTEM EXPANSION AND CONNECT TO THE (E) GROUNDING SYSTEM AS SHOWN.
5. REFER TO SHEET ES1-2 PREPARED BY BIG HORN CONSULTING ENGINEERS DATED 6-24-10 FOR ADDITIONAL GROUNDING NOTES.

LEGEND:

(E) EXISTING

(N) NEW

(E) FENCE

(N) ESD EMERGENCY SHUTDOWN PUSHBUTTON

GROUNDING:

(N) GROUND GRID

(N) BOND EQUIPMENT FRAME TO GROUND GRID

(N) GROUND TAP

(N) GROUND WELL WITH COPPERCLAD GROUND ROD

POINT OF CONNECTION

07-14-14

COLORADO LICENSED JAMES L. CRAIG 38738 PROFESSIONAL ENGINEER

Exp. 10-15-15

DRAWING NO.:	REFERENCE DRAWINGS:		REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
			0	07-14-14	ISSUED FOR BID	CRL	JD		

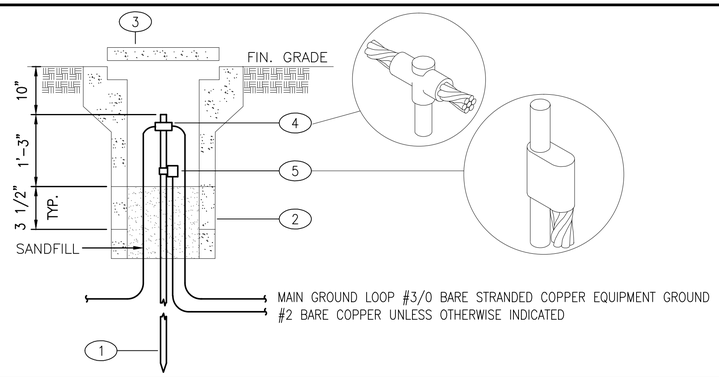
RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME: E102.dwg
PROJECT NO.:
DATE DRAWN: 03-21-14
DRAWN BY: CRL
CHECKED BY: JD

CITY OF GRAND JUNCTION

ENLARGED – CNG GROUNDING PLAN
2014 CNG STATION EXPANSION
MUNICIPAL SERVICE CENTER
333 WEST AVE., GRAND JUNCTION, COLORADO

SCALE: AS SHOWN
DRAWING NO.: E102
REV.: 0

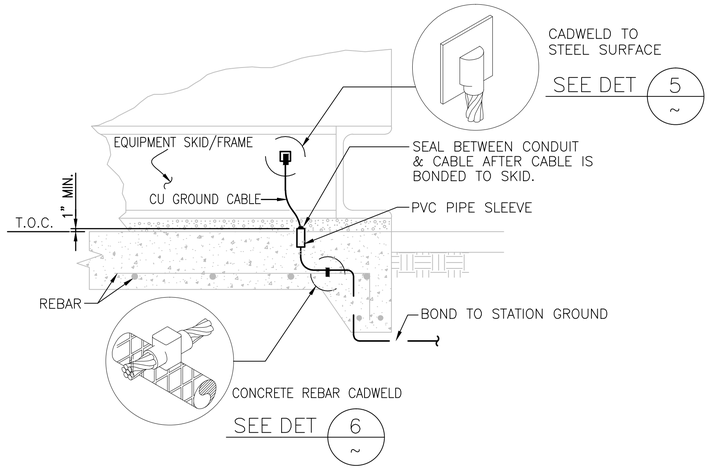


BILL OF MATERIALS		
ITEM	QTY.	DESCRIPTION
1	1	3/4" DIA. x 10 FT. LONG SECTIONAL STEEL GROUND ROD, COPPERCLAD
2	1	9" DIA. x 24" CONCRETE VALVE BOX, SERIES 9 BROOKS PRODUCT
3	1	9" CAST IRON TRAFFIC BOX COVER MARKED "GROUND"–BROOKS PRODUCTS
4	1	GROUNDING MOLD–CADWELD #GTC–182L
5	AS REQ'D.	GROUND CONNECTOR–CADWELD "GS"

DETAIL 1 E103 — NTS — E102

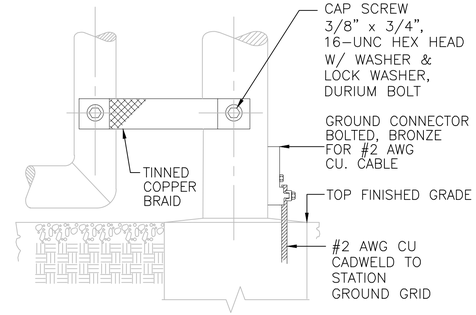
GROUND WELL

TYPICAL



DETAIL 2 E103 — NTS — E102

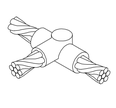
EQUIPMENT & CONCRETE PAD REBAR BONDING



DETAIL 3 E103 — NTS — E102

FENCE GATE & POST GROUNDING

HORIZONTAL TEE

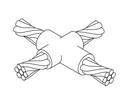


CABLE SIZE		MOLD	WELD
RAN	TAP	PART NO.	METAL
4	4	TAC-1L1L	32
2	2	TAC-1V1V	45
	4	TAC-1V1L	45
1	1	TAC-1Y1Y	45
	2	TAC-1Y1V	45
	4	TAC-1Y1L	45
1/0	1/0	TAC-2C2C	90
	1	TAC-2C1Y	45
	2	TAC-2C1V	45
	4	TAC-2C1L	45
2/0	2/0	TAC-2C2G	90
	1/0	TAC-2C2C	90
	1	TAC-2C1Y	45
	2	TAC-2C1V	45
	4	TAC-2C1L	45
3/0	3/0	TAC-2L2L	115
	2/0	TAC-2L2G	90
	1/0	TAC-2L2C	90
	1	TAC-2L1Y	45
	2	TAC-2L1V	45
	4	TAC-2L1L	45
4/0	4/0	TAC-2Q2Q	150
	3/0	TAC-2Q2L	115
	2/0	TAC-2Q2G	90
	1/0	TAC-2Q2C	90
	1	TAC-2Q1Y	90
	2	TAC-2Q1V	90
	4	TAC-2Q1L	90

PARALLEL TAP

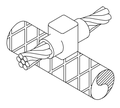
CABLE SIZE		MOLD	WELD
RAN	TAP	PART NO.	METAL
4	4	PCC-ILIL	32
	6	PCC-1L1H	32
2	2	PCC-1V1V	65
	4	PCC-1V1L	45
	6	PCC-1V1H	32
1	2	PCC-1Y1V	65
	4	PCC-1Y1L	45
	6	PCC-1Y1H	45
1/0	2	PCC-2C1V	65
	4	PCC-2C1L	65
	6	PCC-2C1H	45
2/0	2	PCC-2G1V	90
	4	PCC-2G1L	65
	6	PCC-2G1H	65
3/0			
4/0	1	PCC-2Q1Y	115
	2	PCC-2Q1V	115
	4	PCC-2Q1L	90
	6	PCC-2Q1H	90

HORIZONTAL X TYPE A



CABLE SIZE		MOLD	WELD
RAN	TAP	PART NO.	METAL
4	4	XAC-1L1L	45
2	2	XAC-1V1V	65
	4	XAC-1V1L	65
1	1	XAC-1Y1Y	65
	2	XAC-1Y1V	65
	4	XAC-1Y1L	65
1/0	1/0	XAC-2C2C	90
	1	XAC-2C1Y	90
	2	XAC-2C1V	90
	4	XAC-2C1L	90
2/0	2/0	XAC-2G2G	115
	1/0	XAC-2G2C	115
	1	XAC-2G1Y	115
	2	XAC-2G1V	115
3/0	3/0	XAC-2L2L	150
	2/0	XAC-2L2G	150
	1/0	XAC-2L2C	115
	1	XAC-2L1Y	115
	2	XAC-2L1V	115
4/0	4/0	XAC-2Q2Q	200
	3/0	XAC-2Q2L	200
	2/0	XAC-2Q2G	150
	1/0	XAC-2Q2C	150
	1	XAC-2Q1Y	115
	2	XAC-2Q1V	115

HORIZONTAL X TYPE B



CABLE SIZE		MOLD	WELD
RAN	TAP	PART NO.	METAL
4	4	XBC-1L1L	65
2	2	XBC-1V1V	90
	4	XBC-1V1L	65
1	1	XBC-1Y1Y	115
	2	XBC-1Y1V	90
	4	XBC-1Y1L	90
1/0	1/0	XBM-2C2C	150
	1	XBM-2C1Y	150
	2	XBM-2C1V	115
	4	XBM-2C1L	115
2/0	2/0	XBM-2G2G	200
	1/0	XBM-2G2C	200
	1	XBM-2G1Y	150
	2	XBM-2G1V	150
3/0	3/0	XBM-2L2L	250
	2/0	XBM-2L2G	200
	1/0	XBM-2L2C	200
	1	XBM-2L1Y	150
	2	XBM-2L1V	150
4/0	4/0	XBM-2Q2Q	250
	3/0	XBM-2Q2L	250
	2/0	XBM-2Q2G	200
	1/0	XBM-2Q2C	200
	1	XBM-2Q1Y	150
	2	XBM-2Q1V	150

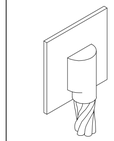
DETAIL 4 E103 — N.T.S. — E102

GROUNDING BRANCH & TAP CONNECTIONS

CABLE TO LUGS

CABLE SIZE	BUS OR LUG	MOLD PART NO.	WELD METAL
4	1/8 x 1	LAC-1LCE	45
2	1/8 x 1	LAC-1VCE	45
1	1/8 x 1	LAC-1YCE	45
1/0	1/8 x 1	LAC-2CCE	45
	3/16 x 1	LAC-2CDE	65
	1/4 x 1	LAC-2CEE	65
2/0	1/8 x 1	LAC-2GCE	65
	3/16 x 1	LAC-2GDE	65
	1/4 x 1	LAC-2GEE	65
3/0	1/8 x 1	LAC-2LCE	65
	3/16 x 1	LAC-2LDE	90
	1/4 x 1	LAC-2LEE	90
4/0	3/16 x 1	LAC-2QDE	90
	1/4 x 1	LAC-2QEE	90
	1/4 x 1 1/2	LAC-2QEG	90
	1/4 x 2	LAC-2QEH	90
	1/4 x 3	LAC-2QEK	90

VERTICAL STEEL SURFACE

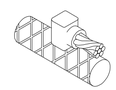


CABLE SIZE	MOLD PART NO.	WELD METAL
4	VBC-IL	65
2	VBC-IV	65
1	VBC-IY	90
1/0	VBC-2C	115
2/0	VBC-2G	115
3/0	VBC-2L	150
4/0	VBC-2Q	150

DETAIL 5 E103 — NTS — E103

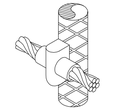
CONNECTION TO BUS BAR

CABLE TO REBAR (PARALLEL)



REBAR SIZE	CABLE SIZE	MOLD PART NO.	WELD METAL
3	6	RRC-511H	25
	4	RRC-511L	32
	2	RRC-511V	45
	1	RRC-511Y	65
	1/0	RRC-512C	90
	2/0	RRC-512G	90
	3/0	RRC-512L	115
	4/0	RRC-512Q	115
4	6	RRA-521H	25
	4	RRA-521L	32
	2	RRA-521V	45
	1	RRA-521Y	65
	1/0	RRC-552C	90
	2/0	RRC-552G	90
	3/0	RRC-552L	115
	4/0	RRC-552Q	115
5	6	RRA-531H	25
	4	RRA-531L	32
	2	RRA-531V	45
	1	RRA-531Y	65
	1/0	RRC-532C	90
	2/0	RRC-532G	90
	3/0	RRC-532L	115
	4/0	RRC-532Q	115
6	6	RRA-541H	25
	4	RRA-541L	32
	2	RRA-541V	45
	1	RRA-541Y	65
	1/0	RRH-542C	90
	2/0	RRH-542G	90
	3/0	RRH-542L	115
	4/0	RRH-542Q	115

CABLE TO REBAR (90°)



REBAR SIZE	CABLE SIZE	MOLD PART NO.	WELD METAL
3	6	RCE-511H	90
	4	RCE-511L	90
	2	RCE-511V	90
	1	RCE-511Y	115
	1/0	RCE-512C	115
	2/0	RCE-512G	115
	3/0	RCE-512L	150
	4/0	RCE-512Q	150
4	6	RCE-521H	90
	4	RCE-521L	90
	2	RCE-521V	90
	1	RCE-521Y	115
	1/0	RCE-552C	115
	2/0	RCE-552G	115
	3/0	RCE-552L	150
	4/0	RCE-552Q	150
5	6	RCE-531H	90
	4	RCE-531L	90
	2	RCE-531V	90
	1	RCE-531Y	115
	1/0	RCE-532C	115
	2/0	RCE-532G	115
	3/0	RCE-532L	150
	4/0	RCE-532Q	150
6	6	RCE-541H	90
	4	RCE-541L	90
	2	RCE-541V	90
	1	RCE-541Y	115
	1/0	RCE-542C	115
	2/0	RCE-542G	115
	3/0	RCE-542L	150
	4/0	RCE-542Q	150

DETAIL 6 E103 — NTS — E103

CONNECTION TO REBAR

07-14-14

COLORADO LICENSED JAMES DOYLE 38736 PROFESSIONAL ENGINEER

Exp. 10-15-15

REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
0	07-14-14	ISSUED FOR BID	CRL	JD		

DRAWING NO.: | REFERENCE DRAWINGS:

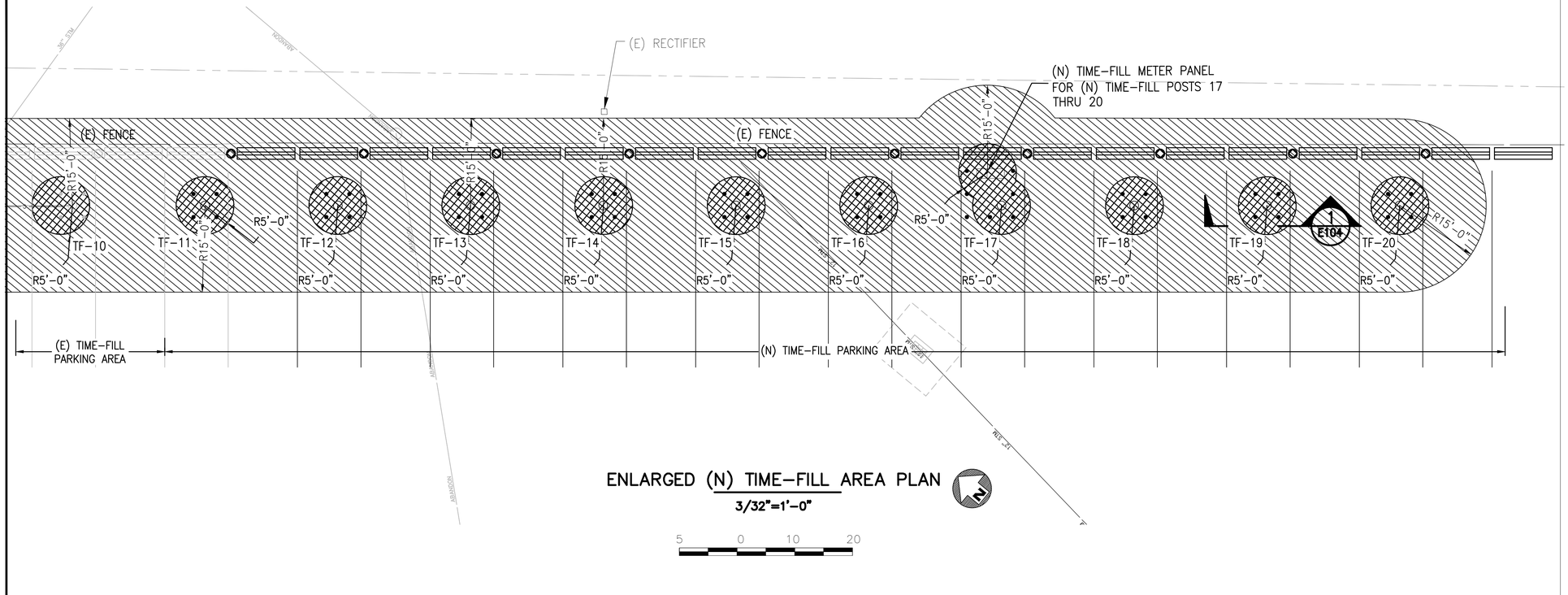
RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94596

FILENAME: E103.dwg
PROJECT NO.:
DATE DRAWN: 04-28-14
DRAWN BY: CRL
CHECKED BY: JD

CITY OF GRAND JUNCTION

GROUNDING DETAILS
2014 CNG STATION EXPANSION
MUNICIPAL SERVICE CENTER
333 WEST AVE., GRAND JUNCTION, COLORADO

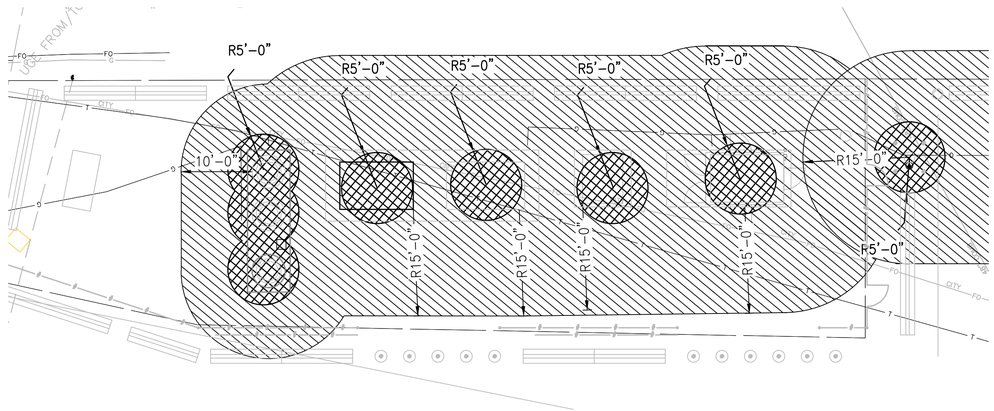
SCALE: AS SHOWN
DRAWING NO.: E103
REV.: 0



ENLARGED (N) TIME-FILL AREA PLAN

3/32"=1'-0"

5 0 10 20



ENLARGED CNG COMPRESSOR AREA PLAN

3/32"=1'-0"

5 0 10 20

NOTES:

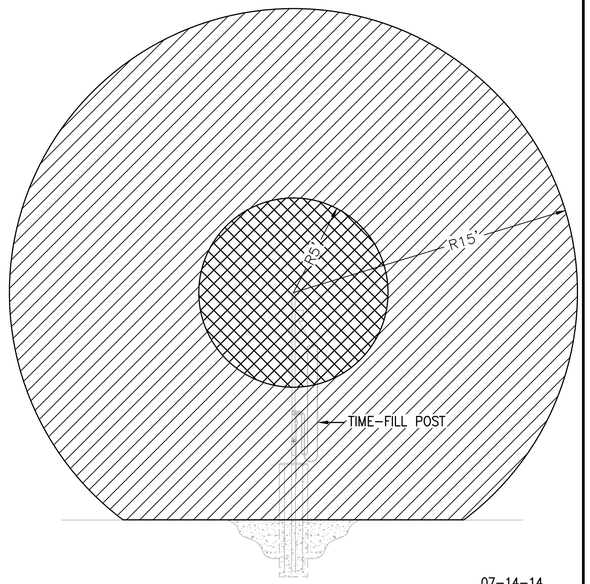
1. THE EXTENT AND DEGREE OF THE HAZARDOUS AREAS ARE BASED ON THE 2013 NFPA 52 VEHICULAR GASEOUS FUEL SYSTEMS CODE.
2. ALL ELECTRICAL DEVICES AND WIRING WITHIN A HAZARDOUS AREA SHALL BE RATED AND INSTALLED IN ACCORDANCE WITH THE 2011 NATIONAL ELECTRICAL CODE.
3. ELECTRICAL EQUIPMENT INSTALLED IN CLASS 1 LOCATIONS SHALL COMPLY WITH ARTICLES 501 AND 511.7 OF THE 2011 NATIONAL ELECTRICAL CODE.

HAZARDOUS AREA CLASSIFICATION IDENTIFICATION
CLASS 1, DIV. 1 GROUP D
CLASS 1, DIV. 2 GROUP D

LEGEND:

(E) EXISTING

(N) NEW



TIME-FILL POSTS DETAIL 1/E104 N.T.S.

07-14-14

COLORADO LICENSED JAMES D. PRAY 38738 PROFESSIONAL ENGINEER

Exp. 10-15-15

DRAWING NO.:	REFERENCE DRAWINGS:		REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
			0	07-14-14	ISSUED FOR BID	CRL	JD		

RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME: E104.dwg
PROJECT NO.:
DATE DRAWN: 03-03-14
DRAWN BY: CRL
CHECKED BY: JD

CITY OF GRAND JUNCTION

HAZARDOUS AREA CLASSIFICATION PLAN
2014 CNG STATION EXPANSION
MUNICIPAL SERVICE CENTER
333 WEST AVE., GRAND JUNCTION, COLORADO

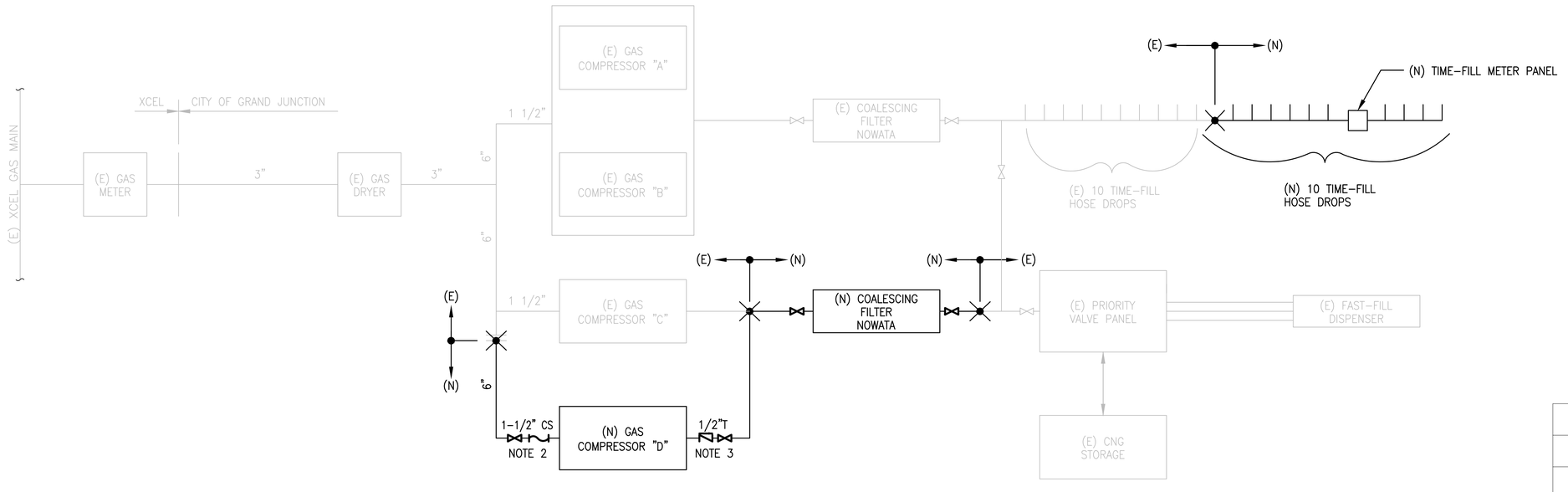
SCALE: AS SHOWN
DRAWING NO.: E104
REV.: 0

NOTES:

1. THIS DRAWING IS SCHEMATIC IN NATURE. CONTRACTOR SHALL COORDINATE AND PROVIDE ALL EQUIPMENT FOR A COMPLETE AND OPERABLE CNG STATION EXPANSION AS SHOWN.
2. CONTRACTOR SHALL PROVIDE AN ISOLATION BALL VALVE (FULL BORE) AND FLEX HOSE ON THE COMPRESSOR INLET LINE.
3. CONTRACTOR SHALL PROVIDE AN ISOLATION BALL VALVE AND CHECK VALVE ON THE COMPRESSOR DISCHARGE LINE.

LEGEND:

(E)	EXISTING
(N)	NEW
✕	POINT OF CONNECTION
CS	CARBON STEEL PIPE
T	STAINLESS STEEL TUBING



COMPRESSOR	MANUFACTURER & MODEL	CAPACITY, SCFM
A & B (EXISTING)	INGERSOLL RAND 20H40NGDX	116
C (EXISTING)	INGERSOLL RAND 20H40NGSX	58
D (NEW)	INGERSOLL RAND 20H40NGSX	58
TOTAL COMPRESSION		232

07–14–14

COLORADO LICENSED JAMES D. CLARK 38738 PROFESSIONAL ENGINEER

Exp. 10–15–15

DRAWING NO.:	REFERENCE DRAWINGS:		REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
			0	07-14-14	ISSUED FOR BID	CRL	JD		

RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME:	P100.dwg
PROJECT NO.:	
DATE DRAWN:	02–27–14
DRAWN BY:	CRL
CHECKED BY:	JD

CITY OF GRAND JUNCTION

STATION FLOW DIAGRAM
2014 CNG STATION EXPANSION
MUNICIPAL SERVICE CENTER
333 WEST AVE., GRAND JUNCTION, COLORADO

SCALE:	DRAWING NO.:	REV.:
AS SHOWN	P100	0

PANEL SCHEDULE – MSCG

TYPE: PANELBOARD | BUS SIZE: 600 | PHASES: 3 | NEUTRAL BUS: YES
VOLTAGE: 277/480 | MAIN BRKR: 600 | WIRES: 4 | GROUND BUS: YES
ENCLOSURE: NEMA3R | MOUNTING: FLUSH | SC RATING: 42000

LOAD TYPE	LOAD DESCRIPTION	AMPS POLES	CKT# LOAD	Ø	CKT# LOAD	AMPS POLES	LOAD TYPE	LOAD DESCRIPTION
PROCESS	--- ---	--- ---	1 14410	A	2 14410	--- ---	PROCESS	--- ---
PROCESS	NATURAL GAS COMPRESSOR "A" ---	90A 3P	3 14410	B	4 14410	90A 3P	PROCESS	NATURAL GAS COMPRESSOR "C" ---
PROCESS	--- ---	--- ---	5 14410	C	6 14410	--- ---	PROCESS	--- ---
PROCESS	--- ---	--- ---	7 14410	A	8 14410	--- ---	PROCESS	--- ---
PROCESS	NATURAL GAS COMPRESSOR "B" ---	90A 3P	9 14410	B	10 14410	90A 3P	PROCESS	(N) NATURAL GAS COMPRESSOR "D" ---
PROCESS	--- ---	--- ---	11 14410	C	12 14410	--- ---	PROCESS	--- ---
PROCESS	--- ---	--- ---	13 6097	A	14 3500	20A 1P	SPARE	UNALLOCATED FUTURE ---
PROCESS	NATURAL GAS DRYER ---	30A 3P	15 6097	B	16 0	--- ---	SPACE	--- ---
PROCESS	--- ---	--- ---	17 6097	C	18 0	--- ---	SPACE	--- ---
SPACE	--- ---	--- ---	19 0	A	20 0	--- ---	SPACE	--- ---
SPACE	--- ---	--- ---	21 0	B	22 0	--- ---	SPACE	--- ---
SPACE	--- ---	--- ---	23 0	C	24 0	--- ---	SPACE	--- ---
SUBFEED	--- ---	--- ---	25 6000	A	26 0	--- ---	SPACE	--- ---
SUBFEED	PANEL LP ---	30A 3P	27 6000	B	28 0	--- ---	SPACE	--- ---
SUBFEED	--- ---	--- ---	29 6000	C	30 0	--- ---	SPACE	--- ---

LOADS BY TYPE:

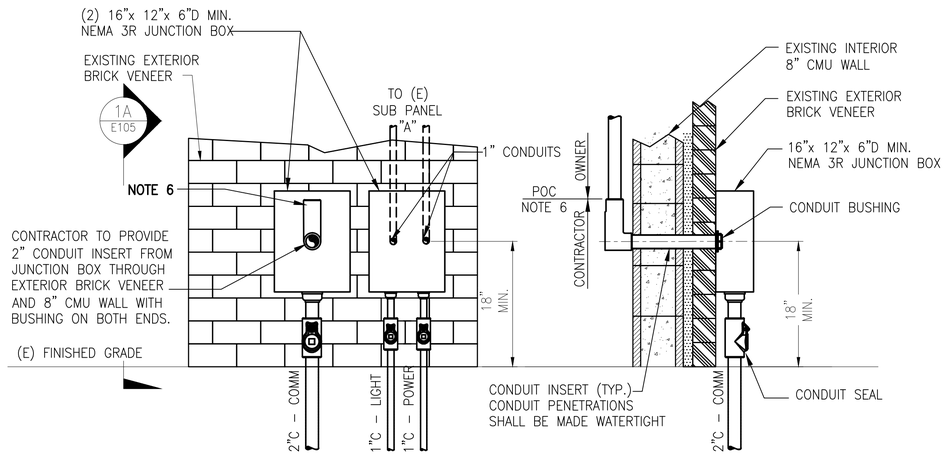
LOAD TYPE	CONNECTED LOAD (VA)	DEMAND FACTOR	DEMAND LOAD (VA)
LIGHTING	0.00	1.25	0.00
KITCHEN	0.00	1.00	0.00
PROCESS	406450.00	1.00	406450.00
RECEPTACLES	10000.00	1.00	10000.00
RECEPTACLES	5600.00	0.50	2800.00
MECH HEATING	0.00	1.00	0.00
MECH COOLING	0.00	1.00	0.00
MECH YEAR ROUND	0.00	1.00	0.00
APPLIANCE	0.00	1.00	0.00
MISCELLANEOUS	0.00	1.00	0.00
MOTOR	0.00	1.00	0.00
SPARE	3500.00	1.00	3500.00
LARGEST MOTOR [1]	ABOVE	0.25	0.00
TOTAL	425550.00		422750.00

LOADS BY PHASE:

PHASE	CONNECTED LOAD (VA)	CONNECTED LOAD (AMPS)	BALANCE (PERCENT)
A	144183.30	520.52	A–B: 97.6
B	140683.30	507.88	B–C: 100
C	140683.30	507.88	C–A: 97.6
TOTAL/AVERAGE	425550.00	512.09	98.4

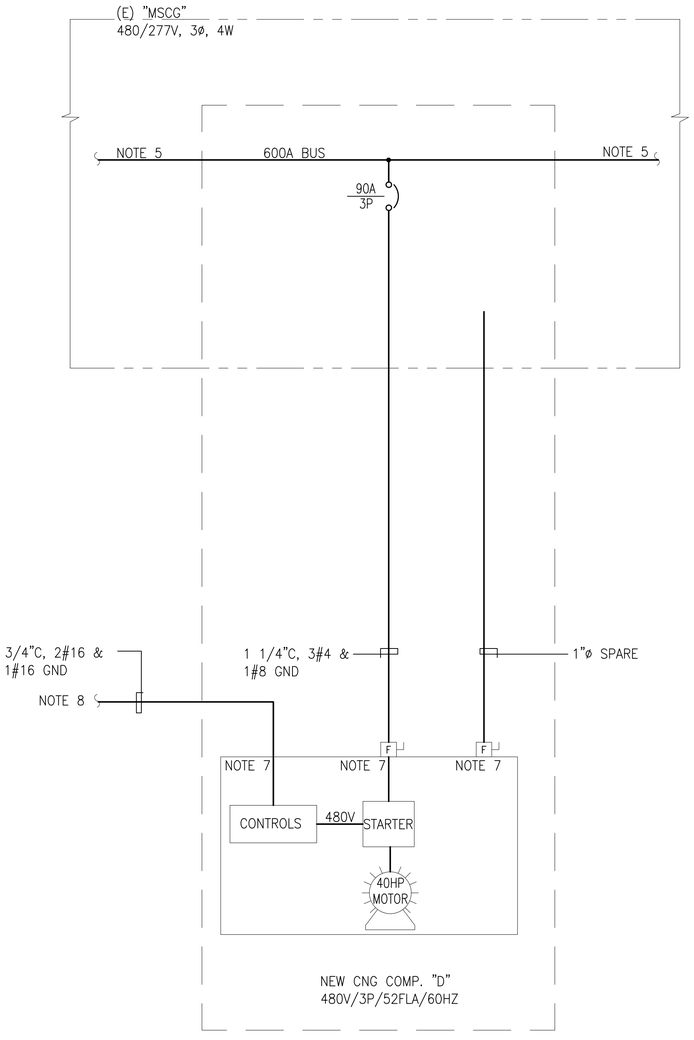
NOTE:

1. REFER TO DETAIL 2 ON THIS SHEET FOR PARTIAL SINGLE LINE DIAGRAM FOR COMPRESSOR "D".



DETAIL 1 / NTS / E105

SECTION 1A / NTS / E105



DETAIL 2 / NTS / E105

NOTES:

1. THE COMPLETE ELECTRICAL INSTALLATION SHALL BE IN ACCORDANCE WITH THE 2011 NATIONAL ELECTRICAL CODE, AND ALL APPLICABLE STATE AND LOCAL CODES ISSUED BY AUTHORITIES HAVING JURISDICTION.
2. ALL ELECTRICAL MATERIALS INSTALLED IN LOCATION THAT ARE CLASSIFIED AS HAZARDOUS AREAS MUST BE SUITABLE FOR THE AREA CLASSIFICATION. SEE DRAWING E104 FOR LOCATION OF HAZARDOUS AREAS.
3. THE NUMBERS & SIZES OF CONDUIT & WIRE SHOWN ON THE PLAN ARE THE MINIMUM REQUIREMENTS. THE FINAL INSTALLATION SHALL BE BASED ON MANUFACTURER'S SUBMITTALS AT NO EXTRA COST TO OWNER.
4. CONTRACTOR SHALL PROVIDE SEAL FITTINGS IN ACCORDANCE WITH THE 2011 NATIONAL ELECTRIC CODE. NO CONDUIT FITTINGS SUCH AS COUPLING & UNIONS OR ANY CONDUIT BODIES ARE ALLOWED BETWEEN THE SEALING FITTINGS AND THE POINT WHERE THE CONDUIT EMERGES FROM THE GROUND.
5. SEE GAS EQUIPMENT SYSTEMS, INC. DRAWING E–100RrevO9 DATED 4/11/2011 FOR COMPLETE SINGLE LINE DIAGRAM OF CNG STATION EQUIPMENT.
6. CONTRACTOR SHALL LEAVE CONDUIT ELBOW READY FOR CONTINUATION BY OWNER.
7. CONTRACTOR SHALL PROVIDE FLEXIBLE CONDUIT FOR ALL CONDUIT CONNECTIONS TO COMPRESSOR.
8. CONTRACTOR SHALL CONNECT COMPRESSOR "D" WITH EXISTING GUARD–IT AUTODIALER BY RACO.

07–14–14

COLORADO LICENSED JAMES R. CRAIG 38738 PROFESSIONAL ENGINEER

Exp. 10–15–15

DRAWING NO.:	REFERENCE DRAWINGS:		REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
			0	07–14–14	ISSUED FOR BID	CRL	JD		

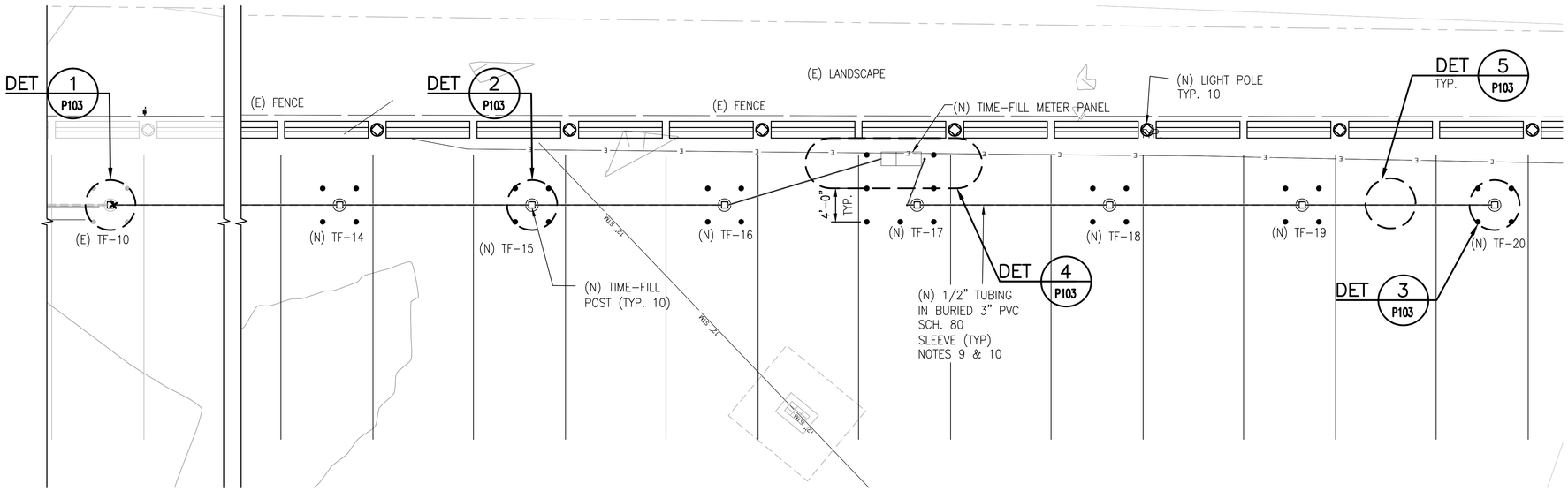
RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME: E105.dwg
PROJECT NO.:
DATE DRAWN: 02–27–14
DRAWN BY: CRL
CHECKED BY: JD

CITY OF GRAND JUNCTION

ELECTRICAL – DETAILS
2014 CNG STATION EXPANSION
MUNICIPAL SERVICE CENTER
333 WEST AVE., GRAND JUNCTION, COLORADO

SCALE: AS SHOWN | DRAWING NO.: E105 | REV.: 0



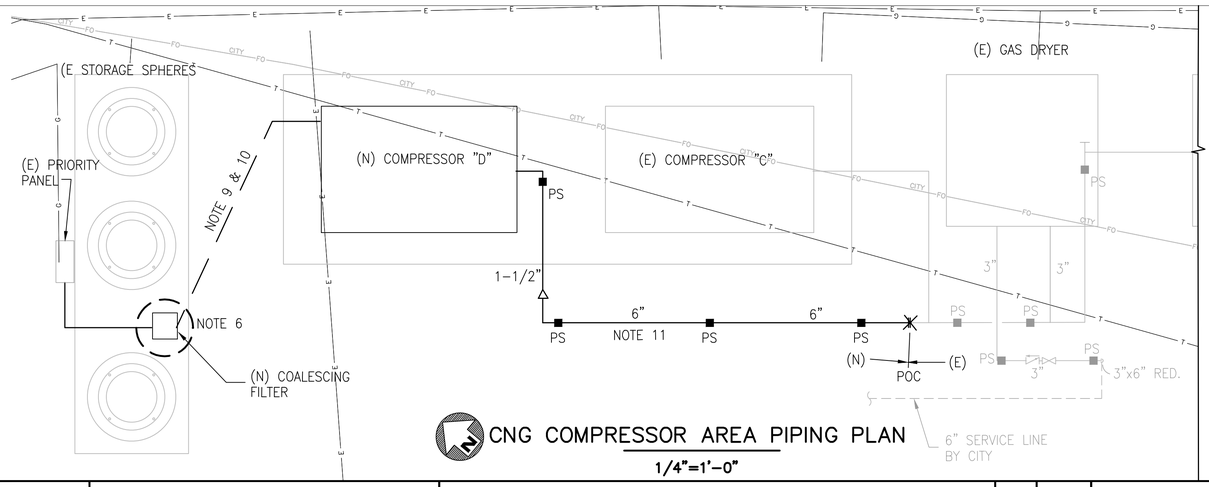
(N) TIME-FILL AREA PIPING PLAN

1/4"=1'-0"

ITEM NO.	DESCRIPTION	PRESSURE	MAT'L TYPE	SIZE	SPECIFICATION	MANUFACTURER	PART No.
5	CHANNEL		CARBON STL	1-5/8"Wx 1-5/8"D		UNISTRUT	P1000
7	ELBOW,THREADED, 45 DEGREE	3000LB	FORGED STL	1" NOM. DIA.	ASTM A-105	ANML INTERNATIONAL INC.	FIG 2112
27	PIPE, CLAMP, COMPLETE WITH BOLTS & SUPPORT			1" NOM. DIA.		UNISTRUT	021N026
28	PIPE, BARE	SCH. 80	SMLS STL	1" NOM. DIA.	ASTM A106 GR. B	U.S. STEEL	
32	PIPE, BARE, WITH TRACER WIRE, LONG RADIUS BENDS ONLY	SCH. 80	PVC	3" NOM. DIA.			
46	TUBING, ANNEALED		316 SS	3/8" O.D. x 0.065" WALL	ASTM A-269		
47	TUBING, ANNEALED		316 SS	1/2" O.D. x 0.083" WALL	ASTM A-269		
57	TUBE FITTING, MALE STRAIGHT CONNECTOR		316 SS	1/2" T x 1/2" NPT		SWAGELOK	SS-810-1-8
58	TUBE FITTING, REDUCING UNION		316 SS	3/8" T x 1/2" T		SWAGELOK	SS-810-6-6
61	TUBE FITTING, UNION TEE		316 SS	1/2" T		SWAGELOK	SS-810-3
62	TUBE FITTING, UNION ELBOW		316 SS	1/2"		SWAGELOK	SS-810-9
64	TUBE, CLAMP, COMPLETE W/ BOLTS & SUPPORT			1/2" T		UNISTRUT	008T012
65	STRUT NUT FOR SWAGELOK TUBE SUPPORTS					SWAGELOK	S-S0-SN

4 2 0 4 8

SCALE 1/4"=1'-0"



CNG COMPRESSOR AREA PIPING PLAN

1/4"=1'-0"

COMPRESSOR INLET

DESIGN CRITERIA PER ASME B31.3

D.P. 275 PSIG 21.9 % P_A
MAOP 275 PSIG 21.9 % P_A
STRENGTH TEST PRESSURE
MAX. 400 PSIG 31.8 % P_A
MIN. 350 PSIG 27.9 % P_A
1128 PSIG=90% P_A
TEST FLUID NITROGEN
PIPE SPEC ASTM A106, GR.B
O.D. 1.900 IN
W.T. 0.145 IN
WELD INSPECTION PER ASME B31.3
☐ RADIOGRAPHIC: ☐ 20% MIN. ☒ 100%

* P_A – MAXIMUM INTERNAL DESIGN PRESSURE BASED ON S_A, BASIC ALLOWABLE STRESS, FROM ASME B31.3

COMPRESSOR HEADER

DESIGN CRITERIA PER ASME B31.3

D.P. 275 PSIG 30.4 % P_A
MAOP 275 PSIG 30.4 % P_A
STRENGTH TEST PRESSURE
MAX. 400 PSIG 44.2 % P_A
MIN. 350 PSIG 38.7 % P_A
813 PSIG=90% P_A
TEST FLUID NITROGEN
PIPE SPEC ASTM A106, GR.B
O.D. 6.625 IN
W.T. 0.280 IN
WELD INSPECTION PER ASME B31.3
☐ RADIOGRAPHIC: ☐ 20% MIN. ☒ 100%

* P_A – MAXIMUM INTERNAL DESIGN PRESSURE BASED ON S_A, BASIC ALLOWABLE STRESS, FROM ASME B31.3

CNG

DESIGN CRITERIA PER ASME B31.3

D.P. 5000 PSIG 84.7 % P_A
MAOP 5000 PSIG 84.7 % P_A
STRENGTH TEST PRESSURE
MAX. 5600 PSIG 94.9 % P_A
MIN. 5500 PSIG 93.2 % P_A
5308 PSIG=90% P_A
TEST FLUID NITROGEN
PIPE SPEC ASTM A269, 316SS, SMLS
O.D. 0.500 IN
W.T. 0.083 IN
WELD INSPECTION PER ASME B31.3
☐ RADIOGRAPHIC: ☐ 20% MIN. ☐ 100%

* P_A – MAXIMUM INTERNAL DESIGN PRESSURE BASED ON S_A, BASIC ALLOWABLE STRESS, FROM ASME B31.3

NOTES:

1. CNG COMPRESSION, DRYING, AND DISPENSING EQUIPMENT SHALL BE LOCATED IN COMPLIANCE WITH THE INTERNATIONAL FIRE CODE AND THE NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 52 – VEHICULAR GASEOUS FUEL SYSTEMS CODE.
2. NOT ALL UNDERGROUND UTILITIES AND SUBSTRUCTURES ARE SHOWN. THOSE SHOWN ARE FOR REFERENCE ONLY. EXACT ROUTING AND LAYOUT OF EXISTING LINES AND SUBSTRUCTURES SHOULD BE VERIFIED IN THE FIELD BEFORE EXCAVATION AND PROJECT EXECUTION.
3. CONTRACTOR SHALL PROVIDE ALL EQUIPMENT, STRUCTURES, AND MATERIAL DESIGNATED AS "NEW" (N) UNLESS SPECIFIED OTHERWISE. ANY ADDITIONAL MATERIALS NOT SHOWN BUT REQUIRED BY CONTRACTOR TO INSTALL EQUIPMENT AND INTERCONNECTING PIPING/TUBING SHALL BE INCLUDED IN THE BID PRICE.
4. CONTRACTOR SHALL PROTECT PIPING AND TUBING FROM MECHANICAL DAMAGE. SUPPORT TUBING EVERY FIVE FEET AND INSTALL METAL THRESHOLDS OVER TUBING FOR PROTECTION FROM FOOT TRAFFIC.
5. CONTRACTOR SHALL IDENTIFY PIPING AND TUBING BY COLOR CODING, PAINTING, AND MARKINGS AS APPROPRIATE IN ACCORDANCE WITH ASME A13.1. MARKINGS SHALL IDENTIFY CONTENTS AND FLOW DIRECTION.
6. CONTRACTOR SHALL PROVIDE COALESCING FILTER NOWATA FUELGUARD RATED AT 6,000 PSIG. FILTER CAN BE MOUNTED ON EXISTING CONCRETE STORAGE PAD OR NEW CONCRETE PEDESTAL. FILTER INSTALLATION SHALL COMPLY WITH DETAIL 4 ON SHEET P103 OF THE INITIAL 2010 CNG STATION INSTALLATION AND SHALL INCLUDE INLET AND OUTLET ISOLATION BALL VALVES AND DRAIN VALVE.
7. PIPE SUPPORTS FOR 6" DIAMETER PIPING SHALL BE FIGURE 510-F TYPE PRE-FABRICATED SUPPORTS BY E-Z LINE PIPE SUPPORT CO. (713) 675-6693. SUPPORTS SHALL INCLUDE BASE PLATES WITH SLOTTED HOLES FOR ANCHORS. CONTRACTOR SHALL PROVIDE CONCRETE FOOTING FOR PIPE SUPPORTS.
8. PIPE SUPPORTS FOR 1-1/2" DIAMETER PIPING SHALL BE FIGURE 204-F TYPE PRE-FABRICATED SUPPORTS BY E-Z LINE PIPE SUPPORT CO. (713) 675-6693. SUPPORTS SHALL INCLUDE BASE PLATES WITH SLOTTED HOLES FOR ANCHORS. CONTRACTOR SHALL PROVIDE CONCRETE FOOTING FOR PIPE SUPPORTS.
9. CONTRACTOR SHALL PLACE A 3-INCH THICK, 18-INCH WIDE LAYER OF RED SLURRY 6-INCHES ABOVE PVC SLEEVES.
10. STAINLESS STEEL TUBING SHALL BE INSERTED IN 3" PE PIPE SLEEVE. COMPRESSION FITTINGS SHALL NOT BE USED A) BELOW GROUND AND B) INSERTED INSIDE PE SLEEVE. CONTRACTOR SHALL KEEP PE PIPE ENDS SECURELY COVERED AT ALL TIMES TO KEEP MOISTURE FROM ENTERING THE PE PIPE. ENDS OF THE PE SLEEVE SHALL EXTEND A MINIMUM OF 4" ABOVE GRADE. SLEEVE ENDS SHALL BE FITTED WITH A 3" PVC CAP WHICH SHALL BE DRILLED AS NEEDED TO ACCOMMODATE TUBING. SPACE BETWEEN CAP AND TUBING SHALL BE TIGHTLY SEALED WITH WEATHERPROOF SEALANT TO PREVENT MOISTURE FROM ENTERING PE PIPE SLEEVE.
11. CONTRACTOR SHALL PROVIDE PRESSURE GAUGE ASSEMBLY PER DETAIL 5 ON SHEET P103 FROM 2010 PROJECT PLANS.
12. VENT OUTLET SHALL BE A MINIMUM TEN-FEET ABOVE GRADE.

LEGEND:

(E)	EXISTING
(N)	NEW
●	(N) FIXED BOLLARDS
TF-#	(N) TIME-FILL POST (11 THRU 20)
×	POINT OF CONNECTION
PS	(N) PIPE SUPPORT. REFER TO NOTES 7 & 8 FOR DETAILS

07-14-14

COLORADO LICENSED JAMES D. DOING 38738 PROFESSIONAL ENGINEER

Exp. 10-15-15

DRAWING NO.:	REFERENCE DRAWINGS:		REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
			0	07-14-14	ISSUED FOR BID	CRL	JD		

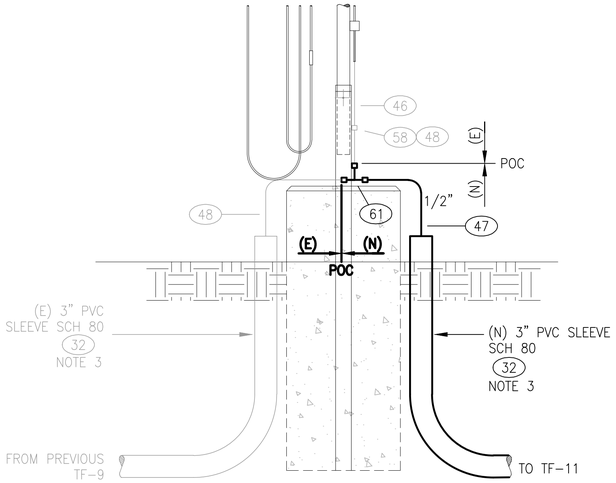
RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME:	P101.dwg
PROJECT NO.:	
DATE DRAWN:	03-03-14
DRAWN BY:	CRL
CHECKED BY:	JD

CITY OF GRAND JUNCTION

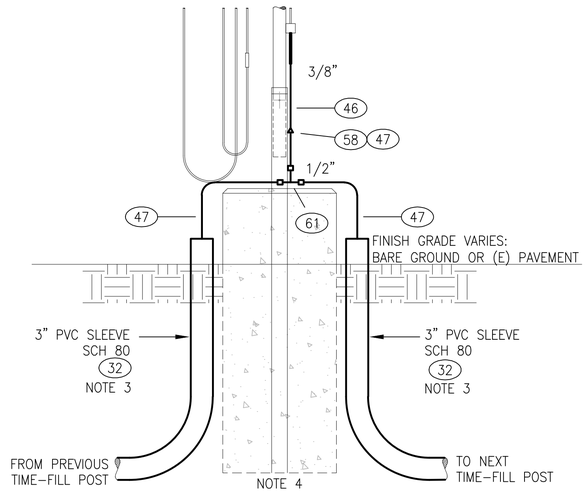
PIPING PLAN
2014 CNG STATION EXPANSION
MUNICIPAL SERVICE CENTER
333 WEST AVE., GRAND JUNCTION, COLORADO

SCALE:	DRAWING NO.:	REV.:
AS SHOWN	P101	0



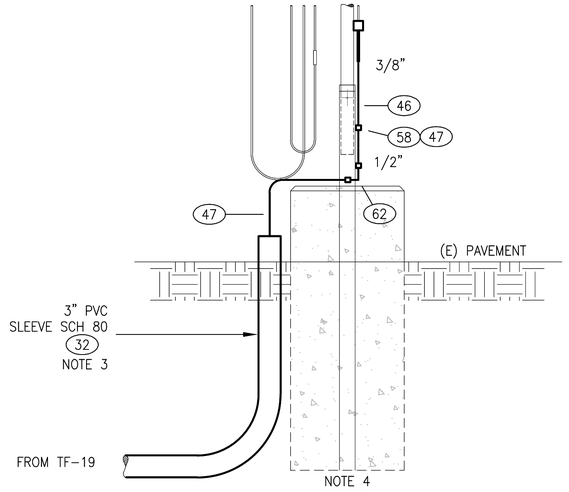
DETAIL 1 P103 NTS P101

POINT OF CONNECTION
LAST (E) TIME-FILL POST



DETAIL 2 P103 NTS P101

(N) TIME-FILL POSTS



DETAIL 3 P103 NTS P101

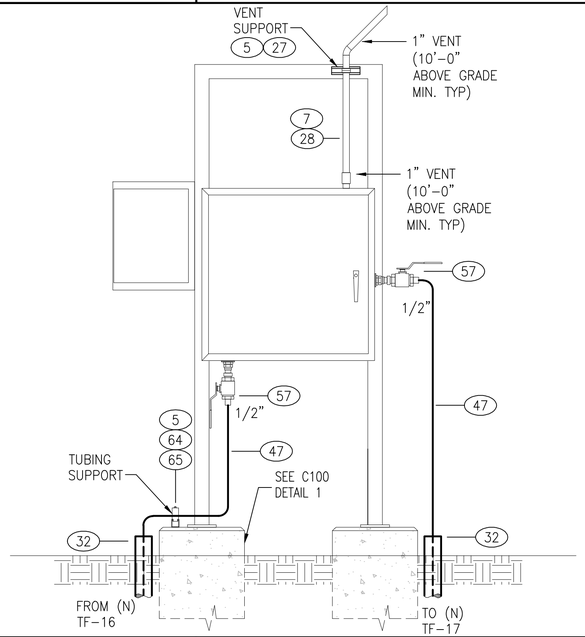
LAST (N) TIME-FILL POST

NOTES:

1. CONTRACTOR SHALL SUPPORT AND PROTECT PIPING AND TUBING AGAINST MECHANICAL DAMAGE. TUBING SHALL BE SUPPORTED EVERY FIVE FEET AND INSTALL METAL THRESHOLDS OVER TUBING FOR PROTECTION FROM FOOT TRAFFIC.
2. CONTRACTOR SHALL INSERT 1/2" O.D. SS TUBING IN 3" PVC CONDUIT FOR TIME-FILL SUPPLY. USE LONG RADIUS BENDS ONLY. END OF PVC SLEEVE SHALL EXTEND A MINIMUM OF 2" ABOVE GRADE. SECURELY COVER THE SLEEVE ENDS AT ALL TIMES UNTIL A WEATHER-PROOF NON-SHRINK SEALANT IS APPLIED TO PREVENT WATER FROM ENTERING THE SLEEVE.
3. CONTRACTOR SHALL PLACE A 3-INCH THICK, 18-INCH WIDE LAYER OF RED SLURRY 6-INCHES ABOVE PVC SLEEVES.
4. SEE SOUDER MILLER DRAWING S2 DETAIL 9 FOR TIME-FILL POST CONCRETE PEDESTAL DETAIL.
5. CONTRACTOR SHALL COORDINATE FINAL LOCATION OF TIME-FILL POSTS WITH OWNER.

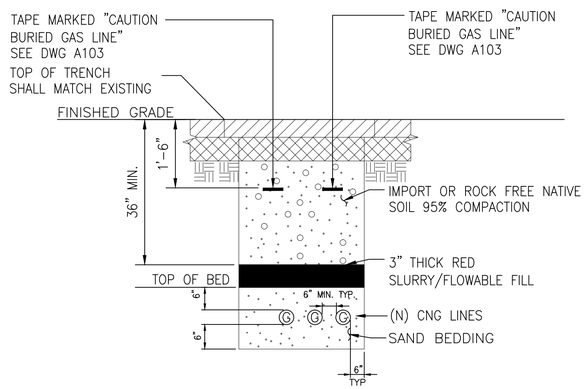
LEGEND:

POC	POINT OF CONNECTION
(E)	EXISTING
(N)	NEW
TF-#	TIME-FILL POST



DETAIL 4 P103 NTS P101

TIME-FILL METER PANEL



DETAIL 5 P103 NTS P101

CNG TRENCH SECTION

07-14-14

COLORADO LICENSED JAMES D. JOPLIN 38738 PROFESSIONAL ENGINEER

Exp. 10-15-15

DRAWING NO.:	REFERENCE DRAWINGS:	REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
		0	07-14-14	ISSUED FOR BID	CRL	JD		

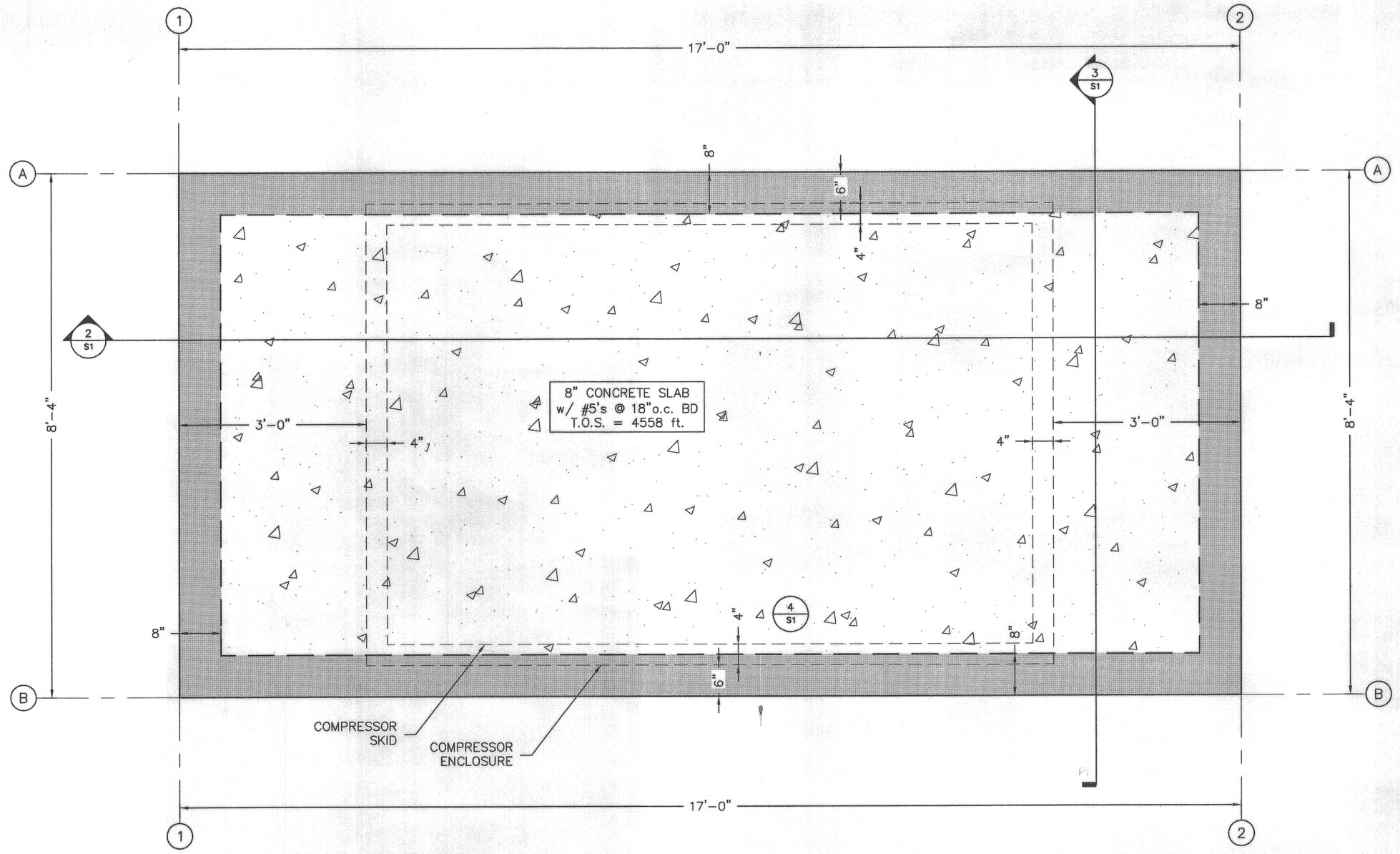
RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME: P103.dwg
PROJECT NO.:
DATE DRAWN: 04/28/14
DRAWN BY: CRL
CHECKED BY: JD

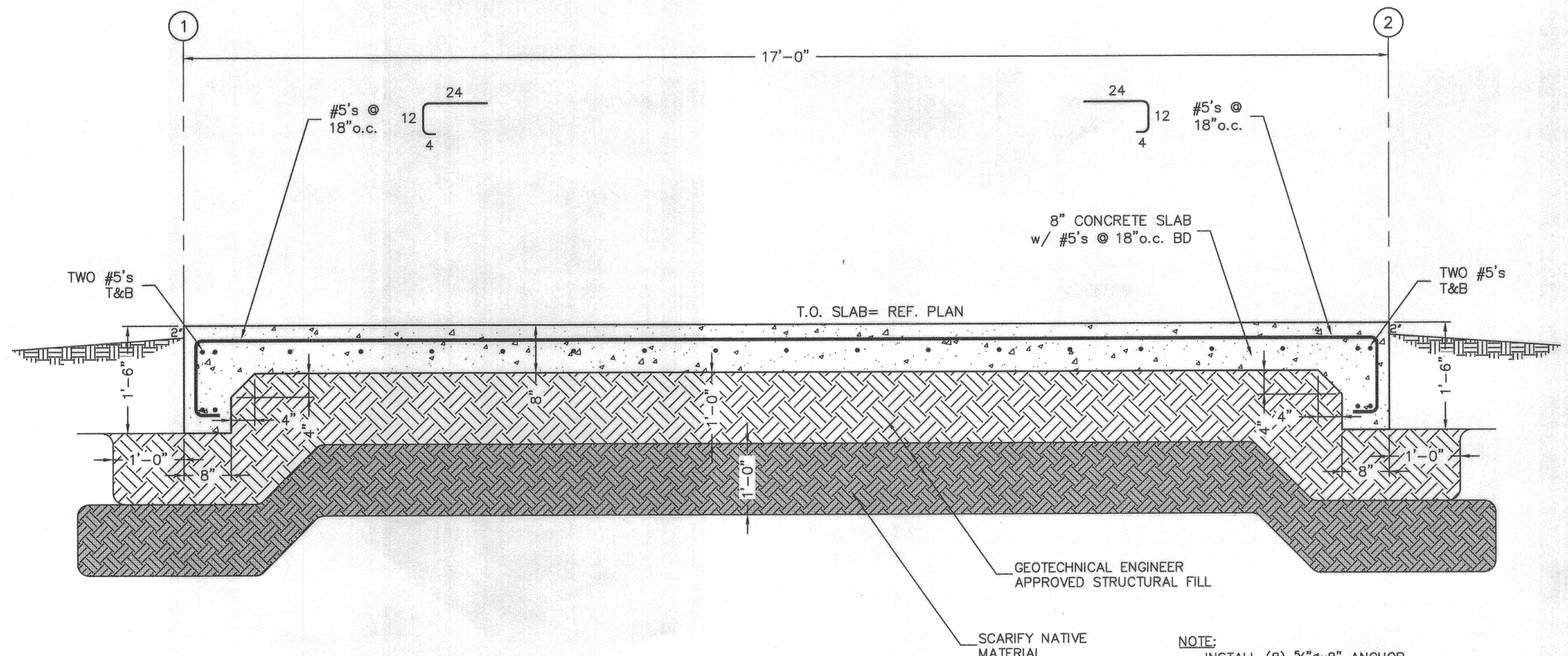
CITY OF GRAND JUNCTION

PIPING SECTIONS & DETAILS
2014 CNG STATION EXPANSION
MUNICIPAL SERVICE CENTER
333 WEST AVE., GRAND JUNCTION, COLORADO

SCALE: AS SHOWN
DRAWING NO.: P103
REV.: 0

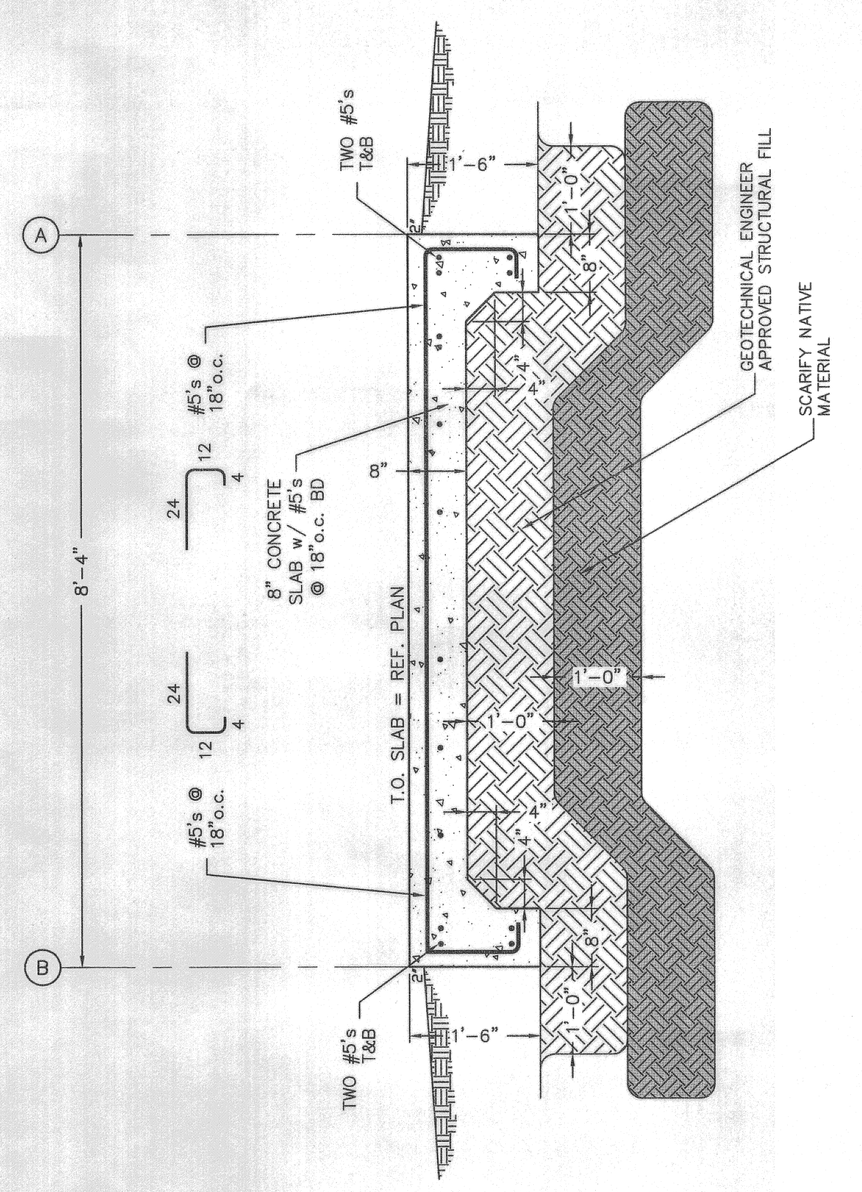


1 FOUNDATION PLAN
3/4"=1'-0"



2 SECTION
3/4"=1'-0"

NOTE:
- INSTALL (8) ⅝"ø x8" ANCHOR BOLTS PER MANUFACTURER'S SPECIFICATIONS
- FOUNDATION BOLTS SHOULD PROJECT THROUGH NUT ½"



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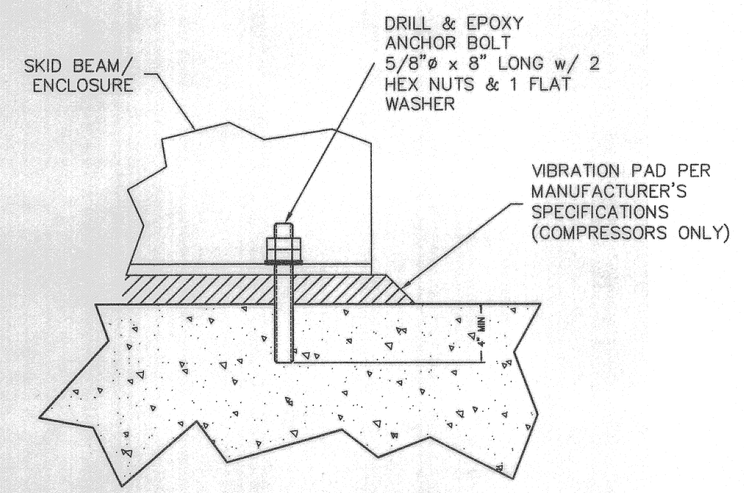

4 ANCHOR BOLT DETAIL
N.T.S.

Revision	Date	Description	By	Chk'd

CITY OF GRAND JUNCTION — COLORADO

CNG SLOW-FILL STATION & SHOP BAY UPGRADES
COMPRESSOR FOUNDATION & DETAILS

SOUDER, MILLER & ASSOCIATES
529 25½ Road, Suite B210
Grand Junction, Colorado 81505
Tel: 970-243-8067 - Fax: 970-241-2845
www.soudermiller.com
Albuquerque - Farmington - Las Cruces - Roswell - Santa Fe, NM
Cortez - Montrose, CO - Safford, AZ - Monticello, UT

Designed By:	Drawn By:	Checked By:
CJA	HMC	CJA

COLORADO LICENSED PROFESSIONAL ENGINEER 41479 6-24-10

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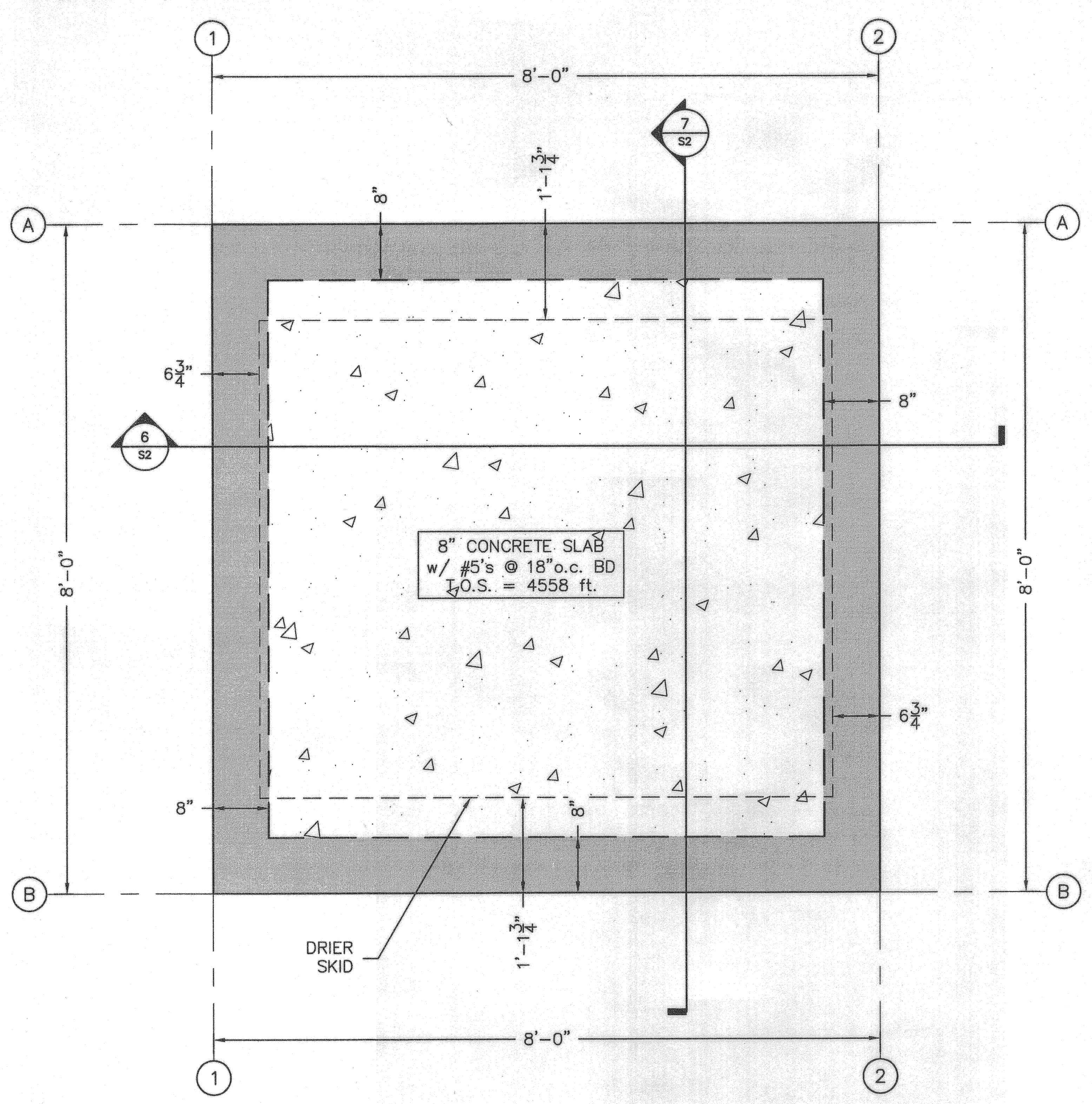
Date: 06-07-10

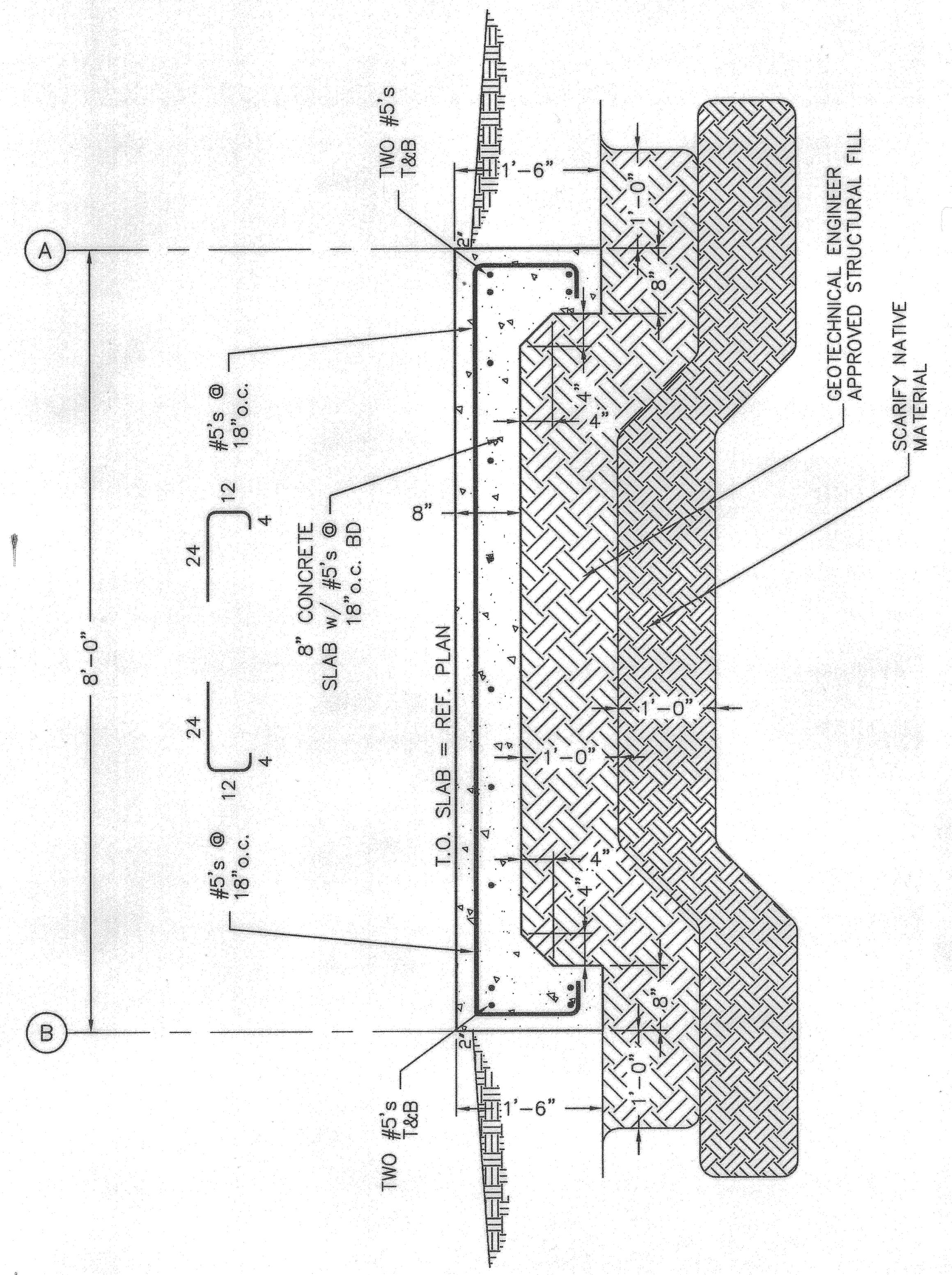
Scale: Horiz: AS NOTED Vert: N/A

Project No: 9820092

SHEET S1



5 FOUNDATION PLAN
3/4"=1'-0"



7 SECTION
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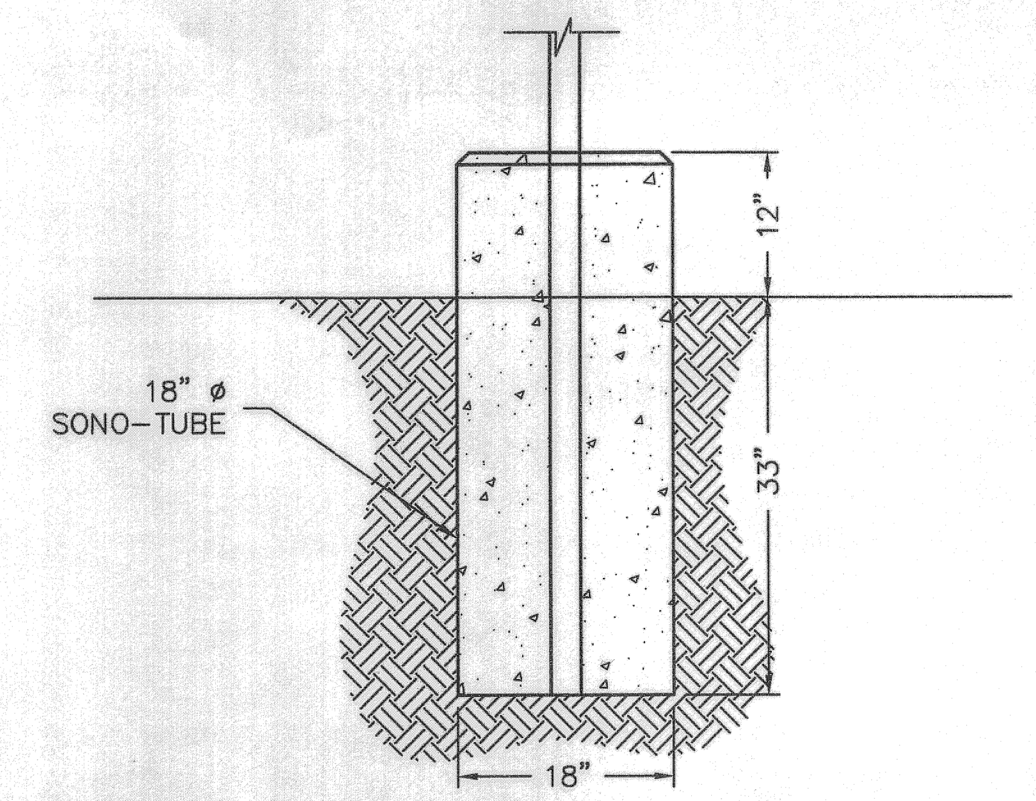
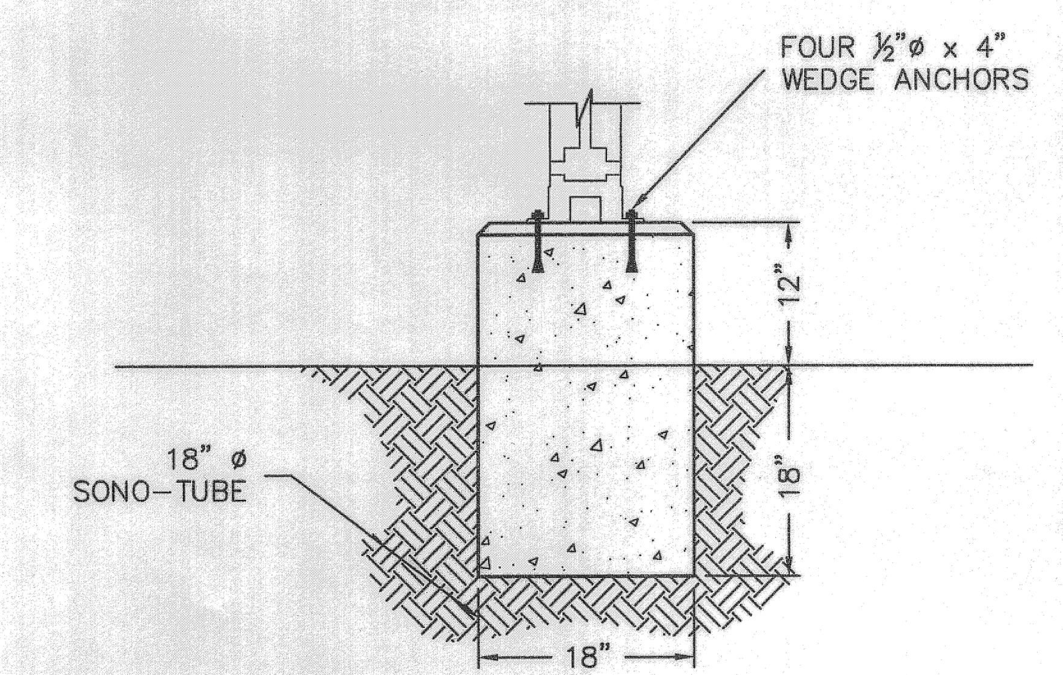
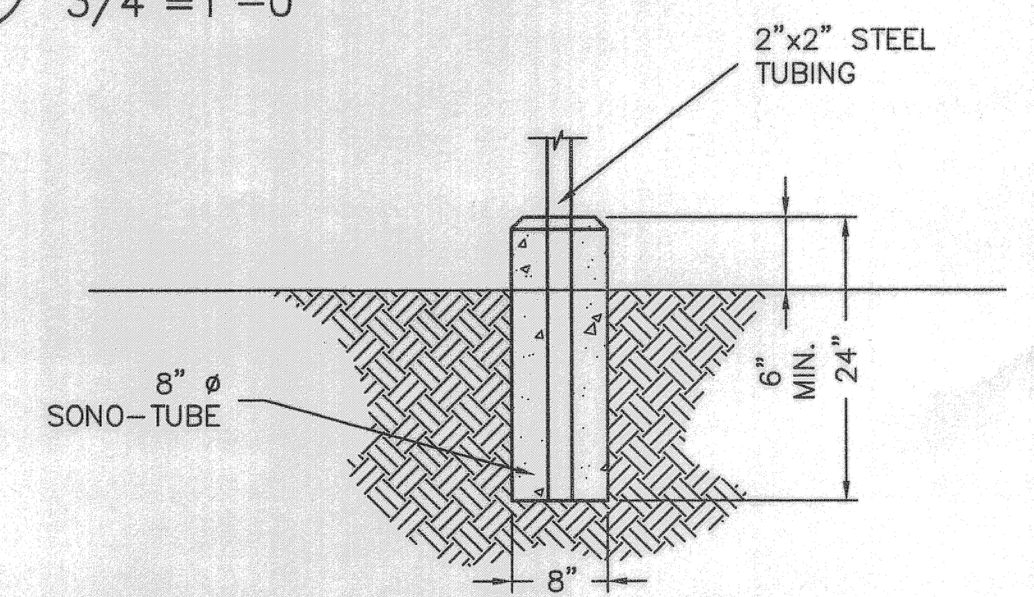


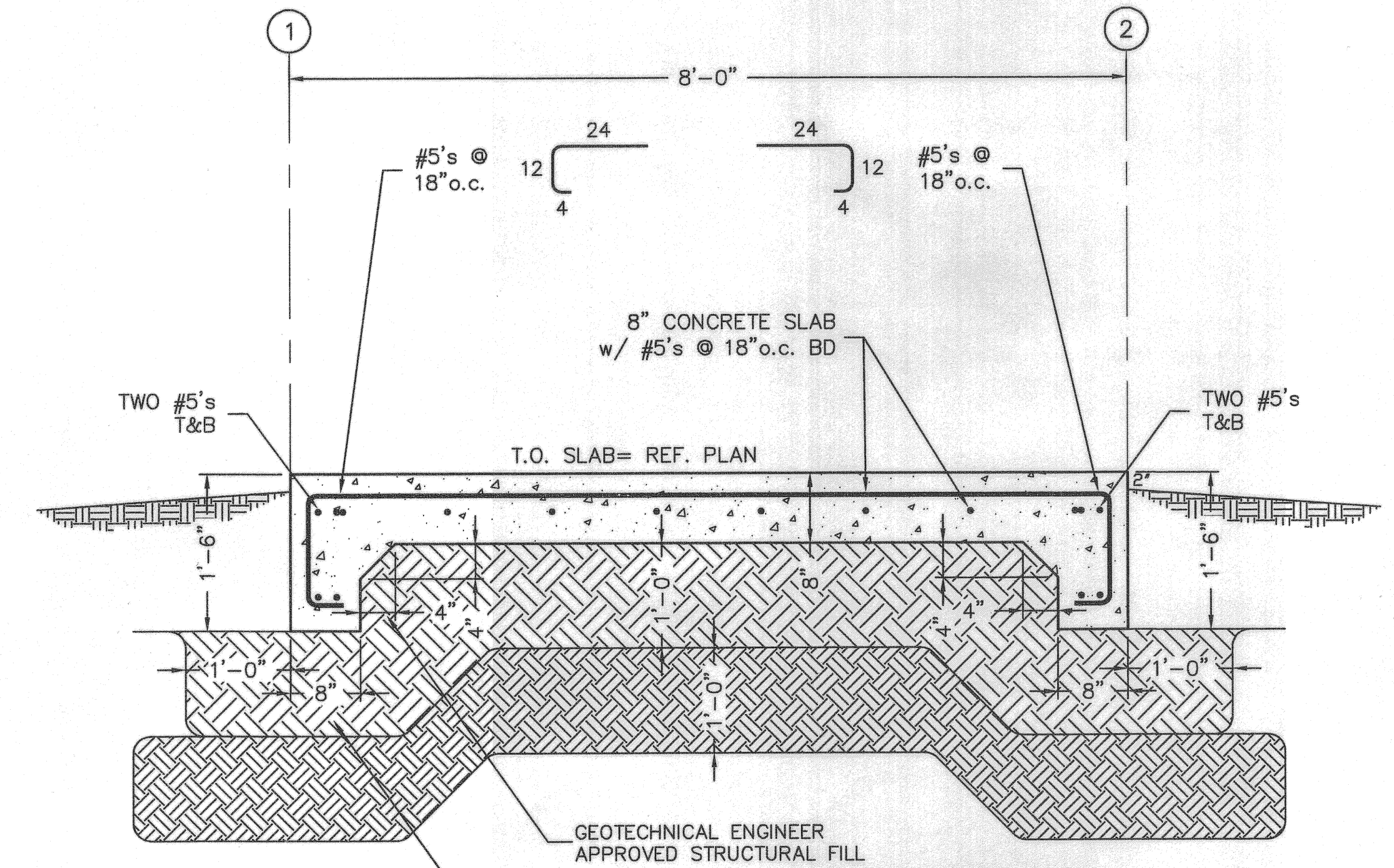
9 FUEL POST FOUNDATION DETAIL
3/4"=1'-0"



10 DISCHARGE FILTER BASE DETAIL
3/4"=1'-0"

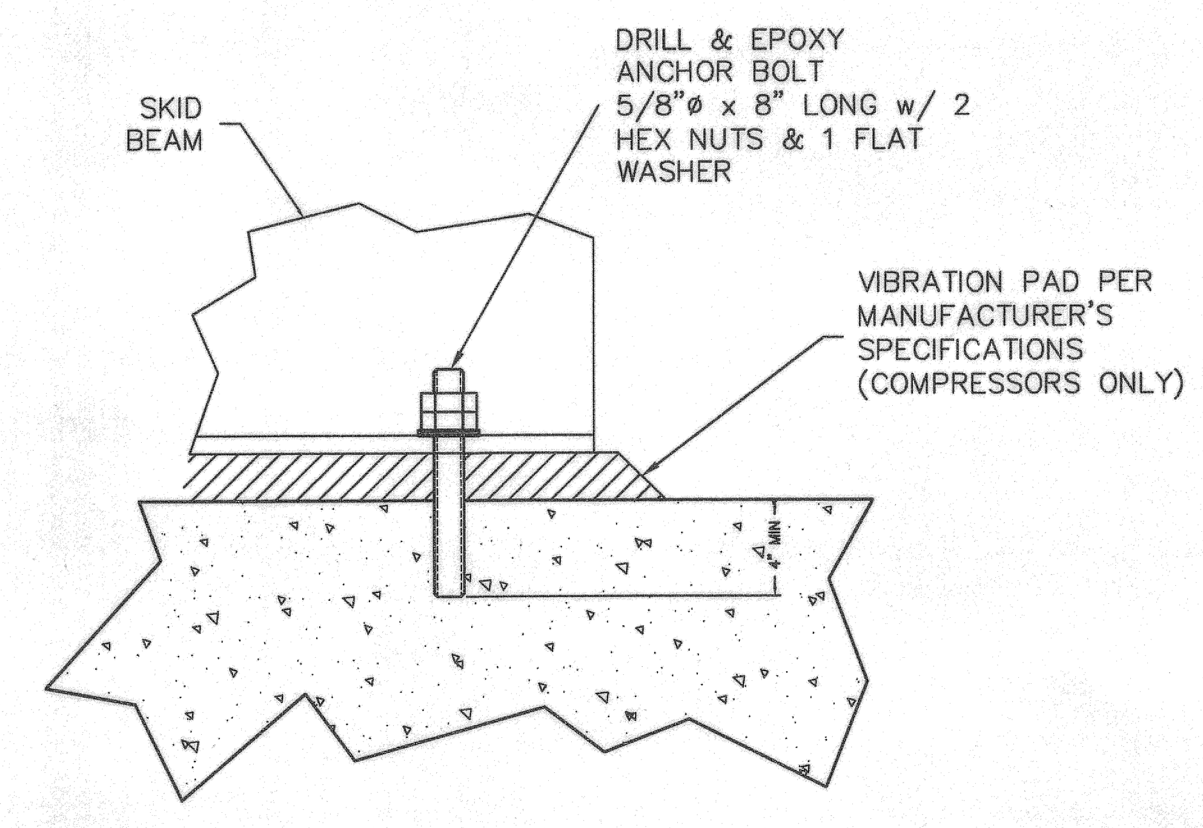


11 ELECTRICAL DISTRIBUTIUON FOUNDATION DETAIL
3/4"=1'-0"

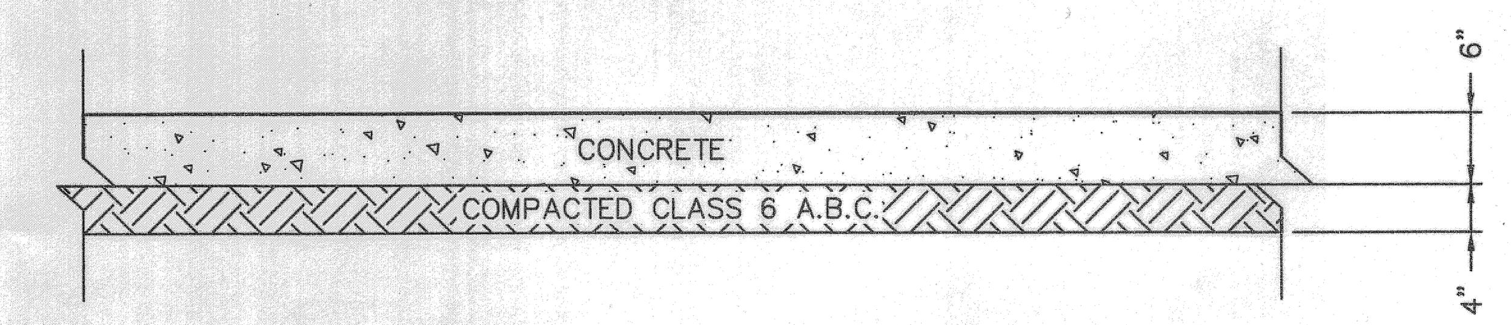


NOTE:
- INSTALL (4) ⅝"øx8" ANCHOR BOLTS PER MANUFACTURER'S SPECIFICATIONS
- FOUNDATION BOLTS SHOULD PROJECT THROUGH NUT ½"

6 SECTION
3/4"=1'-0"



8 ANCHOR BOLT DETAIL
N.T.S.



12 TRANSFORMER PAD DETAIL
3/4"=1'-0"

Revision	Date	Description	By	Ch'd

CITY OF GRAND JUNCTION COLORADO

CNG SLOW-FILL STATION & SHOP BAY UPGRADES
DRIER FOUNDATION PLAN & DETAILS

SOUDER, MILLER & ASSOCIATES
529 25½ Road, Suite B210
Grand Junction, Colorado 81505
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www.soudermiller.com

Albuquerque - Farmington - Las Cruces - Roswell - Santa Fe, NM
Cortez - Montrose, CO - Safford, AZ - Monticello, UT

Designed By: CJA
Drawn By: HMC
Checked By: CJA

COLORADO LICENSED PROFESSIONAL ENGINEER 41479 6-24-10

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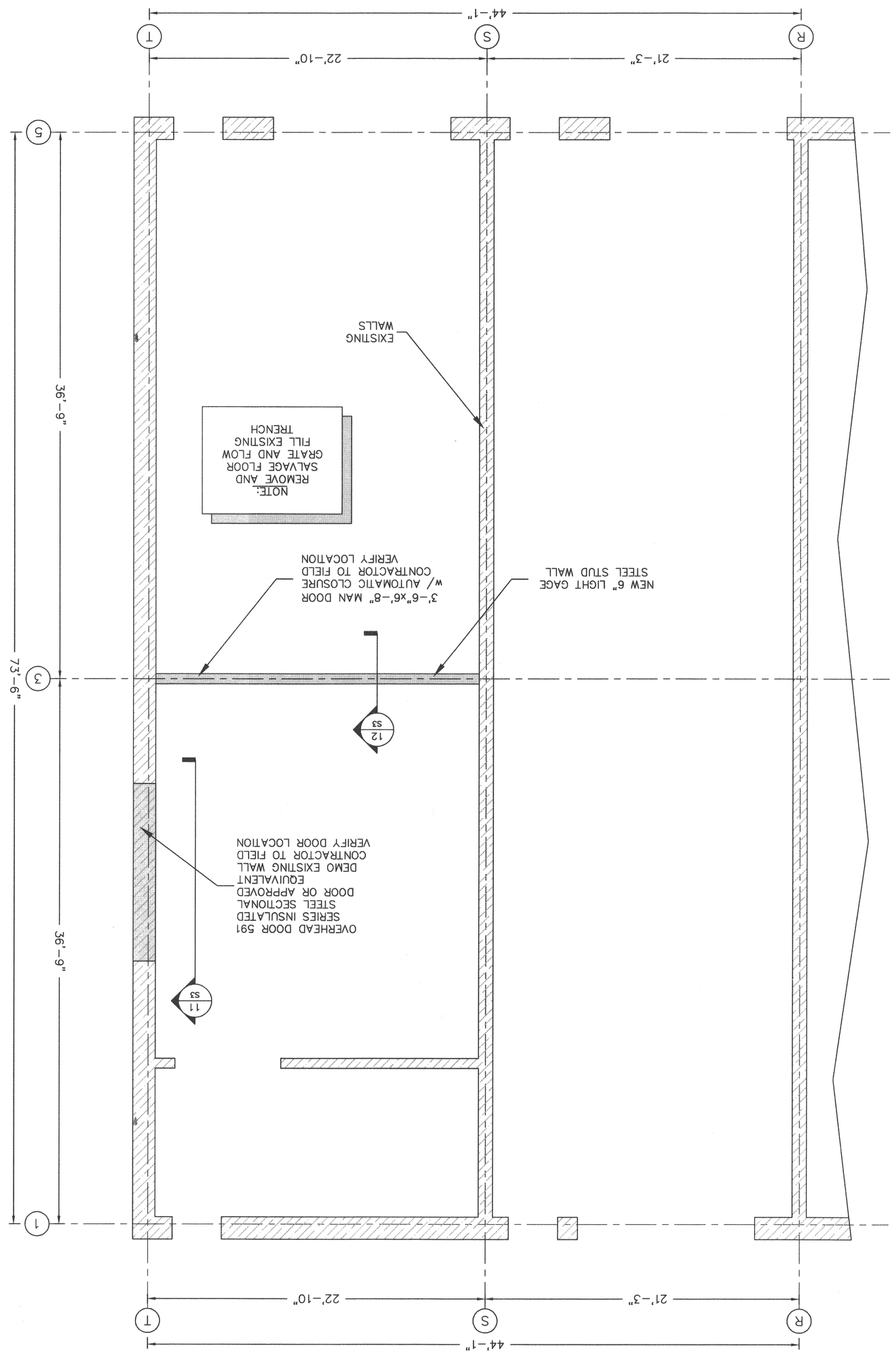
Date: 06-07-10
Scale: Horiz: AS NOTED Vert: N/A
Project No: 9820092
SHEET S2

10 SHOP BAY IMPROVEMENTS
3/16"=1'-0"



12 SECTION
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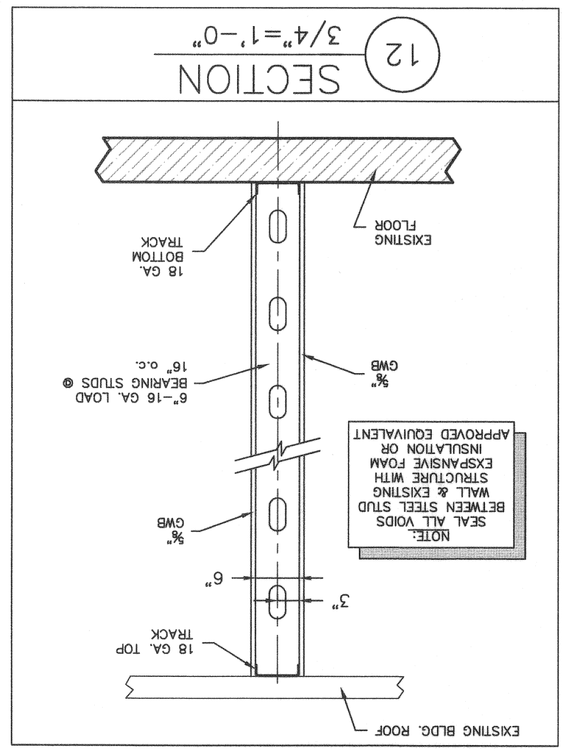

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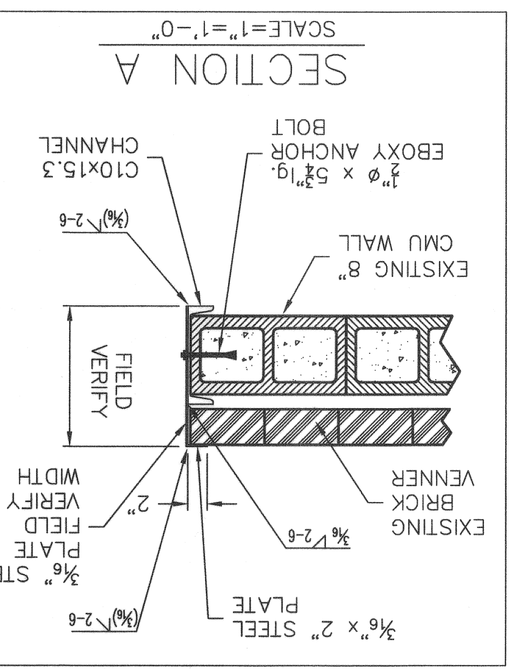

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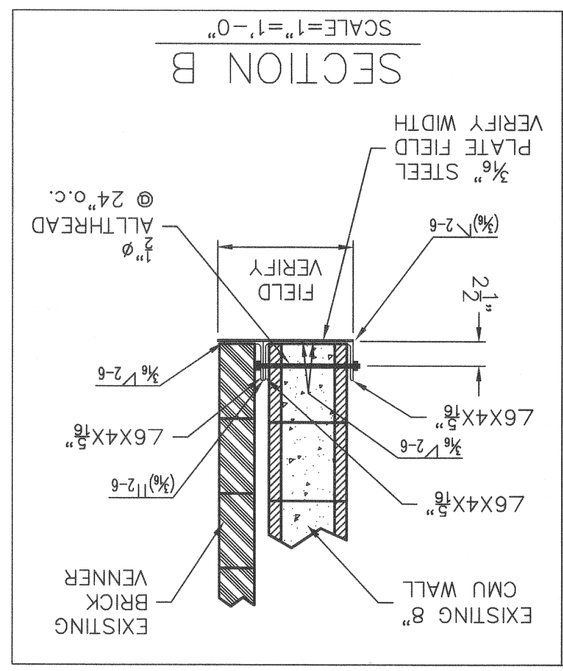
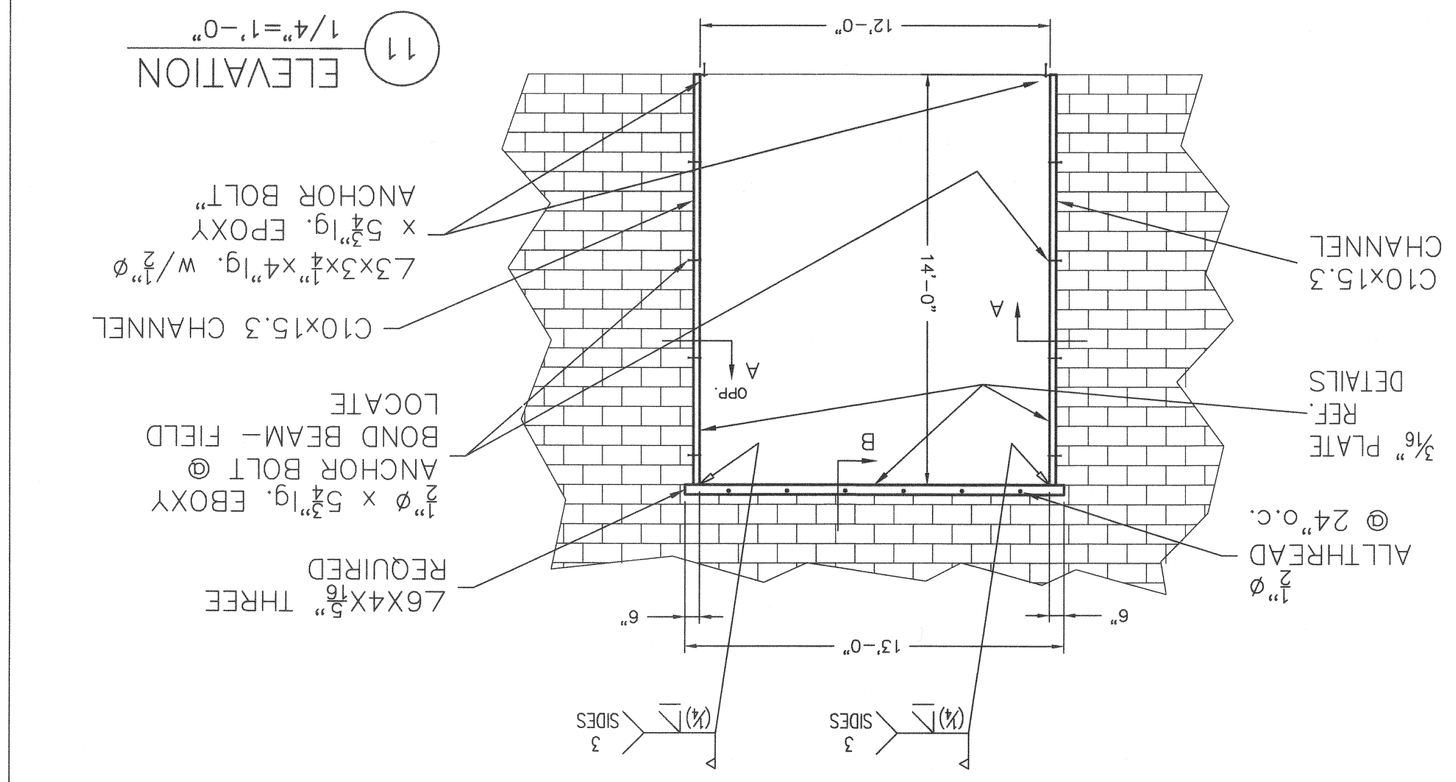


11 ELEVATION
1/4"=1'-0"



CITY OF GRAND JUNCTION
COLORADO

CNG SLOW-FILL STATION &
SHOP BAY UPGRADES
SHOP DOOR PLAN & DETAILS

Revision	Date	Description	By

SOUDER, MILLER & ASSOCIATES
529 25½ Road, Suite B210
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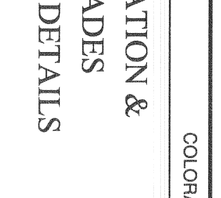
SMA Civil/Environmental Sciences & Engineers

Albuquerque - Farmington - Las Cruces - Roswell - Santa Fe, NM
Cortez - Montrose, CO - Safford, AZ - Monticello, UT

Designed By: CJA
Drawn By: HMC
Checked By: CJA



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Date: 06-07-10
Scale: AS NOTED
Horiz:
Vert: N/A
Project No: 9820092
SHEET S3

General Notes and Specifications

GENERAL NOTES

1. DESIGN OF FOUNDATION IS BASED UPON DRY CONDITIONS. SITE SPECIFIC SOILS CONDITIONS TO BE VERIFIED BY ENGINEER. ASSUMED 1500 PSF.

2. SOIL BENEATH SLABS ON GRADE SHALL BE SOLID, COMPACTED NATIVE MATERIAL, FREE OF FROST, WATER AND FOREIGN DEBRIS, OR APPROVED STRUCTURAL FILL COMPACTED IN ACCORDANCE WITH SPECIFICATIONS WITH MINIMUM DENSITY AS FOLLOWS:

FOOTINGS, WALLS 95% OF MAXIMUM STANDARD PROCTOR
ASTM D698

SLABS 95% OF MAXIMUM STANDARD PROCTOR
ASTM D698

BACKFILL OF FOUNDATION EXCAVATION - 95% OF MAXIMUM STANDARD PROCTOR (NON-SWELLING MATERIAL TO BE ENGINEER APPROVED PRIOR TO INSTALLATION) FOUNDATION BACKFILL TO BE INSPECTED AND CERTIFIED IN WRITING BY ENGINEER PRIOR TO CERTIFICATION OF CONSTRUCTION BY FOUNDATION ENGINEER.

3. ENGINEER SHALL BE NOTIFIED AT LEAST 48 HOURS IN ADVANCE OF FORMING/PILE INSTALLATION TO INSPECT THE EXCAVATION TO DETERMINE THAT THE SOIL CONDITIONS ARE CONSISTENT WITH DESIGN CRITERIA. IF THE SOIL PROPERTIES ARE FOUND TO BE DIFFERENT FROM THIS CRITERIA, THEN THE ENGINEER SHALL BE PROMPTLY NOTIFIED SO THAT THE FOUNDATION DESIGN MAY BE REVIEWED.

4. ENGINEER SHALL BE NOTIFIED AT LEAST 24 HOURS IN ADVANCE OF CONCRETE PLACEMENT TO INSPECT THE REINFORCEMENT.

5. CONTRACTOR AND/OR OWNER SHALL VERIFY ALL DIMENSIONS IN THE FIELD AND NOTIFY ENGINEER OF ANY DISCREPANCIES FOR CORRECTION OR VERIFICATION PRIOR TO COMMENCING WORK IN THE AFFECTED AREA.

6. CONTRACTOR AND/OR OWNER SHALL NOTIFY ENGINEER OF ANY POSSIBLE OMISSION PRIOR TO THE CONSTRUCTION OF THE AFFECTED WORK.

7. ALL INTERIOR UTILITIES AND UTILITY CASINGS TO BE LOCATED AND APPROVED PRIOR TO PLACEMENT OF CONCRETE.

8. ALL STRUCTURAL SUBSTITUTIONS TO BE APPROVED BY ENGINEER.

9. GROUND SURFACE SHALL BE SLOPED TO DRAIN AWAY FROM THE STRUCTURE IN ALL DIRECTIONS AT A SLOPE OF AT LEAST 1 FOOT FOR THE FIRST 10 FEET AND 2% THEREAFTER. ROOF DOWNSPOUTS AND DRAINS SHALL DISCHARGE WELL BEYOND THE LIMITS OF ALL BACKFILL. FINAL GRADING AND DRAINAGE TO BE INSPECTED AND CERTIFIED BY BUILDING DEPARTMENT AND/OR ENGINEER PRIOR TO ISSUANCE OF CERTIFICATE OF OCCUPANCY. INSTALLATION, FUNCTION AND DAYLIGHT OF FOUNDATION DRAIN TO BE INSPECTED AND CERTIFIED PRIOR TO ISSUANCE OF CERTIFICATE OF OCCUPANCY. COMPACTION OF FOUNDATION EXCAVATION BACKFILL TO BE INSPECTED AND CERTIFIED BY ENGINEER PRIOR TO ISSUANCE OF CERTIFICATE OF OCCUPANCY.

10. THE CONTRACTOR SHALL BE RESPONSIBLE TO COORDINATE THE LOCATION OF MECHANICAL OPENINGS, FLOOR DRAINS, INSERTS, DEPRESSIONS, BURIED CABLES AND UTILITIES, ETC. WITH MECHANICAL AND ELECTRICAL DRAWINGS.

11. EXCAVATIONS UNDER EXISTING CONCRETE FOOTINGS FOR ELECTRICAL AND MECHANICAL WORK SHALL BE BACKFILLED WITH A LEAN CONCRETE MIX HAVING A MINIMUM COMPRESSIVE STRENGTH OF 1000 PSI AT 28 DAYS. THIS LEAN CONCRETE FILL SHOULD EXTEND OUT AND DOWN FROM THE EDGES OF THE FOOTING AT A MINIMUM SLOPE OF 9 VERTICAL TO 12 HORIZONTAL AND SHALL BE PACKED TIGHT TO THE BOTTOM OF THE FOOTING.

12. THIS FOUNDATION DESIGN IS BASED UPON CONDITIONS OUTLINED IN ITEM NO. 1. ALL EXCAVATION/PILE INSTALLATION AND COMPACTION RECOMMENDATIONS SHALL BE OBSERVED. ENGINEER TO INSPECT AND CERTIFY EXCAVATION IN WRITING. EXCAVATION IS TO BE CLOSELY EXAMINED BY ENGINEER FOR PROPER BEARING DEPTH. ALL STRUCTURAL FILL TO BE APPROVED IN WRITING BY ENGINEER PRIOR TO INSTALLATION AND PLACED ACCORDING TO ENGINEER RECOMMENDATIONS.

13. THIS FOUNDATION DESIGN DOES NOT PRECLUDE FOUNDATION FROM POSSIBLE MOVEMENT OF 1" OR LESS. FOUNDATION ENGINEER IS NOT RESPONSIBLE FOR MOISTURE OR WATER IN STRUCTURE SUBSOILS THAT IS NOT EVIDENT UPON EXCAVATION. FOUNDATION ENGINEER IS NOT RESPONSIBLE FOR ADVERSE EFFECTS (HEAVING, SETTLING) DUE TO MOISTURE IN STRUCTURE SUBSOILS AFTER CONSTRUCTION. SOIL/MOISTURE CONDITIONS DURING CONSTRUCTION TO BE DOCUMENTED BY ENGINEER PRIOR TO APPROVAL AND ISSUANCE OF CERTIFICATE OF OCCUPANCY. ALL BACKFILL TO BE COMPACTED AND CERTIFIED BY ENGINEER PRIOR TO APPROVAL AND ISSUANCE OF CERTIFICATE OF OCCUPANCY.(REFERENCE NOTE #9) IF MOISTURE IS ENCOUNTERED DURING CONSTRUCTION, NOTIFY ENGINEER IMMEDIATELY. USE OF THESE PLANS AS PERMIT DOCUMENTS CONSTITUTES ACCEPTANCE OF THESE TERMS.

CONCRETE

1. ALL CONCRETE DESIGN, MATERIALS AND CONSTRUCTION SHALL CONFORM TO ACI STANDARD 318-05, THE IBC 2006 EDITION, THE CRSI MANUAL OF STANDARD PRACTICE AND THE PROJECT SPECIFICATIONS. ALL AGGREGATE SHALL BE ANGULAR AND SHALL BE IN ACCORDANCE WITH APPLICABLE IBC STANDARDS. MECHANICALLY VIBRATE ALL CONCRETE WHEN BEING PLACED.

2. CEMENT FOR CONCRETE SHALL BE TYPE-II PORTLAND CEMENT IN ACCORDANCE WITH ASTM C150 AND ALL APPLICABLE IBC STANDARDS.

3. CONCRETE SHALL MEET CITY OF GRAND JUNCTION SPECIFICATIONS AND HAVE A MINIMUM COMPRESSIVE STRENGTH IN 28 DAYS AS FOLLOWS:

FOOTING, WALL, PIERS 4000 PSI CEMENT TYPEI/II
SLABS ON GRADE 4000 PSI CEMENT TYPEI/II

4. ALL REINFORCING BARS SHALL BE DEFORMED BILLET STEEL CONFORMING TO ASTM A615, GRADE 60, EXCEPT PILASTER TIES, GRADE BEAM STIRRUPS, AND DOWELS MAY BE GRADE 40. ALL REINFORCING STEEL TO BE WELDED SHALL CONFORM TO ASTM A706, GRADE 60.

5. REINFORCEMENT SHALL BE DETAILED IN ACCORDANCE WITH THE ACI DETAILING MANUAL, LATEST EDITION. THE USE OF HEAT WHILE BENDING BARS WILL NOT BE PERMITTED. FORMWORK SHALL BE DESIGNED, ERECTED AND REMOVED IN ACCORDANCE WITH THE SPECIFICATIONS.

6. REINFORCEMENT SHALL BE PLACED SO THAT THE FOLLOWING MINIMUM CONCRETE PROTECTION IS PROVIDED UNLESS NOTED OTHERWISE.

CONCRETE SURFACES POURED AGAINST GROUND 3" CLEAR

FORMED SURFACES EXPOSED TO GROUND OR
WEATHER

BARS #6 AND LARGER 2" CLEAR
BARS #5 AND SMALLER 1-1/2" CLEAR
SLABS ON GRADE AT CENTERS

ALL BARS TO BE CONTINUOUS AROUND CORNERS

7. REINFORCEMENT SHALL BE SECURELY TIED AND SHALL BE SUPPORTED WITH METAL OR PLASTIC CHAIRS OR HUNG FROM FORMS.

8. GRADE BEAMS/STEMWALLS SHALL NOT HAVE JOINTS IN A HORIZONTAL PLANE. ANY STOP IN CONCRETE WORK MUST BE MADE AT MID SPAN WITH VERTICAL BULKHEADS AND HORIZONTAL KEYS SPACED 6" ON CENTER, UNLESS NOTED OTHERWISE.

9. ALL FOUNDATION EXCAVATIONS, BACKFILL AND COMPACTION TO BE INSPECTED AND CERTIFIED BY GEOTECHNICAL ENGINEER. ALL REPORTS ARE TO BE SUBMITTED TO THE ENGINEER BEFORE GRADE BEAMS, PADS, FOOTERS, OR PILE CAPS ARE POURED.

10. CONTINUOUS HORIZONTAL BARS AND CORNER BARS IN FOOTING, STEM WALLS/GRADE BEAMS AND SLABS SHALL BE LAPPED A MINIMUM OF 36 BAR DIAMETERS AT SPLICES. SPLICE LOCATION SHALL BE STAGGERED WHERE POSSIBLE.

11. VERTICAL DOWEL BARS IN WALLS AND COLUMNS SHALL BE LAPPED A MINIMUM OF 46 BAR DIAMETERS, UNLESS NOTED OTHERWISE.

12. ADDITIONAL (2) #5 BARS (ONE EACH FACE) WITH A 2'-0" PROJECTION SHALL BE PLACED DIAGONALLY ACROSS THE CORNERS OF ALL OPENINGS AND VERTICAL STEPS IN WALLS.

13. STEM WALLS/GRADE BEAMS BELOW GRADE SHALL HAVE BACKFILL PLACED EQUALLY ON BOTH SIDES UNTIL THE REQUIRED LEVELS ARE REACHED.

14. WHERE ALL INTERIOR SLABS ON GRADE ABUTT WALLS, A BOND BREAKER OF ASPHALT IMPREGNATED CELOTEX SHALL BE PROVIDED BETWEEN WALL AND EDGE OF SLAB.

16. CONTROL AND/OR CONSTRUCTION JOINTS IN SLABS ON GRADE SHALL BE SPACED AT INTERVALS ENCLOSING NO MORE THAN 144 SQUARE FEET WITH A MAXIMUM OF 12 FEET IN ANY ONE DIRECTION. CONSTRUCTION JOINTS SHALL BE FORMED WITH METAL LOAD KEY JOINT.

17. CONSTRUCTION JOINTS (COLD JOINTS) SHALL BE PROVIDED IN WALLS AND GRADE BEAMS WHICH ARE OVER 70 FEET IN A STRAIGHT RUN. WATERSTOPS AND KEYWAYS SHALL BE PROVIDED AT ALL CONSTRUCTION JOINTS WHERE INTERIOR SLABS ON GRADE OCCUR BELOW EXTERIOR GRADE. ALL CONSTRUCTION JOINTS SHALL BE APPROVED BY THE ENGINEER.

18. CAST-IN-PLACE CONCRETE SHALL BE SUBJECT TO TESTING BY AN INDEPENDENT TESTING LABORATORY AS FOLLOWS: 3 TEST CYLINDERS FOR MONOLITHIC SLAB ON GRADE

Revision	Date	Description	By	Chk

CITY OF GRAND JUNCTION COLORADO

CNG SLOW-FILL STATION & SHOP BAY UPGRADES
DETAILS & GENERAL NOTES

SOUDER, MILLER & ASSOCIATES
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SMA Civil/Environmental Scientists & Engineers

Designed By:	Drawn By:	Checked By:
CJA	HMC	CJA

COLORADO LICENSED EDWARD C. MILLER 41479 6-8-10 PROFESSIONAL ENGINEER

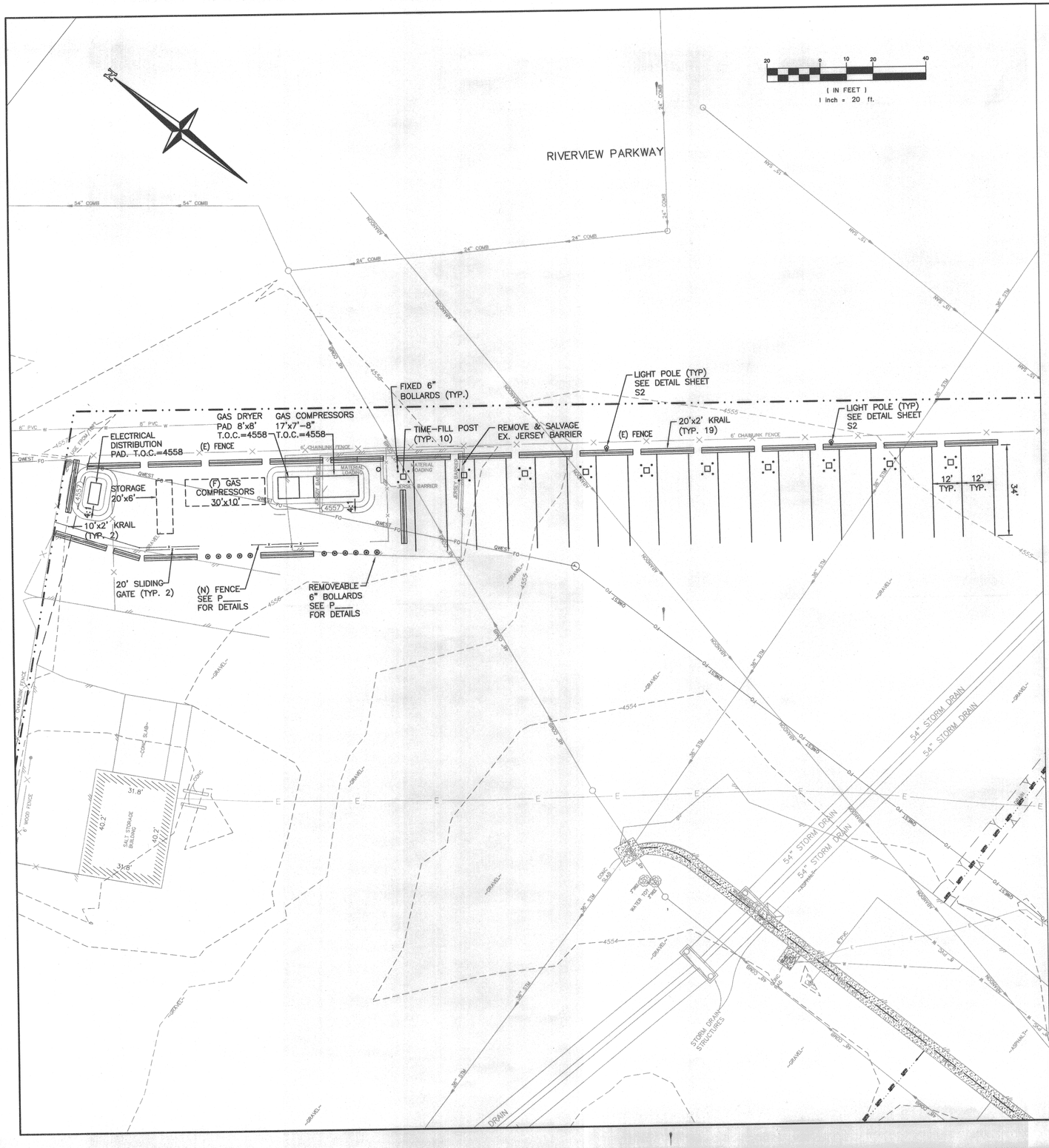
THIS DRAWING IS INCOMPLETE AND NOT TO BE USED FOR CONSTRUCTION UNLESS IT IS STAMPED, SIGNED AND DATED

Date: 06-07-10

Scale:
Horiz: NONE
Vert: N/A

Project No: 9820092

SHEET
S4



GENERAL CONSTRUCTION NOTES

1. Alignment, centerline curve data, and stationing to be verified from approved subdivision plat before construction.

2. Locations of existing utilities shown on these plans are approximate only. Contractor is to contact affected utility for specific locations before digging.

3. All satisfactory excess excavation from either utility or street construction shall be spread uniformly across the lots as directed by the Owner or his designated representative. All unsatisfactory or waste material including vegetation, roots, concrete, rocks, or other debris, shall be hauled from the project by the Contractor. No separate pay.

4. Contractor shall give 48 hour notice to all authorized inspectors, superintendents, or person in charge of public and private utilities affected by his operations prior to commencement of work. Contractor shall assure himself that all construction permits have been obtained prior to commencement of work. All permits obtainable by the Contractor shall be obtained at the Contractor's expense.

5. Contractor shall confine his construction operations to the rights-of-way, easements, and lots, as shown on Plans and Plat. Any damage to private facilities outside these limits shall be repaired by the Contractor at no expense to the Owner.

6. All road construction, and related work, all materials, performance and quality of work, shall conform to the requirements of the City of Grand Junction Standards and Specifications.

7. All utility installations are to be performed in accordance with the technical specifications of the City of Grand Junction. All water and sewer lines must be tested and approved prior to street construction. All water lines to be constructed in accordance with the technical specifications of the City of Grand Junction. All sewer lines to be constructed in accordance with the technical specifications of the City of Grand Junction.

8. Contractor shall familiarize himself with the geotechnical testing requirements of the City of Grand Junction and the affected utility districts. Though the owner is paying for the testing, it shall be the responsibility of the Contractor to contact the testing firm 24 hours in advance of the need for testing, and to verify that the appropriate numbers of tests have been taken. The results of the required types of tests and numbers of passing tests shall be furnished to the Engineer for verification before final acceptance by the Owner will be granted. All failing tests shall be brought to the immediate attention of the Engineer and retests shall be performed until passing results are obtained. All utility lines, including service lines falling within Public rights-of-way or Public easements shall be tested.

9. Only materials on which a proctor test can be performed and accurate nuclear density tests can be run are approved for utility trench backfill unless otherwise approved by the Engineer.

PAVING CONSTRUCTION NOTES

1. All road widths, and radii are to face of curb or flow line unless noted otherwise. Any "spot" design elevations are to flow line of curb and gutter unless otherwise noted.

2. TOC = top of curb elevation
   BOW = back of sidewalk
   EOP = edge of pavement elevation
   RIM = rim of manhole
   INV = invert elevation of manhole or inlet
   CL = centerline
   PL = property line
   FL = flow line
   EL = elevation

3. The top of existing ground or the top of areas cut to final grade are to be scarified, moistened and recompacted to 95% of AASHTO T99 in accordance with Geotechnical recommendation before starting up with embankments or before base is placed.

4. Contractor to protect existing utilities and appurtenances. Manholes, drainage inlets, utility lines, etc., damaged, covered or filled with dirt or debris by the Contractor shall be cleaned and repaired at no expense to the Owner.

5. Aggregate base course must be compacted 95% AASHTO T-180.

6. Hot-mix asphaltic concrete to be in accordance with City of Grand Junction Standards sand Specifications. A mix design for the proposed pit must be approved by Engineer prior to placement of pavement.

7. Where proposed pavement is to match existing pavement, existing pavement is to be square cut, full base thickness is to be brought to match line and existing pavement surface is to be tack-coated before new pavement is placed.

8. Curb, gutter and drainage pans are to have expansion joints at each change in horizontal alignment of curb and gutter, but in no case at a greater distance apart than 200 feet. Locate dummy grooved joints between expansion joints at intervals not exceeding 10 feet.

9. Include backing of curb and gutter and/or sidewalk with native fill material per the typical roadway section in the unit price bid for embankment.

LEGEND

4556 — EXISTING CONTOUR AND LABEL

(4557) — PROPOSED CONTOUR AND LABEL

No.	Revision	Date	Description	By	Chd

CITY OF GRAND JUNCTION COLORADO

GNG SLOW-FILL STATION & SHOP BAY UPGRADES
SITE AND GRADING PLAN

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Designed By:	Drawn By:	Checked By:
CJA	MRH	CJA

COLORADO LICENSED
ROBERT J. ALLEN
41479
6-24-10
PROFESSIONAL ENGINEER

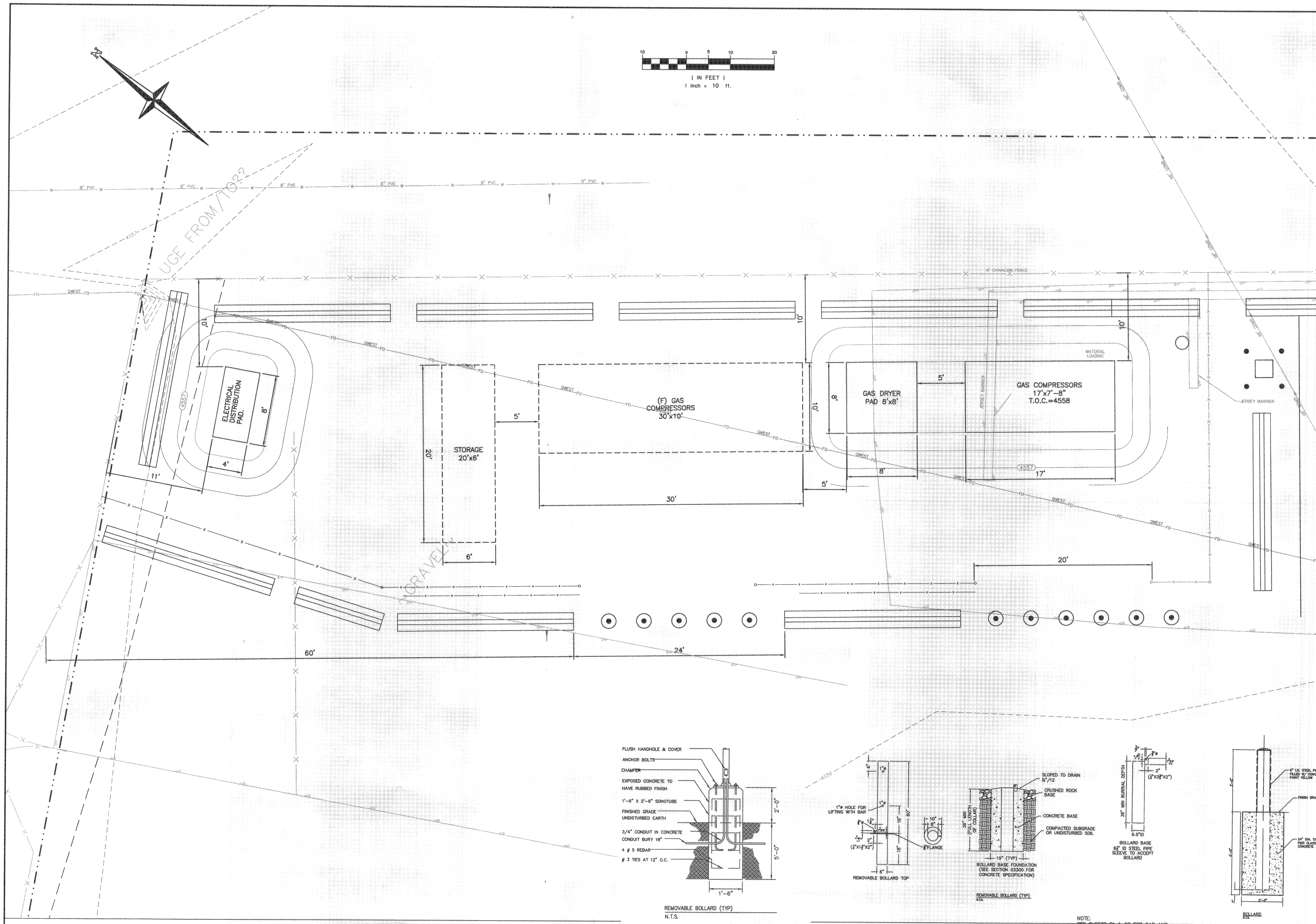
THIS DRAWING IS INCOMPLETE AND NOT TO BE USED FOR CONSTRUCTION UNLESS IT IS STAMPED, SIGNED AND DATED

Date: 6/4/10

Scale: Horiz: 1"=20' Vert:

Project No: 9820092

SHEET C1



Revision	Date	Description	By	Ch'd

CITY OF GRAND JUNCTION COLORADO

GNG SLOW-FILL STATION & SHOP BAY UPGRADES EXPANDED SITE PLAN

SOUDER, MILLER & ASSOCIATES
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Albuquerque - Farmington - Las Cruces - Roswell - Santa Fe, NM
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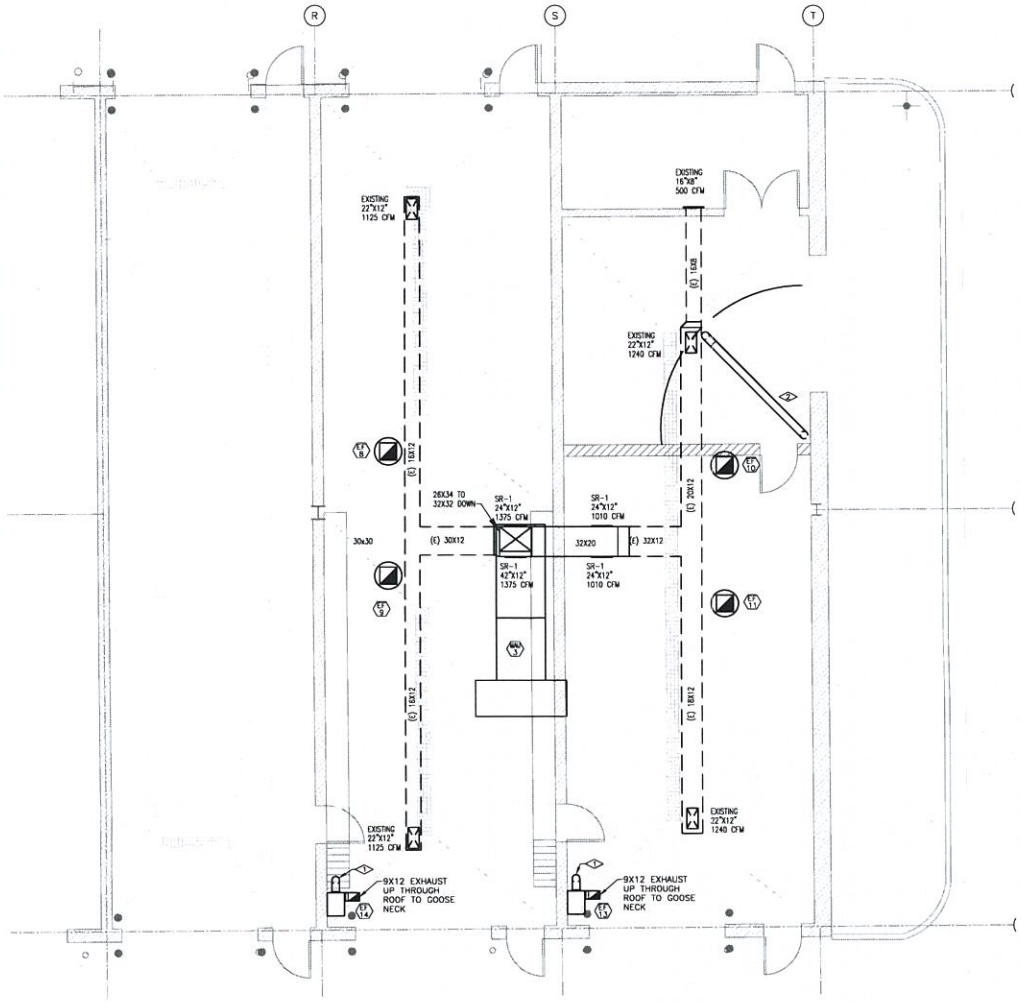
Designed By: CJA
Drawn By: MRH
Checked By: CJA

THIS DRAWING IS INCOMPLETE AND NOT TO BE USED FOR CONSTRUCTION UNLESS IT IS STAMPED, SIGNED AND DATED

Date: 6/4/10
Scale: Horiz: 1"=10' Vert:
Project No: 9820092
SHEET C2



MECHANICAL PLAN

SCALE: 3/16"=1'-0"

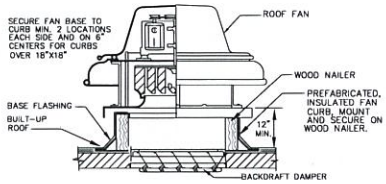
NORTH

DEMOLITION NOTES:

1. REMOVE ALL INFRARED GAS UNIT HEATERS AND CAP GAS LINE.
2. REMOVE PRV-8, PRV-9, PRV-10, AND PRV-11 AND RETURN TO OWNER.
3. REMOVE MAU-3 AND RETURN TO OWNER.
4. REMOVE EXISTING SUPPLY DROP AND DEMO EXISTING SUPPLY DUCT WORK AS REQUIRED TO INSTALL NEW DUCTWORK.

◇ FLAG NOTES:

1. PROVIDE CARMON 8"ø CLX-II HOSE WITH LFT 25/25 RETRACTOR AND RCT END ADAPTER. VERIFY ALL VEHICLE EXHAUST COMPONENT WITH BUILDING OWNER. BALANCE TO 1000 CFM OR OWNER SPECIFIED CFM.
2. RELOCATE EXISTING WELDING EXHAUST ARM. FIELD FABRICATE NEW DUCTWORK FROM FAN TO EXISTING WALL TERMINATION.



ROOF FAN MOUNTING DETAIL

NOT TO SCALE

NATURAL GAS DETECTION SEQUENCE:

- DETECTION 25% LOW GAS ALARM SET POINT
  - GARAGE DOORS OPEN
  - EXHAUST FANS ACTIVATED
  - MAKE UP AIR UNIT AND BURNERS DEACTIVATED
  - HORNS AND STROBES ACTIVATED
- DETECTION 50% GAS ALARM SET POINT
  - GARAGE DOORS OPEN
  - EXHAUST FANS ACTIVATED
  - MAKE UP AIR UNIT AND BURNERS DEACTIVATED
  - LIGHTING AND NON ESSENTIAL ELECTRICAL CIRCUITS DE-ENERGIZED
  - HORNS AND STROBES ACTIVATED

REFER TO RAYMUNDO ENGINEERING COMPANY DRAWINGS FOR MORE DETAILED CONTROLS AND INSTALLATION OF GAS DETECTION EQUIPMENT.

GRILLE – REGISTER – DIFFUSER SCHEDULE

SR-SUPPLY REGISTER RG-RETURN GRILLE CD-CEILING DIFFUSER EG-EXHAUST GRILLE TG-TRANSFER GRILLE

EQUIPMENT NO.	SIZE	TYPE	MANUFACTURER & MODEL	FINISH	OPTIONS-ACCESSORIES
SR-1	24" X 12"	SR	KRUEGER 5800	-	OPPOSABLE BLADE DAMPER

NOTES:

GAS FIRED MAKE-UP AIR UNIT SCHEDULE

EQUIPMENT NO.	SERVICE	SUPPLY AIR (CFM)	EXTERNAL STATIC PRESS. (IN. W.G.)	INPUT (BTU)	OUTPUT (BTU)	EFFIC-IENCY A.F.U.E.	GAS RATE (CFH)	ELECTRIC HP	ELECTRIC VOLT.-PH.-CY.	ELECTRIC MCA	ELECTRIC MOP	MANUFACTURER & MODEL	OPTIONS-ACCESSORIES
MAU-3	SHOP AREA	10000	0.75	1,200,000	1,018,000	85	1,380	5	460-3-60	12.4	15	GREENHECK ICX-120-H32	NOTE 1, 2

NOTES:
1. PAIRED WITH EXHAUST FANS, EF-8, EF-9, EF-10 AND EF-11. PROVIDE WITH ROOF CURB, CONTROL CENTER WITH MAG STARTERS AND DISCONNECT SWITCH, MOTORIZED DAMPER, MODULATING HEATING, VIBRATION ISOLATION, OUTDOOR VENTING, WEATHERHOOD, SERVICE RECEPTACLE, ROOM OVERRIDE TSTAT. 3584 LBS WEIGHT.
2. EVAPORATIVE COOLER, 12" CELDEK, AND AUTOMATIC FREEZE AND DRAIN.
3. PROVIDE TIME CLOCK TO ACTIVE MAKE-UP AIR UNIT AND EXHAUST FANS WITH ROOM OVERRIDE TSTAT.
4. APPROVED EQUIVALENTS ARE REZNOR AND SPEC-AIR. ARES IS NOT AN APPROVED EQUAL.

FAN SCHEDULE

EQUIPMENT NO.	SERVICE	LOCATION	CFM	STATIC PRESS. (IN. W.G.)	MOTOR WATTS	MOTOR HP	MOTOR RPM	MOTOR VOLT.-PH.-CY.	MANUFACTURER & MODEL	OPTIONS-ACCESSORIES
EF-8,9,10,11	SHOP	ROOF	2000	0.5	-	1/2	1322	120-1-60	GREENHECK GB-141-5	SEE NOTE 1
EF-13,14	VEHICLE EXHAUST	INLINE	1000	4	-	1.5	3389	460-3-60	CARMON CMF 10	SEE NOTE 2

NOTES:
1. PROVIDE WITH ROOF CURB, BACKDRAFT DAMPER, DISCONNECT SWITCH LIFTING LUGS, AND AUTO BELT TENSIONER.
2. PROVIDE WITH BACKDRAFT DAMPER, DISCONNECT SWITCH, VIBRATION ISOLATOR, AND WALL PLATFORM WITH RAILS AND PADS.

DRAWING NO.:

REFERENCE DRAWINGS:

6-24-10

REV.	DATE	REVISION DESCRIPTION	BY	BY	BY	BY

Bighorn Consulting Engineers, Inc.
Mechanical & Electrical Engineers
569 S. Westgate Dr., Suite 1
Grand Junction, CO 81505
phone: 970-241-8709,
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FILENAME:
PROJECT NO.: 10-081
DATE DRAWN: 06-24-2010
DRAWN BY:
CHECKED BY:

CITY OF GRAND JUNCTION

MECHANICAL FLOOR PLAN
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE: AS SHOWN
DRAWING NO.: M1-1
REV.:

SECTION 15000
MECHANICAL PROVISIONS

1. SCOPE OF WORK

A. THE CONTRACTOR IS RESPONSIBLE FOR ALL WORK, MATERIALS, AND LABOR TO SATISFY A COMPLETE WORKING SYSTEM WHETHER SPECIFIED OR IMPLIED.
B. ALL WORK IS TO BE PERFORMED IN STRICT COMPLIANCE WITH THE INTERNATIONAL MECHANICAL CODE 2006, ALL LOCAL CODES AND ALL OTHER REGULATION GOVERNING WORK OF THIS NATURE.
C. THE CONTRACTOR SHALL, BEFORE SUBMITTING ANY PROPOSAL, EXAMINE THE PROPOSED SITE AND SHALL DETERMINE FOR HIMSELF THE CONDITIONS THAT MAY EFFECT THE WORK. NO ALLOWANCE SHALL BE MADE IF THE CONTRACTOR FAILS TO MAKE SUCH EXAMINATIONS.
D. ALL EQUIPMENT AND MATERIALS SHALL BE AS SPECIFIED OR "APPROVED EQUAL" BY THE ENGINEER OR ARCHITECT.

2. PERMITS

A. THE CONTRACTOR SHALL SECURE ALL PERMITS OR APPLICATIONS AND PAY ANY AND ALL FEES.

3. SHOP DRAWINGS

A. SUBMIT MATERIAL LIST AND SHOP DRAWINGS FOR MAJOR EQUIPMENT TO THE ACHITECT/ENGINEER FOR APPROVAL. THE CONTRACTOR SHALL SUBMIT FIVE SETS OF SHOP DRAWINGS AND THEY SHALL BE CLEARLY LABELED.

4. FLEXIBLE DUCT WORK

A. FLEXIBLE TYPE DUCT SHALL BE OF TWO ELEMENT SPIRAL CONSTRUCTION COMPOSED OF A CORROSION RESISTANT METAL SUPPORTING SPIRAL AND COATED FABRIC WITH A MINERAL BASE. FLEXIBLE DUCT CONNECTORS SHALL BE LISTED BY U.L., CLASS 1 DUCTS, AND SHALL HAVE A FLAME SPREAD RATING NOT EXCEEDING 25 AND A SMOKE DEVELOPED RATING NOT EXCEEDING 50.
B. USE OF FLEXIBLE DUCTWORK SHALL BE LIMITED TO NO MORE THAN 14 LINEAR FEET PER RUN.
C. CONTRACTOR SHALL BE CAREFUL SO AS NOT TO KINK OR COLLAPSE FLEXIBLE DUCT.

5. REFRIGERANT

A. PIPING CONTRACTOR SHALL PROVIDE AND INSTALL REFRIGERANT PIPING IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND IN SUCH A WAY AS TO BE INCONSPICUOUS AND FREE FROM ANY POSSIBLE CONDENSATION.
B. INSULATE REFRIGERANT LINES WITH ARMOUR-FLEX TYPE INSULATION, SHALL BE TYPE "K" COPPER TUBING, WITH WROUGHT COPPER SOLDER TYPE FITTINGS SUITABLE FOR CONNECTION WITH SILVER SOLDER.

6. DUCTWORK

A. THE DUCTWORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE "SMACNA" APPLICABLE MANUALS.
B. ALL DUCTWORK SHALL BE THE LOW VELOCITY TYPE, UNLESS SPECIFIED OTHERWISE.
C. CONTRACTOR SHALL PROVIDE AND INSTALL APPROVED FIRE DAMPERS AND ACCESS PANELS IN ANY AND ALL DUCTWORK WHICH PENETRATES A HORIZONTAL OR VERTICAL FIRE PARTITION, OR AS OTHERWISE SHOWN ON DRAWINGS.
D. ALL BRANCH DUCTS TO HAVE VOLUME DAMPERS, SMOOTH TURN RADIUS DUCTWORK OR TURNING VANES SHALL BE USED THROUGHOUT WHERE FLOW EXCEEDS 150 CFM.
E. ALL DUCT JOINTS TO BE SEALED IN ACCORDANCE WITH "SMACNA" STANDARDS AND ACCEPTED GOOD PRACTICES.
F. ALL DUCT DIMENSIONS SHOWN ARE NET INSIDE VALUES.DIMENSIONS MAY BE CHANGED SO LONG AS THE NET FREE FACE AREA IS MAINTAINED.
G. ALL CONCEALED DUCTWORK SHALL BE INSULATED WITH 1-1/2" FIBERGLASS INSULATING BLANKET WITH ALUMINUM FOIL FACING.
H. ALL SUPPLY AND RETURN DUCTWORK 15 FEET DOWNSTREAM H. OF THE HVAC UNIT SHALL BE INTERNALLY LINED WITH A 1/2" ACOUSTICAL DUCT LINER.

7. DRAINAGE PIPING

A. (CONDENSATE) SHALL BE SCHEDULE 40 PVC PIPE WITH SOLVENT JOINTS. PITCH HORIZONTAL LINES 1" IN 10'-0". CONDENSATE DRAINS SHALL BE ROUTED TO FLOOR DRAIN OR INDIRECT WASTE DRAIN.

8. HVAC CONTROLS

A. CONTRACTOR TO SUPPLY AND INSTALL ALL CONTROL WIRING AND THERMOSTATS AS REQUIRED.

9. ELECTRICAL

A. CONTRACTOR TO COORDINATE WITH ELECTRICAL CONTRACTOR A. FOR LOCATION OF WIRING FOR EACH HVAC UNIT.

10. PIPE SUPPORTS

A. ALL PIPE SHALL BE SUPPORTED FROM THE BUILDING STRUCTURE IN A NEAT AND WORKMANLIKE MANNER. THE USE OF WIRE OR METAL STRAP TO SUPPORT PIPES WILL NOT BE PERMITTED. SPACING OF PIPE SUPPORTS SHALL NOT EXCEED 8 FEET FOR ALL PIPING. PLASTIC PIPING TO BE SUPPORTED EVERY 4 FEET.

11. DOMESTIC WATER SUPPLY PIPING

A. UNDERGROUND: PROVIDE TYPE "K" SOFT DRAWN COPPER TUBING WITH BRAZED CONNECTIONS.

B. COPPER ABOVE GROUND: PROVIDE TYPE "L" HARD DRAWN COPPER TUBING WITH 125 PSI SOLDER JOINTS, OR BRASS FITTINGS. ALL SOLDER TO BE "NO LEAD" TYPE.

C. ALL HOT WATER PIPING TO BE INSULATED WITH 1" FIBERGLASS INSULATION.

D. ALL COLD WATER PIPING TO BE INSULATED WITH 1/2" FOAM INSULATION.

12. SANITARY/STORM DRAINAGE AND VENT PIPING

A. ABOVE GRADE:
-2" AND BELOW: SCH. 40 GALV. STL. PIPE WITH SCREWED ENDS OR SCH. 40 PVC WITH SOLVENT JOINTS OR DWV COPPER WITH SOLDER JOINTS. ALL SOLDER TO BE "NO LEAD" TYPE.

-3" AND ABOVE: SERVICE WT. CAST IRON WITH NO-HUB OR BELL AND SPIGOT JOINTS, OR SCH. 40 PVC WITH SOLVENT JOINTS.

B. BELOW GRADE: SERVICE WT. CAST IRON WITH BELL AND SPIGOT JOINTS OR SCH. 40 PVC WITH SOLVENT JOINTS.

C. PVC PIPING SHALL NOT BE USED IN AIR PLENUM CEILINGS AND SHALL NOT CROSS FIRE RATED WALLS, CEILINGS, OR FLOORS.

D. DRAINAGE PIPING SHALL BE RUN AS STRAIGHT AS POSSIBLE AND SHALL HAVE LONG TURN FITTINGS.

E. DRAINAGE PIPING 3" SIZE AND SMALLER SHALL RUN AT A UNIFORM GRADE OF AT LEAST 1/4" PER FOOT, AND PIPING LARGER THAN 3" SHALL BE RUN AT A GRADE OF NO LESS THAN 1/8" PER FOOT.

F. ALL VENT PIPING SHALL BE SLOPED TO DRAIN BACK TO FIXTURES.

G. CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER FLASHING OF THE VENT PIPING RUN THROUGH THE ROOF.

11. ALL STUB-INS AND/OR SLAB OR WALL PENETRATION TO BE PER 2006 INTERNATIONAL PLUMBING CODE. ALL PIPING PENETRATIONS OF BUILDING FOUNDATIONS OR FOOTINGS SHALL BE SLEEVED.

13. GAS PIPING

A. PIPING SHALL BE SCHEDULE 40 BLACK STEEL PIPE WITH MALLEABLE IRON FITTINGS.
WHERE GAS PIPE CONNECTS TO EQUIPMENT, IT SHALL BE PROVIDED WITH A DRIP LEG THE FULL SIZE OF THE KUNOUT, A 100% SHUT-OFF VALVE AND A UNION. GAS PIPING CONTAINING PRESSURE GREATER THAN 6" W.G. SHALL BE SCHEDULE 40 BLACK STEEL PIPE WITH WELDED JOINTS.

14. MISCELLANEOUS

A. ALL EXTERIOR OPENINGS TO BE PROPERLY CAULKED AND SEALED WITH A SEALANT OF HIGH QUALITY AND LONG LIFE, TO PREVENT INFILTRATION OF OUTSIDE AIR INTO CONDITIONED SPACE.
COORDINATE INSTALLATION OF ALL ROOF FLASHING AT ROOF PENETRATION.
B. DO NOT SCALE THIS DRAWING FOR EXACT DIMENSIONS.
C. VERIFY ALL FIGURES, CONDITIONS, AND DIMENSIONS AT THE JOB SITE.
D. THE MECHANICAL PLANS ARE INTENDED TO BE DIAGRAMMATIC AND ARE BASED
ON ONE MANUFACTURE'S EQUIPMENT. THEY ARE NOT INTENDED TO SHOW EVERY
ITEM IN ITS EXACT LOCATION, THE EXACT DIMENSIONS, OR ALL THE DETAILS OF THE EQUIPMENT.
E. THE CONTRACTOR SHALL VERIFY THE ACTUAL DIMENSIONS OF THE EQUIPMENT
PROPOSED TO ENSURE THAT THE EQUIPMENT WILL FIT IN THE AVAILABLE SPACE.

15. TESTING AND BALANCING

A. THE HVAC SYSTEM SHALL BE TESTED AND AND BALANCED BY AN INDEPENDENT
AGENCY, UNDER THE SUPER- VISION OF A LICENSED PROFESSIONAL ENGINEER. A SEALED TYPE WRITTEN REPORT SHALL BE SUBMITTED TO THE ARCHITECT/ENGINEER FOR REVIEW AND APPROVAL.

16. GUARANTEE

A. MATERIALS, EQUIPMENT AND INSTALLATION SHALL BE GUARANTEED FOR A PERIOD OF ONE(1) YEAR FROM DATE OF ACCEPTANCE. DEFECTS WHICH APPEAR DURING THAT PERIOD SHALL BE CORRECTED AT THIS CONTRACTOR'S EXPENSE.
B. FOR THE SAME PERIOD, THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE
FOR ANY DAMAGE TO PREMISES CAUSED BY DEFECTS IN WORKMANSHIP OR IN THE WORK OR EQUIPMENT FURNISHED AND/OR INSTALLED BY HIM.

17. FIRE SUPPRESSION INSTALLATION

A. INSTALL IN ACCURDANCE NFPA 13.
B. REAM PIPE AND TUBE ENDS TO FULL INSIDE DIAMETER. REMOVE BURRS AND BEVEL PLAIN END FERROUS PIPE.
C. REMOVE SCALE AND FOREIGN MATERIAL, INSIDE AND OUTSIDE, BEFORE ASSEMBLY.
D. INSTALL SLEEVES WHERE PENETRATING FOOTINGS, FLOORS, OR WALLS. SEAL PIPE AND SLEEVE PENETRATION TO MAINTAIN FIRE RESISTANCE EQUIVALENT TO FIRE SEPARATION OF FOOTINGS, FLOORS, OR WALLS.
E. INSTALL PIPE RUNS TO MINIMIZE OBSTRUCTION TO OTHER WORK. OFFSET AROUND DUCTWORK.
F. INSTALL PIPING IN CONCEALED SPACES ABOVE FINISHED CEILINGS.
G. INSTALL GATE OR BUTTERFLY VALVES FOR SHUT-OFF OR ISOLATING SERVICE.
H. INSTALL DRAIN VALVES AT MAIN SHUT-OFF VALVES, LOW POINTS OF PIPING AND APPARATUS.
I. CONNECT SYSTEM TO WATER SOURCE AHEAD OF DOMESTIC WATER CONNECTION WITH DOUBLE CHECK VALVE.
J. INSTALL HEADS TO COORDINATE WITH REFLECTED CEILING PLAN. CENTER IN TWO DIRECTIONS IN CEILING TILES.
K. PROTECTION:
1. APPLY TEMPORARY TAPE OR PAPER COVER TO SPRINKLER HEADS TO PROTECT FROM PAINTING.
2. PROTECT CONCEALED SPRINKLER HEAD COVER PLATES FROM PAINTING.
L. INTERFACE SPRINKLER SYSTEM WITH BUILDING FIRE AND SMOKE ALARM SYSTEM.
M. LOCATE FIRE DEPARTMENT CONNECTION WITH SUFFICIENT CLEARANCE FROM WALLS, OBSTRUCTIONS, OR ADJACENT SIAMESE CONNECTORS TO ALLOW FULL SWING OF FIRE DEPARTMENT WRENCH HANDLE.
N. FLUSH ENTIRE PIPING SYSTEM OF FOREIGN MATTER.
O. HYDROSTATICALLY TEST ENTIRE SYSTEM. SCHEDULE TEST TO BE WITNESSED BY FIRE MARSHALL,.

END OF SECTION 15000
END OF DIVISION

DRAWING NO.	REFERENCE DRAWINGS.

6-24-10

REV.	DATE.	REVISION DESCRIPTION	BY.	BY	BY	BY

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Mechanical & Electrical Engineers
569 S. Westgate Dr., Suite 1
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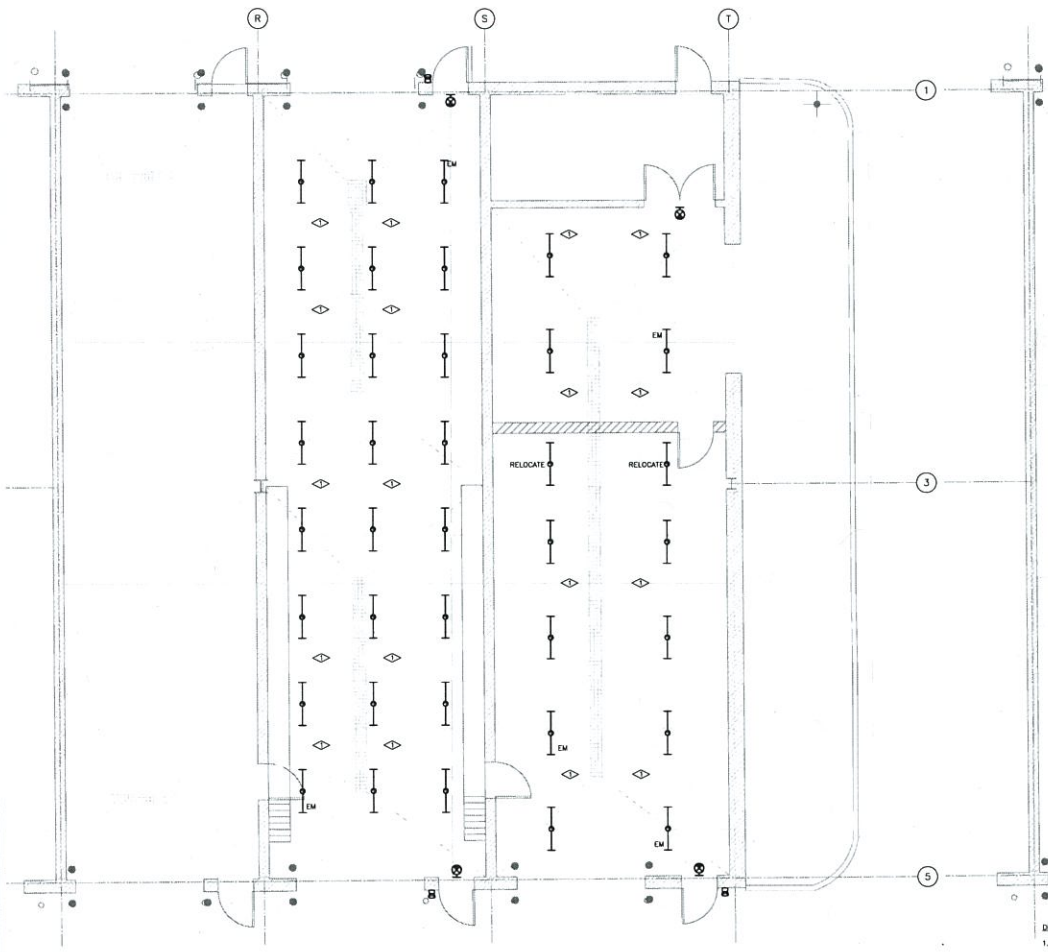
phone: 970-241-8709,
fax: 970-241-9514

FILENAME:
PROJECT NO.: 10-081
DATE DRAWN: 06-24-2010
DRAWN BY:
CHECKED BY:

CITY OF GRAND JUNCTION

MECHANICAL SPECIFICATIONS
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

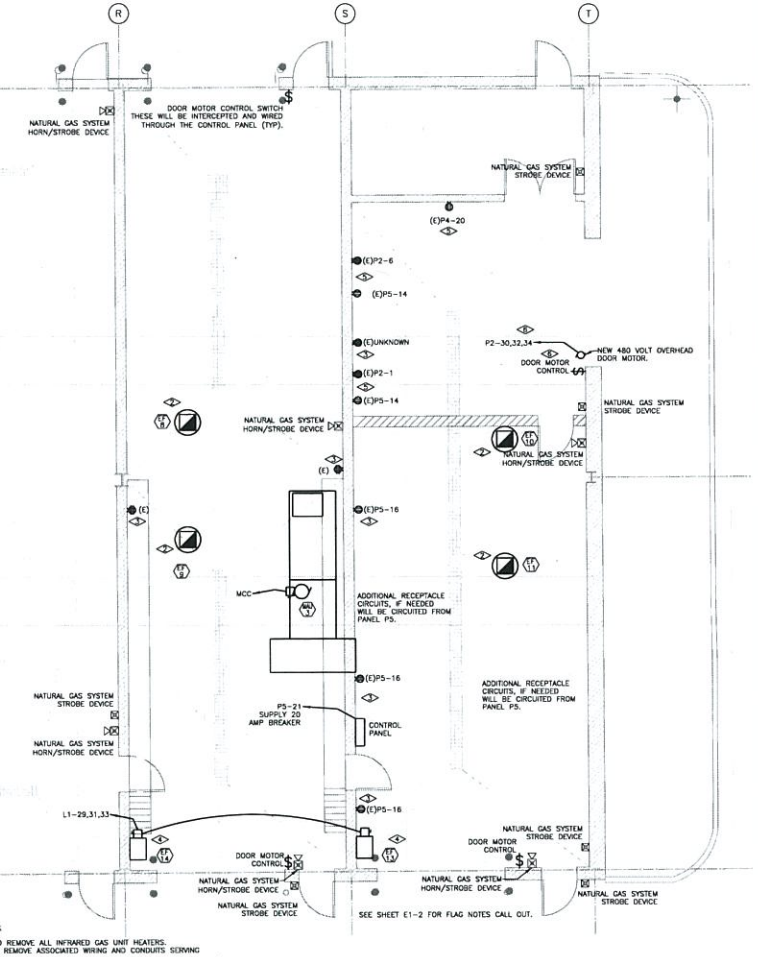
SCALE: AS SHOWN
DRAWING NO.: M1-2
REV.:



LIGHTING PLAN

SCALE: 3/16"=1'-0"

NORTH



DEMOLITION NOTES:

1. MECHANICAL TO REMOVE ALL INFRARED GAS UNIT HEATERS. ELECTRICAL TO REMOVE ASSOCIATED WIRING AND CONDUITS SERVING THEM.
2. MECHANICAL TO REMOVE PRV-8, PRV-9, PRV-10, AND PRV-11 RETAIN CIRCUITS FOR INSTALLATION OF NEW EXHAUST FANS.
3. MECHANICAL TO REMOVE MAU-2. RETAIN WIRING AND CIRCUITS FOR INSTALLATION OF NEW MAKE UP AIR UNIT.
4. THE WELDING SHOP IS BEING RELOCATED NORTH TO A NEW AREA. THE ELECTRICAL CONTRACTOR WILL REMOVE THE EXISTING WELDING OUTLETS AND HOLD FOR REINSTALL IN THE NEW AREA.

POWER PLAN

SCALE: 3/16"=1'-0"

NORTH

DRAWING NO. | REFERENCE DRAWING(S)

REV. | DATE | REVISION DESCRIPTION | BY | BY | BY | BY

6-24-10

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Mechanical & Electrical Engineers
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FILENAME:
PROJECT NO.: 10-081
DATE DRAWN: 06-24-2010
DRAWN BY:
CHECKED BY:

CITY OF GRAND JUNCTION

LIGHTING AND POWER PLAN
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE: AS SHOWN | DRAWING NO.: E1-1 | REV.:

MECHANICAL EQUIPMENT SCHEDULE

COMB: COMBINATION MOTOR STARTER
MAG: MAGNETIC MOTOR STARTER
NR: NONE REQUIRED
P/S: PLUG-IN UNIT
CONT: CONTRACTOR
MAN: MANUAL MOTOR STARTER
W/U: SUPPLIED WITH UNIT:

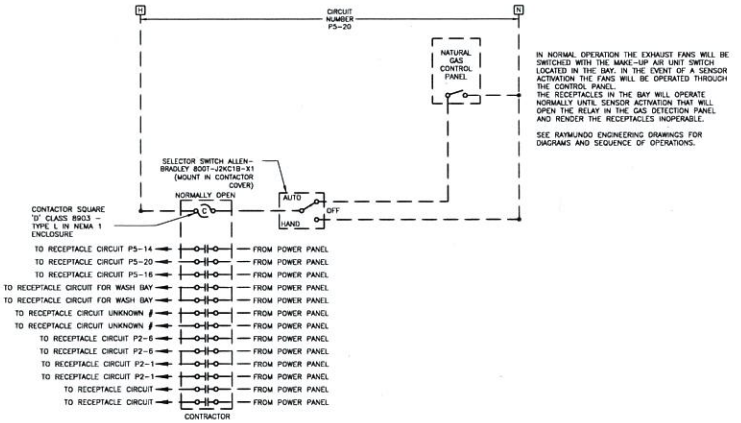
UNIT NO	FUNCTION (NOTES)	LOAD	VOLTS	#	FULL LOAD AMPS	BRANCH CIRCUIT CONDUIT SIZE	BRANCH CIRCUIT NO.	BRANCH CIRCUIT WIRE SIZE	GRND WIRE SIZE	BRKR SIZE	START	DISC FUSE
MUA-3	MAKE UP AIR UNIT MUA-3	5HP	480	3	12.4	3/4"	3	12	12	20	MCC	30 20
EF-8	EXHAUST FAN EF-8		120	1	9.8	3/4"	2	12	12	20	$	
EF-9	EXHAUST FAN EF-9		120	1	9.8	3/4"	2	12	12	20	$	
EF-10	EXHAUST FAN EF-10		120	1	9.8	3/4"	2	12	12	20	$	
EF-11	EXHAUST FAN EF-11		120	1	9.8	3/4"	2	12	12	20	$	
EF-13	EXHAUST FAN EF-13	1.5HP	480	3	3.0	3/4"	3	12	12	15	MAG	
EF-14	EXHAUST FAN EF-14	1.5HP	480	3	3.0	3/4"	3	12	12	15	MAG	

FLAG NOTES:

1. THE EXISTING LIGHTS ARE TO REMAIN. THE ELECTRICAL CONTRACTOR WILL PROVIDE FOUR EMERGENCY BALLASTS IN THE EXISTING LIGHTS AT LOCATIONS SHOWN. THE ELECTRICAL CONTRACTOR WILL ALSO PROVIDE EXIT LIGHTING AND EMERGENCY EGRESS LIGHTING.
2. THE EXISTING PRV-8 THRU PRV-11 WILL BE REMOVED. THE EXISTING WIRING AND CONDUIT WILL BE EVALUATED FOR SERVICEABILITY IF DEEMED SERVICEABLE IT WILL BE REUSED. MECHANICAL WILL LOCATED NEW EXHAUST FANS IN THE SAME LOCATIONS AS WHERE THE PRV'S ARE LOCATED. THE ELECTRICAL CONTRACTOR WILL RECONNECT THE NEW EXHAUST FANS TO THE EXISTING CIRCUITS.
3. THE EXISTING RECEPTACLE LOADS AND ALL NON-ESSENTIAL ELECTRICAL LOADS WILL BE RE-ROUTED THROUGH A CONTACTOR. THE CONTACTOR WILL BE INTERFACED INTO THE NATURAL GAS LEVEL DETECTION SYSTEM. THE NATURAL GAS DETECTION PANEL IS OUTFITTED WITH RELAYS SO THAT IN THE EVENT OF DETECTION OF NATURAL GAS THE RELAY WILL OPEN. WHEN NATURAL GAS IS SENSED THE RELAY IN THE CONTROL PANEL WILL OPEN AND THE CONTACTOR WILL THEN OPEN THE CONTACTS CONTROLLING THE NON-ESSENTIAL LOADS AND THEY WILL BE INOPERABLE.
4. THE ELECTRICAL CONTRACTOR WILL PROVIDE A 480 VOLT 3 POLE 20 AMP BREAKER AND INSTALL IT IN PANEL L1 SPACES 29,31,33. THE EC WILL PROVIDE A 3/4" CONDUIT WITH 3#12(THHN,CU)+1#12(CU)GROUND. EACH EXHAUST FAN WILL BE PROVIDED WITH A FUSED DISCONNECT.
5. THE ELECTRICAL CONTRACTOR WILL PROVIDE WIRING AND CONDUIT TO RELOCATE THE WELDING RECEPTACLES FROM THE EXISTING BAY TO THE NEW BAY.
6. A NEW OVERHEAD DOOR AND CONTROLLER WILL BE INSTALLED. THE ELECTRICAL CONTRACTOR WILL COORDINATE WITH THE OWNER FOR THE SPECIFIC VOLTAGE AND HORSEPOWER OF THE OWNER PROVIDED DOOR MOTOR. THE PANEL LOCATION CALLED OUT ARE FOR A 480 VOLT 3 PHASE MOTOR. THE OWNER MAY SPECIFY A 208 VOLT 3 PHASE MOTOR.

SEQUENCE OF OPERATION:

THE SENSORS WILL ACTIVATE AND OPEN THE CONTROL PANEL RELAY. THIS WILL OPEN THE CIRCUIT TO THE CONTACTOR. THE CONTACTOR WILL DISCONNECT ALL NON-ESSENTIAL LOADS THEY WILL BE TURNED OFF. THE ALARM SYSTEM WILL BE CONFIGURED SO THAT ALL THE DOORS OPEN AND THE EXHAUST FANS OPERATE. IN NORMAL OPERATION THE MAKE-UP AIR UNIT AND THE EXHAUST FANS ARE INTERLOCKED SO THAT THEY OPERATE IN UNISON, THE MAKE-UP AIR UNIT WILL NOT OPERATE WHEN THE CONTROL PANEL IS ACTIVATED.



IN NORMAL OPERATION THE EXHAUST FANS WILL BE SWITCHED WITH THE MAKE-UP AIR UNIT SWITCH LOCATED IN THE BAY. IN THE EVENT OF A SENSOR ACTIVATION THE FANS WILL BE OPERATED THROUGH THE CONTROL PANEL.
THE RECEPTACLES IN THE BAY WILL OPERATE NORMALLY UNTIL SENSOR ACTIVATION THAT WILL OPEN THE RELAY IN THE GAS DETECTION PANEL AND RENDER THE RECEPTACLES INOPERABLE.

SEE RAYMUNDO ENGINEERING DRAWINGS FOR DIAGRAMS AND SEQUENCE OF OPERATIONS.

LIGHTING CONTROL CONTACTOR

NOT TO SCALE

SCHEDULES AND DETAILS

DRAWING NO.:
REFERENCE DRAWINGS:

6-24-10

REV	DATE	REVISION DESCRIPTION	BY	BY	BY	BY

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Mechanical & Electrical Engineers
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FILENAME:
PROJECT NO.: 10-081
DATE DRAWN: 06-24-2010
DRAWN BY:
CHECKED BY:

CITY OF GRAND JUNCTION

ELECTRICAL SCHEDULES AND DETAILS
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE: AS SHOWN
DRAWING NO.: E1-2
REV:

SECTION 16000
GENERAL PROVISIONS

SECTION 16010
GENERAL PROVISIONS

A. THE ARCHITECTURAL GENERAL AND SPECIAL CONDITIONS FOR THE CONSTRUCTION OF THIS PROJECT SHALL BE A PART OF THE ELECTRICAL SPECIFICATIONS. THE ELECTRICAL CONTRACTOR SHALL EXAMINE THE GENERAL AND SPECIAL CONDITIONS BEFORE SUBMITTING HIS OR HER PROPOSAL.
B. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL WORK INCLUDED IN THIS SECTION AND THE DELEGATION OF WORK TO THE ELECTRICAL CONTRACTOR, SHALL NOT RELIEVE HIM OF THIS RESPONSIBILITY. THE ELECTRICAL CONTRACTOR AND HIS SUBCONTRACTORS WHO PERFORM WORK UNDER THIS SECTION SHALL BE RESPONSIBLE TO THE GENERAL CONTRACTOR.
C. WHERE ITEMS OF THE GENERAL CONDITIONS OR OF THE SPECIAL CONDITIONS ARE REPEATED IN THIS SECTION OF THE SPECIFICATIONS, IT IS INTENDED TO CALL PARTICULAR ATTENTION TO OR QUALIFY THEM; IT IS NOT INTENDED THAT ANY OTHER PARTS OF THE GENERAL CONDITIONS OR SPECIAL CONDITIONS SHALL BE ASSUMED TO BE OMITTED IF NOT REPEATED HEREIN.
D. THE NAMING OF A CERTAIN BRAND OR MAKE OR MANUFACTURER IN THE SPECIFICATIONS IS TO ESTABLISH A QUALITY STANDARD FOR THE ARTICLE DESIRED. THE CONTRACTOR IS NOT RESTRICTED TO THE USE OF THE SPECIFIC BRAND OF THE MANUFACTURER NAMED UNLESS SO INDICATED IN THE SPECIFICATIONS.
E. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND PRESENT FIVE (5) COPIES OF SHOP DRAWINGS OR BROCHURES FOR ALL FIXTURES, EQUIPMENT, AND ACCESSORIES TO THE ENGINEER FOR THE ENGINEER'S APPROVAL. CHECKING IS ONLY FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE SHOWN IS SUBJECT TO THE REQUIREMENTS OF THE PLANS AND SPECIFICATIONS. CONTRACTOR IS RESPONSIBLE FOR: DIMENSIONS WHICH SHALL BE CONFIRMED AND CORRELATED AT THE JOB SITE; FABRICATION PROCESSES AND TECHNIQUES CONSTRUCTION; COORDINATION OF HIS WORK WITH THAT OF ALL OTHER TRADES AND THE SATISFACTORY PERFORMANCE OF HIS WORK.
F. THE ELECTRICAL CONTRACTOR SHALL EXAMINE DRAWINGS RELATING TO WORK OF ALL TRADES AND BECOME FULLY INFORMED AS TO EXTENT AND CHARACTER OF WORK REQUIRED AND ITS RELATION TO ALL OTHER WORK IN THE PROJECT.
G. BEFORE SUBMITTING BID, CONTRACTOR SHALL VISIT THE SITE AND EXAMINE ALL ADJOINING EXISTING BUILDINGS, EQUIPMENT AND SPACE CONDITIONS ON WHICH HIS WORK IS IN ANY WAY DEPENDENT FOR THE BEST WORKMANSHIP AND OPERATION ACCORDING TO THE INTENT OF SPECIFICATIONS AND DRAWINGS. HE SHALL REPORT TO THE ARCHITECT ANY CONDITION WHICH MIGHT PREVENT HIM FROM INSTALLING HIS EQUIPMENT IN THE MANNER INTENDED.
H. NO CONSIDERATION OR ALLOWANCE WILL BE GRANTED FOR FAILURE TO VISIT SITE, OR FOR ANY ALLEGED MISUNDERSTANDING OF MATERIALS TO BE FURNISHED OR WORK TO BE DONE.
I. EXISTING CONDUITS, PIPES, EQUIPMENT, ETC.: REFER TO DIVISION 1 FOR ADDITIONAL REQUIREMENTS. EXISTING CONDUITS, PIPES, UTILITY LINES, TANKS, EQUIPMENT, OR OTHER OBSTRUCTIONS WHETHER UNDERGROUND, CONCEALED, OR EXPOSED ARE NOT IN GENERAL INDICATED ON DRAWINGS. PRIOR TO START OF WORK, HAVE EXISTING UTILITY OBSTRUCTIONS CLEARLY MARKED BY UTILITIES LOCATOR SERVICE. PLAN WORK SO AS TO ROUTE AND LOCATE ALL NEW WORK TO AVOID THESE OBSTRUCTIONS. REPAIR OR REPLACE, AT NO COST TO OWNER, EXISTING INSTALLATIONS WHERE DAMAGED, OCCURRING DURING THE COURSE OF CONSTRUCTION.

END OF SECTION 16010

SECTION 16015
ELECTRICAL DRAWINGS AND REFERENCE SYMBOLS

A. THE DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERALLY THE LOCATIONS OF MATERIAL AND EQUIPMENT. THESE DRAWINGS SHALL BE FOLLOWED AS CLOSELY AS POSSIBLE. THE ELECTRICAL CONTRACTOR SHALL COORDINATE THE WORK UNDER THIS SECTION WITH THE ARCHITECTURAL, STRUCTURAL, PLUMBING, HEATING AND AIR CONDITIONING, AND THE DRAWINGS OF OTHER TRADES FOR EXACT DIMENSIONS, CLEARANCES AND ROUGHING-IN LOCATIONS. THIS CONTRACTOR SHALL COOPERATE WITH ALL OTHER TRADES IN ORDER TO MAKE MINOR FIELD ADJUSTMENTS TO ACCOMMODATE THE WORK OF OTHERS. DO NOT RELY ON THE SCALE OF THE DRAWINGS FOR ROUGH-IN MEASUREMENTS, NOR USE THEM AS SHOP DRAWINGS.
B. THE DRAWINGS AND SPECIFICATIONS ARE COMPLEMENTARY, EACH TO THE OTHER, AND THE WORK REQUIRED BY EITHER SHALL BE INCLUDED IN THE CONTRACT AS IF CALLED FOR BY BOTH.
C. IF DIRECTED BY THE ARCHITECT, THE CONTRACTOR SHALL, WITHOUT EXTRA CHARGE, MAKE REASONABLE MODIFICATIONS IN THE LAYOUT AS NEEDED TO PREVENT CONFLICT WITH WORK OF OTHER TRADES OR FOR PROPER EXECUTION OF THE WORK.
D. ELECTRICAL SYMBOLS USED ON THIS PROJECT ARE SHOWN IN A SYMBOL LIST ON THE ACCOMPANYING WORKING DRAWINGS. THIS LIST SHOWS STANDARD SYMBOLS AND ALL MAY NOT APPEAR ON THE PROJECT DRAWINGS, HOWEVER, WHEREVER THE SYMBOL ON PROJECT DRAWINGS OCCURS, THE ITEM SHALL BE PROVIDED AND INSTALLED.

END OF SECTION 16015

SECTION 16020
WORK INCLUDED

A. THE SCOPE OF THE WORK CONSISTS OF ELECTRICAL MODIFICATION TO THE CITY OF GRAND JUNCTION MAINTENANCE BUILDING. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO; MODIFICATION OF DISTRIBUTION PANELS AND OTHER ITEMS AS CALLED OUT ON THE DRAWINGS FOR THE AREAS OF REMODEL. THIS WORK WILL ALSO INCLUDE: ELECTRICAL DISTRIBUTION INSTALLATION; POWERING OF MECHANICAL EQUIPMENT; AND OTHER ITEMS AS CALLED OUT ON THE DRAWINGS FOR THE REMODEL CONSTRUCTION. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL SUPERVISION, LABOR, MATERIALS, EQUIPMENT, MACHINERY, AND ANY AND ALL OTHER ITEMS NECESSARY TO COMPLETE THE SYSTEMS. THE ELECTRICAL CONTRACTOR SHALL NOTE THAT ALL ITEMS OF EQUIPMENT ARE SPECIFIED IN THE SINGULAR; HOWEVER, THE CONTRACTOR SHALL PROVIDE AND INSTALL THE NUMBER OF ITEMS OF EQUIPMENT AS INDICATED ON THE DRAWINGS AND AS REQUIRED FOR COMPLETE SYSTEMS.
B. IT IS THE INTENTION OF THE SPECIFICATIONS AND DRAWINGS TO CALL FOR FINISHED WORK, TESTED, AND READY FOR OPERATION.
C. ANY APPARATUS, APPLIANCE, MATERIAL OR WORK NOT SHOWN ON DRAWINGS BUT MENTIONED IN THE SPECIFICATIONS, OR VICE VERSA, OR ANY INCIDENTAL ACCESSORIES NECESSARY TO MAKE THE WORK COMPLETE AND PERFECT IN ALL RESPECTS AND READY FOR OPERATION, EVEN IF NOT PARTICULARLY SPECIFIED, SHALL BE FURNISHED, DELIVERED AND INSTALLED BY THE CONTRACTOR WITHOUT ADDITIONAL EXPENSE TO THE OWNER. WITH SUBMISSION OF BID, THE ELECTRICAL CONTRACTOR SHALL GIVE WRITTEN NOTICE TO THE ARCHITECT OF ANY MATERIALS OR APPARATUS BELIEVED INADEQUATE OR UNSUITABLE, IN VIOLATION OF LAWS, ORDINANCES, RULES; ANY NECESSARY ITEMS OR WORK OMITTED. IN THE ABSENCE OF SUCH WRITTEN NOTICE, IT IS MUTUALLY AGREED THE CONTRACTOR HAS INCLUDED THE COST OF ALL REQUIRED ITEMS IN HIS PROPOSAL, AND THAT HE WILL BE RESPONSIBLE FOR THE APPROVED SATISFACTORY FUNCTIONING OF THE ENTIRE SYSTEM WITHOUT EXTRA COMPENSATION.

END OF SECTION 16020

SECTION 16030
CODES AND FEES

A. ALL MATERIALS AND WORKMANSHIP SHALL COMPLY WITH ALL APPLICABLE CODES, SPECIFICATIONS, LOCAL ORDINANCES, INDUSTRY STANDARDS, UTILITY COMPANY AND FIRE INSURANCE CARRIER'S REQUIREMENTS. CONTACT PROPER AUTHORITIES, OBTAIN AND PAY FOR REQUIRED PERMITS, INSPECTIONS AND UTILITY SERVICE CONNECTIONS. DO NOT INCLUDE ANY UTILITY COMPANY CHARGES THAT CAN BE BILLED DIRECTLY TO THE OWNER.
B. IN CASE OF DIFFERENCE BETWEEN THE BUILDING CODES, SPECIFICATIONS, STATE LAWS, LOCAL ORDINANCES, INDUSTRY STANDARDS, UTILITY COMPANY REGULATIONS, FIRE INSURANCE CARRIER'S REQUIREMENTS, AND THE CONTRACT DOCUMENTS, THE MOST STRINGENT SHALL GOVERN. THE CONTRACTOR SHALL PROMPTLY NOTIFY THE ARCHITECT IN WRITING OF ANY SUCH DIFFERENCE.
C. NONCOMPLIANCE: SHOULD THE CONTRACTOR PERFORM ANY WORK THAT DOES NOT COMPLY WITH THE REQUIREMENTS OF THE APPLICABLE BUILDING CODES, STATE LAWS, LOCAL ORDINANCES, INDUSTRY STANDARDS, FIRE INSURANCE CARRIER'S REQUIREMENTS, AND UTILITY COMPANY REGULATIONS, HE SHALL BEAR THE COST ARISING IN CORRECTING ANY SUCH DEFICIENCY.

END OF SECTION 16030

SECTION 16100
BASIC METHODS AND MATERIALS

SECTION 16101
GENERAL

A. PROTECTION: ALL WORK, MATERIALS AND EQUIPMENT SHALL BE COMPLETELY AND ADEQUATELY PROTECTED AT ALL TIMES. PAY FOR ALL DAMAGE, INJURY OR LOSS, EXCEPT SUCH AS MAY BE DIRECTLY DUE TO ERRORS IN THE CONTRACT DOCUMENTS OR BE CAUSED BY AGENTS OR EMPLOYEES OF THE OWNER. POST EFFECTIVE DANGER SIGNS WARNING AGAINST HAZARDS CREATED BY THE WORK.
B. TRENCHING AND BACKFILLING: PERFORM ALL TRENCHING AND BACKFILL REQUIRED BY WORK UNDER THIS DIVISION OF THE SPECIFICATIONS. TRENCHING AND BACKFILLING SHALL BE DONE IN ACCORDANCE WITH THE "SITE WORK" DIVISION OF THE SPECIFICATIONS AND AS HEREIN SPECIFIED. THIS PORTION OF THE WORK SHALL BE EXECUTED UNDER THE DIRECT SUPERVISION OF THE GENERAL CONTRACTOR. TRENCHES SHALL BE EXCAVATED TO THE DEPTH REQUIRED FOR THE UTILITIES INVOLVED. THE TRENCH BOTTOM SHALL BE GRADED TRUE AND FREE FROM DEBRIS, STONES AND SOFT SPOTS. WHERE DIRECT BURIAL CABLES ARE USED FOUR INCHES OF FINE SAND SHALL BE PLACED IN THE BOTTOM OF THE TRENCH PRIOR TO CABLE PLACEMENT.
C. EQUIPMENT, MATERIALS, INSTALLATION:
1. ALL EQUIPMENT, ACCESSORIES AND SPECIALTIES CONNECTED TO EQUIPMENT AND ALL ITEMS OF MATERIAL SHALL BE INSTALLED AS RECOMMENDED BY THEIR MANUFACTURERS UNLESS SPECIFICALLY
2. STATED OTHERWISE. PROVIDE PROPER SUPPORTS, MOUNTS, ETC., AS REQUIRED.
3. COORDINATE WITH THE GENERAL CONTRACTOR.
4. OBTAIN INSTRUCTIONS FROM THE ARCHITECT FOR INSTALLATION OF ITEMS NOT COMPLETELY COVERED BY CONTRACT DOCUMENTS OR PUBLISHED MANUFACTURER'S RECOMMENDATIONS.

D. EQUIPMENT FINISH: ALL ELECTRICAL EQUIPMENT SHALL BE FURNISHED FACTORY PAINTED OR FINISHED WITH TWO COATS OF HIGH GRADE ENAMEL AND IN THE MANUFACTURER'S STANDARD COLORS UNLESS OTHERWISE SPECIFIED.
1. UNPAINTED EQUIPMENT AND MATERIALS, EXCEPT CONDUIT IN CONCEALED SPACES, SHALL BE CLEANED AND PRIMED TO BE PAINTED BY THE PAINTING CONTRACTOR IN ACCORDANCE WITH THE PAINTING SECTION OF THESE SPECIFICATIONS.
2. THE COLORS OF ALL EXPOSED ELECTRICAL MATERIAL AND APPARATUS SHALL BE AS SELECTED BY THE OWNER.

E. CHASES, SLEEVES, CUTTING, PATCHING
1. PROVIDE FOR NECESSARY CHASES, HOLES, SLEEVES, BOXES, INSERTS AND HANGERS BY ARRANGEMENT WITH CONTRACTORS OF THE OTHER APPROPRIATE TRADES. PROVIDE "FLAMESEAL" OR OF THE APPROVED FIRESTOPPING MATERIAL AT ALL PENETRATIONS THROUGH RATED WALLS, FLOORS AND CEILINGS.
2. PROVIDE FOR ALL CUTTING AND PATCHING OF HOLES, OPENINGS, AND NOTCHES. OBTAIN WRITTEN APPROVAL OF THE ARCHITECT BEFORE NOTCHING, BORING, CHIPPING, BURNING, DRILLING, WELDING TO STRUCTURAL MEMBERS.

F. INSPECTION
1. ALL WORK AND MATERIALS COVERED BY DRAWINGS AND SPECIFICATIONS SHALL BE SUBJECT TO INSPECTION AT ANY AND ALL TIMES BY REPRESENTATIVES OF THE ARCHITECT AND OWNER. IF ANY MATERIAL OR INSTALLATION DOES NOT CONFORM TO THE DRAWINGS AND SPECIFICATIONS, WITHIN THREE DAYS AFTER BEING
2. WORK SHALL NOT BE CLOSED IN NOR COVERED BEFORE INSPECTION AND APPROVAL BY THE ARCHITECT. PROVIDE FOR UNCOVERING AND MAKING REPAIRS, AT NO EXTRA COST, WHEN UNINSPECTED WORK HAS BEEN CLOSED IN. NOTIFY THE ARCHITECT WHEN WORK IS READY FOR INSPECTION.
3. NOTIFY PROPER AUTHORITIES WHEN WORK IS READY FOR ANY INSPECTIONS REQUIRED BY APPLICABLE CODES, RULES AND REGULATIONS, ALLOWING SUFFICIENT TIME FOR INSPECTIONS TO BE MADE WITHOUT HINDERING PROGRESS OF THE WORK, AND FURNISH THE OWNER, WITHOUT ADDITIONAL COSTS, PROPER CERTIFICATES OF ACCEPTANCE FROM SUCH AUTHORITIES.
4. UPON COMPLETION OF ALL WORK AND ADJUSTMENT OF ALL EQUIPMENT, FINAL INSPECTION SHALL BE MADE UNDER DIRECTION OF THE ARCHITECT. TEST AND OPERATE ALL DEVICES, EQUIPMENT AND SYSTEMS TO DEMONSTRATE THAT THE ELECTRICAL SYSTEM IS COMPLETE AND FUNCTIONAL IN THE MANNER REQUIRED.

G. CLEAN UP
1. DURING THE COURSE OF THE WORK REMOVE ANY MATERIALS NOT INSTALLED IN THE WORK WHICH CONFLICT WITH THE WORK OF OTHERS IF SO DIRECTED BY THE ARCHITECT.
2. AT COMPLETION OF WORK CLEAN UP AND REMOVE FROM THE PREMISES ALL DEBRIS AND MATERIALS NOT INSTALLED IN THE WORK SO THE PREMISES WILL BE LEFT CLEAN. WASH AND WIPE CLEAN ALL LIGHTING FIXTURES AND LAMPS WHICH MAY HAVE BECOME SOILED DURING INSTALLATION.

H. RECORD DRAWINGS: AT COMPLETION OF THE WORK FURNISH TO THE ARCHITECT TWO COMPLETE SETS OF ELECTRICAL PRINTS MARKED TO SHOW THE WORK "AS-BUILT".
I. MAINTENANCE AND OPERATING PROCEDURES: UPON COMPLETION OF ALL WORK AND ADJUSTMENT OF ALL EQUIPMENT INSTRUCT THE OWNER ON THE CORRECT OPERATION AND MAINTENANCE PROCEDURE FOR THE ELECTRICAL SYSTEM IN TOTAL. FURNISH 3 SETS OF TYPED MAINTENANCE MANUALS CONTAINING CUT SHEETS ON ALL EQUIPMENT, TABLES OF FUSES AND FOR WHAT EQUIPMENT, TABLE OF LAMPS AND BALLASTS AND FOR WHAT FIXTURES. INCLUDE A LIST OF CONTACTS WITH PHONE NUMBERS FOR ALL SYSTEMS FOR OWNERS USE, IN THE EVENT THE ELECTRICAL SYSTEM REQUIRES SERVICE WORK WITHIN THE WARRANTY PERIOD.
J. GUARANTEE: GUARANTEE THAT ALL WORK GOVERNED BY THIS DIVISION SHALL BE NEW AND FREE OF DEFECTIVE WORK, MATERIALS, AND COMPONENTS FOR A PERIOD OF ONE YEAR AFTER WRITTEN ACCEPTANCE. REPAIR, REVISE AND REPLACE DEFECTS AS DIRECTED, WITH NO ADDITIONAL COST TO THE OWNER. (INCANDESCENT LAMPS, FUSES AND ANY EXISTING EQUIPMENT ARE EXEMPT)

END OF SECTION 16101

SECTION 16111

CONDUITS

A. PVC CONDUIT SHALL BE USED FOR ALL UNDERGROUND FEEDERS AND BRANCH CIRCUITS UNLESS OTHERWISE DIRECTED ON PLANS OR AS APPROVED BY NEC. ALL CONDUIT SHALL BE UL APPROVED.
B. CONDUIT SIZES SHALL BE AS INDICATED ON THE DRAWINGS, OR MINIMUM IN ACCORDANCE WITH THE NEC, INCLUDING PROVISION FOR GREEN EQUIPMENT GROUNDING CONDUCTOR USING 3/4 INCH MINIMUM CONDUIT. THE USE OF 1/2 INCH CONDUIT ELSEWHERE MAY BE APPROVED IF CONDITIONS WARRANT.
C. SPECIAL CONDUIT FITTINGS SHALL BE APPROPRIATE FOR EACH APPLICATION AND SHALL BE MANUFACTURED BY T & B OR APPROVED EQUAL.
D. CONDUIT SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST EDITION OF THE NEC AND SHALL BE INSTALLED IN A NEAT, WORKMANLIKE MANNER.
E. THE ENTIRE CONDUIT SYSTEM SHALL BE INSTALLED TO PROVIDE A CONTINUOUS BOND THROUGHOUT THE SYSTEM.
F. ELECTRICAL METALLIC TUBING (EMT) MAY BE USED FOR BRANCH CIRCUITS AND RACEWAYS OTHER THAN FOR SERVICE ENTRANCE AND MAIN FEEDERS UNLESS PROHIBITED BY THE NEC OR LOCAL ORDINANCES. EMT SHALL BE UL APPROVED, GALVANIZED INSIDE AND OUTSIDE, COMPLYING WITH ASA C-80.3 FOR ZINC COATED EMT WITH FITTINGS OF THE SAME TYPE MATERIAL AND FINISH, OF THE PRESSURE CONNECTED TYPE FOR EXTERIOR INSTALLATION AND OF THE SET SCREW TYPE FOR INTERIOR INSTALLATION.
G. ALL CONDUIT JOINTS SHALL BE CUT SQUARE, REAMED SMOOTH, AND DRAWN UP TIGHT. BENDS OR OFFSETS SHALL BE MADE WITH AN APPROVED BENDER OR HICKEY, OR HUB-TYPE CONDUIT FITTINGS. NUMBER OF BENDS PER RUN SHALL CONFORM TO THE NEC LIMITATIONS.
H. CONCEALED CONDUITS SHALL BE RUN IN A DIRECT LINE WITH LONG SWEEP BENDS AND OFFSETS. EXPOSED CONDUITS SHALL BE PARALLEL TO AND AT RIGHT ANGLES TO BUILDING LINES, USING CONDUIT FITTINGS FOR ALL TURNS AND OFFSETS.
I. TRANSITIONS BETWEEN NONMETALLIC CONDUITS AND CONDUITS OF OTHER MATERIALS SHALL BE MADE WITH THE MANUFACTURER'S STANDARD ADAPTERS DESIGNED FOR SUCH PURPOSE.
J. EXPOSED CONDUITS SHALL BE SECURELY FASTENED IN PLACE ON MAXIMUM 10 FOOT INTERVALS; AND HANGERS, SUPPORTS OR FASTENERS SHALL BE PROVIDED AT EACH ELBOW AND AT THE END OF EACH STRAIGHT RUN TERMINATING AT A BOX OR CABINET.

END OF SECTION 16111

SECTION 16120
WIRES AND CABLES

A. WIRE AND CABLE SHALL MEET ALL STANDARDS AND SPECIFICATIONS APPLICABLE, AND SHALL BE IN CONFORMANCE WITH THE LATEST EDITION OF THE NEC. INSULATED WIRE AND CABLE SHALL HAVE SIZE, TYPE OF INSULATION, VOLTAGE AND MANUFACTURER'S NAME PERMANENTLY MARKED ON OUTER COVERING AT REGULAR INTERVALS NOT EXCEEDING FOUR FEET. WIRE AND CABLE SHALL BE DELIVERED IN COMPLETE COILS OR REELS WITH IDENTIFYING TAGS, STATING SIZE, TYPE OF INSULATION, ETC.
B. WIRE AND CABLE SHALL BE SUITABLY PROTECTED FROM WEATHER AND OTHER DAMAGE DURING STORAGE AND HANDLING, AND SHALL BE IN FIRST CLASS CONDITION AFTER INSTALLATION.
C. WIRE AND CABLE SHALL BE FACTORY COLOR CODED WITH A SEPARATE COLOR FOR EACH PHASE AND NEUTRAL USED CONSISTENTLY THROUGHOUT THE SYSTEM. COLOR CODING SHALL BE AS REQUIRED BY THE NEC.
D. ALL CONDUCTORS SHALL BE RATED 600 VOLTS, UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE DRAWINGS, OR FOR ELECTRONIC OR COMMUNICATION USE.
E. WIRE AND CABLE FOR VARIOUS APPLICATIONS SHALL BE AS FOLLOWS UNLESS OTHERWISE DESIGNATED:
1. WIRE #10 AND SMALLER SHALL BE SOLID, WIRE #8 AND LARGER SHALL BE STRANDED.
2. #12 THRU #6 DRY LOCATIONS: TYPE THHN, 90 DEGREES C.
3. #12 THRU #6 IN SLABS, UNDERGROUND, OR WET LOCATIONS: TYPE THWN OR TYPE XHHW, 75 DEGREES C.
4. #4 AND LARGER: TYPE XHHW OR TYPE THWN 75 DEGREES C.
F. WIRE AND CABLE SHALL BE AS MANUFACTURED BY GENERAL ELECTRIC, ANACONDA WIRE & CABLE, ROME CABLE, TRIANGLE CONDUIT & CABLE, OR APPROVED EQUAL. SUBSTITUTION OF WIRE AND CABLE MANUFACTURER SHALL BE ONLY WITH THE APPROVAL OF THE ARCHITECT/ENGINEER.
G. FOR ANY SPECIFIC USE NOT COVERED HERE ABOVE, COMPLY WITH THE NEC IN CONDUCTOR USE.
H. ALL CIRCUITS SHALL BE 2#12+G UNLESS OTHERWISE NOTED ON DRAWINGS OR IN SCHEDULES.
I. ALL 15 AND 20 AMP CIRCUITS WITH LENGTHS OVER 150 FT. SHALL HAVE THEIR CONDUCTOR SIZE INCREASED TO #10 FOR VOLTAGE DROP.

END OF SECTION 16120

SECTION 16121
WIRE CONNECTIONS

A. JOINTS ON BRANCH CIRCUITS SHALL OCCUR ONLY WHERE SUCH CIRCUIT DIVIDE AS INDICATED ON PLANS AND SHALL CONSIST OF ONE THROUGH CIRCUIT TO WHICH SHALL BE SPLICED THE BRANCH FROM THE CIRCUIT. IN NO CASE SHALL JOINTS IN BRANCH CIRCUITS BE LEFT FOR THE FIXTURE HANGER TO MAKE. NO SPLICES SHALL BE MADE IN CONDUCTOR EXCEPT AT OUTLET BOXES, JUNCTION BOXES, OR SPLICE BOXES.
B. ALL JOINTS OR SPLICES FOR #10 AWG OR SMALLER SHALL BE MADE WITH UL APPROVED WIRE NUTS OR COMPRESSION TYPE CONNECTORS.
C. ALL JOINTS OR SPLICES FOR #8 AWG OR LARGER SHALL BE MADE WITH A MECHANICAL COMPRESSION CONNECTOR. AFTER THE CONDUCTORS HAVE BEEN MADE MECHANICALLY AND ELECTRICALLY SECURE, THE ENTIRE JOINT OR SPLICE SHALL BE COVERED WITH SCOTCH #33 TAPE OR APPROVED EQUAL TO MAKE THE INSULATION OF THE JOINT OR SPLICE EQUAL TO THE INSULATION OF THE CONDUCTORS. THE CONNECTOR SHALL BE UL APPROVED.

END OF SECTION 16121

SECTION 16125
PULLING CABLES

A. INSTALL CONDUCTORS IN ALL RACEWAYS AS REQUIRED, UNLESS OTHERWISE NOTED, IN A NEAT AND WORKMANLIKE MANNER. ALL EMPTY CONDUITS SHALL HAVE A #14 GALVANIZED PULL WIRE OR NYLON PULLCORD LEFT IN PLACE FOR FUTURE USE.
B. CONDUCTORS SHALL BE COLOR CODED IN ACCORDANCE WITH THE NEC. MAINS, FEEDERS, SUBFEEDERS SHALL BE TAGGED IN ALL PULL, JUNCTION, AND OUTLET BOXES AND IN THE GUTTER OF PANELS WITH APPROVED CODE TYPE WIRE MARKERS.
C. NO LUBRICANT OTHER THAN POWDERED SOAPSTONE OR APPROVED PULLING COMPOUND MAY BE USED TO PULL CONDUCTORS.
D. AT LEAST EIGHT (8) INCHES OF SLACK WIRE SHALL BE LEFT IN EVERY OUTLET BOX WHETHER IT BE IN USE OR LEFT FOR FUTURE USE.
E. ALL CONDUCTORS AND CONNECTIONS SHALL TEST FREE OF GROUNDS SHORTS AND OPENS BEFORE TURNING THE JOB OVER TO THE OWNER.
F. PULL BOXES SHALL BE REQUIRED IN RUNS OVER 100 FEET OR WHEN MORE THAN THREE 90-DEGREE BENDS ARE USED, OR AS INDICATED ON THE DRAWINGS.
G. FEEDERS ARE TO BE RUN ABOVE GROUND TO ALL POWER PANELS AND LIGHTING PANELS, UNLESS INDICATED OTHERWISE ON DRAWINGS.
H. WHERE MOTORS HAVE CONDUIT TERMINAL BOXES, FEEDERS SHALL BE CONNECTED TO SAME BY FLEXIBLE MEANS.
I. ALL MOTORS WITH SLIDING BASE MOUNTINGS SHALL HAVE NOT LESS THAN 12 INCHES NOR MORE THAN 6 FEET OF CONDUIT CONNECTING RIGID CONDUIT FEED TO MOTOR TERMINAL BOX.
J. CONDUCTOR SPLICES SHALL BE MADE ONLY IN JUNCTION BOXES, TERMINAL BOXES, OR PULL BOXES.

END OF SECTION 16125

SECTION 16133
OUTLET BOXES

ALL OUTLET BOXES FOR CONCEALED WIRING SHALL BE SHEET METAL,

A. GALVANIZED OR CADMIUM PLATED, AT LEAST 1 INCHES DEEP, SINGLE OR GANGED, OF SIZE TO ACCOMMODATE DEVICES AND NUMBER OF CONDUCTORS NOTED. BOXES SHALL BE EQUIPPED WITH PLASTER RING OR COVER AS NECESSARY. ALL OUTLET BOXES SHALL BE MANUFACTURED BY STEEL CITY OR APPROVED EQUAL.
B. BOXES FOR EXPOSED WIRING SHALL BE MALLEABLE IRON, CADMIUM FINISH, OR CAST ALUMINUM ALLOY, AS MANUFACTURED BY STEEL CITY, AND SHALL NOT BE LESS THAN 4 INCHES SQUARE BY 1 ½ INCHES DEEP UNLESS OTHERWISE NOTED.
C. FIXTURE OUTLET BOXES SHALL BE MINIMUM 4 IN OCTAGONAL AND, WHERE REQUIRED AS OUTLET AND JUNCTION BOXES, THEY SHALL BE 4 11/16 INCHES BY 2 1/8 INCHES DEEP.

END OF SECTION 16133

SECTION 16190
SUPPORTING DEVICES

A. THE ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL METALLIC SUPPORTS AS REQUIRED FOR THE PROPER INSTALLATION OF RACEWAY SYSTEMS AND ALL OTHER EQUIPMENT INSTALLED UNDER THIS DIVISION OF THE CONTRACT CONFORMING TO THE LATEST EDITION OF THE NEC.
B. CONDUIT SHALL BE SUPPORTED ON APPROVED TYPES OF WALL BRACKETS, CEILING TRAPEZES, STRAP HANGERS OR PIPE SUPPORTS, SECURED BY MEANS OF TOGGLE BOLTS IN HOLLOW MASONRY WALLS OR UNITS. EXPANSION BOLTS WILL BE USED IN CONCRETE OR BLOCK MACHINE SCREWS ON METAL SURFACES AND WOOD SCREWS ON WOOD CONSTRUCTION.
C. CONDUIT SHALL BE SECURELY FASTENED TO ALL SHEET METAL OUTLETS, JUNCTION AND PULL BOXES WITH TWO GALVANIZED LOCKNUTS AND BUSHING, CARE BEING TAKEN TO SEE THAT THE FULL NUMBER OF THREADS PROJECT THROUGH TO PERMIT THE BUSHING TO BE DRAWN TIGHT AGAINST THE END OF THE CONDUIT, AFTER WHICH THE LOCKNUTS SHALL BE MADE TIGHT SUFFICIENTLY TO DRAW THEM INTO FIRM ELECTRICAL CONTACT WITH THE OUTLET BOX. INSTALL A PLASTIC BUSHING ON END OF PIPE THREADS PROTRUDING INTO JUNCTION BOXES AND OTHER ENCLOSURES TO PROTECT CABLING.
D. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SUPPORTS REQUIRED FOR THE ELECTRICAL EQUIPMENT AND CONDUIT.

END OF SECTION 16190

SECTION 16195
ELECTRICAL IDENTIFICATION

A. THE ELECTRICAL CONTRACTOR SHALL MAINTAIN ACCURATE RECORDS OF ALL DEVIATIONS IN WORK AS ACTUALLY INSTALLED FROM WORK INDICATED ON THE DRAWINGS. ON COMPLETION OF THE PROJECT, TWO (2) COMPLETE SETS OF MARKED UP PRINTS SHALL BE DELIVERED TO THE ARCHITECT.
B. IDENTIFICATION OF EQUIPMENT
1. PROVIDE AND INSTALL LAMINATED BLACK AND WHITE LAMACOID NAMEPLATES FOR ALL SERVICE SWITCHES, DISTRIBUTION SWITCHES, DISTRIBUTION SWITCHBOARDS, BRANCH CIRCUIT PANELBOARDS, SAFETY SWITCHES, CABINETS, STARTERS, AND OTHER EQUIPMENT WITH THEIR CORRECT DESIGNATION. LABEL EQUIPMENT IN AREAS ACCESSIBLE TO THE PUBLIC ON INSIDE OF ENCLOSURE ONLY. NAMEPLATES SHALL BE FIRMLY SECURED TO FRONT COVER OR DOOR WITH TWO PROPERLY SIZED POP RIVETS.
2. MOUNT A TYPEWRITTEN DIRECTORY BEHIND PLASTIC ON THE INSIDE OF EACH BRANCH CIRCUIT PANEL DOOR, GIVING THE NUMBER, DESCRIPTION AND LOCATION OF THE CIRCUIT CONTROLLED BY EACH CIRCUIT BREAKER. REVISE EXISTING DIRECTORIES TO REFLECT CIRCUIT MODIFICATIONS UNDER THIS CONTRACT.
3. ALL FUSED SAFETY SWITCHES AND FUSED SWITCH UNITS IN SWITCHBOARDS SHALL INDIVIDUALLY BEAR A FUSE LABEL SHOWING PROPER SIZE AND TYPE OF FUSE TO BE USED.
4. INSTALL WIRING DIAGRAMS ON THE INSIDE COVER OF ALL STARTERS, SWITCHES AND OTHER SUCH EQUIPMENT. SUCH DIAGRAMS SHALL NOT BE HANDWRITTEN.
5. ALL JUNCTION BOXES WITH BLANK COVERS SHALL HAVE CIRCUITS CONTAINED THEREIN IDENTIFIED BY MEANS OF PERMANENT BLACK "MAGIC MARKER" ON THE COVER.

END OF SECTION 16195

SECTION 16199
ELECTRONIC EQUIPMENT

A. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE INSTALLATION AND CONNECTION OF A PROPER POWER SUPPLY TO ALL ELECTRONIC EQUIPMENT FURNISHED BY OTHERS. HE SHALL VERIFY ALL VOLTAGE, FREQUENCY, ETC., REQUIREMENTS PRIOR TO ENERGIZING THE CIRCUIT. THOSE INSTALLING THE EQUIPMENT WILL BE RESPONSIBLE FOR THE PROPER OPERATION OF THE EQUIPMENT PROVIDED THE PROPER POWER SUPPLY CIRCUIT IS INSTALLED BY THE ELECTRICAL CONTRACTOR.
B. PROVIDE TELEPHONE LINES TO EQUIPMENT CONTROL PANELS WITH MODEM ACCESS. COORDINATE WITH MECHANICAL CONTRACTOR.

END OF SECTION 16199

SECTION 16440
DISCONNECT SWITCHES

A. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL SAFETY SWITCHES AS INDICATED ON THE DRAWINGS OR AS REQUIRED. ALL SAFETY SWITCHES SHALL BE UL LISTED.
1. THE SWITCHES SHALL BE FUSED SAFETY SWITCHES (FSS) OR NON-FUSED SAFETY SWITCHES (NFSS) AS SHOWN ON THE DRAWINGS OR REQUIRED AND SHALL BE MANUFACTURED BY SIEMENS, SQUARE D, OR APPROVED EQUAL.
2. SWITCHES SHALL HAVE A QUICK-MAKE AND QUICKBREAK OPERATING HANDLE AND MECHANISM WHICH SHALL BE AN INTEGRAL PART OF THE BOX. PADLOCKING PROVISIONS SHALL BE PROVIDED FOR PADLOCKING IN THE OFF POSITION WITH AT LEAST THREE PADLOCKS. SWITCHES SHALL BE HORSEPOWER RATED FOR 250 VOLTS AC OR DC OR 600 VOLTS AC AS REQUIRED. LUGS SHALL BE UL LISTED FOR COPPER AND ALUMINUM CABLE.
3. SWITCHES SHALL BE FURNISHED IN NEMA 1 GENERAL PURPOSE ENCLOSURES WITH KNOCKOUTS UNLESS OTHERWISE NOTED OR REQUIRED. SWITCHES LOCATED ON THE EXTERIOR OF THE BUILDING OR IN "WET" LOCATIONS SHALL HAVE NEMA 3R ENCLOSURES (WP).
4. THE SAFETY SWITCHES SHALL BE SECURELY MOUNTED IN ACCORDANCE WITH THE NEC. THE CONTRACTOR SHALL PROVIDE ALL MOUNTING MATERIALS AND INSTALL FUSES IN THE FSS. THE FUSES SHALL BE DUAL ELEMENT ON MOTOR CIRCUITS.

END OF SECTION 16440

SECTION 16450
GROUNDING

A. THE CONDUIT SYSTEMS AND NEUTRAL CONDUCTOR FOR THE WIRING SYSTEM, AND THE TELEPHONE SYSTEM SHALL BE SECURELY GROUNDED. THE GROUNDS SHALL BE NEC GROUNDS IN EACH CASE.
B. A GROUND SHALL BE ESTABLISHED AND TESTS CARRIED OUT TO INDICATE THAT SATISFACTORY GROUND HAS BEEN ESTABLISHED IN ACCORDANCE WITH THE NEC.
C. WRITTEN RESULTS OF THIS TEST SHALL BE FORWARDED TO THE ENGINEER BEFORE CONNECTION TO THE SERVICE.

END OF SECTION 16450

SECTION 16475
OVERCURRENT PROTECTIVE DEVICES

A. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL WHERE INDICATED ON THE DRAWINGS OR AS REQUIRED BY THE NEC MOLDED CASE CIRCUIT BREAKERS IN A NEMA TYPE 1 ENCLOSURE. BREAKERS SHALL BE MANUALLY OPERATED, TRIP FREE AND DESIGNED SO THAT ALL POLES OPEN SIMULTANEOUSLY. TRIPPING MECHANISM SHALL BE (THERMALLY, MAGNETICALLY) OPERATED, SHALL OPEN INSTANTANEOUSLY ON SHORT CIRCUITS AND HAVE TIME DELAY ON OVERLOADS, AND HAVE EFFECTIVE SCALING AGAINST TAMPERING. BREAKERS SHALL BE AS CALLED FOR ON THE DRAWINGS OR IN THE PANELBOARD SCHEDULE AND AS MANUFACTURED BY SIEMENS, SQUARE D, OR APPROVED EQUAL.
B. FUSES, UNLESS INDICATED OTHERWISE, SHALL BE DUAL ELEMENT, TIME LAG, CARTRIDGE TYPE AS MANUFACTURED BY BUSSMAN. FUSES FOR MOTOR CIRCUITS SHALL BE SIZED IN ACCORDANCE WITH THE NEC. LABELS INDICATING THE SIZE AND TYPE OF REPLACEMENT FUSES SHALL BE GLUED TO INSIDE OF DOOR ON ALL FUSIBLE SWITCHES AND PANELBOARDS.
C. ALL FUSES SHALL BE OF THE CURRENT AND VOLTAGE RATING AS REQUIRED OR INDICATED.
D. SPARES: SPARE FUSES AMOUNTING TO 10% (MINIMUM THREE) OF EACH TYPE AND RATING SHALL BE SUPPLIED BY THE ELECTRICAL CONTRACTOR. THESE SHALL BE TURNED OVER TO THE OWNER UPON PROJECT COMPLETION.

END OF SECTION 16475

SECTION 16900
CONTROLS AND INSTRUMENTATION

SECTION 16901
GENERAL

A. ALL EQUIPMENT AND MATERIALS USED IN RELATION TO CONTROL WORK FOR THE PROJECT SHALL BE NEW AND SHALL BEAR THE MANUFACTURER'S NAME AND TRADE NAME. THE EQUIPMENT AND MATERIAL SHALL BE ESSENTIALLY THE STANDARD PRODUCT OF A MANUFACTURER REGULARLY ENGAGED IN THE PRODUCTION OF THE REQUIRED TYPE OF EQUIPMENT AND SHALL BE THE MANUFACTURER'S LATEST APPROVED DESIGN.
B. THE ELECTRICAL CONTRACTOR SHALL RECEIVE AND PROPERLY STORE THE EQUIPMENT AND MATERIAL PERTAINING TO THE ELECTRICAL WORK. THE EQUIPMENT SHALL BE TIGHTLY COVERED AND PROTECTED AGAINST DIRT, WATER, CHEMICAL OR MECHANICAL INJURY AND THEFT. THE MANUFACTURER'S DIRECTIONS SHALL BE FOLLOWED COMPLETELY IN THE DELIVERY, STORAGE, PROTECTION AND INSTALLATION OF ALL EQUIPMENT AND MATERIALS.
C. THE ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL ALL ITEM NECESSARY FOR THE COMPLETE INSTALLATION OF THE EQUIPMENT AS RECOMMENDED OR AS REQUIRED BY THE MANUFACTURER OF THE EQUIPMENT OR REQUIRED BY CODE WITHOUT ADDITIONAL COST TO THE OWNER, REGARDLESS OF WHETHER THE ITEMS ARE SHOWN ON THE PLANS OR COVERED IN THE SPECIFICATIONS.
D. IT SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR TO CLEAN THE ELECTRICAL EQUIPMENT, MAKE NECESSARY ADJUSTMENTS AND PLACE THE EQUIPMENT INTO OPERATION BEFORE TURNING EQUIPMENT OVER TO OWNER. ANY PAINT THAT WAS SCRATCHED DURING CONSTRUCTION SHALL BE "TOUCHED-UP" WITH FACTORY COLOR PAINT TO THE SATISFACTION OF THE ARCHITECT. ANY ITEMS THAT WERE DAMAGED DURING CONSTRUCTION SHALL BE REPLACED.
E. GENERAL
1. UNLESS OTHERWISE INDICATED ALL HEATING, VENTILATING, AIR CONDITIONING, PLUMBING, AND OTHER MECHANICAL EQUIPMENT, MOTORS, AND CONTROLS SHALL BE FURNISHED, SET IN PLACE AND WIRED AS FOLLOWS.

RESPONSIBLE DIVISION

ITEM	FURNISHED	SET	POWER-WIRED	CONTROL-WIRED
EQUIPMENT	15	15	16	–
COMBINATION MAGNETIC MOTOR STARTERS, MAGNETIC MOTOR STARTERS AND CONTACTORS	15	16	16	15
FUSED AND UNFUSED DISCONNECT SWITCHES, THERMAL OVERLOAD SWITCHES AND HEATERS, MANUAL MOTOR STARTERS	16(1)	16(1)	16	–
MANUAL-OPERATING AND MULTI-SPEED SWITCHES	15	16	16	16
CONTROLS, RELAYS, TRANSFORMERS	15	15	16	15
THERMOSTATS (LOW VOLTAGE) AND TIME SWITCHES	15	15	16	15
THERMOSTATS (LINE VOLTAGE)	15	15	16	16
TEMPERATURE CONTROL PANELS	15	15	16	15
MOTOR AND SOLENOID VALVES, DAMPER MOTORS, PE & EP SWITCHES	15	15(2)	–	15(2)
PUSH-BUTTON STATIONS AND PILOT LIGHTS	15	15(2)	–	15(2)
HEATING, COOLING, VENTILATION AND AIR CONDITIONING CONTROLS	15	15	16	15
EXHAUST FAN SWITCHES	15	16	16	15(2)

SUBSCRIPT FOOTNOTES:
1) UNDER DIVISION 15 IF FURNISHED FACTORY-WIRED AS PART OF EQUIPMENT OR IF FURNISHED WITH COMBINATION STARTERS.
2) IF ITEM IS FOR LINE VOLTAGE, SET IN PLACE AND CONNECT UNDER DIVISION 16. WHERE FACTORY MOUNTED ON EQUIPMENT OR ATTACHED TO PIPING OR DUCTS AND USING LINE VOLTAGE FURNISH AND SET UNDER DIVISION 15, CONNECT UNDER DIVISION 16.

2. VERIFY LOCATION AND NAMEPLATE DATA OF ALL MECHANICAL EQUIPMENT WITH THE MECHANICAL CONTRACTOR PRIOR TO INSTALLING ELECTRICAL FACILITIES. BE RESPONSIBLE FO COORDINATION OF REVISIONS AND MODIFICATIONS NECESSARY TO PROPERLY SUPPLY ELECTRICAL FACILITIES TO HEATING, VENTILATING, AIR CONDITIONING, PUMPS, MOTORS, CONTROLS, AND OTHER MECHANICAL EQUIPMENT INSTALLED IN PLACE OF EQUIPMENT SPECIFIED. REQUIRED ELECTRICAL FACILITIES CHANGES SHALL BE CONSIDERED TO BE A PART OF THE MECHANICAL CONTRACT.
3. PROVIDE EACH MOTOR WITH A HORSEPOWER RATED DISCONNECT SWITCH AND MOTOR RUNNING OVERCURRENT PROTECTION PER N.E.C. 430-32. TO FACILITATE EASE AND SAFETY OF OPERATION AND MAINTENANCE OF MECHANICAL EQUIPMENT, LOCATE THE DISCONNECT SWITCH IMMEDIATELY ADJACENT TO THE MOTOR, UNLESS OTHERWISE INDICATED. SIZE THERMAL OVERLOAD HEATER UNITS FOR APPROXIMATELY 115% OF FULL LOAD MOTOR CURRENT. SIZE FUSES IN ACCORDANCE WITH THE ACTUAL MOTOR NAMEPLATE RATING AND AS RECOMMENDED BY THE BUSSMAN MFG. CO. CHECK AND COORDINATE ALL STARTERS, FUSES, AND OTHER MOTOR RUNNING PROTECTIVE DEVICES WITH THE EQUIPMENT THEY CONTROL, AND PROVIDE AND INSTALL THE CORRECT SIZE PROTECTIVE ELEMENTS AS REQUIRED.
4. DO NOT CONNECT MOTORS WHICH ARE OF A VOLTAGE RATING DIFFERENT THAN SUPPLY VOLTAGE. REPORT SAME TO THE ARCHITECT IN WRITING AND OBTAIN WRITTEN INSTRUCTIONS FOR RESOLUTION.
5. USE FLEXIBLE CONDUIT FOR ALL CONNECTIONS TO DEVICES DIRECTLY ATTACHED TO DUCTS, PIPING AND MECHANICAL EQUIPMENT.

END OF SECTION 16901

SECTION 16980
DEMONSTRATION OF ELECTRICAL EQUIPMENT

A. THE ELECTRICAL CONTRACTOR SHALL PROVIDE THE ARCHITECT WITH CERTIFICATION OF THE INSPECTION AND APPROVAL OF AN ACTIVE MEMBER OF THE INTERNATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS OF ALL WORK COMPLETED AND INCLUDED IN THE SECTION, IF REQUIRED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING THE INSPECTOR WHEN WORK REACHES INSPECTION STAGE.
B. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING THE LOCAL AUTHORITY HAVING JURISDICTION IN ORDER THAT LOCAL INSPECTION MAY BE CARRIED OUT AT THE PROPER STAGE.
C. THE ELECTRICAL CONTRACTOR SHALL PAY FOR ALL PERMITS, INSPECTION FEES, AND INSTALLATION FEES AS REQUIRED TO COMPLETE THE WORK UNDER THIS SECTION OF THE CONTRACT.
D. THIS CONTRACTOR SHALL GUARANTEE THE MATERIALS AND WORKMANSHIP FOR A PERIOD OF TWELVE (12) MONTHS FROM THE TIME THE INSTALLATION IS ACCEPTED BY THE OWNER. IF, DURING THIS TIME, ANY DEFECTS SHOULD SHOW UP DUE TO ANY DEFECTIVE MATERIALS, WORKMANSHIP, NEGLIGENCE OR WANT OF PROPER CARE ON THE PART OF THIS CONTRACTOR, HE SHALL FURNISH ANY NEW MATERIALS AS NECESSARY, REPAIR SAID DEFECTS, AND PUT THE SYSTEM IN ORDER AT HIS OWN EXPENSE ON RECEIPT OF NOTICE OF SUCH DEFECTS FROM THE ARCHITECT. THIS SPECIFICATION IS NOT INTENDED TO IMPLY THAT THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR NEGLIGENCE OF THE OWNER.

END OF SECTION 16980
END OF DIVISION

6-24-10

DRAWING NO.:	REFERENCE DRAWINGS:	REV:	DATE:	REVISION DESCRIPTION:	BY	BY	BY	BY

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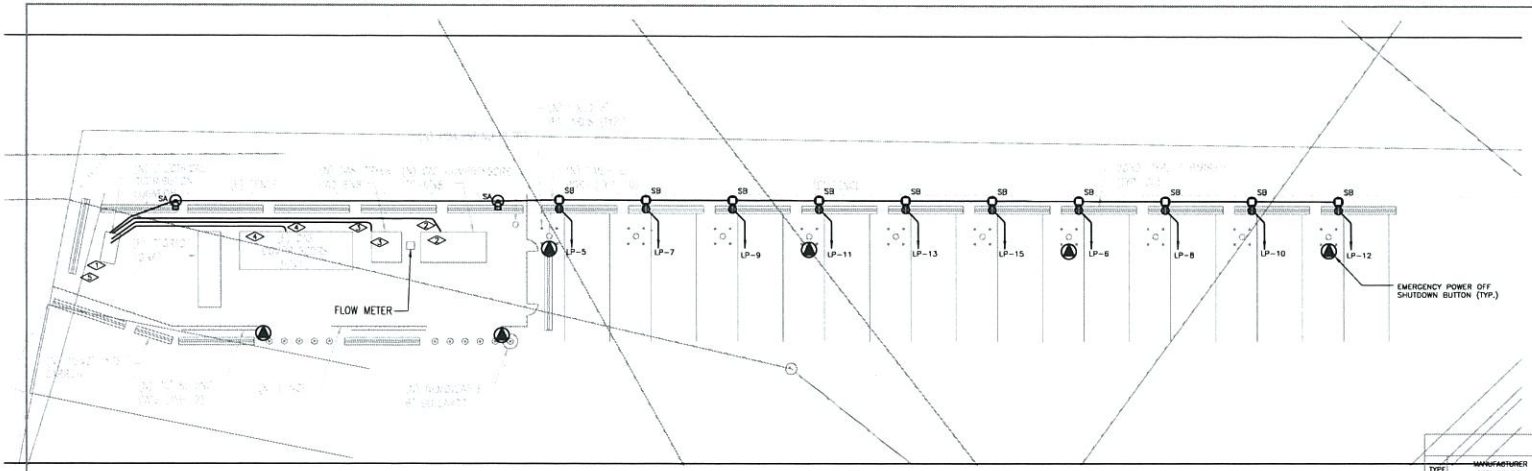
FILENAME:
PROJECT NO.: 10-081
DATE DRAWN: 06-24-2010
DRAWN BY:
CHECKED BY:

CITY OF GRAND JUNCTION

ELECTRICAL SPECIFICATIONS
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

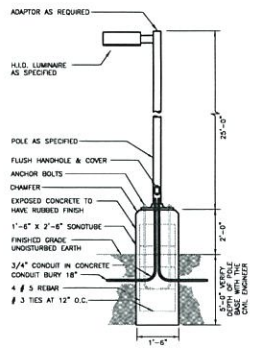
SCALE: AS SHOWN
DRAWING NO.: E1-3
REV:



ELECTRICAL FOR SITE PLAN

SCALE: 1/16"=1'-0"

NORTH



LIGHT POLE DETAIL

NOT TO SCALE

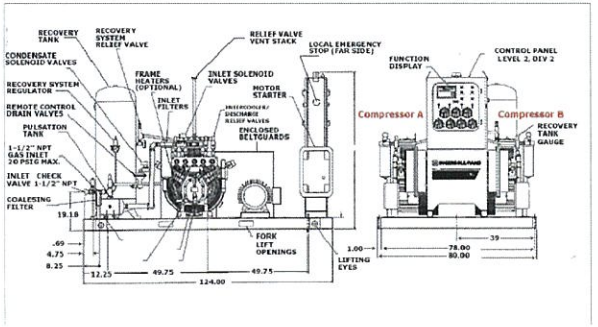
LUMINAIRE SCHEDULE

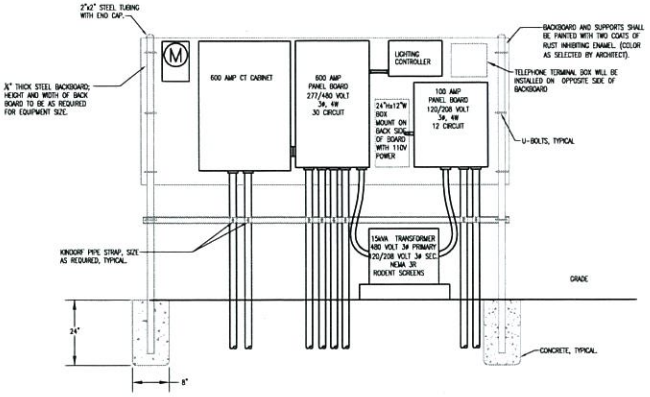
TYPE	MANUFACTURER CATALOG NO.	MANUFACTURER CATALOG NO.	VOLTAGE MOUNTING # OF LAMPS	BALLAST LAMP TYPE LAMP CAT. #	DESCRIPTION
SA	PHOENIX LIGHTING PHCT-AM-150L-50-120-BZ	APPROVED EQUIVALENT	120 25' POLE 1	INDUCTION FLOURESCENT 80 WATT	21.25"Lx15.5"Wx7.24-3"D AREA LIGHT, DARK BRONZE COLOR, SEGMENTED REFLECTOR, 25' ROUND POLE, NIGHT TIME FRIENDLY
SB	PHOENIX LIGHTING AQ-6-8-55L-F-PL-42 -BZ	APPROVED EQUIVALENT	120 42" POLE 1	INDUCTION FLOURESCENT 55 WATT	6"DIA x 60" TALL BOLLARD LIGHT, DARK BRONZE COLOR, SEGMENTED REFLECTOR, FORWARD THROW. PROVIDE W/ MOTION SENSOR

NOTES:
1. THE ELECTRICAL CONTRACTOR IS TO ORDER ALL HARDWARE AND COMPONENTS NECESSARY FOR A FULL AND COMPLETE INSTALLATION AND MOUNTING OF EACH LUMINAIRE.
2. ALL POLES TO BE STRAIGHT POLE, COLOR TO MATCH LUMINAIRES. POLE SHAFT WILL BE RATED FOR WIND GUSTS OF 100 MILES/HOUR
3. ALL FIXTURES TO COMPLY WITH LIGHT TRESPASS AND DARK SKY INITIATIVES PER LOCAL CITY ORDINANCES AND SHALL CONFORM TO SECTION 7.2F OF GRAND JUNCTION ZONING & DEVELOPMENT CODE.
4. NOTIFY ENGINEER OF ANY OBSTRUCTIONS TO POLE PLACEMENT IMMEDIATELY BEFORE PROCEEDING.
5. ORDER ALL POLE MOUNTED LUMINAIRES WITH MULTI-TAP BALLAST AND FIELD VERIFY AVAILABLE VOLTAGE FOR EACH LUMINAIRE PRIOR TO INSTALLATION.
6. ON THE STREET SIDE OF THE FIXTURE TYPE "SB" PROVIDE CUSTOM HOUSE SIDE SHIELD

ELECTRICAL SERVICE FLAG NOTES:

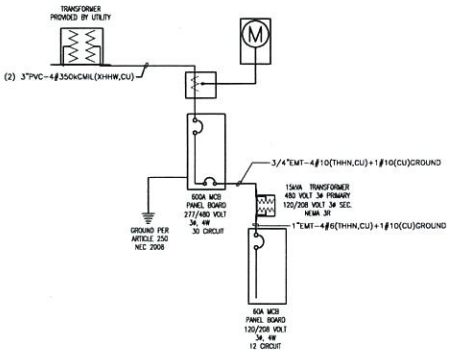
1. PROVIDE A NEW 600 AMP 480 VOLT 3 PHASE PANEL BOARD, A 30KVA TRANSFORMER AND A 60 AMP 120/208 VOLT 3 PHASE PANEL BOARD. SEE PANEL SCHEDULE AND ONE-LINE FOR ADDITIONAL INFORMATION. PANEL BOARD WILL BE LOCATED OUTSIDE OF THE CLASSIFIED AREA. THE ELECTRICAL CONTRACTOR WILL UTILIZE A BACKBOARD AND NEMA 3R PANEL BOARDS.
2. THE COMPRESSOR(S) SKID COMES WITH MOTOR STARTERS AND AN EMERGENCY STOPS. SEE DIAGRAM FOR LOCATION. ELECTRICAL CONTRACTOR WILL PROVIDE 2 RUNS OF 1" RIGID FROM PANEL TO SKID MOUNTED MOTOR STARTER. ELECTRICAL CONTRACTOR WILL PROVIDE 4#6(XHHW,CU)+1#10(CU)GROUND FROM PANEL BOARD TO SKID MOUNTED MOTOR STARTER. THE CONDUIT WILL BE SEALED IN ACCORDANCE WITH ARTICLE 500 FOR CLASS 1 DIVISION 1 CLASSIFICATION.
3. THE DRYER SKID COMES WITH A SINGLE POINT OF CONNECTION. THE ELECTRICAL CONTRACTOR WILL PROVIDE 1 RUN OF 3/4" RIGID FROM PANEL BOARD TO SKID MOUNTED DRYER. THE ELECTRICAL CONTRACTOR WILL PROVIDE 4#10(XHHW,CU)+1#10(CU)GROUND FROM PANEL BOARD TO DRYER. THE CONDUIT WILL BE SEALED IN ACCORDANCE WITH ARTICLE 500 FOR CLASS 1 DIVISION 1 CLASSIFICATION.
4. THE ELECTRICAL CONTRACTOR WILL SUPPLY 2 RUNS OF 3" RIGID FROM THE PANEL BOARD TO THE AREA DESIGNATED FOR THE FUTURE COMPRESSORS. PROVIDE PULL CORD AND CAP FOR FUTURE USE.
5. THE CITY HAS REQUESTED THAT TWO DEDICATED PHONE LINES BE INSTALLED TO THE SITE. THESE WILL BE USED TO PROVIDE DIAL OUT CAPABILITIES INCASE OF TROUBLE AT THE SITE. THE TELEPHONE INTERFACE JUNCTION BOX WILL BE MOUNTED TO THE SIDE OF THE BACK BOARD OPPOSITE THE POWER DISTRIBUTION GEAR.
6. EACH LIGHT AT THE FILLING STATIONS WILL BE EQUIPPED WITH A MOTION SENSOR THAT WILL TURN ON THE LIGHT FOR THAT STATION IN THE EVENT THAT MOTION IS SENSED. THIS WILL HAVE TO BE AN EXTERNALLY MOUNTED SENSOR AS THE SPECIFIED LIGHT DOES NOT LIST THIS AS AN OPTION. EACH POLE WILL BE EQUIPPED WITH A RECEPTACLE FOR BLOCK HEATERS.





DISTRIBUTION GEAR - ELEVATION

NOT TO SCALE



ONE-LINE DIAGRAM

NOT TO SCALE

REV	DATE	REVISION DESCRIPTION	BY	BY	BY	BY

6-24-10

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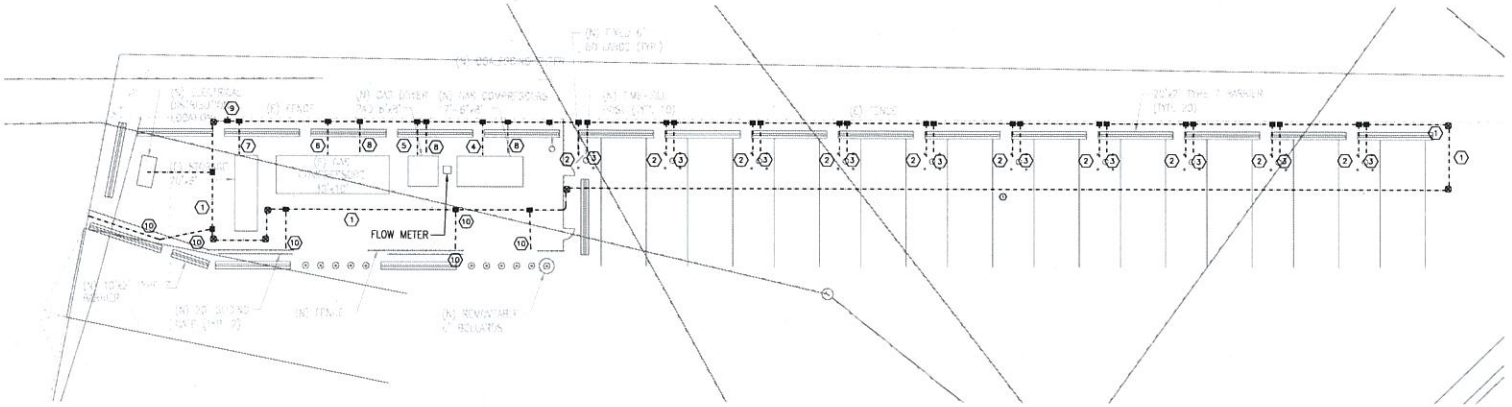
FILENAME:
PROJECT NO.: 10-081
DATE DRAWN: 06-24-2010
DRAWN BY:
CHECKED BY:

CITY OF GRAND JUNCTION

CONDUITS & ONE-LINE
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE: AS SHOWN
DRAWING NO.: ES1-1
REV.



GROUNDING GRID NOTES:

1. GROUNDING RING WILL CONSIST OF BARE 2/0 BURIED A MINIMUM OF 30" DEEP. ALL CONNECTIONS WILL BE EXOTHERMIC WELDED CONNECTORS.
2. ALL FUELING STATIONS WILL BE CONNECTED TO THE GROUNDING RING.
3. THE REBAR FOR THE FUELING STATION PADS WILL BE CONNECTED TO THE GROUNDING RING.
4. THE SKID FOR THE COMPRESSOR FOR NATURAL GAS WILL BE CONNECTED TO THE GROUNDING RING.
5. THE DRYER FRAME WILL BE CONNECTED TO THE GROUNDING GRID.
6. PROVISIONS FOR FUTURE COMPRESSORS CONNECTION TO THE GROUNDING RING WILL BE MADE.
7. THE STORAGE FRAME WILL BE CONNECTED TO THE GROUNDING GRID.
8. THE REBAR FOR THE CONCRETE PADS FOR THE DRYER, THE COMPRESSORS AND THE STORAGE WILL BE CONNECTED TO THE GROUNDING RING.
9. THE EXISTING CHAIN LINK FENCE POLE WILL BE CONNECTED TO THE GROUNDING RING.
10. THE NEW FENCE WILL BE CONNECTED TO THE GROUNDING RING. THE GATES WILL BE BONDED TO THE FENCE.

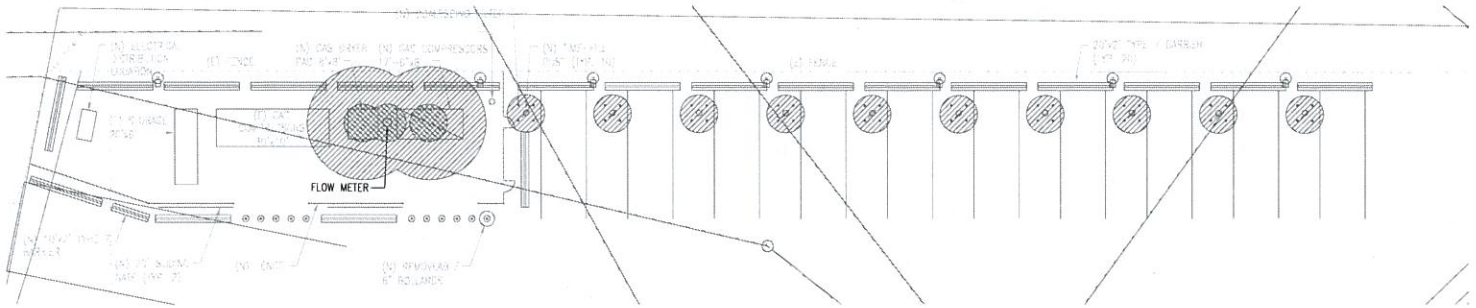
ELECTRICAL GROUNDING SITE PLAN

SCALE: 1/16"=1'-0"

NORTH

INDICATES AREAS THAT ARE CLASSIFIED AS CLASS 1 DIVISION 1. CLASS 1 DIVISION 1 AREAS WILL OCCUR AT THE FILLINGS STATION ENCLOSURE. CLASS 1 DIVISION 1 WILL OCCUR AT 5 FEET AREAS FROM THE COMPRESSOR, DRYER & ANY LOCATION WITH POTENTIAL VENTING OF NATURAL GAS.

INDICATES AREAS THAT ARE CLASSIFIED AS CLASS 1 DIVISION 2. CLASS 1 DIVISION 2 AREAS WILL OCCUR IN A 5 FEET RADIUS AREA FROM THE FILL STATIONS. CLASS 1 DIVISION 2 AREA WILL OCCUR AT THE COMPRESSOR, DRYER, AND METERING AREA. THIS AREA WILL ENCOMPASS A 10 FEET RADIUS FROM THE CLASS 1 DIVISION 1 AREA OUTWARD. THESE AREAS INDICATED BY THE SHADING.



ELECTRICAL CLASSIFIED AREAS SITE PLAN

SCALE: 1/16"=1'-0"

NORTH

DRAWING NO.	REFERENCE DRAWINGS

6-24-10

NO.	DATE	REVISION DESCRIPTION	BY	BY	BY	BY

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FILENAME:
PROJECT NO.: 10-081
DATE DRAWN: 06-24-2010
DRAWN BY:
CHECKED BY:

CITY OF GRAND JUNCTION

ELECTRICAL GROUNDING & CLASSIFIED AREA SITE PLANS
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE: AS SHOWN
DRAWING NO.: ES1-2
REV.

PANEL SCHEDULE – HP

TYPE: PANELBOARD | VOLTAGE: 277/480 | ENCLOSURE: NEMA3R | BUS SIZE: 600 | MAIN BRKR: 600 | MOUNTING: FLUSH | PHASES: 3 | WIRES: 4 | SC RATING: 42000 | NEUTRAL BUS: YES | GROUND BUS: YES

LOAD TYPE	LOAD DESCRIPTION	AMPS / POLES	CKT # / LOAD	φ	CKT # / LOAD	AMPS / POLES	LOAD TYPE	LOAD DESCRIPTION
PROCESS	---	---	1	A	2	---	PROCESS	---
	---	---	14410		49883	---		---
PROCESS	NATURAL GAS COMPRESSOR	90A 3P	3	B	4	250A 3P	PROCESS	NATURAL GAS COMPRESSOR FUTURE
	---		14410		49883			---
PROCESS	---	---	5	C	6	---	PROCESS	---
	---	---	14410		49883	---		---
PROCESS	---	---	7	A	8	---	PROCESS	---
	---	---	14410		49883	---		---
PROCESS	NATURAL GAS COMPRESSOR	90A 3P	9	B	10	250A 3P	PROCESS	NATURAL GAS COMPRESSOR FUTURE
	---		14410		49883			---
PROCESS	---	---	11	C	12	---	PROCESS	---
	---	---	14410		49883	---		---
PROCESS	---	---	13	A	14	20A 1P	SPARE	UNALLOCATED FUTURE
	---	---	6097		3500			---
PROCESS	NATURAL GAS DRYER	30A 3P	15	B	16	---	SPACE	---
	---		6097		0	---		---
PROCESS	---	---	17	C	18	---	SPACE	---
	---	---	6097		0	---		---
SPACE	---	---	19	A	20	---	SPACE	---
	---	---	0		0	---		---
SPACE	---	---	21	B	22	---	SPACE	---
	---	---	0		0	---		---
SPACE	---	---	23	C	24	---	SPACE	---
	---	---	0		0	---		---
SUBFEED	---	---	25	A	26	---	SPACE	---
	---	---	6000		0	---		---
SUBFEED	PANEL LP	30A 3P	27	B	28	---	SPACE	---
	---		6000		0	---		---
SUBFEED	---	---	29	C	30	---	SPACE	---
	---	---	6000		0	---		---

LOADS BY TYPE:

LOAD TYPE	CONNECTED LOAD (VA)	DEMAND FACTOR	DEMAND LOAD (VA)
LIGHTING	0.00	1.25	0.00
KITCHEN	0.00	1.00	0.00
PROCESS	406450.00	1.00	406450.00
RECEPTACLES	10000.00	1.00	10000.00
RECEPTACLES	5600.00	0.50	2800.00
MECH HEATING	0.00	1.00	0.00
MECH COOLING	0.00	1.00	0.00
MECH YEAR ROUND	0.00	1.00	0.00
APPLIANCE	0.00	1.00	0.00
MISCELLANEOUS	0.00	1.00	0.00
MOTOR	0.00	1.00	0.00
SPARE	3500.00	1.00	3500.00
LARGEST MOTOR [1]	ABOVE	0.25	0.00
TOTAL	425550.00		422750.00

LOADS BY PHASE:

PHASE	CONNECTED LOAD (VA)	CONNECTED LOAD (AMPS)	BALANCE (PERCENT)
A	144183.30	520.52	A–B: 97.6
B	140683.30	507.88	B–C: 100
C	140683.30	507.88	C–A: 97.6
TOTAL/AVERAGE	425550.00	512.09	98.4

NOTES:

1. THE LARGEST CONNECTED MOTOR LOAD IS INCLUDED IN MECHANICAL, PROCESS, OR MOTOR LOADS.

PANEL SCHEDULE – LP

TYPE: PANELBOARD | VOLTAGE: 120/208 | ENCLOSURE: NEMA3R | BUS SIZE: 100 | MAIN BRKR: NONE | MOUNTING: FLUSH | PHASES: 3 | WIRES: 4 | SC RATING: 12000 | NEUTRAL BUS: YES | GROUND BUS: YES

LOAD TYPE	LOAD DESCRIPTION	AMPS / POLES	CKT # / LOAD	φ	CKT # / LOAD	AMPS / POLES	LOAD TYPE	LOAD DESCRIPTION
PROCESS	CONTROL POWER	20A 1P	1	A	2	20A 1P	RECEPTACLE	SERVICE RECEPTACLE
	---		1200		1200			---
RECEPTACLE	SERVICE RECEPTACLE	20A 1P	3	B	4	20A 1P	RECEPTACLE	GATE MOTOR
	---		1200		1200			---
RECEPTACLE	POLE MOUNTED	20A 1P	5	C	6	20A 1P	RECEPTACLE	POLE MOUNTED
	---		1200		1200			---
RECEPTACLE	POLE MOUNTED	20A 1P	7	A	8	20A 1P	RECEPTACLE	POLE MOUNTED
	---		1200		1200			---
RECEPTACLE	POLE MOUNTED	20A 1P	9	B	10	20A 1P	RECEPTACLE	POLE MOUNTED
	---		1200		1200			---
RECEPTACLE	POLE MOUNTED	20A 1P	11	C	12	20A 1P	RECEPTACLE	POLE MOUNTED
	---		1200		1200			---
RECEPTACLE	POLE MOUNTED	20A 1P	13	A	14	---	SPACE	---
	---		1200		0	---		---
RECEPTACLE	POLE MOUNTED	20A 1P	15	B	16	---	SPACE	---
	---		1200		0	---		---
PROCESS	FLOW METER CONTROL	20A 1P	17	C	18	---	SPACE	---
	---		1200		0	---		---
LIGHTING	EXTERIOR LIGHTING	20A 1P	19	A	20	---	SPACE	---
	---		1340		0	---		---
SPACE	---	---	21	B	22	---	SPACE	---
	---	---	0		0	---		---
SPACE	---	---	23	C	24	---	SPACE	---
	---	---	0		0	---		---

LOADS BY TYPE:

LOAD TYPE	CONNECTED LOAD (VA)	DEMAND FACTOR	DEMAND LOAD (VA)
LIGHTING	1340.00	1.25	1675.00
KITCHEN	0.00	0.00	0.00
PROCESS	2400.00	1.00	2400.00
RECEPTACLES	10000.00	1.00	10000.00
RECEPTACLES	5600.00	0.50	2800.00
MECH HEATING	0.00	1.00	0.00
MECH COOLING	0.00	1.00	0.00
MECH YEAR ROUND	0.00	1.00	0.00
APPLIANCE	0.00	1.00	0.00
MISCELLANEOUS	0.00	1.00	0.00
MOTOR	0.00	1.00	0.00
SPARE	0.00	1.00	0.00
LARGEST MOTOR [1]	ABOVE	0.25	0.00
TOTAL	19340.00		16875.00

LOADS BY PHASE:

PHASE	CONNECTED LOAD (VA)	CONNECTED LOAD (AMPS)	BALANCE (PERCENT)
A	7340.00	61.17	A–B: 81.7
B	6000.00	50.00	B–C: 100
C	6000.00	50.00	C–A: 81.7
TOTAL/AVERAGE	19340.00	53.72	87.8

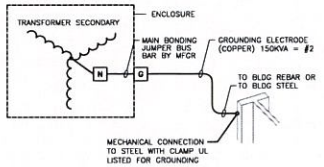
NOTES:

1. THE LARGEST CONNECTED MOTOR LOAD IS INCLUDED IN MECHANICAL, PROCESS, OR MOTOR LOADS.

ELECTRICAL LEGEND

NOTE: SYMBOLS SHOWN ARE STANDARD. VARIATION AND/OR COMBINATION MAY BE USED ON THE PLANS SUCH AS $_{3S}$ (3: SWITCHING DESIGNATION)$_{\square 7}$ (4: CIRCUIT NO.), $\square$ 30A–2P (30A–2P: 30 AMPERE–TWO POLE), ETC. THIS LIST SHOWS STANDARD SYMBOLS AND ALL MAY NOT APPEAR ON THE PROJECT DRAWINGS; HOWEVER, WHEREVER THE SYMBOL ON THE PROJECT DRAWINGS OCCUR; THE ITEM SHALL BE PROVIDED AND INSTALLED.

- BRANCH CIRCUIT PANELBOARD
- TELEPHONE TERMINAL BOARD
- ELECTRIC MOTOR
- FUSED SAFETY SWITCH / DISCONNECT COMBINATION
- MOTOR STARTER
- CONTACTOR
- 1A–7 CIRCUITRY HOMERUN: PANEL LA – CIR. #7
- CONDUIT OR WIRE CONCEALED IN WALL/CLG.
- CONDUIT OR WIRE UNDERFLOOR/UNDERGND.
- CEILING JUNCTION BOX – SURFACE/FLUSH
- WALL JUNCTION BOX – SURFACE/FLUSH
- DUPLEX RECEPTACLE
- FLOOR MOUNTED RECEPTACLE
- SPLIT WIRED DUPLEX RECEPTACLE
- FOURPLEX RECEPTACLE
- FLOOR MOUNTED FOURPLEX RECEPTACLE
- APPLIANCE RECEPTACLE – 3 WIRE
- THERMOSTAT
- COMBINATION DATA/TELEPHONE
- FLOOR MOUNTED COMBINATION DATA/TELEPHONE
- TELEVISION OUTLET
- OPEN/CLOSE/STOP PUSH BUTTON
- $ SINGLE POLE SWITCH
- $_2$ TWO POLE SWITCH
- $_3$ THREE–WAY SWITCH
- $_4$ FOUR–WAY SWITCH
- $_D$ DIMMER SWITCH
- $_M$ MOTION SENSOR LIGHT SWITCH
- $_C$ LIGHTING CONTROL STATION
- $_{MS}$ MANUAL MOTOR STARTER
- A FLUORESCENT FIXTURE TYPE A
- FLUORESCENT WALL BRACKET FIXTURE
- WALL BRACKET LIGHT FIXTURE
- OPEN STRIP FLUORESCENT FIXTURE
- SURFACE CEILING MOUNTED FIXTURE
- DOUBLE FACE EXIT SIGN, WALL AND CEILING MOUNTED
- SINGLE FACE EXIT SIGN, WALL AND CEILING MOUNTED
- WALL MOUNTED EMERGENCY LIGHT
- EMERGENCY HEAD REMOTE MOUNTED
- (M) MECHANICAL CONTRACTOR FURNISHED EQUIPMENT
- DRAWING FLAG NOTE
- ROOM (100) ROOM DESIGNATION
- NL NIGHT/SECURITY LIGHT – DO NOT SWITCH
- WP WEATHERPROOF
- A.F.F. ABOVE FINISHED FLOOR
- A.F.G. ABOVE FINISHED GRADE
- GFCI GROUND FAULT CIRCUIT INTERRUPTER
- EM EMERGENCY FUNCTION
- 44" MOUNTING HEIGHT – A.F.F. OR A.F.G. TO C.L. HIGH
- GFCI WP GROUND FAULT CIRCUIT INTERRUPTER RECEPTACLE WITH A WEATHER PROOF COVER
- GFCI 44" GROUND FAULT CIRCUIT INTERRUPTER RECEPTACLE MOUNTED AT 44" ABOVE FINISHED FLOOR



TRANSFORMER GROUNDING DETAIL

NOT TO SCALE

6-24-10

REV.	DATE	REVISION DESCRIPTION	BY	BY	BY	BY

DRAWING NO. | REFERENCE DRAWINGS:

Bighorn Consulting Engineers, Inc.
Mechanical & Electrical Engineers
569 S. Westgate Dr., Suite 1
Grand Junction, CO 81505
phone: 970-241-8709,
fax: 970-241-9514

FILENAME:
PROJECT NO. 10-081
DATE DRAWN. 06-24-2010
DRAWN BY:
CHECKED BY:

CITY OF GRAND JUNCTION

ELECTRICAL SCHEDULES AND DETAILS
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE: AS SHOWN | DRAWING NO.: ES1-3 | REV.

PROJECT PLANS FOR
CNG SLOW-FILL STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

INDEX OF SHEETS

DRAWINGS BY RAYMUNDO ENGINEERING (CNG STATION PIPING & SHOP BAY GAS DETECTION)

DRAWING NO.	TITLE
A100	COVER SHEET
A101	SITE PLAN
A102	ENLARGED – CNG SITE PLAN
A103	SIGN – REQUIREMENTS
P100	STATION FLOW DIAGRAM
P101	PIPING PLAN
P102	PIPING SECTIONS & DETAILS: DRYER, COMPRESSOR
P103	PIPING SECTION & DETAILS
P104	BILL OF MATERIALS
G201	FLOOR PLAN – GAS DETECTION
G202	REFLECTED CEILING PLAN – GAS DETECTION
G203	BUILDING ELEVATIONS
G204	GAS DETECTION CONTROL SYSTEM
G205	POWER & CONTROLS
G206	SECTIONS & DETAILS
G207	SECTIONS & DETAILS

DRAWINGS BY BIG HORN (CNG STATION ELECTRICAL & SHOP BAY MECHANICAL/ELECTRICAL)

DRAWING NO.	TITLE
M1–1	MECHANICAL FLOOR PLAN
M1–2	MECHANICAL SPECIFICATIONS
E1–1	LIGHTING AND POWER PLAN
E1–2	ELECTRICAL SCHEDULES AND DETAILS
E1–3	ELECTRICAL SPECIFICATIONS
ES1–1	CONDUITS & ONE–LINE
ES1–2	ELECTRICAL GROUNDING & CLASSIFIED AREA SITE PLANS
ES1–3	ELECTRICAL SCHEDULES AND DETAILS

DRAWINGS BY SMA (SITE & STRUCTURAL CIVIL)

DRAWING NO.	TITLE
S1	COMPRESSOR FOUNDATION & DETAILS
S2	DRYER FOUNDATION & DETAILS
S3	SHOP DOOR PLAN & DETAILS
S4	GENERAL NOTES
C1	SITE & GRADING PLAN
C2	EXPANDED SITE PLAN

CONTACTS:

PROJECT MANAGER

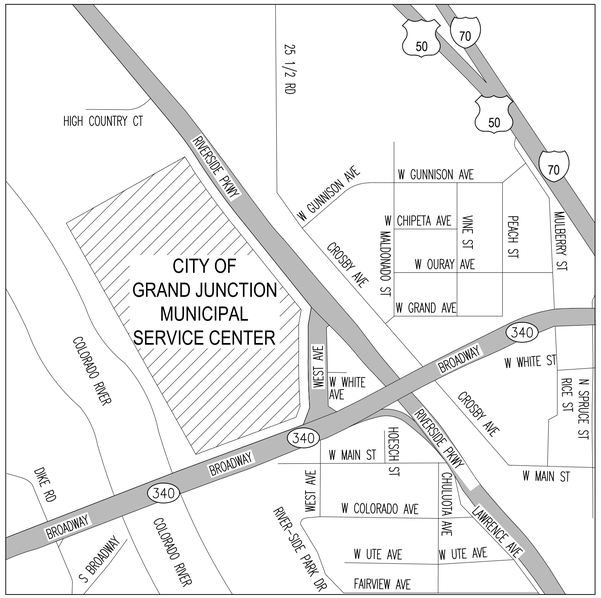
BRET GUILLORY, PE; CFM
UTILITY ENGINEER
250 N. 5TH STREET
CITY OF GRAND JUNCTION, CO 81501
PHONE: (970) 244–1590

PROJECT ENGINEER

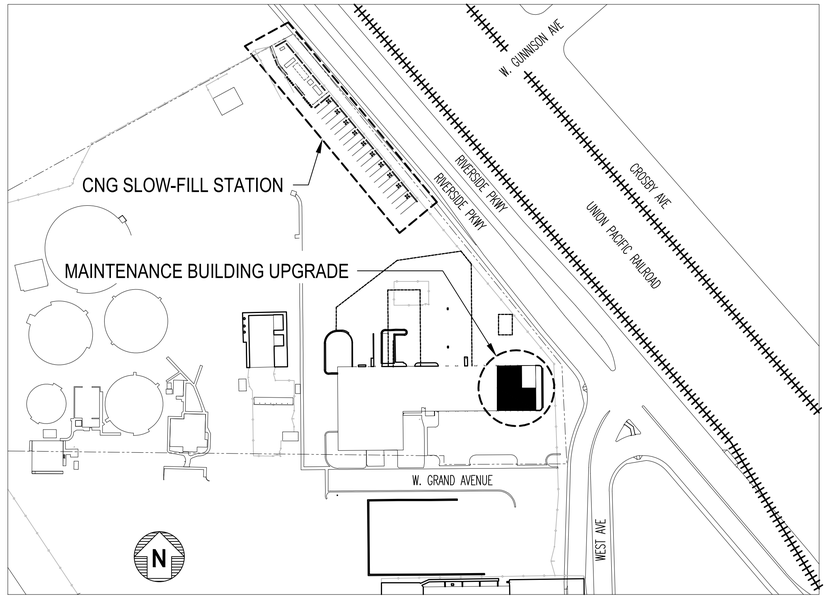
RAYMUNDO ENGINEERING
JIM DONG
390 N.WIGET LANE, STE 150
WALNUT CREEK, CA 94598
PHONE: (925) 988–8678
FAX: (925) 988–0174
EMAIL: JD@RAYMUNDO.COM

CONSTRUCTOR

TO BE DETERMINED



VICINITY MAP



PLOT – PLAN

PROJECT OBJECTIVES

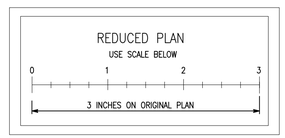
1. PROVIDE A SLOW–FILL FUELING STATION FOR UP TO TEN (10) COMPRESSED NATURAL GAS (CNG) VEHICLES.
2. PROVIDE IMPROVEMENTS TO TWO SHOP BAYS IN THE FLEET MAINTENANCE BUILDING TO ACCOMMODATE THE SAFE REPAIR AND SERVICING OF CNG VEHICLES.

NOTICE

CONTRACTOR SHALL ORGANIZE AND PERFORM WORK SO THAT EXISTING FACILITIES IN VICINITY OF PROJECT SITE REMAIN IN OPERATION DURING CONSTRUCTION.

SPECIAL INSPECTION

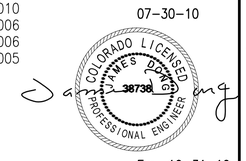
INSTALLATION OF ANCHOR BOLTS IN CONCRETE IS SUBJECT TO SPECIAL INSPECTION IN ACCORDANCE WITH THE IBC. CONTRACTOR SHALL SUBMIT SPECIAL INSPECTION REPORT TO THE LOCAL BUILDING DEPT.



THIS FACILITY SHALL CONFORM TO THE FOLLOWING CODES, STANDARDS & SPECIFICATIONS:

NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 52	2010
INTERNATIONAL BUILDING CODE	2006
INTERNATIONAL FIRE CODE WITH AMENDMENTS	2006
NATIONAL ELECTRICAL CODE	2005
PROJECT SPECIFICATIONS	

07–30–10



Exp. 10–31–10

REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
2	07–30–10	ISSUED FOR BIDS	LDG	CRL		
1A	06–24–10	ISSUED FOR PERMITS	KS	CRL		
1	06–08–10	ISSUED FOR PERMITS	KS	CRL		

DRAWING NO.: | REFERENCE DRAWINGS:

RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME:	A100.dwg
PROJECT NO.:	80
DATE DRAWN:	05–17–10
DRAWN BY:	KS
CHECKED BY:	CRL

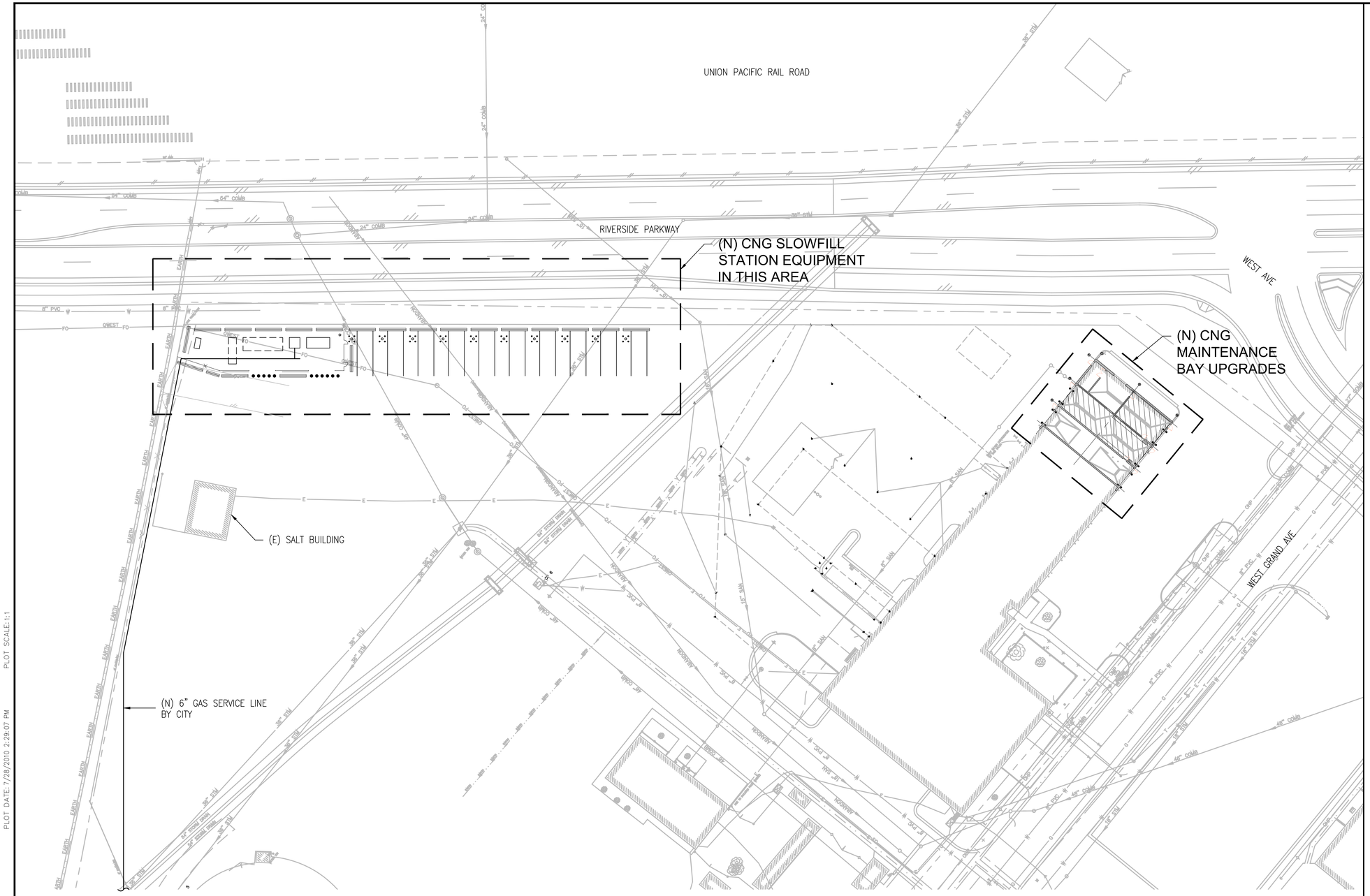
CITY OF GRAND JUNCTION

COVER–SHEET
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE:	DRAWING NO.:	REV.:
NTS	A100	2

PLOT SCALE:1:1 | PLOT DATE:7/28/2010 2:27:00 PM | SAVE DATE:7/28/2010 2:25:15 PM | 22x34

DRAWING:k:\city of grand junction\current_city of grand junction\a100_rev2.dwg



NOTES:

1. THIS DRAWING DOES NOT SHOW NEW ABOVEGROUND & UNDERGROUND CONDUITS & LINES THAT ARE TO BE INSTALLED BY CONTRACTOR TO INTERCONNECT THE NEW CNG SURFACE EQUIPMENT. SEE ELECTRICAL, PIPING, & CIVIL PLANS FOR ALL NEW ABOVEGROUND & UNDERGROUND FACILITIES.
2. NOT ALL EXISTING UNDERGROUND DUCTS & LINES ARE SHOWN. THE EXACT ROUTING & LAYOUT OF EXISTING UNDERGROUND DUCTS AND LINES MUST BE VERIFIED IN THE FIELD BEFORE EXCAVATION & PROJECT EXECUTION.

LEGEND:

(E) EXISTING

(N) NEW

SITE PLAN
1"=40'-0"

GRAPHIC SCALE
40' 0 20' 40' 80'
SCALE 1"=40'

07-30-10

COLORADO LICENSED JAMES L. CARNEY 38736 PROFESSIONAL ENGINEER

Exp. 10-31-10

08-14-09

REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
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1A	06-24-10	ISSUED FOR PERMITS	KS	CRL		
1	06-08-10	ISSUED FOR PERMITS	KS	CRL		

DRAWING NO.: | REFERENCE DRAWINGS:

FILENAME: A101.dwg
PROJECT NO.: 80
DATE DRAWN: 05-26-10
DRAWN BY: KS
CHECKED BY: CRL

CITY OF GRAND JUNCTION

SITE PLAN
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE: AS SHOWN | DRAWING NO.: A101 | REV.: 2

PLOT SCALE:1:1 PLOT DATE:7/28/2010 2:29:07 PM SAVE DATE:7/28/2010 11:13:20 AM 22x34

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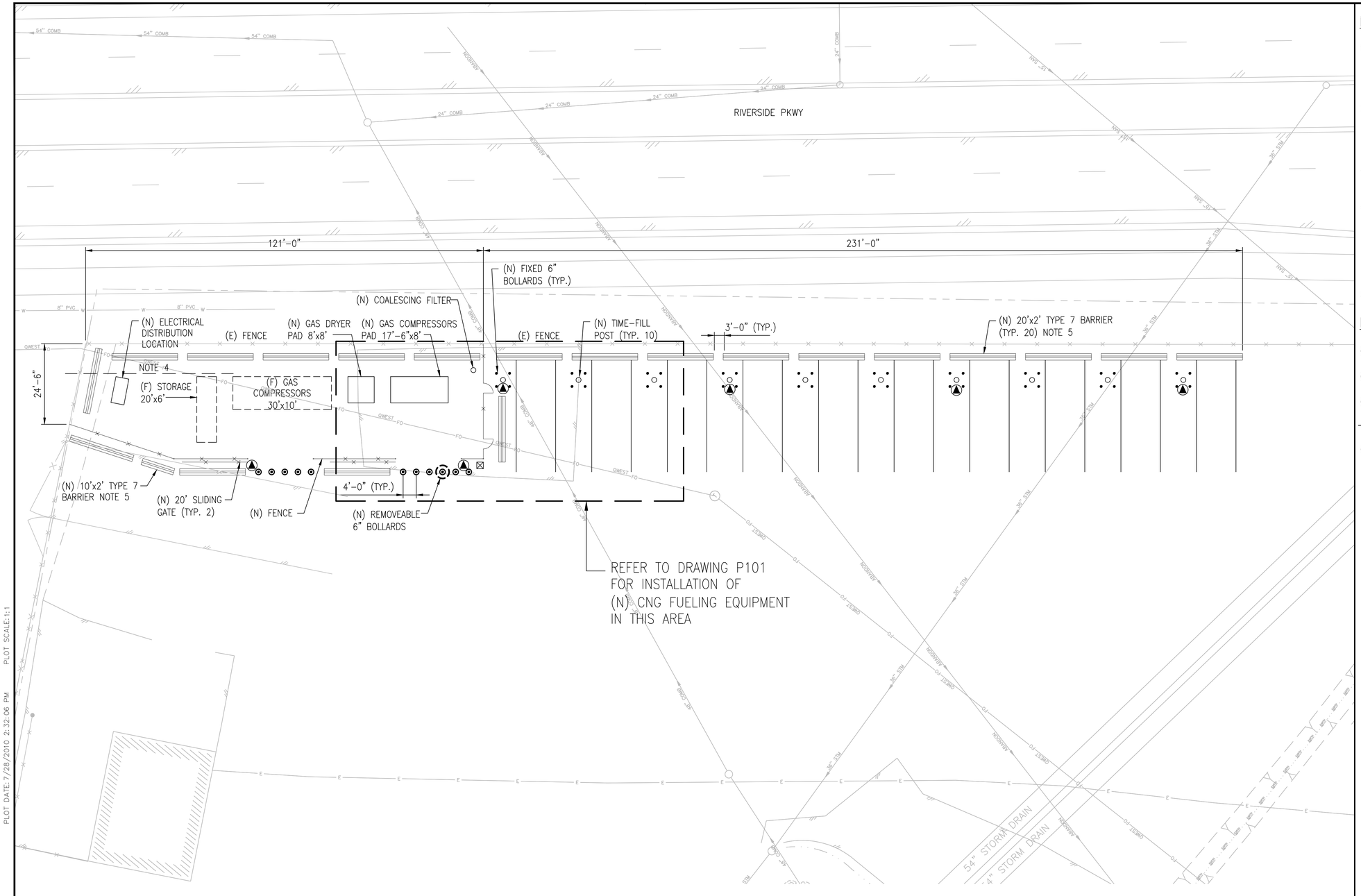

ENLARGED PLAN

SCALE: 1/16"=1'-0"

16 8 0 16 32

SCALE 1/16"=1'-0"

NOTES:

1. CNG COMPRESSION, DRYING, AND DISPENSING EQUIPMENT SHALL BE LOCATED IN COMPLIANCE WITH THE INTERNATIONAL FIRE CODE AND THE NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 52 – VEHICULAR GASEOUS FUEL SYSTEMS CODE.
2. NOT ALL UNDERGROUND UTILITIES AND SUBSTRUCTURES ARE SHOWN. THOSE SHOWN ARE FOR REFERENCE ONLY. EXACT ROUTING AND LAYOUT OF EXISTING LINES AND SUBSTRUCTURES SHOULD BE VERIFIED IN THE FIELD BEFORE EXCAVATION AND PROJECT EXECUTION.
3. CONTRACTOR SHALL PROVIDE ALL EQUIPMENT, STRUCTURES, AND MATERIAL DESIGNATED AS "NEW" (N) UNLESS SPECIFIED OTHERWISE.
4. CONTRACTOR SHALL PROVIDE THREE (3) BURIED 4" PVC SLEEVES SCH 80 AS INDICATED FOR FUTURE COMPRESSOR(S) DISCHARGE. TOP OF COVER SHALL BE THREE (3) FEET MINIMUM. SLEEVE ENDS SHALL BE SECURELY FITTED WITH A CAP TO PREVENT WATER INTRUSION. CONTRACTOR SHALL IDENTIFY LOCATION OF BURIED SLEEVE ENDS WITH VINYL FLAGS. REFER TO CNG TRENCH DETAIL FOR ADDITIONAL REQUIREMENTS.
5. CONTRACTOR SHALL ANCHOR ALL TYPE 7 BARRIERS.

LEGEND:

(E)	EXISTING
(N)	NEW
(F)	FUTURE
-x-x-x-	FENCE
▲	ESD EMERGENCY SHUTDOWN PUSHBUTTON & FIRE EXTINGUISHER (20-B:C MIN) W/ WEATHER-PROOF ENCLOSURE SUITABLE FOR BOLLARD/FENCE MOUNTING.
⊠	KNOX BOX AS SPECIFIED BY LOCAL AUTHORITIES HAVING JURISDICTION

07-30-10

COLORADO LICENSED JAMES L. DONG 38738 PROFESSIONAL ENGINEER

Exp. 10-31-10

08-14-09

REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
2	07-30-10	ISSUED FOR BIDS	LDG	CRL		
1A	06-24-10	ISSUED FOR PERMITS	KS	CRL		
1	06-08-10	ISSUED FOR PERMITS	KS	CRL		
A	05-24-10	ISSUED FOR REVIEW	KS	CRL		

DRAWING NO.: | REFERENCE DRAWINGS:

RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME: A102.dwg
PROJECT NO.: 80
DATE DRAWN: 05-24-10
DRAWN BY: KS
CHECKED BY: CRL

CITY OF GRAND JUNCTION

ENLARGED – CNG SITE PLAN
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE: AS SHOWN | DRAWING NO.: A102 | REV.: 2

22x34 SAVE DATE: 7/28/2010 11:18:28 AM PLOT DATE: 7/28/2010 2:32:06 PM PLOT SCALE:1:1

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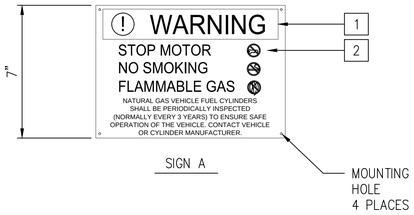
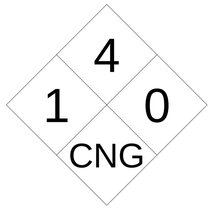


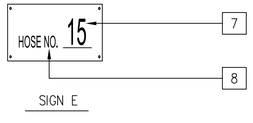
SIGN A

SIGN B

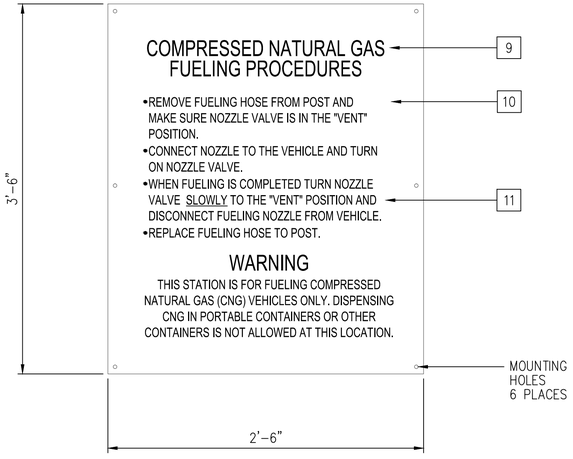
SIGN C



SIGN D



SIGN E



SIGN F

NOTES:

GENERAL:

SIGNS "A" THRU "F" AND "D" SHALL BE MADE OF 0.08 INCH THICK ALUMINUM. LETTERS TO BE 3M WEATHERIZED VINYL. BORDERS TO BE 1/2 " THICK; BACKGROUND = WHITE (EXCEPT FOR SIGN "D". BACKGROUND COLORS SHALL BE IN ACCORDANCE WITH NFPA 704)

SIGN A

1 BLACK SAN SERIF, 1⅜" HIGH, WITH 3/16" STROKE, ORANGE BACKROUND

2 BLACK SAN SERIF, 9/16" HIGH WITH 1/16" STROKE, CENTER JUSTIFIED, WHITE BACKGROUND

3 NOT USED

SIGN B

4 RED HELVETICA, 1⅝" HIGH WITH 3/32" STROKE, CENTER JUSTIFIED, WHITE BACKGROUND

SIGN C

5 RED HELVETICA, ⅞" HIGH WITH 3/32" STROKE, CENTER JUSTIFIED, WHITE BACKGROUND

6 RED HELVETICA, 9/16" HIGH WITH 1/16" STROKE, WHITE BACKGROUND

SIGN E

7 BLACK HELVETICA, 3" HIGH WITH ¼" STROKE. HOSE NUMBER SHALL BE 15, WHITE BACKGROUND

8 BLACK HELVETICA, 1" HIGH WITH ⅛" STROKE, WHITE BACKGROUND

SIGN F

9 TITLES ARE TO BE 1 3/4" HIGH BLUE HELVETICA WITH 1/4" STROKE, CENTER JUSTIFIED.

10 BLUE HELVETICA, 1" WITH 1/8" STROKE. TEXT MAY BE "FORCE JUSTIFIED" SO IT IS FLUSH TO BOTH LEFT AND RIGHT MARGINS. SENTENCES TO BE 1 1/4" APART. LEFT MARGIN SHALL BE 1" WIDE.

11 WORD "SLOWLY" SHALL BE RED HELVETICA, 1" HIGH WITH 3/16" STROKE, AND UNDERLINED.

SIGN SCHEDULE "A"

I.D.	HEADING (1)	MESSAGE (1)	OSHA GRAPHIC	SIZE WxH	MATL. (2) (3)	REF. CAT. # (4) (5)
A	SEE DETAIL					
B	SEE DETAIL					
C	SEE DETAIL					
D	SEE DETAIL		NO	7½"x7½"	AL	SETON M8818
E	SEE DETAIL		NO	4"x8"	AL	SETON
F	SEE DETAIL		NO		AL	
G	CAUTION	BURIED GAS LINE BELOW	NO	6" WIDE	PET	SETON 37237
H	CAUTION	BURIED ELECTRIC LINE BELOW	NO	6" WIDE	PET	SETON 37236
I		FIRE EXTINGUISHER	YES	24"x12"	AL	SETON 37799
J	DANGER	HIGH VOLTAGE KEEP OUT	YES	14"x10"	AL	SETON M2469
K	DANGER	AUTO START EQUIPMENT	YES	10"x7"	AL	SETON M9578

NOTES:

(1) ALL SIGNS EXCEPT SIGN "D", SHALL BE IN ACCORDANCE WITH OSHA SPECIFICATIONS 1910.145 AND ANSI SPECIFICATIONS Z535. SIGN "D" SHALL BE IN ACCORDANCE WITH NFPA 704.

(2) ALL SIGNS SHALL BE SUITABLE FOR OUTDOOR USE.

(3) MATERIAL CODE: PRESSURE-SENSITIVE VINYL (PSV); ALUMINUM (AL); POLYETHYLENE TAPE (PET); VINYL (VYL)

(4) VENDORS LISTED ARE ONLY FOR ESTABLISHING STANDARDS OF QUALITY AND PERFORMANCE. OTHER MANUFACTURERS MAY BE SUBSTITUTED IF APPROVED AS EQUAL BY THE ENGINEER.

(5) THIS LIST OF SIGNS IS NOT NECESSARILY ALL INCLUSIVE OR 100% COMPLETE. CONTRACTOR SHALL SUPPLY ALL EQUIPMENT AND MATERIALS NECESSARY FOR A COMPLETE SYSTEM.

SIGN SCHEDULE "B"

LOCATION	REQUIRED SIGNS AND QUANTITY (EACH LOCATION)
EMERGENCY STATION SHUTDOWN PB	(2)B, (2)C, (2)I
EVERY 50' OF PERIMETER FENCE @ CNG STATION & SLOW - FILL AREAS	(1)A, (1)C, (1)D
BURIED GAS LINE	(ENTIRE LENGTH)G
BURIED ELECTRIC LINE	(ENTIRE LENGTH)H
CNG STATION FENCE FACING SLOW - FILL AREA	(1)F
SLOW - FILL POST (10 POSTS)	(1)A, (1)E,
ELECTRICAL DISTRIBUTION PANEL	(4)J
COMPRESSOR ENCLOSURE (DOOR & SIDES)	(4)D, (4)J, (4)K

NOTES:

(1) ALL SIGNS SHALL BE PROVIDED BY CONTRACTOR. CONTRACTOR SHALL PROVIDE ALL BRACKETS, SUPPORTS, AND OTHER HARDWARE TO SECURELY MOUNT SIGNS IN PLACE. ALL METALLIC MOUNTING HARDWARE SHALL BE GALVANIZED STEEL. FOR POLE MOUNTING, USE STRAPS. FOR FENCE MOUNTING, USE MOUNTING HOLES.

(2) ALL EQUIPMENT, DEVICES, AND VALVES SHALL BE TAGGED AND ALL LINES SHALL BE IDENTIFIED TO MEET ANSI/ASME A13.3.

(3) SEE A102 FOR FACILITY LAYOUT.

07-30-10

COLORADO LICENSED JAMES D. PIKAS 38738 PROFESSIONAL ENGINEER

Exp. 10-31-10

REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
2	07-30-10	ISSUED FOR BIDS	LDG	CRL		
1	06-08-10	ISSUED FOR PERMITS	KS	CRL		

DRAWING NO.: | REFERENCE DRAWINGS:

RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME: A103.dwg
PROJECT NO.: 80
DATE DRAWN: 05-26-10
DRAWN BY: KS
CHECKED BY: CRL

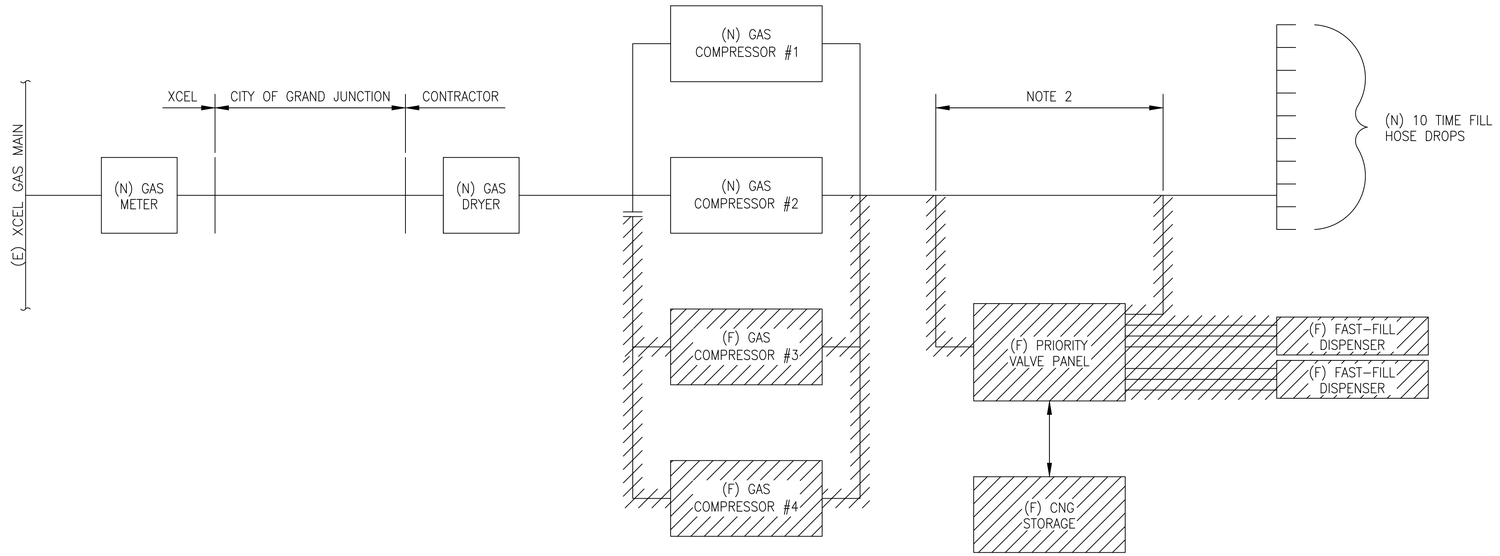
CITY OF GRAND JUNCTION

SIGN - REQUIREMENTS
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE: NTS | DRAWING NO.: A103 | REV.: 2

NOTES:

1. THIS DRAWING IS SCHEMATIC IN NATURE. CONTRACTOR SHALL COORDINATE AND PROVIDE ALL EQUIPMENT FOR A COMPLETE AND OPERABLE CNG FILL STATION AS SHOWN IN PHASE 1.
2. FOR PHASE 2, LINE SHOULD BE REMOVED TO ALLOW ALL CNG TO FLOW THROUGH THE PRIORITY PANEL.



EQUIPMENT	GAS METER	GAS DRYER	GAS COMPRESSORS	PRIORITY CONTROL/STORAGE	DISPENSING
PHASE 1	100 SCFM	500 SCFM	2 X 50 SCFM (40 HP EA)	N/A	10 X HOSE DROPS
PHASE 2 FUTURE (NOT IN CONTRACT)	500 SCFM	500 SCFM	2 X 50 SCFM 2 X 200 SCFM	3 – BANK CASCADE	10 X HOSE DROPS 2 X FAST-FILL DISPENSERS

LEGEND:

(E) EXISTING

(N) NEW

(F) FUTURE (NOT IN CONTRACT)

/// FUTURE (NOT IN CONTRACT)

07-30-10

COLORADO LICENSED JAMES C. KNOX 38738 PROFESSIONAL ENGINEER

Exp. 10-31-10

REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
2	07-30-10	ISSUED FOR BIDS	LDG	CRL		
1	06-08-10	ISSUED FOR PERMITS	KS	CRL		
A	05-21-10	30% DESIGN SUBMITTAL	KS	CRL		

DRAWING NO.: | REFERENCE DRAWINGS:

RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME: P100.dwg
PROJECT NO.: 80
DATE DRAWN: 05-21-10
DRAWN BY: KS
CHECKED BY: CRL

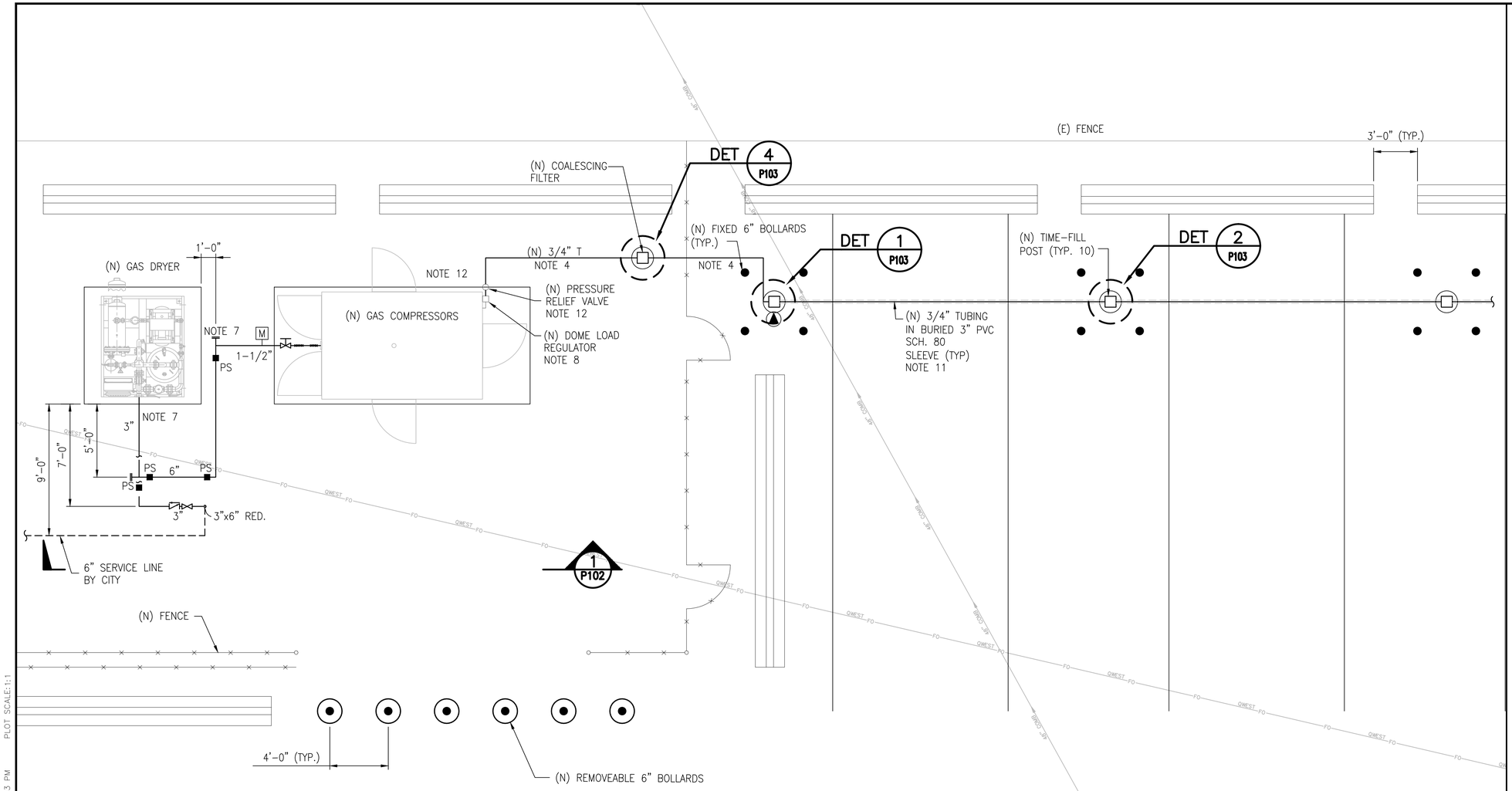
CITY OF GRAND JUNCTION

STATION FLOW DIAGRAM
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE: AS SHOWN | DRAWING NO.: P100 | REV.: 2

22x34 SAVE DATE: 7/28/2010 11:49:13 AM PLOT DATE: 7/28/2010 2:47:03 PM PLOT SCALE:1:1

DRAWING:K:\city of grand junction\current_city of grand junction\p100_rev2.dwg



NOTES:

1. CNG COMPRESSION, DRYING, AND DISPENSING EQUIPMENT SHALL BE LOCATED IN COMPLIANCE WITH THE INTERNATIONAL FIRE CODE AND THE NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 52 – VEHICULAR GASEOUS FUEL SYSTEMS CODE.
2. NOT ALL UNDERGROUND UTILITIES AND SUBSTRUCTURES ARE SHOWN. THOSE SHOWN ARE FOR REFERENCE ONLY. EXACT ROUTING AND LAYOUT OF EXISTING LINES AND SUBSTRUCTURES SHOULD BE VERIFIED IN THE FIELD BEFORE EXCAVATION AND PROJECT EXECUTION.
3. CONTRACTOR SHALL PROVIDE ALL EQUIPMENT, STRUCTURES, AND MATERIAL DESIGNATED AS "NEW" (N) UNLESS SPECIFIED OTHERWISE. ANY ADDITIONAL MATERIALS NOT SHOWN BUT REQUIRED BY CONTRACTOR TO INSTALL EQUIPMENT AND INTERCONNECTING PIPING/TUBING SHALL BE INCLUDED IN THE BID PRICE.
4. CONTRACTOR SHALL PROTECT PIPING AND TUBING FROM MECHANICAL DAMAGE. SUPPORT TUBING EVERY FIVE FEET AND INSTALL METAL THRESHOLDS OVER TUBING FOR PROTECTION FROM FOOT TRAFFIC.
5. CONTRACTOR SHALL IDENTIFY PIPING AND TUBING BY COLOR CODING, PAINTING, AND MARKINGS AS APPROPRIATE IN ACCORDANCE WITH ASME A13.1. MARKINGS SHALL IDENTIFY CONTENTS AND FLOW DIRECTION.
6. CONTRACTOR SHALL COORDINATE INSTALLATION OF THE GAS SERVICE LINE WITH THE CITY.
7. CONTRACTOR SHALL PROVIDE PRESSURE GAUGE AT INLET AND OUTLET OF GAS DRYER. SEE DETAIL 5 ON DRAWING P103.
8. CONTRACTOR SHALL PROVIDE DOME LOAD REGULATOR. REGULATOR SHALL BE INSTALLED ON EXTERIOR OF COMPRESSOR ENCLOSURE.
9. PIPE SUPPORTS FOR 6" DIAMETER PIPING SHALL BE FIGURE 510-F TYPE PRE-FABRICATED SUPPORTS BY E-Z LINE PIPE SUPPORT CO. (713) 675-6693. SUPPORTS SHALL INCLUDE BASE PLATES WITH SLOTTED HOLES FOR ANCHORS. CONTRACTOR SHALL INSTALL CONCRETE FOOTING FOR PIPE SUPPORTS.
10. PIPE SUPPORTS FOR 1-1/2" AND 3" DIAMETER PIPING SHALL BE FIGURE 204-F TYPE PRE-FABRICATED SUPPORTS BY E-Z LINE PIPE SUPPORT CO. (713) 675-6693. SUPPORTS SHALL INCLUDE BASE PLATES WITH SLOTTED HOLES FOR ANCHORS. CONTRACTOR SHALL INSTALL CONCRETE FOOTING FOR PIPE SUPPORTS.
11. CONTRACTOR SHALL PLACE A 3-INCH THICK, 18-INCH WIDE LAYER OF RED SLURRY 6-INCHES ABOVE PVC SLEEVES.
12. CONTRACTOR SHALL PROVIDE A PRESSURE RELIEF VALVE (PRV) RATED FOR 5,000 PSIG MINIMUM DOWNSTREAM FROM THE DOME LOAD REGULATOR. PRV SET POINT SHALL BE 4,500 PSIG. PRV SHALL BE SUPPORTED TO WITHSTAND REACTIVE DISCHARGE FORCES AND DISCHARGE SHALL BE VENTED A MINIMUM OF TEN FEET ABOVE GRADE.

LEGEND:

(E)	EXISTING
(N)	NEW
●	(N) FIXED BOLLARDS
◉	(N) REMOVEABLE BOLLARDS
PS	(N) PIPE SUPPORT

(29) STATION INLET

DESIGN CRITERIA PER ASME B31.3

D.P. 275 PSIG 22.3 % PA
MAOP 275 PSIG 22.3 % PA
STRENGTH TEST PRESSURE
MAX. 400 PSIG 32.5 % PA
MIN. 350 PSIG 28.4 % PA
1107 PSIG=90% PA
TEST FLUID NITROGEN
PIPE SPEC ASTM A106, GR.B
O.D. 3.500 IN.
W.T. 0.216 IN
WELD INSPECTION PER ASME B31.3
☐ RADIOGRAPHIC: ☐ 20% MIN. ☒ 100%

* P_A – MAXIMUM INTERNAL DESIGN PRESSURE BASED ON S_A, BASIC ALLOWABLE STRESS, FROM ASME B31.3

(28) COMPRESSOR INLET

DESIGN CRITERIA PER ASME B31.3

D.P. 275 PSIG 21.9 % PA
MAOP 275 PSIG 21.9 % PA
STRENGTH TEST PRESSURE
MAX. 400 PSIG 31.8 % PA
MIN. 350 PSIG 27.9 % PA
1128 PSIG=90% PA
TEST FLUID NITROGEN
PIPE SPEC ASTM A106, GR.B
O.D. 1.900 IN
W.T. 0.145 IN
WELD INSPECTION PER ASME B31.3
☐ RADIOGRAPHIC: ☐ 20% MIN. ☒ 100%

* P_A – MAXIMUM INTERNAL DESIGN PRESSURE BASED ON S_A, BASIC ALLOWABLE STRESS, FROM ASME B31.3

(30) COMPRESSOR HEADER

DESIGN CRITERIA PER ASME B31.3

D.P. 275 PSIG 30.4 % PA
MAOP 275 PSIG 30.4 % PA
STRENGTH TEST PRESSURE
MAX. 400 PSIG 44.2 % PA
MIN. 350 PSIG 38.7 % PA
813 PSIG=90% PA
TEST FLUID NITROGEN
PIPE SPEC ASTM A106, GR.B
O.D. 6.625 IN
W.T. 0.280 IN
WELD INSPECTION PER ASME B31.3
☐ RADIOGRAPHIC: ☐ 20% MIN. ☒ 100%

* P_A – MAXIMUM INTERNAL DESIGN PRESSURE BASED ON S_A, BASIC ALLOWABLE STRESS, FROM ASME B31.3

(45) CNG

DESIGN CRITERIA PER ASME B31.3

D.P. 5000 PSIG 86.4 % PA
MAOP 5000 PSIG 86.4 % PA
STRENGTH TEST PRESSURE
MAX. 5800 PSIG 100.3% PA
MIN. 5500 PSIG 95.1 % PA
5203 PSIG=90% PA
TEST FLUID NITROGEN
PIPE SPEC ASTM A213, 316SS, SMLS
O.D. 0.250 IN
W.T. 0.035 IN
WELD INSPECTION PER ASME B31.3
☐ RADIOGRAPHIC: ☐ 20% MIN. ☐ 100%

* P_A – MAXIMUM INTERNAL DESIGN PRESSURE BASED ON S_A, BASIC ALLOWABLE STRESS, FROM ASME B31.3

(46) CNG

DESIGN CRITERIA PER ASME B31.3

D.P. 5000 PSIG 92.7 % PA
MAOP 5000 PSIG 92.7 % PA
STRENGTH TEST PRESSURE
MAX. 5800 PSIG 107.5% PA
MIN. 5500 PSIG 102.0% PA
4852 PSIG=90% PA
TEST FLUID NITROGEN
PIPE SPEC ASTM A213, 316SS, SMLS
O.D. 0.375 IN
W.T. 0.049 IN
WELD INSPECTION PER ASME B31.3
☐ RADIOGRAPHIC: ☐ 20% MIN. ☐ 100%

* P_A – MAXIMUM INTERNAL DESIGN PRESSURE BASED ON S_A, BASIC ALLOWABLE STRESS, FROM ASME B31.3

(47) CNG

DESIGN CRITERIA PER ASME B31.3

D.P. 5000 PSIG 92.9 % PA
MAOP 5000 PSIG 92.9 % PA
STRENGTH TEST PRESSURE
MAX. 5800 PSIG 107.7% PA
MIN. 5500 PSIG 102.2% PA
4842 PSIG=90% PA
TEST FLUID NITROGEN
PIPE SPEC ASTM A213, 316SS, SMLS
O.D. 0.500 IN
W.T. 0.065 IN
WELD INSPECTION PER ASME B31.3
☐ RADIOGRAPHIC: ☐ 20% MIN. ☐ 100%

* P_A – MAXIMUM INTERNAL DESIGN PRESSURE BASED ON S_A, BASIC ALLOWABLE STRESS, FROM ASME B31.3

(48) CNG

DESIGN CRITERIA PER ASME B31.3

D.P. 5000 PSIG 81.6 % PA
MAOP 5000 PSIG 81.6 % PA
STRENGTH TEST PRESSURE
MAX. 5800 PSIG 94.7 % PA
MIN. 5500 PSIG 89.8 % PA
5508 PSIG=90% PA
TEST FLUID NITROGEN
PIPE SPEC ASTM A213, 316SS, SMLS
O.D. 0.750 IN
W.T. 0.109 IN
WELD INSPECTION PER ASME B31.3
☐ RADIOGRAPHIC: ☐ 20% MIN. ☐ 100%

* P_A – MAXIMUM INTERNAL DESIGN PRESSURE BASED ON S_A, BASIC ALLOWABLE STRESS, FROM ASME B31.3

PIPING PLAN

1/4"=1'-0"

4 2 0 4 8

SCALE 1/4"=1'-0"

07-30-10

COLORADO LICENSED JAMES D. KRUG 38738 PROFESSIONAL ENGINEER

Exp. 10-31-10

DRAWING NO.:	REFERENCE DRAWINGS:
P102	PIPING SECTION
P103	PIPING DETAILS
P104	PIPING BILL OF MATERIALS

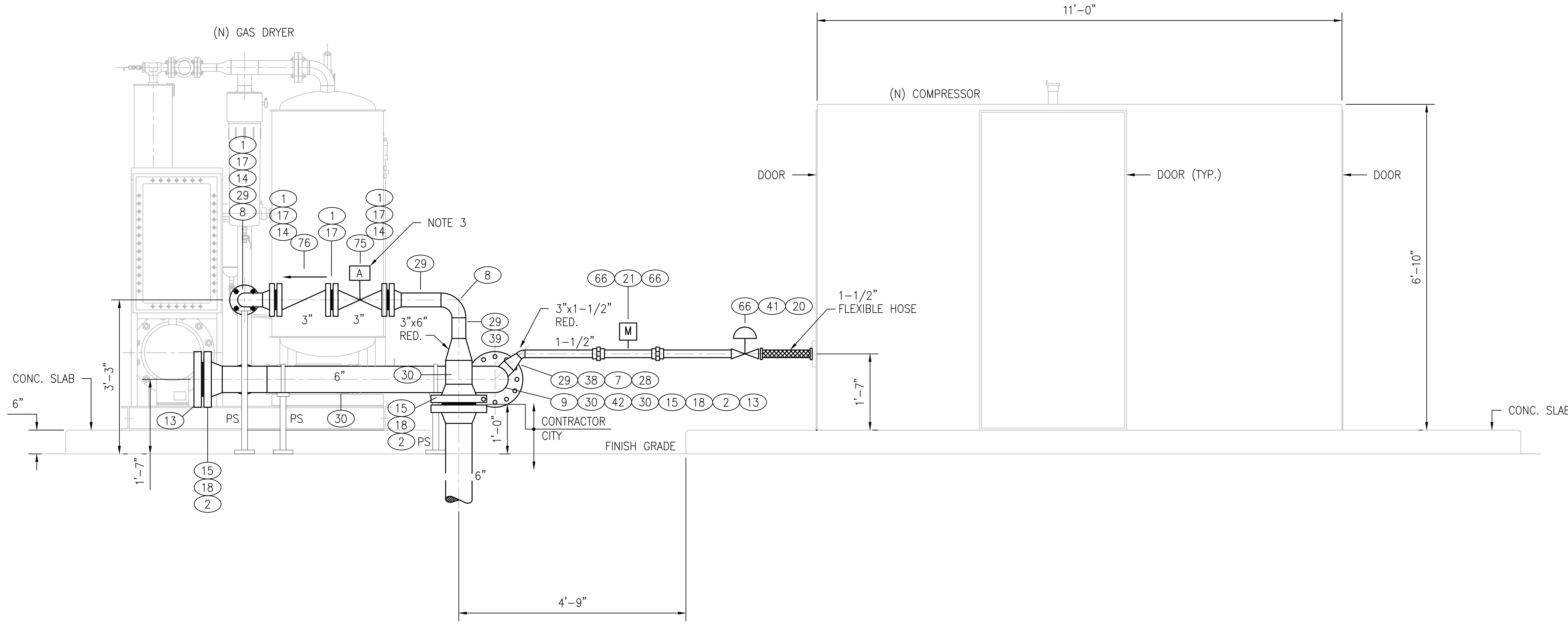
REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
2	07-30-10	ISSUED FOR BIDS	LDG	CRL		
1A	06-24-10	ISSUED FOR PERMITS	KS	CRL		
1	06-08-10	ISSUED FOR PERMITS	KS	CRL		

FILENAME:	P101.dwg
PROJECT NO.:	80
DATE DRAWN:	05-27-10
DRAWN BY:	KS
CHECKED BY:	CRL

CITY OF GRAND JUNCTION

PIPING PLAN
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE:	DRAWING NO.:	REV.:
AS SHOWN	P101	2



NOTES:

1. CONTRACTOR SHALL SUPPORT AND PROTECT PIPING AND TUBING AGAINST MECHANICAL DAMAGE. TUBING SHALL BE SUPPORTED EVERY FIVE FEET.
2. NOT ALL PIPE SUPPORTS ARE SHOWN FOR CLARITY.
3. CONTRACTOR SHALL PROVIDE A 3/8" 316 STAINLESS STEEL TUBING RUN FROM THE GAS DRYER FOR POWER GAS TO OPERATE THE PNEUMATIC ACTUATOR ON THE STATION INLET SHUTOFF VALVE. ACTIVATION OF THE STATION EMERGENCY SHUTDOWN SYSTEM SHALL CLOSE THE SHUTOFF VALVE. SHUTOFF VALVE SHALL BE API 607 FIRE RATED AND CLOSE ON LOSS OF POWER GAS.

LEGEND:

(N)	NEW
PS	(N) PIPE SUPPORT
M	FLOW METER
A	ACTUATOR

07-30-10

COLORADO LICENSED PROFESSIONAL ENGINEER 38738

Exp. 10-31-10

SECTION 1/P102 P101 — 3/4"=1'-0"

(N) DRYER & (N) COMPRESSOR

DRAWING NO.	REFERENCE DRAWINGS
P104	PIPING BILL OF MATERIALS

REV.	DATE	REVISION DESCRIPTION	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
2	07-30-10	ISSUED FOR BIDS	LDG	CRL		
1A	06-24-10	ISSUED FOR PERMITS	KS	CRL		
1	06-08-10	ISSUED FOR PERMITS	KS	CRL		

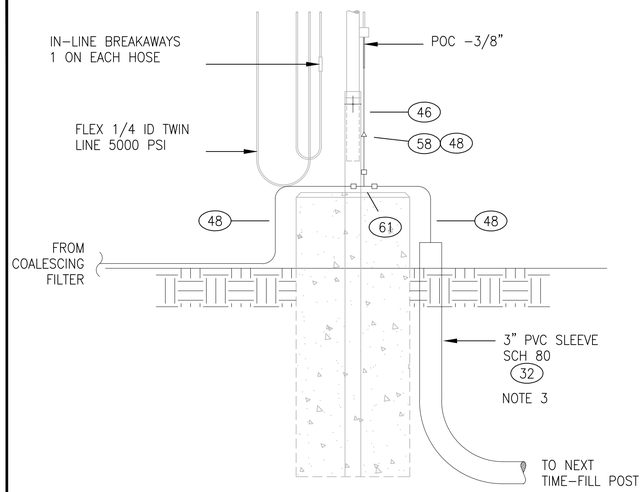
RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME: P102.dwg
PROJECT NO.: 80
DATE DRAWN: 05-27-10
DRAWN BY: KS
CHECKED BY: CRL

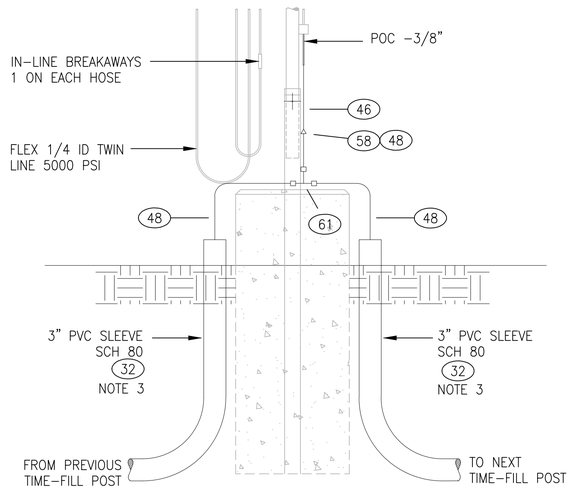
CITY OF GRAND JUNCTION

PIPING SECTIONS & DETAILS: DRYER, COMPRESSOR
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

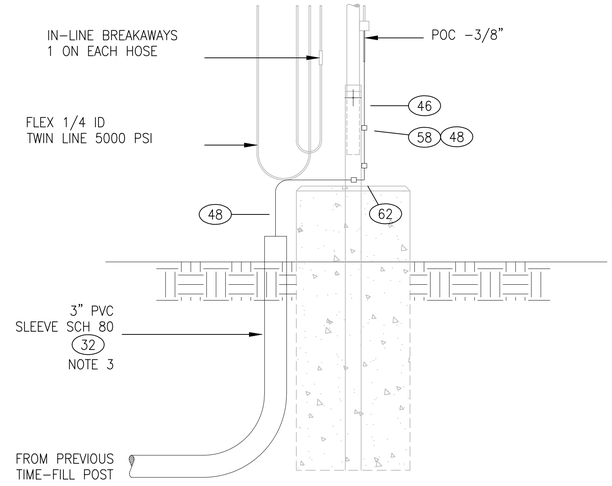
SCALE: AS SHOWN | DRAWING NO.: P102 | REV.: 2



DETAIL 1 NTS P103 — FIRST TIME-FILL POST



DETAIL 2 NTS P103 — INTERMEDIATE TIME-FILL POSTS



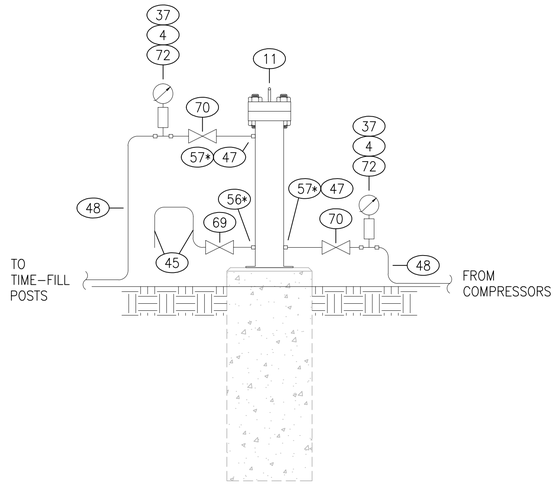
DETAIL 3 NTS P103 — LAST TIME-FILL POST

NOTES:

1. CONTRACTOR SHALL SUPPORT AND PROTECT PIPING AND TUBING AGAINST MECHANICAL DAMAGE. TUBING SHALL BE SUPPORTED EVERY FIVE FEET AND INSTALL METAL THRESHOLDS OVER TUBING FOR PROTECTION FROM FOOT TRAFFIC.
2. CONTRACTOR SHALL INSERT 3/4" O.D. SS TUBING IN 3" PVC CONDUIT FOR TIME-FILL SUPPLY. USE LONG RADIUS BENDS ONLY. END OF PVC SLEEVE SHALL EXTEND A MINIMUM OF 2" ABOVE GRADE. SECURELY COVER THE SLEEVE ENDS AT ALL TIMES UNTIL A WEATHER-PROOF NON-SHRINK SEALANT IS APPLIED TO PREVENT WATER FROM ENTERING THE SLEEVE.
3. CONTRACTOR SHALL PLACE A 3-INCH THICK, 18-INCH WIDE LAYER OF RED SLURRY 6-INCHES ABOVE PVC SLEEVES.

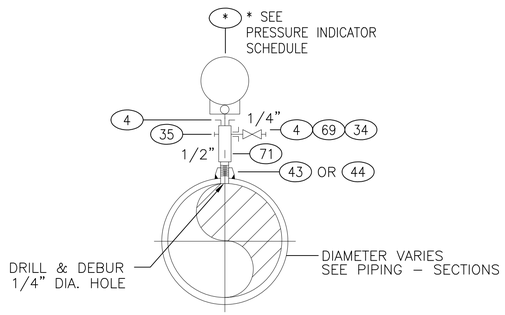
LEGEND:

POC POINT OF CONNECTION



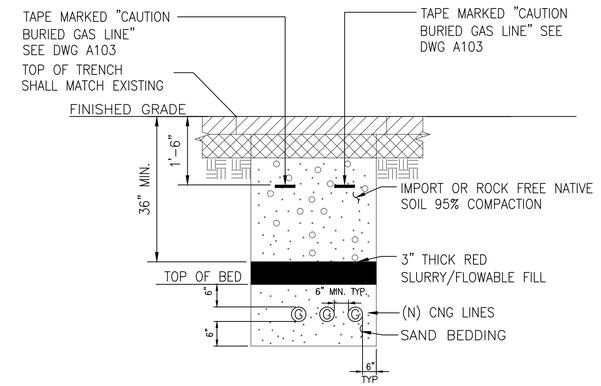
* - POC

DETAIL 4 NTS P103 — COALESCING FILTER



PRESSURE INDICATOR SCHEDULE			
TAG NO.	B/M ITEM NO.	RANGE (PSIG)	LOCATION
PI-1	36	0-60	STATION INLET
PI-2	36	0-60	COMPRESSOR INLET

DETAIL 5 NTS P103 — PRESSURE TAP & INDICATOR



DETAIL 6 NTS P103 — CNG TRENCH SECTION

07-30-10

COLORADO LICENSED
JAMES C. KRAMER
38736
PROFESSIONAL ENGINEER

Exp. 10-31-10

REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
2	07-30-10	ISSUED FOR BIDS	LDG	CRL		
1	06-08-10	ISSUED FOR PERMITS	KS	CRL		

DRAWING NO.: | REFERENCE DRAWINGS:

RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME: P103.dwg
PROJECT NO.: 80
DATE DRAWN: 05-27-10
DRAWN BY: KS
CHECKED BY: CRL

CITY OF GRAND JUNCTION

PIPING SECTIONS & DETAILS
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE: AS SHOWN | DRAWING NO.: P103 | REV.: 2

PLOT SCALE:1:1 PLOT DATE:7/28/2010 2:53:26 PM SAVE DATE:7/28/2010 2:52:53 PM 22x34

DRAWING:K:\city of grand junction\current_city of grand junction\p103_rev2.dwg

ITEM NO.	DESCRIPTION	PRESSURE RATING	MAT'L TYPE	SIZE	SPECIFICATION	MANUFACTURER	PART No.
1	BOLT, STUD W/ (2) HEAVY HEX NUTS, FOR 3" ANSI 150 FLG		STEEL	5/8" DIA. x 3-3/4" LONG	ASTM A193-B7 W/ A194-2H NUTS		
2	BOLT, STUD W/ (2) HEAVY HEX NUTS, FOR 6" ANSI 150 FLG		STEEL	3/4" DIA. x 4-3/4" LONG	ASTM A193-B7 W/ A194-2H NUTS		
4	BUSHING, HEX HEAD, THREADED	6000 PSIG MAX WP	FORGED STL	1/2" x 1/4"	ASTM A-105	ANVIL	2139
7	ELBOW, BUTT WELDING, 45 DEGREE	SCH. 40	SMLS STL	1-1/2" NOM. DIA.	ASTM A-106 GRADE B	ANVIL	
8	ELBOW, BUTT WELDING, 90 DEGREE	SCH. 40	SMLS STL	3" NOM. DIA.	ASTM A-106 GRADE B	ANVIL	
9	ELBOW, BUTT WELDING, 90 DEGREE	SCH. 40	SMLS STL	6" NOM. DIA.	ASTM A-106 GRADE B	ANVIL	
11	FILTER, COALESCING	6000 PSIG		3/4" FNPT INLET/OUTLET		NOWATA	THE FUELGUARD
13	FLANGE,BLIND	ANSI 150	FORGED STL	6" NOM. DIA.			
14	FLANGE, WN BEVEL TO 3.500" O.D. x 0.216" W.T. PIPE, RF	ANSI 150	FORGED STL	3" NOM. DIA.			
15	FLANGE, WN BEVEL TO 6.625" O.D. x 0.280" W.T. PIPE, RF	ANSI 150	FORGED STL	6" NOM. DIA.			
17	GASKET, FF, G-10 GLASS EPOXY, FOR 3" ANSI 150 FLG	ANSI 150	GLASS EPOXY		ANSI B-16.21 AND B-16.5	PSI	
18	GASKET, FF, G-10 GLASS EPOXY, FOR 6" ANSI 150 FLG	ANSI 150	GLASS EPOXY		ANSI B-16.21 AND B-16.5	PSI	
20	HOSE, SINGLE BRAIDED CONNECTOR, THREADED ENDS, 12" LONG			1-1/2" MNPT x 1-1/2" MNPT		FLEXICRAFT	
21	FLOW METER, MASTER TOUCH		316 SS	1-1/2" MNPT x 14" LONG		ELDRIDGE PRODUCTS, INC	8112MP
23	NIPPLE, PIPE THREADED BOTH ENDS		316 SS	1-1/2" NPT x 3" LONG		SWAGELOK	SS-16-HLN
24	NIPPLE, PIPE THREADED BOTH ENDS		CARBON STL	1-1/2" NPT x 3" LONG	ASTM A106 GRADE B	ANVIL	
25	NIPPLE, PIPE THREADED BOTH ENDS		CARBON STL	3/4" NPT x 4" LONG	ASTM A106 GRADE B	ANVIL	
28	PIPE, BARE	SCH. 40	SMLS STL	1-1/2" NOM. DIA.	ASTM A106 GRADE B	U.S. STEEL	
29	PIPE, BARE	SCH. 40	SMLS STL	3" NOM. DIA.	ASTM A106 GRADE B	U.S. STEEL	
30	PIPE, BARE	SCH. 40	SMLS STL	6" NOM. DIA.	ASTM A106 GRADE B	U.S. STEEL	
32	PIPE, BARE, WITH TRACER WIRE, LONG RADIUS BENDS ONLY	SCH. 80	PVC	3" NOM. DIA.			
33	PIPE, BARE, WITH TRACER WIRE, LONG RADIUS BENDS ONLY	SCH. 80	PVC	4" NOM. DIA.			
34	PLUG, HEX HEAD, THREADED	6000 PSIG MAX WP	FORGED STL	1/4" NOM. DIA	ASTM A105 / ANSI B16.11	VOGT	SERIES 2580
35	PLUG, HEX HEAD, THREADED	6000 PSIG MAX WP	FORGED STL	1/2" NOM. DIA.	ASTM A105 / ANSI B16.11	VOGT	SERIES 2580
36	PRESSURE GAUGE, BOURDON, LIQUID FILLED, 0-60 PSIG			1/2% ACC. 4.5" DIAL, 1/4" PORT		ASHCROFT	
37	PRESSURE GAUGE, BOURDON, LIQUID FILLED, 0-5000 PSIG			1/2% ACC. 4.5" DIAL, 1/4" PORT		ASHCROFT	
37A	PRESSURE RELIEF VALVE, SET POINT AT 4500 PSIG	5000 PSIG		3/4"			
38	REDUCER CONCENTRIC, WELDING	SCH. 40	SMLS STL	1-1/2" x 3"	ASTM A-106 GR. B/ ANSI B16.9		
39	REDUCER CONCENTRIC, WELDING	SCH. 40	SMLS STL	3" x 6"	ASTM A-106 GR. B/ ANSI B16.9		
40	REGULATOR, DOME LOAD	5000 PSIG		3/4"			
41	REGULATOR, PRESSURE		CARBON STL	1-1/2"			
42	TEE, PIPE, WELDED			6"x6"x3"			
43	THREADOLET, REDUCING	3000 PSIG MAX WP	FORGED STL	1/2" NPT x 3" RUN		BONNEY FORGE	THREADOLET
44	THREADOLET, REDUCING	3000 PSIG MAX WP	FORGED STL	1/2" NPT x 6" RUN		BONNEY FORGE	THREADOLET
45	TUBING, ANNEALED		316 SS	1/4" O.D. x 0.035" WALL	ASTM A-213		
46	TUBING, ANNEALED		316 SS	3/8" O.D. x 0.049" WALL	ASTM A-213		
47	TUBING, ANNEALED		316 SS	1/2" O.D. x 0.065" WALL	ASTM A-213		
48	TUBING, ANNEALED		316 SS	3/4" O.D. x 0.109" WALL	ASTM A-213		
56	TUBE FITTING, MALE STRAIGHT REDUCING CONNECTOR		316 SS	1/4" T x 1/2" NPT		SWAGELOK	SS-400-1-8
57	TUBE FITTING, MALE STRAIGHT REDUCING CONNECTOR		316 SS	1/2" T x 3/4" NPT		SWAGELOK	SS-810-1-12
58	TUBE FITTING, REDUCING UNION		316 SS	3/4" T x 3/8" T		SWAGELOK	SS-1210-6-6
61	TUBE FITTING, UNION TEE		316 SS	3/4" T x 3/4" T x 3/4" T		SWAGELOK	SS-1210-3
62	TUBE FITTING, UNION ELBOW		316 SS	3/4" x 3/4"		SWAGELOK	SS-1210-9
66	UNION, PIPE, THREADED	3000 PSIG	FORGED STL	1-1/2" NPT			
69	VALVE, HAND, NEEDLE	6000 PSIG MAX WP	316 SS	1/4" T x 1/4" T		HOKE	2112G4Y
70	VALVE, HAND, BALL	5000 PSIG	316 SS	1/2" T x 1/2" T		HOKE	7223G8Y
71	VALVE, HAND, MULTI-PORT, GUAGE, THREADED	6000 PSIG MAX WP	CARBON STL	1/2" MNPT x 1/2" FNPT		AGCO	M5VDC-44
72	VALVE, HAND, GUAGE, THREADED	6000 PSIG MAX WP	316 SS	1/2" MNPT x 1/2" FNPT		AGCO	M9VIS-44C
75	VALVE, BALL, WITH PNEUMATIC ACTUATOR	ANSI 150	CARBON STL	3" FLG x 3" FLG	API 607	JAMESBBURY	3" 9150-31-2236XTZ/VPVL600-SR4/5/LR1598/EF8551A001MS
76	VALVE, CHECK	ANSI 150	CARBON STL	3" FLG x 3" FLG	BUNA-N-SEAL	KF INDUSTRIES	KF SERIES 35

07-30-10

COLORADO LICENSED JAMES C. KNOX 38736 PROFESSIONAL ENGINEER

Exp. 10-31-10

NOTES:

1. THIS BILL OF MATERIALS IS FOR GENERAL REFERENCE ONLY. CONTRACTOR SHALL PROVIDE A COMPLETE AND OPERABLE FACILITY AND SHALL BE RESPONSIBLE FOR DETERMINING MATERIALS AND THEIR QUANTITIES IN ACCORDANCE WITH THE APPLICABLE DRAWINGS AND SPECIFICATIONS AND MATERIALS SHALL NOT BE LIMITED TO THE STATED ITEMS ON THE DRAWINGS AND BILL OF MATERIALS.

REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY:	CHECKED BY	APPROVED BY	APPROVED BY
2	07-30-10	ISSUED FOR BIDS	LDG	CRL		
1A	06-24-10	ISSUED FOR PERMITS	KS	CRL		
1	06-08-10	ISSUED FOR PERMITS	KS	CRL		

DRAWING NO.:

REFERENCE DRAWINGS:

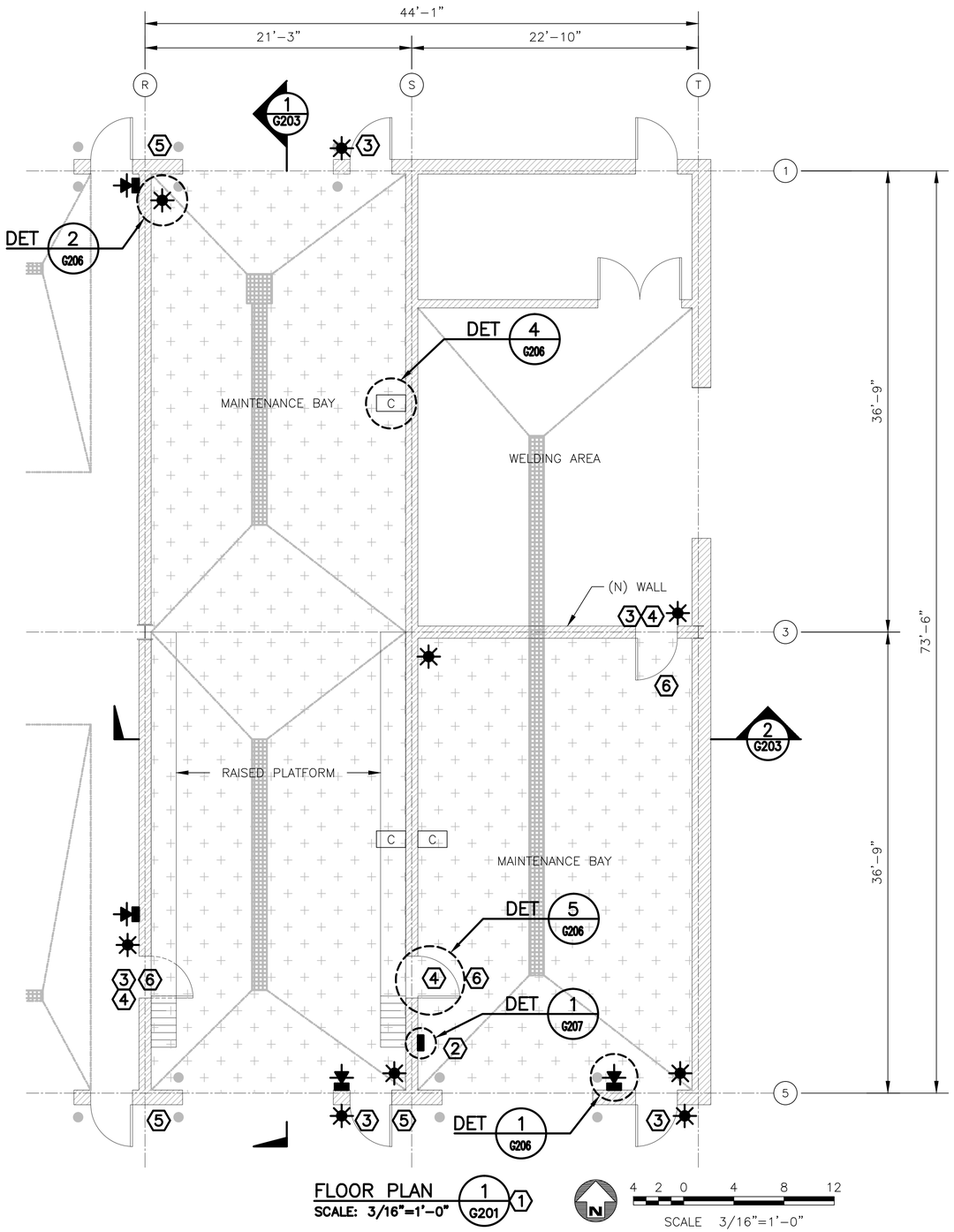
RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME: P104.dwg
PROJECT NO.: 80
DATE DRAWN: 05-27-10
DRAWN BY: KS
CHECKED BY: CRL

CITY OF GRAND JUNCTION

BILL OF MATERIALS
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE: AS SHOWN
DRAWING NO.: P104
REV.: 2



FLOOR PLAN 1 G201 1
SCALE: 3/16"=1'-0"

N

4 2 0 4 8 12
SCALE 3/16"=1'-0"

KEYNOTES:

1. PROVIDE HORNS AND FLASHING STROBES AT DESIGNATED LOCATIONS IN AND ADJACENT TO THE AREA FOR THE REPAIR AND SERVICING OF CNG VEHICLES (IFC 2211.7.2.2.1). HORNS AND STROBES SHALL BE ACTIVATED UPON GAS DETECTION AT 25% LFL.
2. PROVIDE CNG GAS DETECTION CONTROL PANEL, BACKUP BATTERY SYSTEM, AND AUTODIALER.
3. PROVIDE THE FOLLOWING SIGN ON THE SIDE OF THE DOOR FACING AWAY FROM THE AREA DESIGNATED FOR CNG VEHICLES:

SIGN SHALL BE MULTI-LAYER ACRYLIC, 10" x 7" MINIMUM, WITH WARNING HEADER. SIGN SHALL COMPLYWITH ANSI Z535.2 ENVIRONMENTAL AND FACILITY SAFETY SIGNS STANDARD.

4. PROVIDE THE FOLLOWING SIGN ON BOTH SIDES OF THE DOOR:

SIGN SHALL BE MULTI-LAYERED ACRYLIC, 10" x 7" MINIMUM, SIGN SHALL COMPLY WITH ANSI Z535.2 ENVIRONMENTAL AND FACILITY SAFETY SIGNS STANDARD.

5. PROVIDE THE FOLLOWING SIGN NEXT TO GARAGE DOOR:

SIGN SHALL BE MULTI-LAYERED ACRYLIC, 30" x 22" MINIMUM. SIGN SHALL COMPLY WITH ANSI Z535.2 ENVIRONMENTAL AND FACILITY SAFETY SIGNS STANDARD.

6. PROVIDE DOOR CLOSER.

LEGEND:

- AREAS DESIGNATED FOR THE REPAIR AND SERVICING OF CNG VEHICLES
- (N) GAS ALARM HORN
- (N) GAS ALARM FLASHING STROBE
- (E) EXISTING
- (N) NEW
- C (N) GAS SENSOR CALIBRATION STATION

SHEET NOTES:

1. AN OBJECTIVE OF THIS PROJECT IS TO PROVIDE BUILDING IMPROVEMENTS TO ACCOMMODATE THE SAFE REPAIR, SERVICING & STORAGE OF COMPRESSED NATURAL GAS (CNG) VEHICLES WITHIN THE AREAS DESIGNATED. THE AREAS DESIGNATED FOR CNG BUSES SHALL CONTINUE TO BE AVAILABLE FOR THE REPAIR AND SERVICING OF LIQUID FUELED VEHICLES.
2. THIS DRAWING IS INTENDED TO SCHEMATICALLY SHOW THE MODIFICATIONS TO ACCOMMODATE THE REPAIR, SERVICING & STORAGE OF CNG VEHICLES WITHIN THE AREAS DESIGNATED FOR CNG VEHICLES. CONTRACTOR SHALL REFER TO THE ELECTRICAL AND MECHANICAL DESIGN DRAWINGS FOR INSTALLATION DETAILS OF EQUIPMENT.
3. EXISTING BUILDING CONDITIONS SHOWN IN THIS DRAWING WERE OBTAINED FROM THE 1982 PHASE 1 MUNICIPAL SERVICE CENTER CITY OF GRAND JUNCTION, COLORADO CONSTRUCTION RECORD.
4. CONTRACTOR SHALL VISIT THE JOB SITE AND VERIFY ALL CONDITIONS, LOCATIONS, AND DIMENSIONS BEFORE STARTING WORK.
5. CITY PERSONNEL SHALL PERFORM THE FOLLOWING ACTIVITIES PRIOR TO ALLOWING CNG VEHICLES TO ENTER THE AREAS DESIGNATED FOR THE REPAIR AND SERVICING OF CNG VEHICLES:
   a. CNG FUEL SHUTOFF VALVES SHALL BE CLOSED PRIOR TO WORK ON ANY PORTION OF THE VEHICLES FUEL SYSTEM (IFC 2211.5).
   b. CNG VEHICLES WHICH MAY HAVE SUSTAINED DAMAGE TO THE FUEL SYSTEM SHALL BE INSPECTED AND EVALUATED FOR FUEL SYSTEM INTEGRITY. INSPECTION SHALL INCLUDE TESTING THE ENTIRE FUEL DELIVERY SYSTEM USING A HAND-HELD GAS DETECTOR (IFC 2211.5).
   c. CNG VEHICLES SHALL CONTAIN NO MORE THAN 500 PSIG OF CNG.
6. PROVIDE A STANDBY BATTERY AND CHARGING SYSTEM TO PROVIDE BACK UP POWER TO GAS DETECTION PANEL.
7. CONTRACTOR SHALL PROVIDE CALIBRATION STATIONS TO ALLOW PERSONNEL TO INTRODUCE CALIBRATION GAS TO EACH GAS SENSOR. A CALIBRATION LINE SHALL BE ATTACHED TO EACH CEILING MOUNTED GAS SENSOR TO FACILITATE THE INTRODUCTION OF CALIBRATION GAS FROM GROUND LEVEL WITHOUT THE USE OF LIFTING DEVICES. CALIBRATION LINES FROM THE GAS SENSOR SHALL BE GROUPED TOGETHER AT STRATEGICALLY LOCATED CALIBRATION STATIONS. THE LENGTH OF THE CALIBRATION LINE TO EACH SENSOR SHALL NOT EXCEED SIXTY FEET.
8. PROVIDE THE FOLLOWING SIGN NEXT TO THE GARAGE DOORS FOR THE BAYS NOT UPGRADED FOR CNG VEHICLES (TYP. 14).

SIGN SHALL BE MULTI-LAYERED ACRYLIC, 30" x 22" MINIMUM, WITH NOTICE HEADER AND DOOR GRAPHIC. SIGN SHALL COMPLY WITH ANSI Z535.2 ENVIRONMENTAL AND FACILITY SAFETY SIGNS STANDARD.

07-30-10

COLORADO LICENSED CHARLES L. DORAN 38738 PROFESSIONAL ENGINEER

Exp. 10-31-10

REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
2	07-30-10	ISSUED FOR BIDS	LDG	CRL		
1A	06-24-10	ISSUED FOR PERMITS	KS	CRL		
1	06-08-10	ISSUED FOR PERMITS	KS	CRL		
A	05-21-10	30% DESIGN SUBMITTAL	KS	CRL		

DRAWING NO.: | REFERENCE DRAWINGS:

RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME: G201.dwg
PROJECT NO.: 80
DATE DRAWN: 05-21-10
DRAWN BY: KS
CHECKED BY: CRL

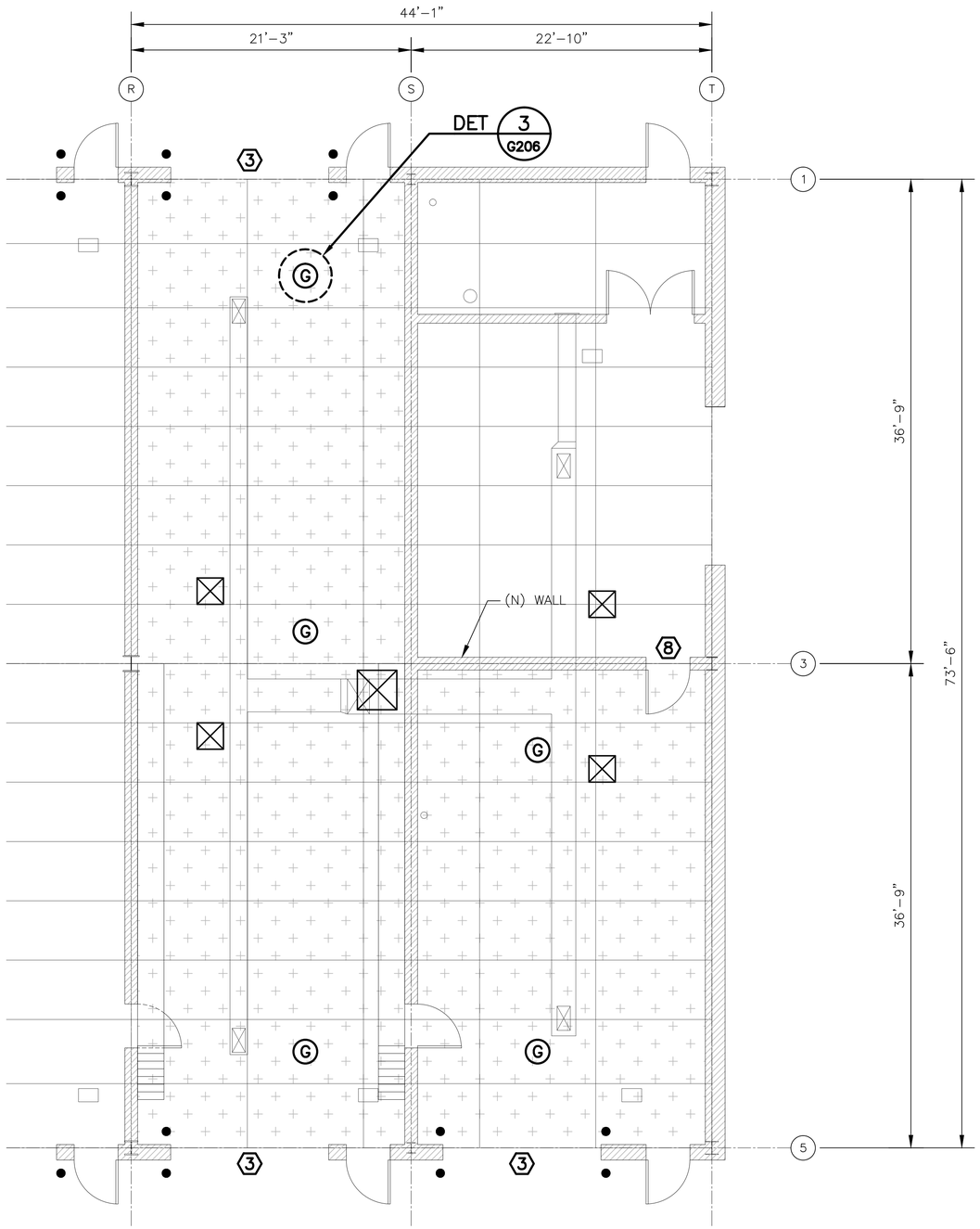
CITY OF GRAND JUNCTION

FLOOR PLAN - GAS DETECTION
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE: AS SHOWN | DRAWING NO.: G201 | REV.: 2

22x34 SAVE DATE:4/3/2012 1:39:37 PM PLOT DATE:7/22/2014 11:14:25 AM PLOT SCALE:1:1

DRAWING:k:\city of grand junction\current_city of grand junction\g201_rev2.dwg



REFLECTED CEILING PLAN 1 G202 (1)(2)(4)(5)(6)(7)

SCALE: 3/16"=1'–0"

N

4 2 0 4 8 12

SCALE 3/16"=1'–0"

KEYNOTES:

1. PROVIDE COMBUSTIBLE GAS DETECTION SYSTEM WITH CEILING MOUNTED GAS SENSORS, CONTROL PANEL (REFER TO DRAWING G201 FOR LOCATION), AND ACCESSORIES IN ACCORDANCE WITH THE 2006 INTERNATIONAL FIRE CODE (IFC 2211.7.2). SYSTEM PERFORMANCE SHALL BE CERTIFIED BY A NATIONALLY RECOGNIZED TESTING LABORATORY AS A COMBUSTIBLE GAS DETECTION SYSTEM. GAS DETECTION SYSTEM SHALL CAUSE THE FOLLOWING ACTIONS UPON GAS DETECTION AT 25% LFL :

   a. ACTIVATE GAS ALARM VENTILATION SYSTEM (IFC 2211.7.2.2.3),
   b. ACTIVATE GARAGE DOOR MOTOR OPERATORS (IFC 2211.7.1.1),
   c. SHUTOFF HEATING SYSTEM (IFC 2211.7.2.2.2),
   d. ACTIVATE STROBES AND HORNS (IFC 2211.7.2.2.1),

   DEACTIVATION OF NON–ESSENTIAL ELECTRICAL CIRCUITS SHALL OCCUR UPON GAS DETECTION AT 50% LFL. NON–ESSENTIAL ELECTRICAL CIRCUITS ARE THOSE CIRCUITS OTHER THAN FOR FIRE ALARM SYSTEM, AND GAS ALARM INCLUDING RELATED BUILDING SYSTEMS.

   FAILURE OF THE GAS DETECTION SYSTEM SHALL RESULT IN THE DEACTIVATION OF THE HEATING SYSTEM, ACTIVATION OF THE GAS ALARM VENTILATION SYSTEM, AND CAUSE A TROUBLE SIGNAL TO BE SENT TO THE SHOP SUPERVISOR. (IFC 2211.7.2.3).

2. PROVIDE GAS ALARM MECHANICAL VENTILATION SYSTEM INTERLOCKED WITH THE GAS DETECTION SYSTEM (IFC 2211.7.1). MINIMUM VENTILATION RATE SHALL BE SIX AIR CHANGES PER HOUR IN THE SPACES DESIGNATED AS CNG VEHICLE SERVICE AREAS. VENTILATION SYSTEM SHALL BE SPARK–PROOF AND VENTILATION AIR SHALL NOT BE RECIRCULATED. AIR OUTLETS SHALL BE LOCATED AT THE HIGH POINT ABOVE THE SPACES DESIGNATED AS CNG VEHICLE SERVICE AREAS IN EXTERIOR WALLS OR THE ROOF (IFC 2211.7.1.1).

3. PROVIDE AN AUTOMATIC MOTOR OPERATOR INTERLOCKED WITH THE GAS DETECTION SYSTEM AND AN ENTRAPMENT SAFETY SYSTEM FOR GARAGE DOOR. THIS SHALL PROVIDE MAKE–UP AIR INLETS FOR THE GAS ALARM VENTILATION SYSTEM THAT ARE UNIFORMLY ARRANGED ON EXTERIOR WALLS NEAR FLOOR LEVEL (IFC 2211.7.1.1). MOTOR OPERATOR AND ENTRAPMENT SAFETY SYSTEM SHALL BE RATED FOR USE IN CLASS 1, DIVISION 2 LOCATIONS.

4. EXISTING LIGHT FIXTURES IN THE AREAS DESIGNATED FOR CNG VEHICLES IF LOCATED LESS THAN 18–INCHES FROM THE BOTTOM OF THE CEILING, SHALL BE LOWERED OR REPLACED WITH VAPOR–TIGHT FIXTURES.

5. REMOVE EXISTING SPACE HEATERS IN THE CNG DESIGNATED AREAS.

6. SEAL ALL VENTS, LOUVERS, & OTHER OPENINGS 1) BETWEEN AREAS DESIGNATED FOR CNG VEHICLES AND OTHER AREAS IN THE REPAIR SHOP AND 2) IN THE WALL SEPARATING THE CNG SHOP BAYS.

7. ALL NEW ELECTRICAL INSTALLATIONS WITHIN THE 18–INCH DEEP ZONE BELOW THE CEILING IN THE AREAS DESIGNATED FOR REPAIR OF CNG VEHICLES SHALL BE SUITABLE FOR CLASS 1, DIVISION 2 LOCATIONS.

8. RELOCATE EXISTING VENTILATION FAN TO THE NON–CNG AREA.

SHEET NOTES:

1. AN OBJECTIVE OF THIS PROJECT IS TO PROVIDE BUILDING IMPROVEMENTS TO ACCOMMODATE THE SAFE REPAIR, SERVICING & STORAGE OF COMPRESSED NATURAL GAS (CNG) VEHICLES WITHIN THE AREAS DESIGNATED. THE AREAS DESIGNATED FOR CNG VEHICLES SHALL CONTINUE TO BE AVAILABLE FOR THE REPAIR AND SERVICING OF LIQUID FUELED VEHICLES.
2. THIS DRAWING IS INTENDED TO SCHEMATICALLY SHOW THE MODIFICATIONS TO ACCOMMODATE THE REPAIR, SERVICING & STORAGE OF CNG VEHICLES WITHIN THE AREAS DESIGNATED FOR CNG VEHICLES. CONTRACTOR SHALL REFER TO THE ELECTRICAL AND MECHANICAL DESIGN DRAWINGS FOR INSTALLATION DETAILS OF EQUIPMENT.
3. EXISTING BUILDING CONDITIONS SHOWN IN THIS DRAWING WERE OBTAINED FROM THE 1982 PHASE 1 MUNICIPAL SERVICE CENTER CITY OF GRAND JUNCTION, COLORADO CONSTRUCTION RECORD.
4. CONTRACTOR SHALL VISIT THE JOB SITE AND VERIFY ALL CONDITIONS, LOCATIONS, AND DIMENSIONS BEFORE STARTING WORK.
5. CONTRACTOR SHALL VERIFY ALL SIZES, LOCATIONS, AND PENETRATIONS FOR ANY ROOF MOUNTED EQUIPMENT. ALL ROOF PENETRATIONS SHALL BE FLASHED, WATERPROOFED, LOCATED OUT OF WATERWAYS, AND SPACED AT LEAST 12–INCHES FROM WALLS, CURBS, AND OTHER VERTICAL SURFACES TO FACILITATE PROPER APPLICATION OF SLEEVES, FLASHING LAYERS, ETC.
6. GAS SENSORS SHALL BE MOUNTED UNDERNEATH THE BUILDING CEILING.

LEGEND:

- AREAS DESIGNATED FOR THE PARKING, REPAIR, AND SERVICING OF CNG VEHICLES
- (G) (N) METHANE GAS DETECTOR
- (E) EXISTING
- (N) NEW

07–30–10

COLORADO LICENSED JAMES C. KRUGER 38736 PROFESSIONAL ENGINEER

Exp. 10–31–10

REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
2	07–30–10	ISSUED FOR BIDS	LDG	CRL		
1	06–08–10	ISSUED FOR PERMITS	KS	CRL		
A	05–21–10	30% PROGRESS SUBMITTAL	KS	CRL		

DRAWING NO.: | REFERENCE DRAWINGS:

RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME: G202.dwg
PROJECT NO.: 80
DATE DRAWN: 05–21–10
DRAWN BY: KS
CHECKED BY: CRL

CITY OF GRAND JUNCTION

REFLECTED CEILING PLAN – GAS DETECTION
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE: AS SHOWN | DRAWING NO.: G202 | REV.: 2

22x34 SAVE DATE: 7/28/2010 3:00:19 PM PLOT DATE: 7/28/2010 3:00:52 PM PLOT SCALE:1:1

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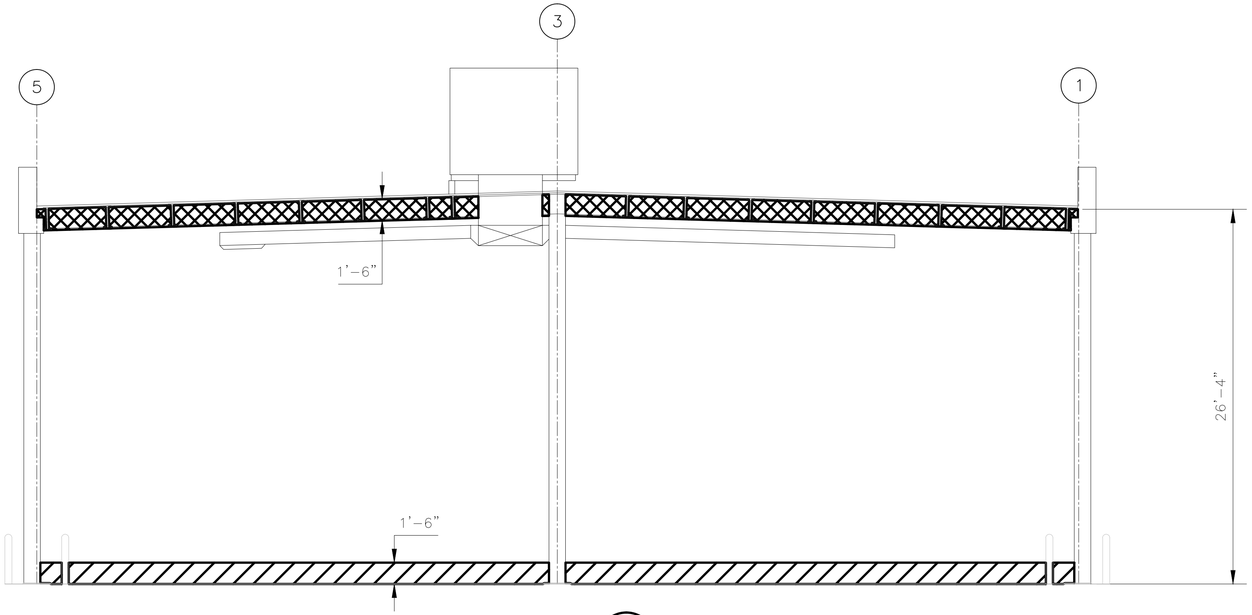
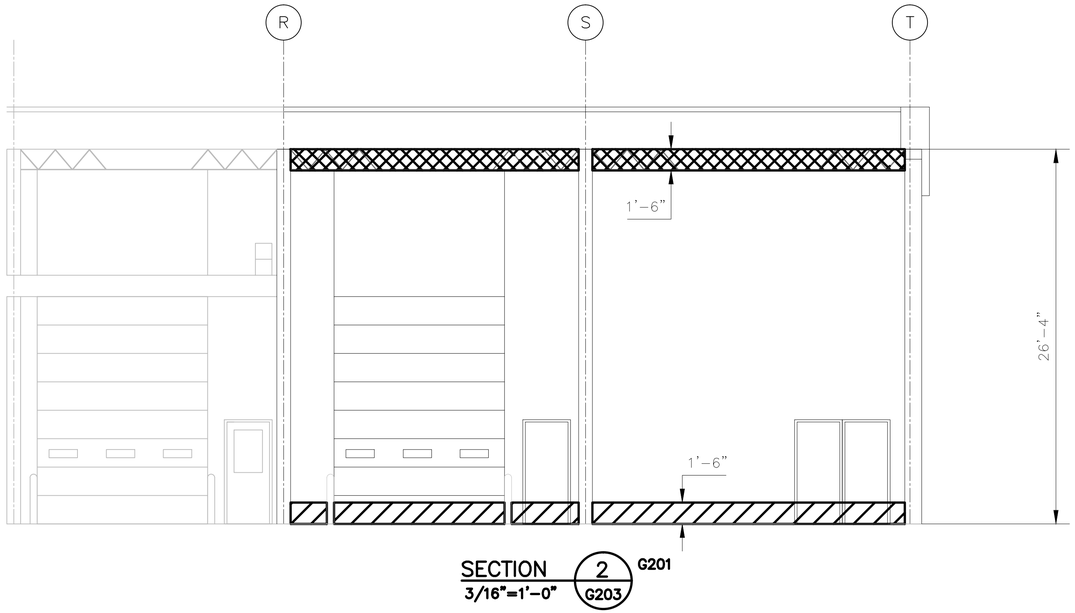


SECTION 1 G201 / G203
3/16"=1'-0"



SECTION 2 G201 / G203
3/16"=1'-0"

NOTES:

1. EXCEPT FOR THE AREA IDENTIFIED AS CLASS 1 DIVISION 2, THE INTERIOR OF BUILDING SHALL REMAIN UNCLASSIFIED AS DEFINED IN SECTION 500 OF THE NEC. POSITIVE VENTILATION AT THE RATE OF 6 AIR CHANGES PER HOUR SHALL BE PROVIDED TO REDUCE HAZARDS & MAINTAIN NON-HAZARDOUS AREA CLASSIFICATION AT THE CEILING.
2. BUILDING ELEVATIONS WERE BASED ON PHASE 1 MUNICIPAL CENTER 1982 CONSTRUCTION RECORD DWGS.

LEGEND:

RESTRICTED ZONE – NO OPEN FLAME OR (N) DEVICE OR EQUIPMENT WITH ARCING CONTACTS OR SURFACE TEMPERATURE ABOVE 750°F, UNLESS APPROVED FOR USE IN A HAZARDOUS AREA.

AREA PRESENTLY CLASSIFIED AS CLASS 1, DIVISION 2 GROUP "D" WHICH COULD BE EXPOSED TO GASOLINE & FLAMMABLE GASES OR VAPORS THAT ARE LIGHTER OR HEAVIER THAN AIR.

(N) NEW

(E) EXISTING

07-30-10

COLORADO LICENSED JAMES C. DAVIS 38738 PROFESSIONAL ENGINEER

Exp. 10-31-10

DRAWING NO.:

REFERENCE DRAWINGS:

REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
2	07-30-10	ISSUED FOR BIDS	LDG	CRL		
1	06-08-10	ISSUED FOR PERMITS	KS	CRL		

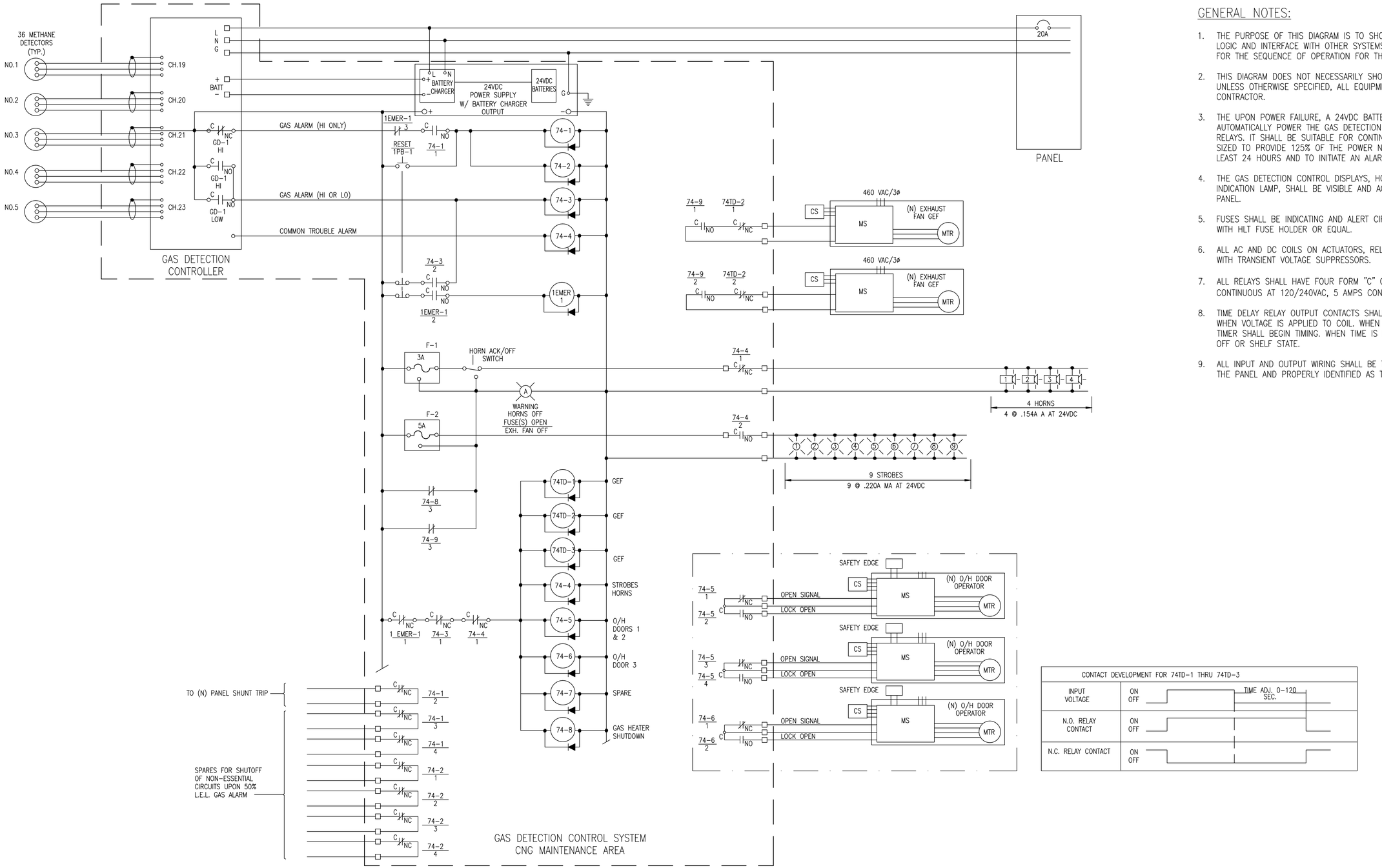
RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME: G203.dwg
PROJECT NO.: 80
DATE DRAWN: 05-17-10
DRAWN BY: KS
CHECKED BY: CRL

CITY OF GRAND JUNCTION

BUILDING ELEVATIONS
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE: AS SHOWN
DRAWING NO.: G203
REV.: 2



GENERAL NOTES:

1. THE PURPOSE OF THIS DIAGRAM IS TO SHOW THE GAS DETECTION SYSTEM CONTROL LOGIC AND INTERFACE WITH OTHER SYSTEMS. REFER TO SPECIFICATION SECTION 16700 FOR THE SEQUENCE OF OPERATION FOR THE GAS DETECTION SYSTEM.
2. THIS DIAGRAM DOES NOT NECESSARILY SHOW ALL EQUIPMENT AND DEVICES REQUIRED. UNLESS OTHERWISE SPECIFIED, ALL EQUIPMENT AND DEVICES ARE TO BE PROVIDED BY CONTRACTOR.
3. THE UPON POWER FAILURE, A 24VDC BATTERY BACKUP WITH BATTERY CHARGER SHALL AUTOMATICALLY POWER THE GAS DETECTION SYSTEM INCLUDING CONTROLLERS AND RELAYS. IT SHALL BE SUITABLE FOR CONTINUOUS OPERATION AT 24VDC ±5% AND SIZED TO PROVIDE 125% OF THE POWER NEEDED TO MAINTAIN ALL LOADS FOR AT LEAST 24 HOURS AND TO INITIATE AN ALARM FOR AT LEAST 10 MINUTES.
4. THE GAS DETECTION CONTROL DISPLAYS, HORN ACKNOWLEDGE SWITCH, AND WARNING INDICATION LAMP, SHALL BE VISIBLE AND ACCESSIBLE WITHOUT HAVING TO OPEN THE PANEL.
5. FUSES SHALL BE INDICATING AND ALERT CIRCUIT ACTIVATING TYPE. BUSS TYPE GMT WITH HLT FUSE HOLDER OR EQUAL.
6. ALL AC AND DC COILS ON ACTUATORS, RELAYS, TRIPS, ETC. SHALL BE PROVIDED WITH TRANSIENT VOLTAGE SUPPRESSORS.
7. ALL RELAYS SHALL HAVE FOUR FORM "C" CONTACTS EACH RATED AT 10 AMPS CONTINUOUS AT 120/240VAC, 5 AMPS CONTINUOUS AT 125/250VDC.
8. TIME DELAY RELAY OUTPUT CONTACTS SHALL OPERATE OR CHANGE STATE IMMEDIATELY WHEN VOLTAGE IS APPLIED TO COIL. WHEN VOLTAGE IS REMOVED FROM COIL, THE TIMER SHALL BEGIN TIMING. WHEN TIME IS EXPIRED, CONTACTS TRANSFER BACK TO OFF OR SHELF STATE.
9. ALL INPUT AND OUTPUT WIRING SHALL BE TERMINATED TO TERMINAL BLOCKS INSIDE THE PANEL AND PROPERLY IDENTIFIED AS TO ORIGIN OR CIRCUIT.

CONTACT DEVELOPMENT FOR 74TD-1 THRU 74TD-3		
INPUT VOLTAGE	ON / OFF	TIME ADJ. 0-120 SEC.
N.O. RELAY CONTACT	ON / OFF	
N.C. RELAY CONTACT	ON / OFF	

07-30-10

COLORADO LICENSED JAMES L. CRONG 38738 PROFESSIONAL ENGINEER

Exp. 10-31-10

REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
2	07-30-10	ISSUED FOR BIDS	LDG	CRL		
1	06-08-10	ISSUED FOR PERMITS	KS	CRL		

DRAWING NO.: | REFERENCE DRAWINGS:

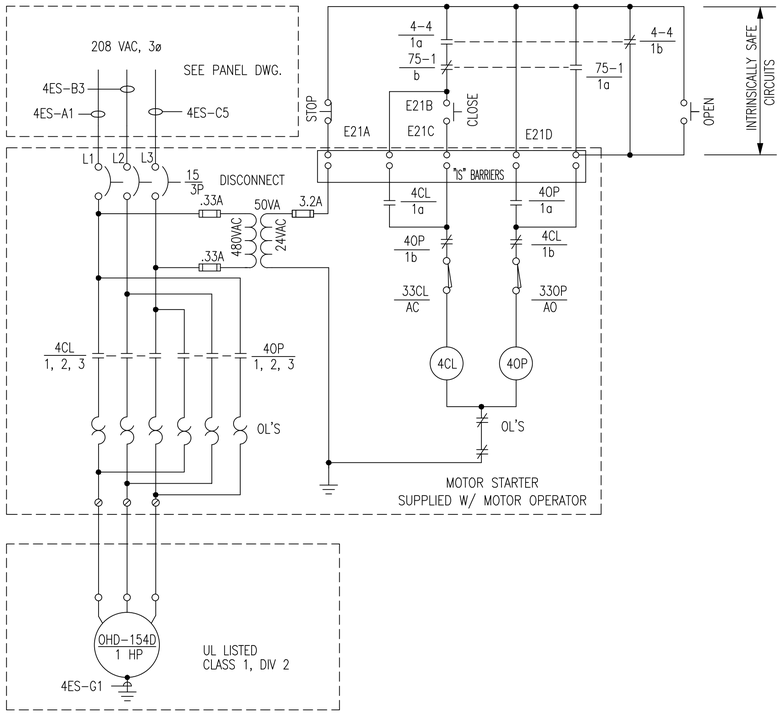
RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME: G204.dwg
PROJECT NO.: 80
DATE DRAWN: 05-18-10
DRAWN BY: KS
CHECKED BY: CRL

CITY OF GRAND JUNCTION

GAS DETECTION CONTROL SYSTEM
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE: NTS | DRAWING NO.: G204 | REV.: 2



NOTES:

1. SEE DIVISION 8, SECTION 08331 FOR MOTOR OPERATOR SPECIFICATIONS.
2. 75-1/a & 75-1/b ARE SAFETY EDGE CONTACTS DESIGNED TO SENSE OBSTRUCTION & SIGNAL OHD OPERATOR TO STOP & OPEN DOOR. SAFETY EDGE DEVICE SHALL BE APPROVED FOR CLASS 1, DIV. 2 HAZARDOUS LOCATION.
3. 33CL & 33OP ARE LIMIT SWITCHES. CONTACT "AC" OPENS (A) WHEN DOOR IS FULLY CLOSED (C) & CONTACT "AO" OPENS (A) WHEN DOOR IS FULLY OPENED (O). LIMIT SWITCHES SHALL BE APPROVED FOR CLASS 1, DIV.2 HAZARDOUS LOCATION.

07-30-10

COLORADO LICENSED
JAMES D. KING
38738
PROFESSIONAL ENGINEER

Exp. 10-31-10

DETAIL 1 / G205 — N.T.S. — G204

OVERHEAD DOOR OPERATORS

REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
2	07-30-10	ISSUED FOR BIDS	LDG	CRL		
1	06-08-10	ISSUED FOR PERMITS	KS	CRL		

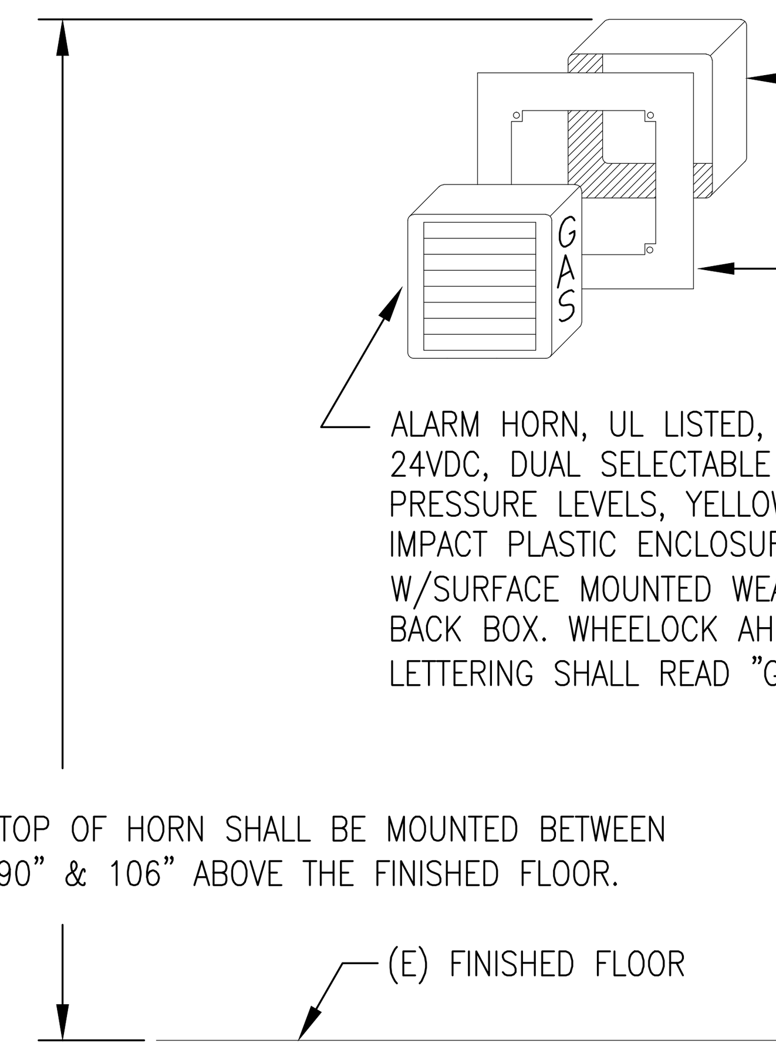
DRAWING NO.: | REFERENCE DRAWINGS:

RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

FILENAME: G205.dwg
PROJECT NO.:
DATE DRAWN: 05-17-10
DRAWN BY: KS
CHECKED BY:

CITY OF GRAND JUNCTION
POWER & CONTROLS
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION

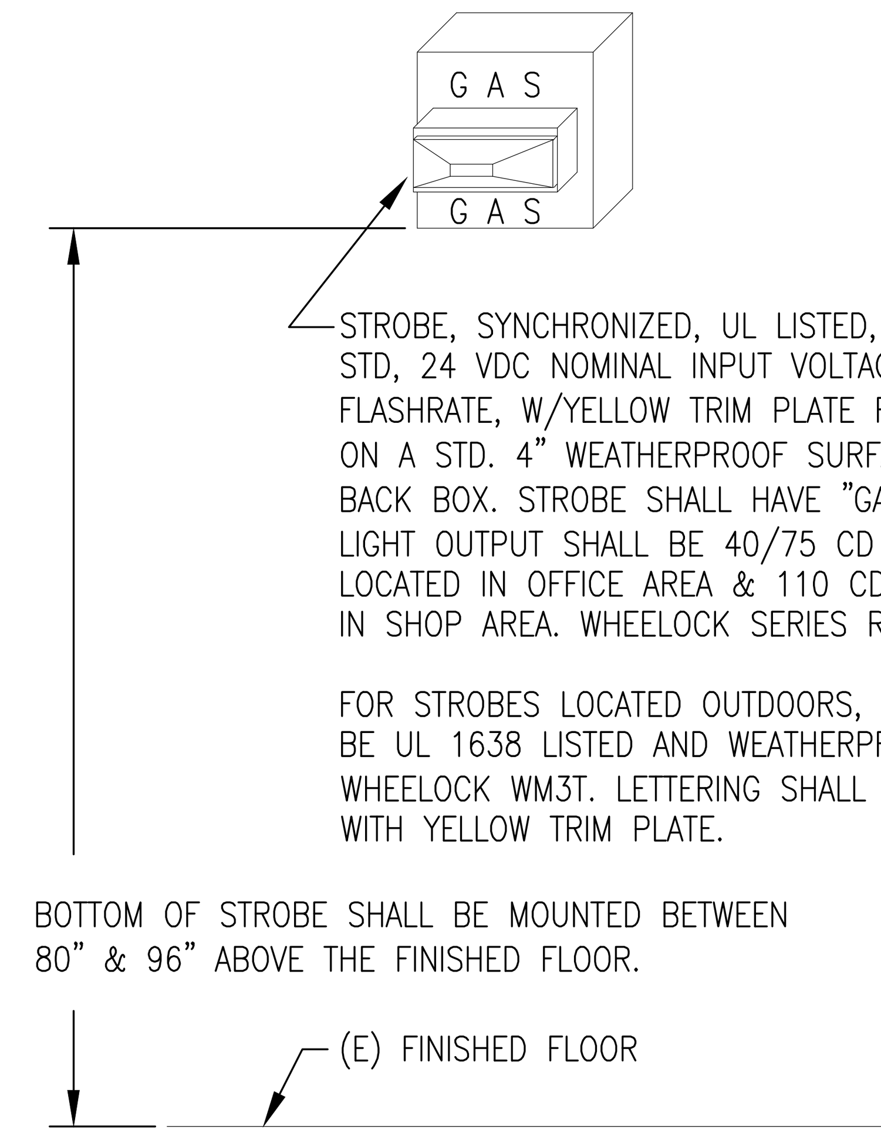
SCALE: NONE | DRAWING NO.: G205 | REV.: 2



DETAIL 1 G201 G206 N.T.S.

ALARM HORN

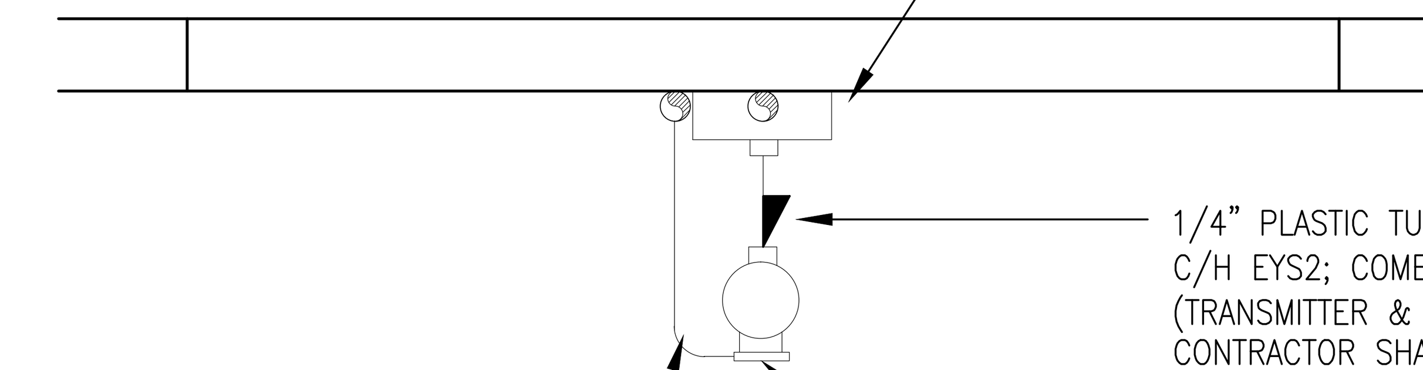
TYP. 4



DETAIL 2 G201 G206 N.T.S.

STROBE

TYP. 9



NOTE:

1. CONTRACTOR SHALL INSTALL EYS CONDUIT SEAL WHEN CONDUIT LEAVES CLASS 1, DIVISION 1 AREA.

LEGEND:

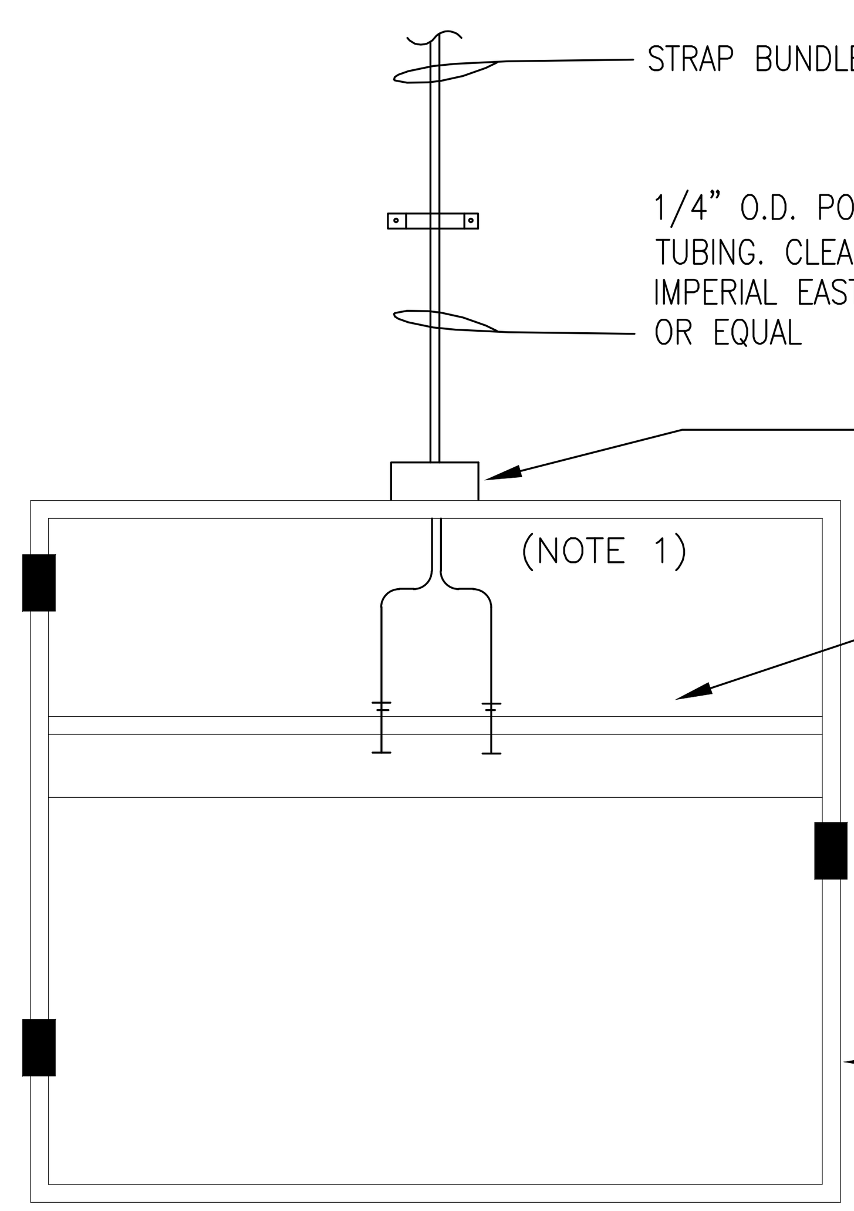
◤ CONDUIT SEAL, EXPLOSION PROOF

C/H CROUSE HINES

DETAIL 3 G202 G206 N.T.S.

COMBUSTIBLE GAS SENSOR

TYP. 5



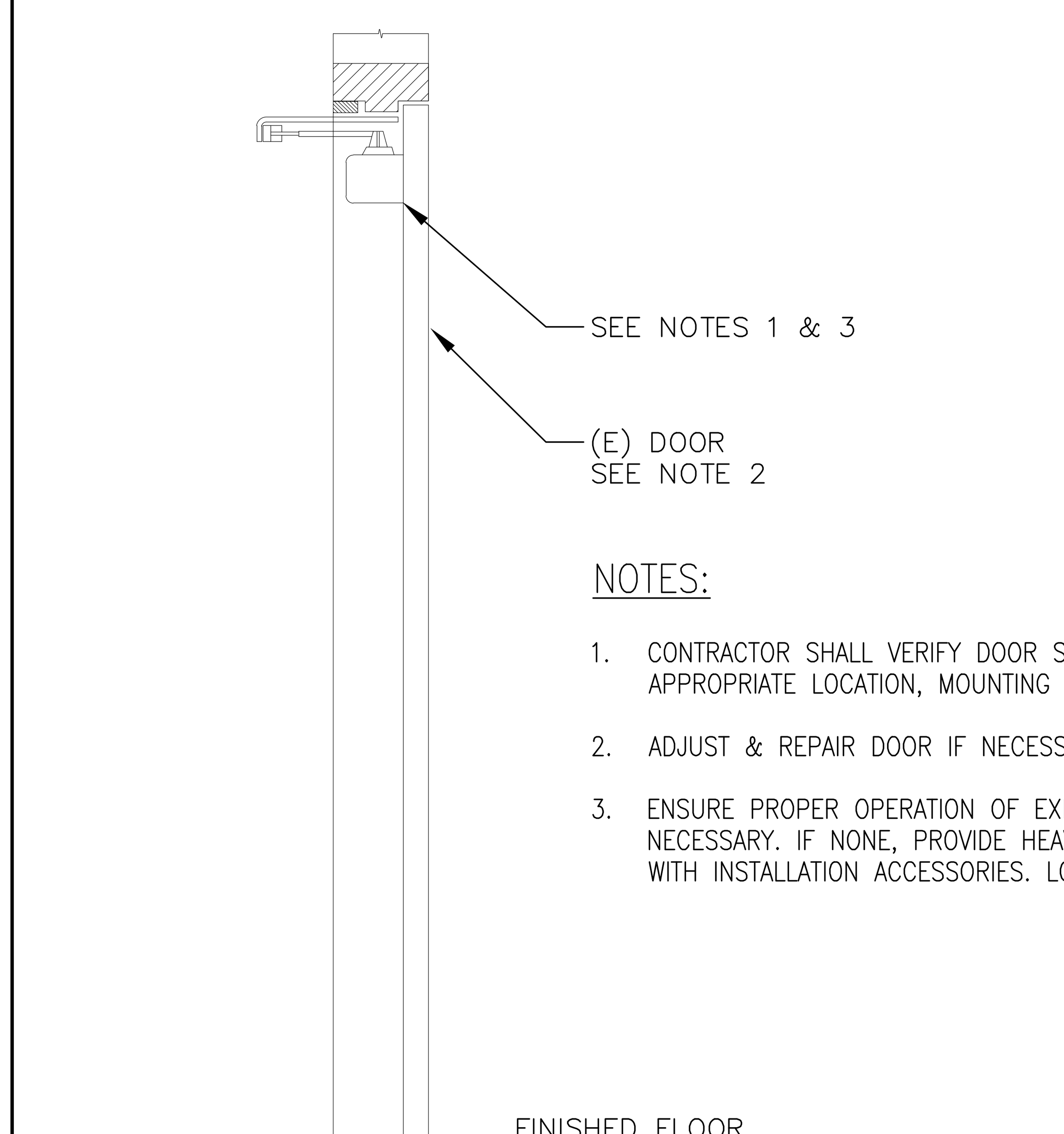
NOTE:

1. QUANTITY OF TUBING RUNS MAY VARY FOR EACH CALIBRATION STATION. LENGTH OF EACH TUBING RUN SHALL NOT EXCEED 60 FEET.

DETAIL 4 G201 G206 N.T.S.

CALIBRATION STATION

TYP. 3



NOTES:

1. CONTRACTOR SHALL VERIFY DOOR SIZE & ORIENTATION (LH OR RH) AND DETERMINE APPROPRIATE LOCATION, MOUNTING & REQUIRED CLEARANCE FOR CLOSER.
2. ADJUST & REPAIR DOOR IF NECESSARY FOR PROPER OPERATION.
3. ENSURE PROPER OPERATION OF EXISTING DOOR CLOSER. ADJUST AND REPAIR AS NECESSARY. IF NONE, PROVIDE HEAVY DUTY DOOR CLOSER, UL LISTED, COMPLETE WITH INSTALLATION ACCESSORIES. LCN 4040 SERIES OR APPROVED EQUAL.

DETAIL 5 G201 G206 N.T.S.

DOOR CLOSER

GENERAL NOTES:

1. SEE DIVISION 16 & RELATED SECTION OF TECHNICAL SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. CONTRACTOR SHALL VISIT JOB SITE AND VERIFY ALL CONDITION, LOCATIONS, AND DIMENSIONS BEFORE STARTING WORK.

LEGEND:

(E) EXISTING

(N) NEW

07-30-10

COLORADO LICENSED PROFESSIONAL ENGINEER JAMES DONG 38738

Exp. 10-31-10

REV.	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
2	07-30-10	ISSUED FOR BIDS	LDG	CRL		
1	06-08-10	ISSUED FOR PERMITS	KS	CRL		

DRAWING NO.: REFERENCE DRAWINGS:

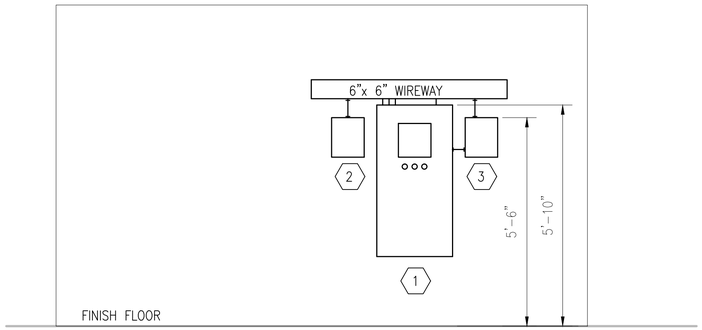
RAYMUNDO ENGINEERING COMPANY, INC. WALNUT CREEK, CALIF. 94598

FILENAME: G206.dwg
PROJECT NO.: 80
DATE DRAWN: 05-18-10
DRAWN BY: KS
CHECKED BY: CRL

CITY OF GRAND JUNCTION

SECTIONS & DETAILS
CNG STATION & SHOP BAY UPGRADES
MUNICIPAL SERVICE CENTER
CITY OF GRAND JUNCTION, COLORADO

SCALE: NTS | DRAWING NO.: G206 | REV.: 2



NOTE:

1. CONDUITS ARE NOT SHOWN.

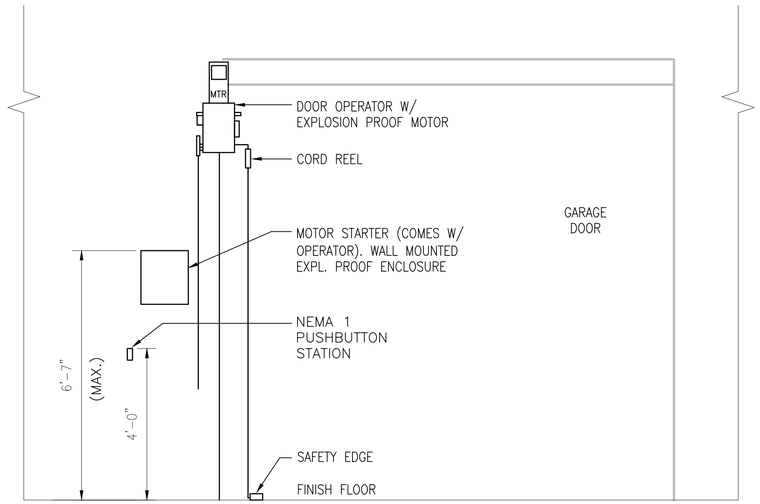
KEY NOTES:

1. GAS DETECTION PANEL INCLUDING CONTROL RELAYS
2. BATTERY BACKUP SYSTEM
3. AUTODIALER

DETAIL 1 / G207 — G201 — N.T.S.

GAS DETECTION PANELS

TYP.



NOTES:

1. SEE DIVISION 8 & RELATED SECTIONS FOR ADDITIONAL REQUIREMENTS.
2. CONDUITS ARE NOT SHOWN.

DETAIL 2 / G207 — G202 — N.T.S.

GARAGE DOOR MOTOR OPERATOR

TYP. 3

GENERAL NOTES:

1. CONTRACTOR SHALL VISIT JOB SITE AND VERIFY ALL CONDITIONS, LOCATIONS, AND DIMENSIONS BEFORE STARTING WORK.

07-30-10

COLORADO LICENSED JAMES L. CLARK 38738 PROFESSIONAL ENGINEER

Exp. 10-31-10

DETAIL

DETAIL

DRAWING NO.: | REFERENCE DRAWINGS:

REV:	DATE:	REVISION DESCRIPTION:	DRAWN BY	CHECKED BY	APPROVED BY	APPROVED BY
2	07-30-10	ISSUED FOR BIDS	LDG	CRL		
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RAYMUNDO ENGINEERING COMPANY, INC.
WALNUT CREEK, CALIF. 94598

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CITY OF GRAND JUNCTION

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SCALE:	DRAWING NO.:	REV.:
NTS	G207	2

Electrical box for power to time fill stations and flow meter.

Phone conduit terminates at box on the column on bay from the wall penetration. Grey box on right side of photo.

Conduit race along length of shop +/-110 feet long, 20 feet high. Electrical conduit only.

Interior shop wall where communications and electrical conduits penetrate wall.

Current terminal time fill station. Extension of 10 new time fill stations starts here.

Typical Time Fill Station.

Compressor Pad

Existing 40hp Compressor