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CITY OF Grand Junction COLORADO

NOTICE TO PROCEED

Date: December 10, 2020

Contractor: ZAP Engineering & Construction Services, Inc.

Project: Design/Build Grand Junction Bio Compressed Natural Gas (BioCNG) Storage and Fueling Station Optimization Project RFP-4813-20-DH

In accordance with the contract dated December 3, 2020 the Contractor is hereby notified to begin work on the Project on or before December 14, 2020.

The date of final completion as determined is July 9, 2021.

CITY OF GRAND JUNCTION, COLORADO

DocuSigned by:
Duane Hoff Jr., Senior Buyer – City of Grand Junction
9F789E7D50F145C...
Duane Hoff Jr., Senior Buyer

Receipt of this Notice to Proceed is hereby acknowledged:

Contractor: ZAP Engineering and Construction Services, Inc.

By: DocuSigned by:
Frank E. Lousberg – ZAP Engineering & Construction Services, Inc.
5FD7FDFCFF2045D...

Print Name: Frank E. Lousberg - ZAP Engineering & Construction Services, Inc.

Title: FEL

Date: 12/11/2020 | 09:57 MST

CITY OF Grand Junction COLORADO

LETTER OF INTENT

Date: October 5, 2020

Company: ZAP Engineering & Construction Services, Inc.

Project: Design/Build Grand Junction Bio Compressed Natural Gas (BioCNG) Storage and Fueling Station Optimization Project RFP-4813-20-DH

Based upon review of the proposals received, and interviews held, for Design/Build Grand Junction Bio Compressed Natural Gas (BioCNG) Storage and Fueling Station Optimization Project RFP-4813-20-DH, your firm has been selected as the preferred proposer.

Your pricing proposal has been reviewed, and the evaluation committee has an additional piece of scope they would like for you to add to your proposal, for a potential Add/Alternate item (See attached). If it is determined that your pricing/scope response is acceptable, then this item may potentially be added to the contract. However, if negotiations are needed, we will reach out to you to do so. Otherwise, it is the intent of the City of Grand Junction to award the aforementioned project to your firm as is listed in the RFP documents, your proposal response, and negotiated terms (if required).

The award for the project must be approved by City Council prior to an official award and contract issued.

Once the contract has been awarded, you may contact Kurt Carson, Project Manager at 970-256-4171 to begin project scheduling.

Feel free to contact me with any questions at 970-244-1545.

Thank you and Best Regards

Duane Hoff Jr., Senior Buyer

Add/Alternate Option:

The original phase of the City of Grand Junction CNG fueling site currently consists of three (3) Ingersoll Rand 20H40NG compressors with Murphy Panel manual controls that have between 19 and 22,000 hours on them. These compressors were installed in 2011 and are budgeted for replacement in 2023.

In 2015, the second phase was added to phase which included the addition of an ANGI NV-50 compressor. In late 2017 phase three was constructed which added an Ariel EA-200 compressor to a separate system that was installed specifically for fueling the County fleet of transit buses. Some connectivity was provided between phase three, and phases one and two at the time in order to create some redundancy but in general they are run separately.

Fleet Services would like a cost estimate to include the replacement of two (2) existing 40 Horsepower Ingersoll compressors with one (1) 50 Horsepower ANGI, or quality equivalent such as Ariel. This will give us all the compression we need, and still allow for redundancy when one of the separate systems is out of commission.

CHANGE ORDER
Number 1

Date: April 2, 2021
To: ZAP Engineering & Construction Services, Inc.
From: City of Grand Junction, Utilities Department, Wastewater Division
Project: Design/Build Grand Junction Bio Compressed Natural Gas (BioCNG) Storage and Fueling Station Optimization project
PO: 2020-00000626

The above referenced contract shall be modified as follows:

1. Install three (3) new C1D2 LED light fixtures to replace three (3) existing light fixtures in the classified area. This item is required due to NFPA 52 classification requirements.

2. Addition of temperature transmitters to allow the ability for temperature compensation for the new storage packs and the existing storage spheres on the south facility. This addition would allow operations the ability to account for temperature swings and better control the system.

3. Upgrade HMI on the JW Compressor by converting Crimson 2.0 program to Crimson 3.1 and add upgrade the module display. The current system is no longer supported by Redlion and has been phased out. This upgrade will update the HMI to the current Redlion platform.

Summary of Contract price adjustments:

Original Contract Amount	$1,013,640.00
This Change Order	$24,924.17
Revised Contract Amount	$1,038,564.17

Summary of Contract time adjustments:

Original Contract Time	229 days
This Change Order	0 days
Revised Contract Time	229 days

Contract Start Date:	December 3, 2020
Contract Completion Date:	July 29, 2021

This compensation modification constitutes all costs directly or indirectly attributable to the changes ordered herein related to the performance of the Contract.

Owner: **City of Grand Junction**

Prepared and Recommended by: _____ Date: 4/2/2021

Kurt Carson, WW Services Manager/Project Manager

Approved by: _____ Date: 4/6/21

Randi Kim, Utilities Director

Contractor: **ZAP Engineering & Construction Services, Inc.**

Signature: _____ Digitally signed by Josh Ruyle Date: 2021.04.02 10:59:01-06'00' Date: 4/2/2021

Name and Title: Josh Ruyle, Project Manager

ZAP
ENGINEERING & CONSTRUCTION SERVICES, INC.

CHANGE ORDER 001 ESTIMATE

DATE: 4/2/2021

Description	Estimate	Contingency %	Total Estimate	Comments
Item 1. C1D2 Lights			**$ 8,192.60**	
ZAP Engineering	$ 524.00	0%	**$ 524.00**	2 hours of PM ($118/hr.), 2 hours of Engineer II ($144/hr.)
Subcontractor - Willow Creek Supply & Install	$ 6,600.00	0%	**$ 6,600.00**	Supply and Install of light fixtures, Estimate Attached
Item 1 Fixed Fee (15%)			**$ 1,068.60**	
Install new Class 1, Div 2 light fixtures for a total of three existing lights.				
Item 2. Temperature Transmitters			**$ 9,778.45**	
ZAP Engineering	$ 1,128.00	0%	**$ 1,128.00**	4 hours of PM ($118/hr.), 4 hours of Engineer IV ($160/hr.)
Material Cost - Temperature Transmitters	$ 5,000.00	0%	**$ 5,000.00**	
Subcontractor - JW Programming	$ 375.00	0%	**$ 375.00**	Estimate Attached
Subcontractor - Willow Creek Install	$ 2,000.00	0%	**$ 2,000.00**	Estimate Attached
Item 2 Fixed Fee (15%)			**$ 1,275.45**	
Install temperature transmitters for storage temperature compensation on the new storage packs and existing storage spheres on the south facility.				
Item 3. HMI Upgrade			**$ 6,953.12**	
ZAP Engineering	$ 892.00	0%	**$ 892.00**	2 hours of PM ($118/hr.), 4 hours of Engineer IV ($160/hr.)
Subcontractor - JW Programming	$ 3,000.00	0%	**$ 3,000.00**	Estimate Attached
Subcontractor - JW Hardware	$ 2,128.19	0%	**$ 2,128.19**	Estimate Attached
Subcontractor - JW Adapter Plate	$ 26.00	0%	**$ 26.00**	Estimate Attached
Item 2 Fixed Fee (15%)			**$ 906.93**	
Upgrade existing Redlion HMI from Crimson 2.0 program to Crimson 3.1, which includes new Module Display Graphite Redlion G07S000.				
		TOTAL	**$ 24,924.17**	

NOTES:

1. All engineering, materials and subcontracted work will be billed at cost. ZAP has included a fixed fee due the contract, which is setup as "cost plus fixed fee".
2. ZAP has not included and contingency in the change order pricing and will work to execute as planed.

Willow Creek
INSTRUMENTATION
& ELECTRICAL

March 17,2021

Josh Ruyle
Project Manager
ZAP Engineering & Construction Services, Inc

RE: Grand Junction BioCNG Project
Lighting Modifications

Dear Mr. Ruyle, ITEM 1

Willow Creek Electrical and Instrumentation is pleased to present this lump sum proposal for lighting modifications on the Grand Junction BioCNG Project in the amount of six thousand six hundred dollars ($6,600.00).

Unit rate to replace existing poles (if required)

- $1,800.00 per pole.

OPTION FOR NEW POLE TO REPLACE DAMAGED POLE, CURRENTLY NOT INCLDUED IN CHANGE ORDER

Electrical Inclusions

- Purchase new class 1, division 2 fixtures for installation on existing poles.
- Proposal is based on WCE utilizing existing power feeder cables.

We would like to thank you for the opportunity to provide construction services. Aligned incentives and a solid team of proven industry professionals are without fail the best formula for safe and productive projects. Please do not hesitate to call with any questions or needed clarification 970-210-7116.

Sincerely,
Willow Creek Instrumentation & Electrical
Dewey Archer
Dewey Archer

Josh Ruyle

From: Dewey Archer <deweya@willowcreekcompanies.com>
Sent: Thursday, March 25, 2021 2:33 PM
To: Steve Brackett; Travis Byers
Cc: Josh Ruyle
Subject: RE: 20250 BioCNG - Estimate Request - Added Temp Transmitters

ITEM 2

Josh
The below scope would add $2,000 to the original scope assuming we would complete it all in the same time frame.

- 1-inch below grade conduit installed utilizing PVC coated RGS direct buried (no concrete).
- #16 twisted shielded pair installed to each new TT.

Dewey

From: Steve Brackett <steveb@willowcreekcompanies.com>
Sent: Thursday, March 25, 2021 10:59 AM
To: Travis Byers <TravisB@willowcreekcompanies.com>; Dewey Archer <deweya@willowcreekcompanies.com>
Cc: Josh Ruyle <ruylej@zapecs.com>
Subject: FW: 20250 BioCNG - Estimate Request - Added Temp Transmitters

Steven Brackett
Willow Creek Companies, LLC
(970)210-0205
steveb@willowcreekcompanies.com

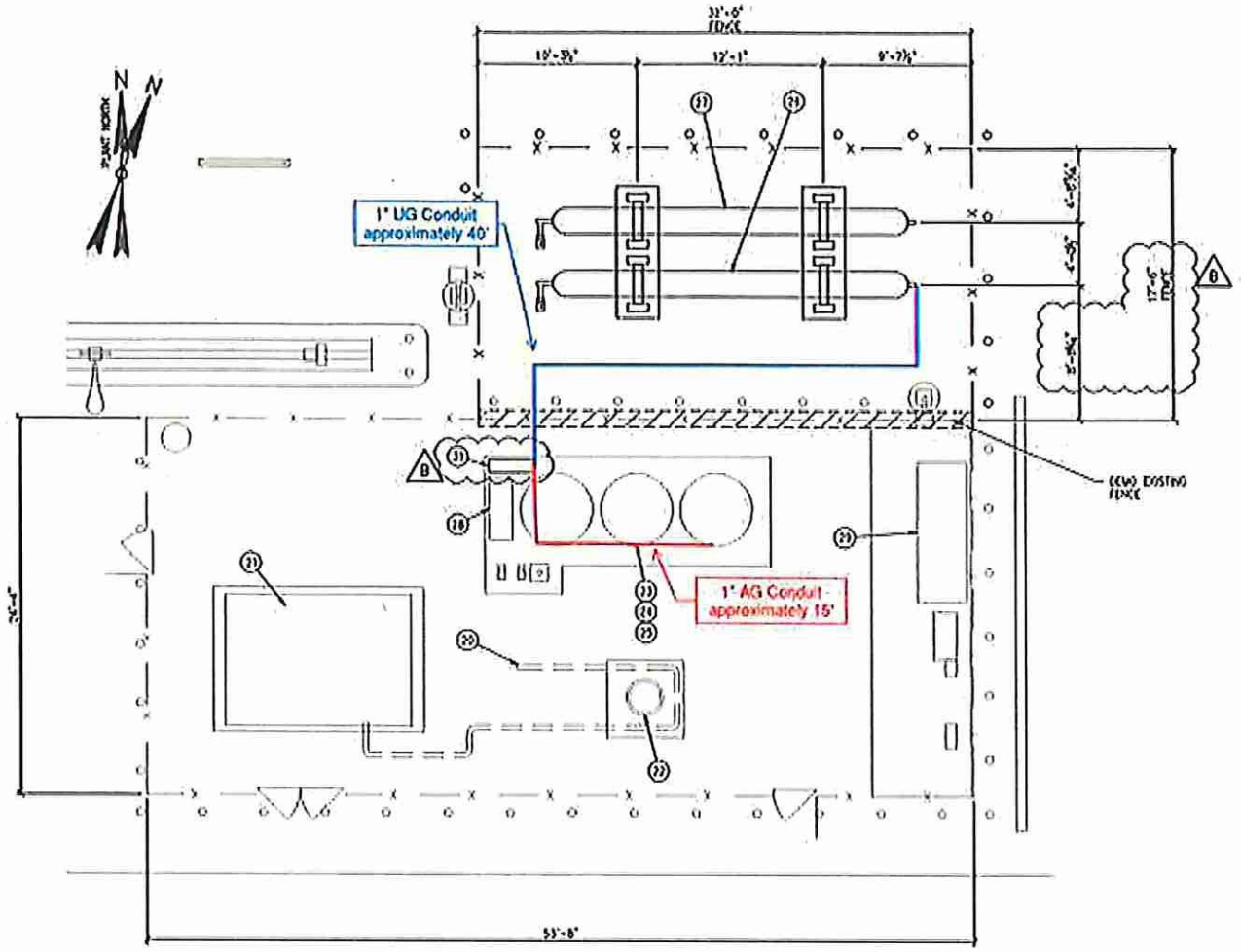
Willow Creek COMPANIES

From: Josh Ruyle <ruylej@zapecs.com>
Sent: Thursday, March 25, 2021 10:47 AM
To: Steve Brackett <steveb@willowcreekcompanies.com>
Subject: 20250 BioCNG - Estimate Request - Added Temp Transmitters

Hey Steve,
I have another item I am hoping to get a cost for. This is added scope and are trying to understand the total cost impact to see if the City would like to pursue adding a temperature transmitter at each storage pack. I didn't include

Please see below and attached for a rough outline of the new conduit needed for this. We would install underground out to the new storage packs and the aboveground to the existing spheres. Would need hydrovac for the underground conduit run, but this will be in the same trench as the tubing run out to the packs.

Let me know if you have any questions.



Regards,

Josh Ruyle, PMP | Project Manager | ZAP Engineering & Construction Services, Inc.
O: 303.565.5540 | C: 720-308-3105 | www.zapecs.com|755 Parfet Street Suite 200 Lakewood, CO 80215
LinkedIn

Please note our address has changed.

This electronic mail message may contain CONFIDENTIAL information which is (a) CLIENT PRIVILEGED COMMUNICATION, WORK PRODUCT, PROPRIETARY IN NATURE, OR OTHERWISE PROTECTED BY LAW FROM DISCLOSURE, and (b) Intended only for the use of the Addressee(s) named herein. If you are not an Addressee, or the person responsible for delivering this to an Addressee, you are hereby notified that reading, copying, or distributing this message is prohibited. If you have received this electronic mail message in error, please reply to the sender and take the steps necessary to delete the message completely from your computer system

J-W Power Company
P.O. Box 226406
Dallas, TX 75222-6406
(972) 233-8191

GAS COMPRESSOR SALE QUOTATION

Customer: **ZAP Engineering & Construction Services, Inc.** Date: March 30, 2021

Attn: Josh Ruyle Project: Grand Junction Programming

Gentlemen:

J-W Power Company is pleased to submit this quotation in response to your inquiry, which is referenced above. This quotation is subject to only those terms and conditions of sale which are set forth on the accompanying page. Any purchase order pursuant to this quotation shall not result in a contract until it is accepted and acknowledged by J-W Power Company, Dallas, Texas. **This quotation is firm for 30 days *.**

DISPENSING

J-W Base Programming Scope (32 hrs) $4,000

- Program Modification:
  Only allow Storage Filling when Bio-Gas pressure is greater than the "Biogas Stop pressure" set point
  Only start compressor for storage filling if pressure is >= "Biogas Stop pressure" plus "Biogas SPAN" set point or compressor is running and Bio Gas pressure is greater than the "Biogas Stop pressure" set point

- Retain current Storage Filling Logic based on High Bank, Mid Bank, Low Bank cascade (small changes to override logic)
  Storage Filling overrides listed in order of priority:
  1. Site ESD, Site Fault Condition Exists, Compressor Fault Condition Exists
  2. Bio-Gas pressure is <= "Biogas Stop pressure" (logic change)
  3. Direct fill pressure is less than its storage fill override set point
  4. Time fill pressure is less than its storage fill override set point
  5. A higher priority storage bank is less than its fill set point the current lower priority fill valve will close until the higher priority is full.

- Add Storage Dispensing Logic (Storage Bank Out Flow Valve control)
  When either Direct Fill / Time fill becomes active the Low Bank out flow valve would open first. Once the Low bank pressure is within a set range above the active Direct Fill pressure / Time Fill pressure the mid bank out flow valve would open. Once the Mid bank pressure was within a set range above the active Direct Fill pressure / Time Fill pressure then the High Bank out flow valve would open and remain open until active fill is complete or an override condition occurs. (*We will need to discuss if out flow valves remain open or if they close as the dispensing progresses to the higher pressure banks.*)

  Storage Dispensing overrides are listed in order of priority:
  1. Site ESD or Site Fault Condition Exists
  2. Both Direct Fill and Time fill are inactive
  3. If Direct Fill becomes active while Time fill is active all storage out flow valves would close and dispensing would restart from Low Bank.
  4. If Time Fill becomes active while Direct fill is active. The Time fill valve would remain closed until Direct Fill is complete then all storage out flow valves would close and dispensing would restart from Low Bank.
  5. High Bank Dispensing timer expires (*further discussion needed*)

- Additional Changes to Compressor Operation:
  If the compressor is running to fill storage and Direct Fill or Time fill become active the compressor will continue to run loaded while Dispensing Logic is active if Bio-Gas pressure is greater than the "Biogas Stop pressure" set point. Storage Filling would resume after the active filling is complete.

J-W Power Company
P.O. Box 226406
Dallas, TX 75222-6406
(972) 233-8191

If the Bio-Gas pressure drops below the "Biogas Stop pressure" set point while storage dispensing is active the compressor will run unloaded/recycle until high bank pressure equals the active Direct Fill / Time Fill pressure then the compressor will load to finish the active Direct Fill or Time Fill then stop.

- Updates to PLC and HMI to improve screen refresh rate and communications
- Internal function testing (not customer witnessed)
- Provide support for and panel wiring changes
- Update Panel Drawings before Site Modifications dependent on customer schedule
- Update Sequence of Operations after commissioning is compete

ITEM 2

Adder: Customer Witnessed FAT (additional 16 hrs) +$2,000
- Remote or In Person witness of FAT

Adder: Temperature Compensate Storage Filling with TC per storage Bank (additional 3 hrs) +$375
- Change card settings to accept TC inputs & add Bank temperatures

Adder: Upgrade Red Lion G306 or Red Lion Graphite G07S0000 (additional 24 hrs) +$3,000 plus hardware cost
- Convert Crimson 2.0 program to Crimson 3.1
- Provide modification kit and new HMI
- Hardware:
  - Module Display Graphite Redlion G07S000* $2,128.19
  - Adapter Plate $26

Up to 2 days Onsite Support & Follow up Remote Support

ITEM 3

- Travel Expenses billed at cost. An estimate can be provided for customer supplied dates
- Remote Support billed per hour only if it is a change in scope ($125 per hour)
- Onsite support (1) Engineer/Programmer $1,250 per day
- Travel Days (1) Engineer/Programmer $600 per day in addition to travel expenses
- Estimated Onsite Support & Travel

Expenses	Days	Cost/Day	Total/day
*Airfare Travel(incl parking)	2	$ 1100.00	$ 1100.00
Travel Days	2	$ 600.00	$ 1200.00
*Rental car $/day	4	$ 125.00	$ 500.00
*Hotel $/day	4	$ 125.00	$ 500.00
Meals	4	$ 75.00	$ 300.00
Courtney McCollum	2	$ 1250.00	$ 2500.00
		Estimated Total Cost:	$ 6,100.00
*Subject to change based on travel costs at time of booking			

Payment Terms: ****All invoices are due upon receipt of invoice. ****

Warranty: **Limited to only program modifications by J-W Power Company.**

J-W POWER COMPANY

By: Courtney McCollum

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CITY OF GRAND JUNCTION, COLORADO

****

CONTRACT

This CONTRACT made and entered into this 3rd day of December, 2020 by and between the **City of Grand Junction, Colorado,** a government entity in the County of Mesa, State of Colorado, hereinafter in the Contract Documents referred to as the "Owner" and **ZAP Engineering & Construction Services, Inc.** hereinafter in the Contract Documents referred to as the "Contractor."

WITNESSETH:

WHEREAS, the Owner advertised that sealed Responses would be received for furnishing all labor, tools, supplies, equipment, materials, and everything necessary and required for the Project described by the Contract Documents and known as **Design/Build Grand Junction Bio Compressed Natural Gas (BioCNG) Storage and Fueling Station Optimization Project RFP-4813-20-DH**.

WHEREAS, the Contract has been awarded to the above named Contractor by the Owner, and said Contractor is now ready, willing and able to perform the Work specified in accordance with the Contract Documents;

NOW, THEREFORE, in consideration of the compensation to be paid the Contractor, the mutual covenants hereinafter set forth and subject to the terms hereinafter stated, it is mutually covenanted and agreed as follows:

ARTICLE 1

Contract Documents: It is agreed by the parties hereto that the following list of instruments, drawings, and documents which are attached hereto, bound herewith, or incorporated herein by reference constitute and shall be referred to either as the "Contract Documents" or the "Contract", and all of said instruments, drawings, and documents taken together as a whole constitute the Contract between the parties hereto, and they are fully a part of this agreement as if they were set out verbatim and in full herein:

The order of contract document governance shall be as follows:

a. The body of this contract agreement;
b. Solicitation Documents for the Project; **Design/Build Grand Junction Bio Compressed Natural Gas (BioCNG) Storage and Fueling Station Optimization Project;**

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c. Contractors Negotiated Response to the Solicitation (Contractor's Proposal No. 920289 Rev. 1) Negotiated Terms and Conditions/Scope of Work, Project Schedule, Pricing, etc.; ;
d. Work Change Requests (directing that changed work be performed);
e. Field Orders;
f. Change Orders.

ARTICLE 2

Definitions: The clauses provided in the Solicitation apply to the terms used in the Contract and all the Contract Documents.

ARTICLE 3

Contract Work: The Contractor agrees to furnish all labor, tools, supplies, equipment, materials, and all that is necessary and required to complete the tasks associated with the Work described, set forth, shown, and included in the Contract Documents as indicated in the Solicitation Document. The as-built drawings and redlines are from previous BioCNG projects and included as the attachments to the RFP. Contractor is aware and agrees that said drawings are for reference and shall not be used to site the new improvement. Site location must be reviewed and approved by Owner during the design process.

ARTICLE 4

Contract Time and Liquidated Damages: Time is of the essence with respect to this Contract. The Contractor hereby agrees to commence Work under the Contract on or before December 14, 2020, and to achieve Final Completion of the Work no later than July 29, 2021. In the event the Work is not completed in the times set forth and as agreed upon, the Contractor further agrees to pay Liquidated Damages to the Owner as set forth in the Solicitation. The Contractor acknowledges and recognizes the delays, expenses and difficulties involved in proving in a legal proceeding the actual losses suffered by the Owner if the work is not completed on time. Accordingly, instead of requiring any such proof, the Owner and the Contractor agree that as Liquidated Damages for delay, but not as a penalty, the Contractor shall pay to the Owner the amounts specified in the Solicitation.

ARTICLE 5

Contract Price and Payment Procedures: The Contractor shall accept as full and complete compensation for the performance and completion of all of the Work specified in the Contract Documents, the Guaranteed Maximum Price of **One Million Thirteen Thousand Six Hundred Forty and 00/100 Dollars ($1,013,640.00). This GMP includes the base amount of $715,380, the Add/Alternate for Compressor Replacement of $256,400, and the Add/Alternate for ANG75E Option Adder of $41,860 (all GMPs include Contractor's Fixed Fees).** If this Contract contains unit price pay items, the Contract Price shall be adjusted in accordance with the actual quantities of items completed and accepted by the Owner at the unit prices quoted in the Solicitation Response. The amount of the Contract Price is and has heretofore been appropriated by the Grand Junction City Council for the use and benefit of this Project. The Contract Price shall not be modified except by Change Order or other written directive of the Owner. The Owner shall not issue a Change

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Order or other written directive which requires additional work to be performed, which work causes the aggregate amount payable under this Contract to exceed the amount appropriated for this Project, unless and until the Owner provides Contractor written assurance that lawful appropriations to cover the costs of the additional work have been made.

Unless otherwise provided in the Solicitation, monthly partial payments shall be made as the Work progresses. Applications for partial and Final Payment shall be prepared by the Contractor and approved by the Owner in accordance with the Solicitation.

Upon Final Completion of the Work under the Contract and before the Contractor shall receive final payment, the Owner shall publish at least twice in a newspaper of general circulation published in the County a notice that: 1. the Owner has accepted such Work as completed according to the Contract Documents; 2. the Contractor is entitled to final payment therefore; 3. thirty days after the first publication, specifying the exact date, the Owner shall pay the full balance due under the Contract; and 4. persons having claims for labor, materials, team hire, sustenance, provisions, provender, or other supplies used or consumed by the Contractor or a subcontractor shall file a verified statement of the amount due and unpaid on account of such claim prior to the date specified for such payment. Nothing herein shall be construed as relieving the Contractor and the Sureties on the Contractor's Bonds from any claim or claims for work or labor done or materials or supplies furnished in the execution of the Contract.

ARTICLE 6

Bonds: The Contractor shall furnish currently herewith the Bonds required by the Contract Documents, such Bonds being attached hereto. The Performance Bond shall be in an amount not less than one hundred percent (100%) of the Contract Price set forth in Article 5. The Payment Bond shall be in an amount not less than one hundred (100%) of the Contract Price set forth in Article 5.

ARTICLE 7

Contract Binding: The Owner and the Contractor each binds itself, its partners, successors, assigns and legal representatives to the other party hereto in respect to all covenants, agreements and obligations contained in the Contract Documents. The Contract Documents constitute the entire agreement between the Owner and Contractor and may only be altered, amended or repealed by a duly executed written instrument. Neither the Owner nor the Contractor shall, without the prior written consent of the other, assign or sublet in whole or in part its interest under any of the Contract Documents and specifically, the Contractor shall not assign any moneys due or to become due without the prior written consent of the Owner.

ARTICLE 8

Severability: If any part, portion or provision of the Contract shall be found or declared null, void or unenforceable for any reason whatsoever by any court of competent jurisdiction or any governmental agency having the authority thereover, only such part, portion or provision

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shall be effected thereby and all other parts, portions and provisions of the Contract shall remain in full force and effect.

IN WITNESS WHEREOF, City of Grand Junction, Colorado, has caused this Contract to be subscribed and sealed and attested in its behalf; and the Contractor has signed this Contract the day and the year first mentioned herein.

The Contract is executed in two counterparts.

CITY OF GRAND JUNCTION, COLORADO

DocuSigned by:
By: Duane Hoff Jr., Senior Buyer – City of Grand Junction 12/4/2020 | 14:37 MST
9E789E7D50F14BC...
Duane Hoff Jr., Senior Buyer Date

ZAP Engineering & Construction Services, Inc.

DocuSigned by:
By: Frank E. Lousberg 12/4/2020 | 14:24 MST
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Frank E. Lousberg FEL Date

Request for Proposal
RFP-4813-20-DH

Design/Build Grand Junction Bio Compressed Natural Gas (BioCNG) Storage and Fueling Station Optimization Project

RESPONSES DUE:
August 26, 2020 Prior to 3:30 PM MDT
Accepting Electronic Responses Only
Responses Only Submitted Through the Rocky Mountain E-Purchasing System (RMEPS)
https://www.rockymountainbidsystem.com/default.asp
(Purchasing Representative does not have access or control of the vendor side of RMEPS. If website or other problems arise during response submission, vendor MUST contact RMEPS to resolve issue prior to the response deadline. 800-835-4603)

PURCHASING REPRESENTATIVE:
Duane Hoff Jr., Senior Buyer
duaneh@gjcity.org
970-244-1545

This solicitation has been developed specifically for a Request for Proposal intended to solicit competitive responses for this solicitation, and may not be the same as previous City of Grand Junction solicitations. All offerors are urged to thoroughly review this solicitation prior to submitting. Submittal by **FAX, EMAIL or HARD COPY IS NOT ACCEPTABLE** for this solicitation.

REQUEST FOR PROPOSAL

TABLE OF CONTENTS

Section

1.0 Administrative Information and Conditions for Submittal

2.0 General Contract Terms and Conditions

3.0 Insurance Requirements

4.0 Specifications/Scope of Services

5.0 Preparation and Submittal of Proposals

6.0 Evaluation Criteria and Factors

7.0 Solicitation Response Form

Attachments

REQUEST FOR PROPOSAL

SECTION 1.0: ADMINISTRATIVE INFORMATION & CONDITIONS FOR SUBMITTAL

1.1 Issuing Office: This Request for Proposal (RFP) is issued by the City of Grand Junction. All contact regarding this RFP shall be directed to:

RFP Questions:
Duane Hoff Jr., Senior Buyer
duaneh@gjcity.org

1.2 Purpose: The purpose of this RFP is to obtain proposals from qualified and professional design-build firms/contractors specializing in the design, development, and construction of Bio Compressed Natural Gas (BioCNG) fueling facilities, to provide design services and construction of a low pressure biogas storage system at the Persigo Wastewater Treatment Plant and construction of improvements to the instrumentation and automation of a CNG fleet fueling station. Storage facility to be located at the Persigo WWTP, 2145 River Road, Grand Junction, CO. Automation and instrumentation located at City's Municipal Campus area at 333 West Avenue, Grand Junction, CO.

1.3 Recommended Pre-Proposal Virtual Meeting/Briefing: A pre-proposal virual meeting/briefing recommended for all prospective offerors. The purpose of this virtual meeting/briefing will be to inspect and to clarify the contents of this Request for Proposal (RFP). The virtual meeting/briefing shall take place on July 27, 2020 at 2:00pm. Nothing stated during the Virtual Meeting/Briefing will modify the solicitation. Only information provided in an addendum can modify the solicitation.

The virtual meeting will be hosted via **Microsoft Teams** and attendees shall participate remotely. The link for the virtual meeting is below.

https://teams.microsoft.com/dl/launcher/launcher.html?url=%2f_%23%2fl%2fmeetup-join%2f19%3ameeting_YmVjMWU2ZDUtNjRlNC00Nzc2LWJjMzAtOTVhZDJkMDBhNTZk%40thread.v2%2f0%3fcontext%3d%257b%2522Tid%2522%253a%25228d207e5d-3faa-4a17-8389-db5747bc379c%2522%252c%2522Oid%2522%253a%252227bd0506-8294-424d-891e-42a0f92aae16%2522%257d%26anon%3dtrue&type=meetup-join&deeplinkId=5a2f879f-f73b-49ef-bf1c-a86686c4f899&directDl=true&msLaunch=true&enableMobilePage=true&suppressPrompt=true&promptSuccess=true

1.4 The Owner: The Owner is the City of Grand Junction, Colorado and is referred to throughout this Solicitation. The term Owner means the Owner or his authorized representative.

1.5 Procurement Process: Procurement processes shall be governed by the most current version of the City of Grand Junction Purchasing Policy and Procedure Manual.

1.6 Compliance: All participating Offerors, by their signature hereunder, shall agree to comply with all conditions, requirements, and instructions of this RFP as stated or implied herein. Should the Owner omit anything from this packet which is necessary to the clear understanding of the requirements, or should it appear that various instructions are in

conflict, the Offeror(s) shall secure instructions from the Purchasing Division prior to the date and time of the submittal deadline shown in this RFP.

1.7 Submission: Please refer to section 5.0 for what is to be included. ***Each proposal shall be submitted in electronic format only, and only through the Rocky Mountain E-Purchasing website (https://www.rockymountainbidsystem.com/default.asp).*** *This site offers both "free" and "paying" registration options that allow for full access of the Owner's documents and for electronic submission of proposals. (Note: "free" registration may take up to 24 hours to process. Please Plan accordingly.)* Please view our "**Electronic Vendor Registration Guide"** at http://www.gjcity.org/business-and-economic-development/bids/ for details. For proper comparison and evaluation, the City requests that proposals be formatted as directed in Section 5.0 "Preparation and Submittal of Proposals." Submittals received that fail to follow this format may be ruled non-responsive. (Purchasing Representative does not have access or control of the vendor side of RMEPS. If website or other problems arise during response submission, vendor **MUST** contact RMEPS to resolve issue prior to the response deadline. **800-835-4603**)

1.8 Altering Proposals: Any alterations made prior to opening date and time must be initialed by the signer of the proposal, guaranteeing authenticity. Proposals cannot be altered or amended after submission deadline.

1.9 Withdrawal of Proposal: A proposal must be firm and valid for award and may not be withdrawn or canceled by the Offeror for sixty (60) days following the submittal deadline date, and only prior to award. The Offeror so agrees upon submittal of their proposal. After award this statement is not applicable.

1.10 Addenda: All Questions shall be submitted in writing to the appropriate person as shown in Section 1.1. Any interpretations, corrections and changes to this RFP or extensions to the opening/receipt date shall be made by a written Addendum to the RFP by the Owner. Sole authority to authorize addenda shall be vested in the City of Grand Junction Purchasing Representative. Addenda will be issued electronically through the Rocky Mountain E-Purchasing website at www.rockymountainbidsystem.com and http://www.gjcity.org/business-and-economic-development/bids/ Offerors shall acknowledge receipt of all addenda in their proposal.

1.11 Exceptions and Substitutions: All proposals meeting the intent of this RFP shall be considered for award. Offerors taking exception to the specifications shall do so at their own risk. The Owner reserves the right to accept or reject any or all substitutions or alternatives. When offering substitutions and/or alternatives, Offeror must state these exceptions in the section pertaining to that area. Exception/substitution, if accepted, must meet or exceed the stated intent and/or specifications. The absence of such a list shall indicate that the Offeror has not taken exceptions, and if awarded a contract, shall hold the Offeror responsible to perform in strict accordance with the specifications or scope of work contained herein.

1.12 Confidential Material: All materials submitted in response to this RFP shall ultimately become public record and shall be subject to inspection after contract award. "**Proprietary or Confidential Information"** is defined as any information that is not generally known to competitors and which provides a competitive advantage. Unrestricted disclosure of

proprietary information places it in the public domain. Only submittal information clearly identified with the words "***Confidential Disclosure***" and uploaded as a separate document shall establish a confidential, proprietary relationship. Any material to be treated as confidential or proprietary in nature must include a justification for the request. The request shall be reviewed and either approved or denied by the Owner. If denied, the proposer shall have the opportunity to withdraw its entire proposal, or to remove the confidential or proprietary restrictions. Neither cost nor pricing information nor the total proposal shall be considered confidential or proprietary

1.13 Response Material Ownership: All proposals become the property of the Owner upon receipt and shall only be returned to the proposer at the Owner's option. Selection or rejection of the proposal shall not affect this right. The Owner shall have the right to use all ideas or adaptations of the ideas contained in any proposal received in response to this RFP, subject to limitations outlined in the section titled "Confidential Material". Disqualification of a proposal does not eliminate this right.

1.14 Minimal Standards for Responsible Prospective Offerors: A prospective Offeror must affirmably demonstrate their responsibility. A prospective Offeror must meet the following requirements:

- Have adequate financial resources, or the ability to obtain such resources as required.
- Be able to comply with the required or proposed completion schedule.
- Have a satisfactory record of performance.
- Have a satisfactory record of integrity and ethics.
- Be otherwise qualified and eligible to receive an award and enter into a contract with the Owner.

1.15 Nonconforming Terms and Conditions: A proposal that includes terms and conditions that do not conform to the terms and conditions of this Request for Proposal is subject to rejection as non-responsive. The Owner reserves the right to permit the Offeror to withdraw nonconforming terms and conditions from its proposal prior to a determination by the Owner of non-responsiveness based on the submission of nonconforming terms and conditions

1.16 Open Records: All proposals shall be open for public inspection after the contract is awarded. Trade secrets and confidential information contained in the proposal so identified by offer as such shall be treated as confidential by the Owner to the extent allowable in the Open Records Act.

1.17 Sales Tax: City of Grand Junction is, by statute, exempt from the State Sales Tax and Federal Excise Tax; therefore, all fees shall not include taxes.

1.18 Public Opening: Proposals shall be opened in the City Hall Auditorium, 250 North 5th Street, Grand Junction, CO 81501, immediately following the proposal deadline. Offerors, their representatives and interested persons may be present. Only the names and locations on the proposing firms will be disclosed.

SECTION 2.0: GENERAL CONTRACT TERMS AND CONDITIONS

2.1. Acceptance of RFP Terms: A proposal submitted in response to this RFP shall constitute a binding offer. Acknowledgment of this condition shall be indicated on the Cover Letter by the Offeror or an officer of the Offeror legally authorized to execute contractual obligations. A submission in response to the RFP acknowledges acceptance by the Offeror of all terms and conditions, as set forth herein. An Offeror shall identify clearly and thoroughly any variations between its proposal and the Owner's RFP requirements. Failure to do so shall be deemed a waiver of any rights to subsequently modify the terms of performance, except as outlined or specified in the RFP.

2.2. Execution, Correlation, Intent, and Interpretations: The Contract Documents shall be signed by the Owner and Contractor. By executing the contract, the Contractor represents that they have familiarized themselves with the local conditions under which the Work is to be performed and correlated their observations with the requirements of the Contract Documents. The Contract Documents are complementary, and what is required by any one, shall be as binding as if required by all. The intention of the documents is to include all labor, materials, equipment, services and other items necessary for the proper execution and completion of the scope of work as defined in the technical specifications and drawings contained herein. All drawings, specifications and copies furnished by the Owner are, and shall remain, Owner property. They are not to be used on any other project.

2.3. Permits, Fees, & Notices: The Contractor shall secure and pay for all permits, fees and licenses necessary for the proper execution and completion of the work. The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and orders of any public authority bearing on the performance of the work. If the Contractor observes that any of the Contract Documents are at variance in any respect, Contractor shall promptly notify the Owner in writing, and any necessary changes shall be adjusted by change order/amendment. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Owner, Contractor shall assume full responsibility and shall bear all costs attributable.

2.4. Warranty: The Contractor warrants to the Owner that all materials and equipment furnished under this contract will be new unless otherwise specified, and that all work will be of good quality, free from faults and defects and in conformance with the Contract Documents. All work not so conforming to these standards may be considered defective. If required by Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. If within ten (10) days after written notice to the Contractor requesting such repairs or replacement, the Contractor should neglect to make or undertake with due diligence to the same, the City may make such repairs or replacements. All indirect and direct costs of such correction or removal or replacement shall be at the Contractor's expense. The Contractor will also bear the expenses of making good all work of others destroyed or damaged by the correction, removal or replacement of his defective work.

2.5. Quantities of Work and Unit Price: 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. 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.

2.6. Responsibility for those Performing the Work: The Contractor shall be responsible to the Owner for the acts and omissions of all their employees and all other persons performing any of the work under a contract with the Contractor.

2.7. Use of the Site: The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents, and shall not unreasonably encumber the site with any materials or equipment.

2.8. Cleanup: The Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by their operations. At the completion of work they shall remove all their waste materials and rubbish from and about the project, as well as all their equipment and surplus materials.

2.9. Payment & Completion: The Contract Sum is stated in the Contract and is the total amount payable by the Owner to the Contractor for the performance of the work under the Contract Documents. Upon receipt of written notice that the work is ready for final inspection and acceptance and upon receipt of application for payment, the Owner's Project Manager will promptly make such inspection and, when Owner finds the work acceptable under the Contract Documents and the Contract fully performed, the Owner shall make payment in the manner provided in the Contract Documents. Partial payments will be based upon estimates, prepared by the Contractor, of the value of Work performed and materials placed in accordance with the Contract Documents.

2.10. Bid Bond: 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** written 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 a Bid is accepted and a Contact is awarded, the apparent successful bidder has ten calendar days to enter into a contractor in the form prescribed and to furnish the bonds with a legally responsible and approved surety. Failure to do so will result I forfeiture of the Bid Guaranty to the City as Liquidated Damages.

Each bidder shall guaranty its total bid price for a period of sixty (60) Calendar Days from the date of the bid opening.

2.11. Performance & Payment Bonds: Contractor shall furnish a Performance and a Payment Bond, each in an amount at least equal to that specified for the contract amount as security for the faithful performance and payment of all Contractor's obligations under the Contract Documents. These bonds shall remain in effect for the duration of the Warranty Period (as specified in the Special Conditions). Contractor shall also furnish other bonds that may be required by the Special Conditions. All bonds shall be in the forms prescribed by the Contract Documents and be executed by such sureties as (1) are licensed to conduct business in the State of Colorado and (2) are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as

Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff, Bureau of Accounts, U.S. Treasury Department. All bonds singed by an agent must be accompanied by a certified copy of the Authority Act. If the surety on any bond furnished by the Contractor is declared bankrupt, or becomes insolvent, or its rights to do business in Colorado are terminated, or it ceases to meet the requirements of clauses (1) and (2) of this section, Contractor shall within five (5) days thereafter substitute another bond and surety, both of which shall be acceptable to the City.

2.12. Retention: The Owner will deduct money from the partial payments in amounts considered necessary to protect the interest of the Owner and will retain this money until after completion of the entire contract. The amount to be retained from partial payments will be five (5) percent of the value of the completed work, and not greater than five (5) percent of the amount of the Contract. When the retainage has reached five (5) percent of the amount of the Contract no further retainage will be made and this amount will be retained until such time as final payment is made.

2.13. Liquidated Damages for Failure to Meet Project Completion Schedule: 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 **$1,000.00** 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.

2.14. Contingency/Force Account: Contingency/Force Account work will be authorized by the Owner's Project Manager and is defined as minor expenses to cover miscellaneous or unforeseen expenses related to the project. The expenses are not included in the Drawings, Specifications, or Scope of Work and are necessary to accomplish the scope of this contract. Contingency/Force Account Authorization will be directed by the Owner through an approved form. Contingency/Force Account funds are the property of the Owner and any Contingency/Force Account funds, not required for project completion, shall remain the property of the Owner. Contractor is not entitled to any Contingency/Force Account funds, that are not authorized by Owner or Owner's Project Manager.

2.15. Protection of Persons & Property: The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. Contractor shall erect and maintain, as required by existing safeguards for safety and protection, and all reasonable precautions, including posting danger signs or other warnings against hazards promulgating safety regulations and notifying owners and users of adjacent utilities. When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct by the Contractor in the execution of the work, or in consequence of the non-execution thereof by the Contractor, they shall restore, at their own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, rebuilding, or otherwise restoring as may be directed, or it shall make good such damage or injury in an acceptable manner.

2.16. Changes in the Work: The Owner, without invalidating the contract, may order changes in the work within the general scope of the contract consisting of additions, deletions or other revisions. All such changes in the work shall be authorized by Change Order and shall be executed under the applicable conditions of the contract documents. A Change Order is a written order to the Contractor signed by the Owner issued after the execution of the contract, authorizing a change in the work or an adjustment in the contract sum or the contract time.

2.17. Minor Changes in the Work: The Owner shall have authority to order minor changes in the work not involving an adjustment in the contract sum or an extension of the contract time and not inconsistent with the intent of the contract documents.

2.18. Uncovering & Correction of Work: The Contractor shall promptly correct all work found by the Owner as defective or as failing to conform to the contract documents. The Contractor shall bear all costs of correcting such rejected work, including the cost of the Owner's additional services thereby made necessary. The Owner shall give such notice promptly after discovering of condition. All such defective or non-conforming work under the above paragraphs shall be removed from the site where necessary and the work shall be corrected to comply with the contract documents without cost to the Owner.

2.19. Acceptance Not Waiver: The Owner's acceptance or approval of any work furnished hereunder shall not in any way relieve the proposer of their present responsibility to maintain the high quality, integrity and timeliness of his work. The Owner's approval or acceptance of, or payment for, any services shall not be construed as a future waiver of any rights under this Contract, or of any cause of action arising out of performance under this Contract.

2.20. Change Order/Amendment: No oral statement of any person shall modify or otherwise change, or affect the terms, conditions or specifications stated in the resulting contract. All change orders/amendments to the contract shall be made in writing by the Owner Purchasing Division.

2.21. Assignment: The Offeror shall not sell, assign, transfer or convey any contract resulting from this RFP, in whole or in part, without the prior written approval from the Owner.

2.22. Compliance with Laws: Proposals must comply with all Federal, State, County and local laws governing or covering this type of service and the fulfillment of all ADA (Americans with Disabilities Act) requirements. Contractor hereby warrants that it is qualified to assume the responsibilities and render the services described herein and has all requisite corporate authority and professional licenses in good standing, required by law.

2.23. Debarment/Suspension: The Contractor herby certifies that the Contractor is not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Governmental department or agency.

2.24. Confidentiality: All information disclosed by the Owner to the Contractor for the purpose of the work to be done or information that comes to the attention of the Contractor during the course of performing such work is to be kept strictly confidential.

2.25. Conflict of Interest: No public official and/or Owner employee shall have interest in any contract resulting from this RFP.

2.26. Contract: This Request for Proposal, submitted documents, and any negotiations, when properly accepted by the Owner, shall constitute a contract equally binding between the Owner and Offeror. The contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements,

either written or oral, including the Proposal documents. The contract may be amended or modified with Change Orders, Field Orders, or Amendment.

2.27. Project Manager/Administrator: The Project Manager, on behalf of the Owner, shall render decisions in a timely manner pertaining to the work proposed or performed by the Offeror. The Project Manager shall be responsible for approval and/or acceptance of any related performance of the Scope of Work.

2.28. Cancelation of Solicitation: Any solicitation may be canceled by the Owner or any solicitation response by a vendor may be rejected in whole or in part when it is in the best interest of the Owner.

2.29. Contract Termination: This contract shall remain in effect until any of the following occurs: (1) contract expires; (2) completion of services; (3) acceptance of services or, (4) for convenience terminated by either party with a written *Notice of Cancellation* stating therein the reasons for such cancellation and the effective date of cancellation at least thirty days past notification.

2.30. Employment Discrimination: During the performance of any services per agreement with the Owner, the Offeror, by submitting a Proposal, agrees to the following conditions:

2.30.1. The Offeror shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, age, disability, citizenship status, marital status, veteran status, sexual orientation, national origin, or any legally protected status except when such condition is a legitimate occupational qualification reasonably necessary for the normal operations of the Offeror. The Offeror agrees to post in conspicuous places, visible to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

2.30.2. The Offeror, in all solicitations or advertisements for employees placed by or on behalf of the Offeror, shall state that such Offeror is an Equal Opportunity Employer.

2.30.3. Notices, advertisements, and solicitations placed in accordance with federal law, rule, or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section.

2.31. Immigration Reform and Control Act of 1986 and Immigration Compliance: The Offeror certifies that it does not and will not during the performance of the contract employ illegal alien workers or otherwise violate the provisions of the Federal Immigration Reform and Control Act of 1986 and/or the immigration compliance requirements of State of Colorado C.R.S. § 8-17.5-101, *et.seq.* (House Bill 06-1343).

2.32. Ethics: The Offeror shall not accept or offer gifts or anything of value nor enter into any business arrangement with any employee, official, or agent of the Owner.

2.33. Failure to Deliver: In the event of failure of the Offeror to deliver services in accordance with the contract terms and conditions, the Owner, after due oral or written notice, may procure the services from other sources and hold the Offeror responsible for any costs

resulting in additional purchase and administrative services. This remedy shall be in addition to any other remedies that the Owner may have.

2.34. Failure to Enforce: Failure by the Owner at any time to enforce the provisions of the contract shall not be construed as a waiver of any such provisions. Such failure to enforce shall not affect the validity of the contract or any part thereof or the right of the Owner to enforce any provision at any time in accordance with its terms.

2.35. Force Majeure: The Offeror shall not be held responsible for failure to perform the duties and responsibilities imposed by the contract due to legal strikes, fires, riots, rebellions, and acts of God beyond the control of the Offeror, unless otherwise specified in the contract.

2.36. Indemnification: Offeror shall defend, indemnify and save harmless the Owner and all its officers, employees, insurers, and self-insurance pool, from and against all liability, suits, actions, or other claims of any character, name and description brought for or on account of any injuries or damages received or sustained by any person, persons, or property on account of any negligent act or fault of the Offeror, or of any Offeror's agent, employee, subcontractor or supplier in the execution of, or performance under, any contract which may result from proposal award. Offeror shall pay any judgment with cost which may be obtained against the Owner growing out of such injury or damages.

2.37. Independent Firm: The Offeror shall be legally considered an Independent Firm and neither the Firm nor its employees shall, under any circumstances, be considered servants or agents of the Owner. The Owner shall be at no time legally responsible for any negligence or other wrongdoing by the Firm, its servants, or agents. The Owner shall not withhold from the contract payments to the Firm any federal or state unemployment taxes, federal or state income taxes, Social Security Tax or any other amounts for benefits to the Firm. Further, the Owner shall not provide to the Firm any insurance coverage or other benefits, including Workers' Compensation, normally provided by the Owner for its employees.

2.38. Ownership: All plans, prints, designs, concepts, etc., shall become the property of the Owner.

2.39. Oral Statements: No oral statement of any person shall modify or otherwise affect the terms, conditions, or specifications stated in this document and/or resulting agreement. All modifications to this request and any agreement must be made in writing by the Owner.

2.40. Patents/Copyrights: The Offeror agrees to protect the Owner from any claims involving infringements of patents and/or copyrights. In no event shall the Owner be liable to the Offeror for any/all suits arising on the grounds of patent(s)/copyright(s) infringement. Patent/copyright infringement shall null and void any agreement resulting from response to this RFP.

2.41. Remedies: The Offeror and Owner agree that both parties have all rights, duties, and remedies available as stated in the Uniform Commercial Code.

2.42. Venue: Any agreement as a result of responding to this RFP shall be deemed to have been made in, and shall be construed and interpreted in accordance with, the laws of the City of Grand Junction, Mesa County, Colorado.

2.43. Expenses: Expenses incurred in preparation, submission and presentation of this RFP are the responsibility of the company and can not be charged to the Owner.

2.44. Sovereign Immunity: The Owner specifically reserves its right to sovereign immunity pursuant to Colorado State Law as a defense to any action arising in conjunction to this agreement.

2.45. Public Funds/Non-Appropriation of Funds: Funds for payment have been provided through the Owner's budget approved by the City Council/Board of County Commissioners for the stated fiscal year only. State of Colorado statutes prohibit the obligation and expenditure of public funds beyond the fiscal year for which a budget has been approved. Therefore, anticipated orders or other obligations that may arise past the end of the stated Owner's fiscal year shall be subject to budget approval. Any contract will be subject to and must contain a governmental non-appropriation of funds clause.

2.46. Collusion Clause: Each Offeror by submitting a proposal certifies that it is not party to any collusive action or any action that may be in violation of the Sherman Antitrust Act. Any and all proposals shall be rejected if there is evidence or reason for believing that collusion exists among the proposers. The Owner may or may not, at the discretion of the Owner Purchasing Representative, accept future proposals for the same service or commodities for participants in such collusion.

2.47. Gratuities: The Contractor certifies and agrees that no gratuities or kickbacks were paid in connection with this contract, nor were any fees, commissions, gifts or other considerations made contingent upon the award of this contract. If the Contractor breaches or violates this warranty, the Owner may, at their discretion, terminate this contract without liability to the Owner.

2.48. OSHA Standards: All Offerors agree and warrant that services performed in response to this invitation shall conform to the standards declared by the US Department of Labor under the Occupational Safety and Health Act of 1970 (OSHA). In the event the services do not conform to OSHA Standards, the Owner may require the services to be redone at no additional expense to the Owner.

2.49. Performance of the Contract: The Owner reserves the right to enforce the performance of the contract in any manner prescribed by law or deemed to be in the best interest of the Owner in the event of breach or default of resulting contract award.

2.50. Benefit Claims: The Owner shall not provide to the Contractor any insurance coverage or other benefits, including Worker's Compensation, normally provided by the Owner for its employees.

2.51. Default: The Owner reserves the right to terminate the contract immediately in the event the Contractor fails to meet delivery or completion schedules, or otherwise perform in accordance with the accepted proposal. Breach of contract or default authorizes the Owner

to purchase like services elsewhere and charge the full increase in cost to the defaulting Contractor.

2.52. Multiple Offers: Proposers must determine for themselves which product or service to offer. If said proposer chooses to submit more than one offer, THE ALTERNATE OFFER must be clearly marked "Alternate Proposal". The Owner reserves the right to make award in the best interest of the Owner.

2.53. Cooperative Purchasing: Purchases as a result of this solicitation are primarily for the Owner. Other governmental entities may be extended the opportunity to utilize the resultant contract award with the agreement of the successful provider and the participating agencies. All participating entities will be required to abide by the specifications, terms, conditions and pricings established in this Proposal. The quantities furnished in this proposal document are for only the Owner. It does not include quantities for any other jurisdiction. The Owner will be responsible only for the award for our jurisdiction. Other participating entities will place their own awards on their respective Purchase Orders through their purchasing office or use their purchasing card for purchase/payment as authorized or agreed upon between the provider and the individual entity. The Owner accepts no liability for payment of orders placed by other participating jurisdictions that choose to piggy-back on our solicitation. Orders placed by participating jurisdictions under the terms of this solicitation will indicate their specific delivery and invoicing instructions.

2.54. Definitions:

2.54.1. "Offeror" and/or "Proposer" refers to the person or persons legally authorized by the Consultant to make an offer and/or submit a response (fee) proposal in response to the Owner's RFP.

2.54.2. The term "Work" includes all labor, materials, equipment, and/or services necessary to produce the requirements of the Contract Documents.

2.54.3. "Contractor" is the person, organization, firm or consultant identified as such in the Agreement and is referred to throughout the Contract Documents. The term Contractor means the Contractor or his authorized representative. The Contractor shall carefully study and compare the General Contract Conditions of the Contract, Specification and Drawings, Scope of Work, Addenda and Modifications and shall at once report to the Owner any error, inconsistency or omission he may discover. Contractor shall not be liable to the Owner for any damage resulting from such errors, inconsistencies or omissions. The Contractor shall not commence work without clarifying Drawings, Specifications, or Interpretations.

2.54.4. "Sub-Contractor is a person or organization who has a direct contract with the Contractor to perform any of the work at the site. The term sub-contractor is referred to throughout the contract documents and means a sub-contractor or his authorized representative.

2.55. Public Disclosure Record: If the Proposer has knowledge of their employee(s) or sub-proposers having an immediate family relationship with an Owner employee or elected official, the proposer must provide the Purchasing Representative with the name(s) of these individuals. These individuals are required to file an acceptable "Public Disclosure Record", a statement of financial interest, before conducting business with the Owner.

2.56. Keep Jobs in Colorado Act: Contractor shall be responsible for ensuring compliance with Article 17 of Title 8, Colorado Revised Statutes requiring 80% Colorado labor to be employed on public works. Contractor shall, upon reasonable notice provided by the Owner, permit the Owner to inspect documentation of identification and residency required by C.R.S. §8-17-101(2)(a). If Contractor claims it is entitled to a waiver pursuant to C.R.S. §8-17-101(1), Contractor shall state that there is insufficient Colorado labor to perform the work such that compliance with Article 17 would create an undue burden that would substantially prevent a project from proceeding to completion, and shall include evidence demonstrating the insufficiency and undue burden in its response.

Unless expressly granted a waiver by the Owner pursuant to C.R.S. §8-17-101(1), Contractor shall be responsible for ensuring compliance with Article 17 of Title 8, Colorado Revised Statutes requiring 80% Colorado labor to be employed on public works. Contractor shall, upon reasonable notice provided by the Owner, permit the Owner to inspect documentation of identification and residency required by C.R.S. §8-17-101(2)(a).

2.56.1. "Public Works project" is defined as:

(a) any construction, alteration, repair, demolition, or improvement of any land, building, structure, facility, road, highway, bridge, or other public improvement suitable for and intended for use in the promotion of the public health, welfare, or safety and any maintenance programs for the upkeep of such projects

(b) for which appropriate or expenditure of moneys may be reasonably expected to be $500,000.00 or more in the aggregate for any fiscal year

(c) except any project that receives federal moneys.

SECTION 3.0: INSURANCE REQUIREMENTS

Insurance Requirements: The selected Contractor agrees to procure and maintain, at its own cost, policy(s) of insurance sufficient to insure against all liability, claims, demands, and other obligations assumed by the Contractor pursuant to this Section. Such insurance shall be in addition to any other insurance requirements imposed by this Contract or by law. The Contractor shall not be relieved of any liability, claims, demands, or other obligations assumed pursuant to this Section by reason of its failure to procure or maintain insurance in sufficient amounts, durations, or types. Contractor shall procure and maintain and, if applicable, shall cause any Subcontractor of the Contractor to procure and maintain insurance coverage listed below. Such coverage shall be procured and maintained with forms and insurers acceptable to the Owner. In the case of any claims-made policy, the necessary retroactive dates and extended reporting periods shall be procured to maintain such continuous coverage. Minimum coverage limits shall be as indicated below unless specified otherwise:

(a) Worker Compensation: Contractor shall comply with all State of Colorado Regulations concerning Workers' Compensation insurance coverage.

(b) General Liability insurance with minimum limits of:

ONE MILLION DOLLARS ($1,000,000) each occurrence and
ONE MILLION DOLLARS ($1,000,000) per job aggregate.

The policy shall be applicable to all premises and operations. The policy shall include coverage for bodily injury, broad form property damage (including completed operations), personal injury (including coverage for contractual and employee acts), blanket contractual, products, and completed operations. The policy shall include coverage for explosion, collapse, and underground hazards. The policy shall contain a severability of interests provision.

(c) Comprehensive Automobile Liability insurance with minimum limits for bodily injury and property damage of not less than:

ONE MILLION DOLLARS ($1,000,000) each occurrence and
ONE MILLION DOLLARS ($1,000,000) aggregate

(d) Professional Liability & Errors and Omissions Insurance policy with a minimum of:

ONE MILLION DOLLARS ($1,000,000) per claim

This policy shall provide coverage to protect the contractor against liability incurred as a result of the professional services performed as a result of responding to this Solicitation.

With respect to each of Contractors owned, hired, or non-owned vehicles assigned to be used in performance of the Work. The policy shall contain a severability of interests provision. The policies required by paragraph (b) above shall be endorsed to include the Owner, and the Owner's officers and employees as additional insureds. Every policy required above shall be primary insurance, and any insurance carried by the Owner, its officers, or its employees, or carried by or provided through any insurance pool of the Owner, shall be excess and not contributory insurance to that provided by Bidder. No additional insured endorsement to any required policy shall contain any exclusion for bodily injury or property damage arising from completed operations. The Bidder shall be solely responsible for any deductible losses under any policy required above.

SECTION 4.0: SPECIFICATIONS/SCOPE OF SERVICES

4.1. General/Background: The Persigo Wastewater Treatment Plant (a.k.a. Persigo) has a rated capacity of 12.5 million gallons of wastewater per day. It is located in Grand Junction, Colorado and is jointly owned by the City of Grand Junction and Mesa County.

In 2015, Persigo commissioned a first-of-its-kind project that beneficially recaptures waste methane biogas produced as a byproduct of the anaerobic digestion process and converts it into compressed natural gas (CNG) which is used as a vehicle fuel. The CNG produced at Persigo is a carbon-neutral advanced biofuel and is used locally to fuel 69 fleet vehicles owned by the City of Grand Junction and Mesa County.

The biogas recapture system is called BioCNG; it purifies, pressurizes and stores the gas in a pipeline which conveys the fuel to the centrally located CNG vehicle fueling station. While the BioCNG project has been incredibly successful, it has been determined after operating the system for 5 years that about 21% or 25,500 gasoline gallon equivalents per year of CNG, available to be used as vehicle fuel, are still being flared to the atmosphere because there is not enough available storage volume in the current system. In addition to the storage constraints, there is a significant offset in the biogas production rates at Persigo and its demand pattern at the fleet fueling stations.

Under current operations, Persigo produces approximately 45,000 – 50,000 standard cubic feet (scf) of CNG per day that can be used in vehicles for fuel. The existing gas storage is comprised of 3 high pressure spheres at the CNG fueling station, a medium pressure 4-inch pipeline that is about 6 miles in length between Persigo and the fueling station, and raw digester gas storage under a floating anaerobic digester cover at Persigo. In total, the existing gas storage volume is about 75,000 – 80,000 scf and represents a best case scenario of 1.5 days of CNG storage. Currently, the demand for CNG by the fleet vehicles is about double the amount of CNG produced at Persigo.

This project desires to implement solutions identified for both supply side storage and demand side management. Conceptually, this project envisions constructing an additional 60,000 - 75,000 scf of low pressure gas storage in a ground mounted membrane gas holder system at Persigo and provide upgrades to the existing fueling station which includes additional gas flow metering, flow control valves, radio or cellular telemetry, a PLC, and programming and integration of the controls. Through increasing gas storage onsite at Persigo and enhancing the instrumentation and automation at the fueling stations, we aim to eliminate the flaring of CNG and maximize the beneficial use of this renewable resource. Furthermore, beneficially using all the current biogas will allow the facility to investigate options and alternatives to potentially increase gas production in the future.

Project Purpose: The purpose of this RFP is to obtain proposals from qualified and professional design-build firms/contractors specializing in the design, development, and construction of Bio Compressed Natural Gas (BioCNG) fueling facilities, to provide design services and construction of a low pressure biogas storage system at the Persigo Wastewater Treatment Plant and construction of improvements to the instrumentation and automation of a CNG fleet fueling station. Storage facility to be located at the Persigo WWTP, 2145 River Road, Grand Junction, CO. Automation and instrumentation located at City's Municipal Campus area at 333 West Avenue, Grand Junction, CO.

Budget: The total all-inclusive budget for this project is $1,080,000, excludes option maintenance costs and shall not be exceeded. Reference Section 4.2.3 "Pricing" for details.

Grant Funding: A portion of this project is funded with a Department of Local Affairs grant. Consultant and any subcontractors must satisfy all administrative requirements required by the grant funding including but not limited to:

> ***"Plans & Specifications***. *Construction plans and specifications shall be drawn up by a qualified engineer or architect licensed in the State of Colorado, or pre-engineered in accordance with Colorado law, and hired by the Grantee through a competitive selection process.* "

4.2. Special Conditions/Provisions:

4.2.1 Recommended Pre-Proposal Virtual Meeting/Briefing: A pre-proposal virual meeting/briefing recommended for all prospective offerors. The purpose of this virtual meeting/briefing will be to inspect and to clarify the contents of this Request for Proposal (RFP). The virtual meeting/briefing shall take place on July 27, 2020 at 2:00pm. Nothing

stated during the Virtual Meeting/Briefing will modify the solicitation. Only information provided in an addendum can modify the solicitation.

The virtual meeting will be hosted via **Microsoft Teams** and attendees shall participate remotely. The link for the virtual meeting is below.

https://teams.microsoft.com/dl/launcher/launcher.html?url=%2f_%23%2fl%2fmeetup-join%2f19%3ameeting_YmVjMWU2ZDUtNjRlNC00Nzc2LWJjMzAtOTVhZDJkMDBhNTZk%40thread.v2%2f0%3fcontext%3d%257b%2522Tid%2522%253a%25228d207e5d-3faa-4a17-8389-db5747bc379c%2522%252c%2522Oid%2522%253a%252227bd0506-8294-424d-891e-42a0f92aae16%2522%257d%26anon%3dtrue&type=meetup-join&deeplinkId=5a2f879f-f73b-49ef-bf1c-a86686c4f899&directDl=true&msLaunch=true&enableMobilePage=true&suppressPrompt=true&promptSuccess=true

4.2.2 Licenses and Permits: Contractor is responsible for obtaining all necessary licenses and permits required for Construction, at Contractors expense. See Section 2.3

4.2.3 Freight/Shipping: All freight/shipping shall be F.O.B. Destination – Freight Pre-paid and allowed. Staging area provided at 333 West Ave, Grand Junction, CO 81501. Final location of approximately 39 5'26.072" N Lat 108 13"26.407" W Lon.

4.2.4 Price: Pricing shall be established as "cost plus a fixed fee with a guaranteed maximum price", and shall be all inclusive to include but not be limited to: all design, labor, equipment, supplies, materials, freight (F.O.B. Destination – Freight Pre-paid and Allowed to the site), travel, meetings, conference calls, mobilization costs, fuel, set-up and take down costs, and full-time inspection costs, and all other costs related to the successful completion of the project.

The Owner shall not pay nor be liable for any other additional costs including but not limited to: taxes, shipping charges, insurance, interest, penalties, termination payments, attorney fees, liquidated damages, etc.

Contractor shall submit their pricing utilizing the attached form in Section 7.0 Solicitation Response Form.

All fees will be considered by the Owner to be negotiable.

4.2.5 Warranty: Contractor shall submit manufacturer warranty information for Owner's approval, prior to product ordering. Additionally, Contractor shall provide a minimum 1 year Contractors warranty.

4.2.6 Laws, Codes, Rules, and Regulations: Contractor shall ensure that all services provided meet all Federal, State, County, and City laws, codes, rules, regulations, and requirements for providing such services.

4.2.7 Freight/Shipping: All freight/shipping shall be F.O.B. Destination – Freight Pre-Paid and Allowed to each of the project sites.

4.2.8 Equipment/Product/Materials Quantities: Contractor shall be responsible for determining all measurements for correctness, and all quantities/types of equipment/products/materials required for successful project completion. Also see Section 2.5 **Quantities of Work and Unit Price.**

4.2.9 Contractor Staging Area: Awarded Contractor shall coordinate with Owner for proposed project staging area during the construction phase.

4.2.10 Construction Working Schedule: Working schedule shall be Monday – Friday from 7:00am-5:00pm. If alternate scheduling is needed, Contractor shall coordinate with, and receive approval from, the City's Project Manager.

4.2.11 Time of Completion: Contractor shall submit a complete project schedule with their proposal. The City and awarded Contractor shall negotiate the final project completion date.

4.2.12 Contract: A binding contract shall consist of: (1) the RFP and any amendments thereto, (2) the proposer's response (proposal) to the RFP, (3) clarification of the proposal, if any, and (4) the City's Purchasing Department's acceptance of the proposal by "Notice of Award". All Exhibits and Attachments included in the RFP shall be incorporated into the contract by reference.

A. The contract expresses the complete agreement of the parties and, performance shall be governed solely by the specifications and requirements contained therein.

B. Any change to the contract, whether by modification and/or supplementation, must be accomplished by a formal contract amendment signed and approved by and between the duly authorized representative of the bidder and the City Purchasing Division or by a modified Purchase Order prior to the effective date of such modification. The proposer expressly and explicitly understands and agrees that no other method and/or no other document, including acts and oral communications by or from any person, shall be used or construed as an amendment or modification to the contract.

4.2.13 CITY PROJECT MANAGER: The Project Manager for the Project is Kurt Carson – Wastewater Services Manager, who can be reached at (970)256-4171. <u>During Design and Construction</u>, 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 -Utilities
Attn: Kurt Carson, Project Manager
2145 River Road
Grand Junction, CO 81505

4.3. Scope of Services: The general scope of services to be obtained as a result of this RFP includes all design, preconstruction, and construction services required for successful completion of the project.

The BioCNG design/build firm shall design, obtain all permits, construct, manufacture, procure equipment/material, install, train City personnel, and test the low pressure biogas storage system, and the improvements to the instrumentation and automation of a CNG fleet fueling station.

Minimum BioCNG Design/Build Firm Requirements:

• At least five years in the industry, with experience directly related to owning and operating facilities similar in size and scope.

• Successfully completed three (3) similar projects in the last five (5) years.

• Each design/build firm must show:
  (a) complete disclosure of any incidents of default on projects where the Firm or related entity acted as project sponsor and the current status of such incidents;
  (b) complete disclosure of any liabilities, contingent liabilities, obligations, charges and liens, covenants, off-balance sheet financing arrangements, defaults, legal action pending, or other matters that might prevent the Firm from implementing the Project; and
  (c) the Firm's or related entity's latest audited financial statements available as at the date of the RFP Submission.

• Ability to meet the bonding and insurance requirements of the City of Grand Junction. Submit a Bid Bond and COI with this response.

• Architect and engineers retained to construct facility are to be licensed/registered to practice in Colorado.

• Qualified and permitted by law to perform the services provided for this project. All personnel engaged in this work for this project shall likewise be qualified and permitted to perform necessary duties.

• Ensure compliance with all applicable environmental regulations related to the project.

• The ability to develop value engineered solution options, budget and/or cost estimates, plans, drawings, designs, and to obtain and manage permitting, scheduling and any other typical building construction task.

• Project management and supervision.

• Coordination of construction, scheduling of construction meetings and resolving discrepancies or disputes with sub-contractors or other supply or services vendors.

• Preparation of all plans, schematics, drawings, scope, specifications, and all other related documents and requirements associated with the successful completion of this project..

• Providing a time frame for completion of total design development, and each construction phase as well as a schedule for total completion of the project.

• Scheduling inspections and meeting applicable National, State and local building code requirements to achieve approval of work. The selected firm will be responsible for obtaining all building permits and will be responsible for permit related fees.

• The BioCNG firm may use local, qualified partners in design, engineering, construction and maintenance of the facility.

Summary of Requirements of the selected Design/Build Firm:

➢ Designing a BioCNG vehicle fueling station and storage facility (at a minimum Design shall consist of: architectural and engineering, program management, construction management, feasibility studies (if required), preliminary engineering, design, architectural engineering, surveying, mapping or other related A&E Services;

➢ Securing all local, state and Federal permits required to construct the Station;

➢ Determining if utility upgrades are required for operation of the Station and Storage Facility, and coordinating any required utility upgrades;

➢ Constructing the Station on a site provided by Owner;

➢ Completion of all work on the Station and Storage Facility (including testing and commissioning) by the negotiated date between the awarded Contractor and Owner;

➢ Providing training to Owner employees on vehicle fueling and Station operating, safety and emergency procedure, and;

➢ Owner shall be the sole contracting entity for the equipment and be provided by the selected Contractor.

➢ Develop Performance Specification of the Design-Build

➢ Project management and coordination

➢ Data collection, review and organization

➢ Validate additional gas storage volume requirements

➢ Permitting including but not limited to: site application amendment

➢ Basis of design report

➢ Progressive design with owner review at 60% and 90%

➢ Construction administration

Attached Documents:

1. GVT methodology to maximize biogas
2. CNG time fill post
3. CNG storage
4. CNG fast fill dispenser
5. 2017 CNG slow fill expansion drawings
6. 2010 FAST FILL CNG PLANS
7. Biogas operating data - flare vs pipeline

4.4. RFP Tentative Time Schedule:

• Request for Proposal Available	July 17, 2020
• Recommended Pre-Proposal Virtual Meeting/Briefing	July 27, 2020
• Inquiry deadline, no questions after this date	August 7, 2020
• Addendum Posted	August 13, 2020
• Submittal deadline for proposals	August 26, 2020
• Owner evaluation of proposals	August 27 – September 9, 2020
• Interviews (if required)	September 16, 2020
• Final selection	September 23, 2020
• City Council Approval	October 7, 2020
• Contract execution	October 8, 2020
• Work begins	Upon Notice to Proceed
• Completion Date	TBD

4.5. Questions Regarding Scope of Services:

Duane Hoff Jr., Senior Buyer
duaneh@gjcity.org

SECTION 5.0: PREPARATION AND SUBMITTAL OF PROPOSALS

Submission: ***Each proposal shall be submitted in electronic format only, and only through the Rocky Mountain E-Purchasing website (https://www.rockymountainbidsystem.com/default.asp).*** *This site offers both "free" and "paying" registration options that allow for full access of the Owner's documents and for electronic submission of proposals. (Note: "free" registration may take up to 24 hours to process. Please Plan accordingly.)* Please view our "**Electronic Vendor Registration Guide"** at http://www.gjcity.org/business-and-economic-development/bids/ for details. (Purchasing Representative does not have access or control of the vendor side of RMEPS. If website or other problems arise during response submission, vendor **MUST** contact RMEPS to resolve issue prior to the response deadline; **800-835-4603**). For proper comparison and evaluation, the City requests that proposals be formatted as directed. Offerors are required to indicate their interest in this Project, show their specific experience and address their capability to perform the Scope of Services in the Time Schedule as set forth herein. For proper comparison and evaluation, the Owner requires that proposals be formatted **A** to **G**.

A. Cover Letter: Cover letter shall be provided which explains the Firm's interest in the project. The letter shall contain the name/address/phone number/email of the person who will serve as the firm's principal contact person with Owner's Contract Administrator and shall identify individual(s) who will be authorized to make presentations on behalf of the firm. The statement shall bear the signature of the person having proper authority to make formal commitments on behalf of the firm. By submitting a response to this solicitation the Contractor agrees to all requirements herein.

B. Qualifications/Experience/Credentials: Proposers shall provide their qualifications for consideration as a contract provider to the City of Grand Junction and include prior experience in similar projects. In addition to Section 4.3 Scope of Services, Proposers shall also provide the following information with their proposal submittal:

RNG/CNG Fueling Station Design Experience and Capabilities

Note: Key personnel will be committed to this project in the Design/Build contract and can only be changed by approval of the City.

Provide a summary of key personnel experience information. List the most recent projects first. Include project owner and contact reference, project location, scope of project, design cost, construction cost, project duration, completion date and current fueling station performance. Additional discussion of Key Personnel experience can be provided as a narrative in the RFP.

Important experience includes BioCNG fueling stations with compression and storage, specifically for municipal trucks, and projects requiring coordination of BioCNG as the primary fuel source. Higher rating will be given to design experience in Design/Build BioCNG time-fill fueling applications with treated digester gas as the primary fuel source. The RFP response must include the following information, which will be used to rate the fueling station experience and design capabilities of the Design/Build team.

a. Discuss the design experience of key personnel that is similar or relevant to this Project. Design experience should include time-fill RNG/CNG fueling logic for refuse trucks or

similar heavy equipment fleets, instrumentation and controls work, and storage/compression equipment selection.

b. Discuss experience of the key personnel working together on past Design/Build or Design-Bid-Build projects. List previous projects and roles of the key personnel. Provide client references and resumes of key personnel.
c. Discuss goals and challenges on previous projects that the team was involved in and how goals were met and challenges were addressed by key personnel.
d. Discuss projects with a change order values over 10% of the original project cost (not including change orders) or time delays over 2 months of the original duration. Describe circumstances that led to the change orders or delays and how the issues were resolved with the owner.

WWTP Biogas Upgrades Design Experience and Capabilities

Note: Key personnel will be committed to this project in the Design/Build contract and can only be changed by approval of the City.

Provide a summary of key personnel experience. List the most recent projects first. Include project owner and contact reference, project location, scope of project, design cost, construction cost, project duration, and completion date. Additional discussion of firm experience can be provided as a narrative in the RFP. Important experience includes biogas treatment, compression, delivery, and storage specifically for vehicle fuel, and projects requiring coordination of facilities and operation of treated biogas with BioCNG fueling stations. Higher rating will be given to design experience in Design/Build at Wastewater Treatment Plants of similar size to the City's and that have direct coordination with a BioCNG project. The RFP response must include the following information, which will be used to rate the biogas facilities design capabilities of the Design/Build team.

a. Discuss the design experience of key personnel that is similar or relevant to this Project. Design experience should include modifications to an existing biogas piping system and installed biogas equipment, instrumentation and controls work, biogas storage/compression design and equipment selection, and biogas treatment equipment design and selection.
b. Discuss experience of the key personnel working together on past Design/Build or Design-Bid-Build projects. List previous projects and roles of the key personnel. Provide client references and resumes of key personnel.
c. Discuss goals and challenges on previous projects that the team was involved in and how goals were met and challenges were addressed by key personnel.
d. Discuss projects with a change order values over 10% of the original project cost (not including change orders) or time delays over 2 months of the original duration. Describe circumstances that led to the change orders or delays and how the issues were resolved with the owner.

Contractor Experience and Capabilities

Note: Key personnel will be committed to this project in the Design/Build contract and can only be changed by approval of the City.

Provide a summary of key personnel experience. List at least three projects (within the last three years) for each project type listed below. If less than three completed projects, Contractor can still be used for the Design/Build team but will receive fewer points in the evaluation. List the most recent projects first. Additional discussion of contractor experience can be provided as a narrative in the RFP.

Important construction experience includes installation of biogas treatment, compression, delivery, and storage systems specifically for vehicle fuel, and projects requiring coordination of treated biogas with BioCNG suppliers and integration of BioCNG with biogas fueling stations. Higher rating will be given to construction experience in Design/Build at Wastewater Treatment Plantss of similar size to the City's and that have direct coordination with a BioCNG project. The RFP response must include the following information, which will be used to rate the construction and construction management capabilities of the Design/Build team.

a. List recent construction projects completed at a wastewater treatment plant that included site utilities, structural, mechanical, electrical, and instrumentation and controls work.
b. List recent construction projects completed at a wastewater treatment plant that included modifications to digester gas piping system and installed digester gas equipment.
c. List recent construction projects that included the installation of piping and equipment for a compressed natural gas system at a minimum operating pressure of 4,000 psig. If Contractor does not have this experience, list the proposed subcontractor and provide the subcontractor information.
d. Discuss projects listed with a change order values over 10% of the original project cost (not including change orders) or time delays over 2 months of the original duration.
e. Describe circumstances that led to the change orders or delays and how the issues were resolved with the owner.
f. Provide the contractor's safety information, including a summary of the safety program or plan and the Experience Modification Rate for the most recent year available.
g. For information only. Provide information on major subcontractors (e.g. structural concrete, electrical, process mechanical) proposed for this project. Indicate if the subcontractor worked on a previous Design/Build or a Design-Bid-Build project. If subcontractors have not been determined, list subcontractors you have previously worked with and the project they worked on.

Start-Up, Commissioning, and Performance Verification

The RFP response must include the following information, which will be used to rate the support that the Design/Build team provides for startup and commissioning of the project.

a. Describe the general approach and process that will be used in start-up, commissioning and performance verification for this project. Identify the personnel that will perform start-up and list previous experience.
b. Discuss the experience of the Design/Build in start-up, commissioning and performance verification.
c. Describe the types of operation and maintenance documents prepared on previous projects and recommended O&M documents for this project.

C. **Strategy and Implementation Plan:** Describe your (the firm's) interpretation of the Owner's objectives with regard to this RFP. Describe the proposed strategy and/or plan for achieving the objectives of this RFP. The Firm may utilize a written narrative or any other printed technique to demonstrate their ability to satisfy the Scope of Services. The narrative should describe a logical progression of tasks and efforts starting with the initial steps or tasks to be accomplished and continuing until all proposed tasks are fully described and the RFP objectives are accomplished. Include a **time schedule** for completion of your firm's implementation plan and an estimate of time commitments from Owner staff.

D. **References:** Provide references per Section 4.3 Scope of Services, Minimum BioCNG Design/Build Firm Requirements with name, address, telephone number, and email address that can attest to your experience in projects of similar scope and size.

E. **Bid Bond and Certificate of Insurance:** Proposer shall submit a Bid Bond and Certificate of Insurance, as per the solicitation documents.

F. **Fee Proposal:** Provide your fee proposal, as stated in Section 4.2.4 Pricing, using the Solicitation Response Form found in Section 7.

G. **Additional Data (optional):** Provide any additional information that will aid in evaluation of your qualifications with respect to this project.

H. **Financial Statements:** Proposer shall provide an audited financial statement, as prepared by a certified public accountant, for their prior fiscal year, consisting of a balance sheet, profit and loss statement and such other financial statements as may be appropriate, which shall demonstrate that the proposer possesses adequate financial ability and stability to enable the Proposer to fulfill their obligations under the terms of this RFP. If requested by the Proposer, such information shall be treated as confidential by the Owner and shall not be subject to public disclosure. These documents must depict the financial status of that entity, subsidiary, division, or subdivision thereof, which will actually provide services. If the Proposer is a partnership or joint venture, individual financial statements must be submitted for each general partner or joint venture thereof. Consolidated balance sheets and profit/loss statements depicting the financial status of a Parent Corporation or joint venture shall not be considered an acceptable response.

SECTION 6.0: EVALUATION CRITERIA AND FACTORS

6.1 **Evaluation:** An evaluation team shall review all responses and select the proposal or proposals that best demonstrate the capability in all aspects to perform the scope of services and possess the integrity and reliability that will ensure good faith performance.

6.2 **Intent:** Only respondents who meet the qualification criteria will be considered. Therefore, it is imperative that the submitted proposal clearly indicate the firm's ability to provide the services described herein.

Submittal evaluations will be done in accordance with the criteria and procedure defined herein. The Owner reserves the right to reject any and all portions of proposals and take into consideration past performance. The following parameters will be used to evaluate the submittals (**with weighted values**):

- Responsiveness of Submittal to the RFP **(1)**
  (Firm has submitted a proposal that is fully comprehensive, inclusive, and conforms in all respects to the Request for Proposals (RFP) and all of its requirements, including all forms and substance.)
- Understanding of the Project and Objectives **(6)**
  (Firm's ability to demonstrate a thorough understanding of the City's goals pertaining to this specific project.)
- Experience **(5)**
  (Firm's proven proficiency in the successful completion of similar projects.)
- Necessary Resources/Capability **(3)**
  (Firm has provided sufficient information proving their available means to perform the required scope of work/service; to include appropriate bonding, insurance an all other requirements necessary to complete the project.)
- Strategy & Implementation Plan **(4)**
  (Firm has provided a clear interpretation of the City's objectives in regard to the project, and a fully comprehensive plan to achieve successful completion. See Section 5.0 Item C. – Strategy and Implementation Plan for details.)
- Fees **(2)**
  (All fees associated with the project are provided complete, comprehensive, and reasonable.)

Owner also reserves the right to take into consideration past performance of previous awards/contracts with the Owner of any vendor, contractor, supplier, or service provider in determining final award(s).

The Owner will undertake negotiations with the top rated firm and will not negotiate with lower rated firms unless negotiations with higher rated firms have been unsuccessful and terminated.

6.3 **Oral Interviews:** The Owner may invite the most qualified rated proposers to participate in oral interviews.

6.4 **Award:** Firms shall be ranked or disqualified based on the criteria listed in Section 6.2. The Owner reserves the right to consider all of the information submitted and/or oral presentations, if required, in selecting the project Contractor.

SECTION 7.0: SOLICITATION RESPONSE FORM

RFP-4813-20-DH

"Design/Build Grand Junction Bio Compressed Natural Gas (BioCNG) Storage and Fueling Station Optimization Project"

Offeror must submit entire Form completed, dated and signed.

1) Cost plus a Fixed Fee with a Guaranteed Maximum Price:

Fixed Fee $_____

WRITTEN:_____**dollars.**

Guaranteed Maximum Price $_____

WRITTEN:_____**dollars.**

The Owner reserves the right to accept any portion of the work to be performed at its discretion

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The undersigned has thoroughly examined the entire Request for Proposals and therefore submits the proposal and schedule of fees and services attached hereto. This offer is firm and irrevocable for sixty (60) days after the time and date set for receipt of proposals.

The undersigned Offeror agrees to provide services and products in accordance with the terms and conditions contained in this Request for Proposal and as described in the Offeror's proposal attached hereto; as accepted by the Owner.

Prices in the proposal have not knowingly been disclosed with another provider and will not be prior to award.

- Prices in this proposal have been arrived at independently, without consultation, communication or agreement for the purpose of restricting competition.
- No attempt has been made nor will be to induce any other person or firm to submit a proposal for the purpose of restricting competition.
- The individual signing this proposal certifies they are a legal agent of the offeror, authorized to represent the offeror and is legally responsible for the offer with regard to supporting documentation and prices provided.
- Direct purchases by the City of Grand Junction are tax exempt from Colorado Sales or Use Tax. Tax exempt No. 98-903544. The undersigned certifies that no Federal, State, County or Municipal tax will be added to the above quoted prices.
- City of Grand Junction payment terms shall be Net 30 days.
- Prompt payment discount of _____ percent of the net dollar will be offered to the Owner if the invoice is paid within _____ days after the receipt of the invoice.

RECEIPT OF ADDENDA: the undersigned Contractor acknowledges receipt of Addenda to the Solicitation, Specifications, and other Contract Documents. State number of Addenda received: _____.

It is the responsibility of the Proposer to ensure all Addenda have been received and acknowledged.

_____	_____
Company Name – (Typed or Printed)	Authorized Agent – (Typed or Printed)
_____	_____
Authorized Agent Signature	Phone Number
_____	_____
Address of Offeror	E-mail Address of Agent
_____	_____
City, State, and Zip Code	Date

4675 MacArthur Court, Suite 800
Newport Beach, California 92660 USA
949/437-9017 fax 949/724-1343

www.cleanenergyfuels.com

Clean Energy℠

Construction of Grand Valley Transit CNG Fueling Facility

Methodology to Maximize Biogas Usage

For reference: The city of Grand Junction has a biogas system that supplements the utility gas supply for the CNG fueling facilities. Biogas is continuously accumulating in storage that rises in pressure from 20-95 psig., total storage volume is around 11,500 scf (5.7 miles of 4" poly pipe).

Biogas mode explanation:

On the weekend (Saturday afternoon until Sunday night) the bio gas usage will be maximized by only operating the compressor to feed time-fill fueling locations when biogas is available.
At the beginning of this time period, the vehicles parked at the time-fill fueling locations need to be empty or partially empty in order to accept the biogas as it becomes available.
If there is demand from the fast fill dispenser the compressor will still operate as normal and use utility gas along with any available biogas.

Time-fill fueling will be controlled by a pressure transducer on the biogas supply line. The compressor will be turned on to feed time-fill fueling locations when the biogas rises above 85 psi and run until the pressure is pulled down to 22psi. (These 2 pressure variables will be set points that can be adjusted in the field.)

The system will only run in this delayed time-fill mode from Saturday afternoon until Sunday night (Saturday 10am until Sunday 6pm). On Sunday night, the system will change from the delayed time-fill mode to the regular filling mode. This will result in the compressor operating until the time-fill line pressure target is reached. The compressor will again draw utility gas along with any available biogas. Changing back to the regular mode on Sunday night will ensure the vehicles are filled and ready for Monday morning.
(The time frame when the bio gas mode is turned on and off will be a variable that can be set in the field.)

Regular Mode Summary:

Time-Fill: The compressor will feed CNG to the time-fill until line pressure reaches pressure target. Compressor will turn on whenever the time fill line pressure falls below a set threshold pressure.
Fast-Fill: The compressor and/or storage vessels will feed CNG to the dispenser line whenever pressure falls below the set threshold, the compressor will operate until the pressure target is reached.

Biogas Mode Summary:

Time Fill: The compressor will only operate when biogas pressure rises above 85psi and continue to operate until the biogas line pressure falls below 22psi.
Fast-Fill: The compressor and/or storage vessels will feed CNG to the dispenser line whenever pressure falls below the set threshold, the compressor will operate until the pressure target is reached.

TimefillCNG

by Clean Energy®

Overnight Fleet Fueling Made Easy







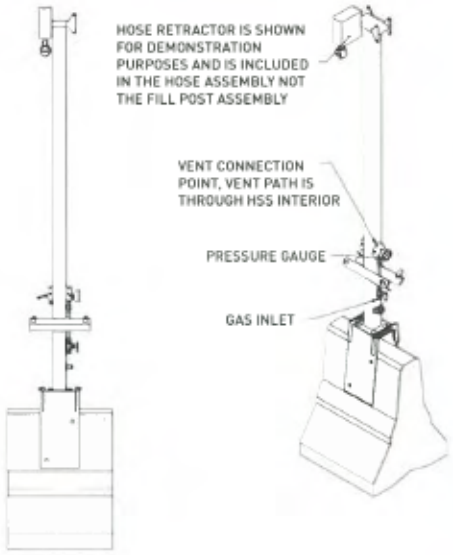




Safe, Affordable, Easy-to-Install

Clean Energy®'s fill posts are engineered to the highest standards to deliver consistent CNG fueling performance for your fleet. Our dispensing systems have earned a reputation worldwide for proven fast-fill and time-fill performance in public station, fleet operations, and bulk CNG transportation.

Compact size and modular design makes this time fill post easy to install and affordable. High-quality pressure fitting components are used throughout, and are skillfully assembled to perform reliably and accurately under the toughest CNG fueling conditions. TimefillCNG posts are pressure-tested in factory, K-rail mounting avoids vehicle impacts, and special valve connections ensure safe connection and disconnection.



Technical

MEDIUM	SWEET, DRY NATURAL GAS
MAXIMUM ALLOWABLE HEAVY HYDROCARBON	-40°C (-40°F)
MAXIMUM DESIGN PIPING PRESSURE (MAWP)	5 PPM
RECOMMENDED GAS DRYNESS	<4 LBS H2O/MMSCF
DESIGN AMBIENT TEMPERATURE	-29 TO 65°C (-20 TO 150°F), -40 TO 65°C (-40° TO 150°F)
	310 BAR (4500 PSIG)
MINIMUM GAS INLET TEMPERATURE	-29°C (-20°F)
FILLING PRESSURE	250 BAR (3625 PSIG) TEMPERATURE COMPENSATED TO 15°C
DESIGN FLOW RATE	SCFM 250
	NM^3/H 400
GAS INLET CONNECTIONS	3/8" COMPRESSION FITTING
GAS OUTLET CONNECTIONS	NGV 1 TYPE 2 FUELING NOZZLE
HOSE OPTIONS	1, 2, 3 OR 4 PARALLEL FILL HOSES
DIMENSIONS	14" W X 87"H (360 MM W X 2200MM H)
APPROXIMATE WEIGHT	61 LBS (28 KG) (WITHOUT HOSES)
CODE COMPLIANCE	NFPA 52/70, ASME B 31.3, CE
ELECTRICAL BONDING	GROUND MOUNTING INCLUDED
OPTIONS	COLD WEATHER PACKAGE (BELOW -20°F AMBIENT) CAISSON MOUNTING, OR K -RAIL MOUNTING

Features

Compact, Modular Design

Quick 4 Bolt K-Rail Installation

Up to 4 Hoses; Lengths up to 33'

Interchangeable with CompleteCNG Hose Modules

K-Rail "Or Caisson" Installation

Seamless Integration with Most Mounting Systems

Code Compliant (ASME, CSA, CE, ISO, NFPA, NEC)

John Polovina
Business Development Manager
562.370.4746
john.polovina@cleanenergyfuels.com

Clean Energy®

4675 MacArthur Court, Suite 800
Newport Beach, CA 92660
Tel 949.437.1000 • Fax 949.724.1397
www.CleanEnergyFuels.com

ALTERNATIVE FUELS

ALLIED EQUIPMENT, INC.

COMPRESSED NATURAL GAS STORAGE SPHERE



- 48" Inside Diameter
- 5,500 to 10,000 PSI Design Pressure
- Fabricated to ASME Code Section VIII, Division 1 or 2
- 33.5 Cubic Ft. Water Volume
- 250 Gallon Capacity
- 1" Relief Valve with Isolation and Bleed Block Included
- 1/2" Drain Valve Included
- Outer Dimensions 63"(H) x 56"(W)
- Weight 8,735 lbs.
- White Epoxy Paint
- Stackable Options Available

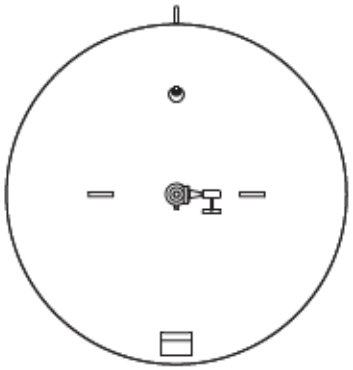


48" ID SPHERE

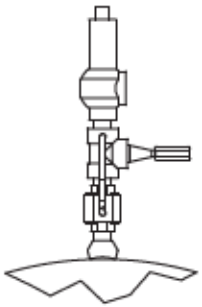
Storage Pressure	Cubic Ft. Per Sphere	Gasoline Gallons per Sphere	*Diesel Gallons per Sphere
5,000#	12,314	103	91
4,500#	11,650	97	86
4,000#	11,045	92	82
3,600#	10,564	88	78

**135 cu. ft. of natural gas is equal to one (1) gallon of diesel fuel.*

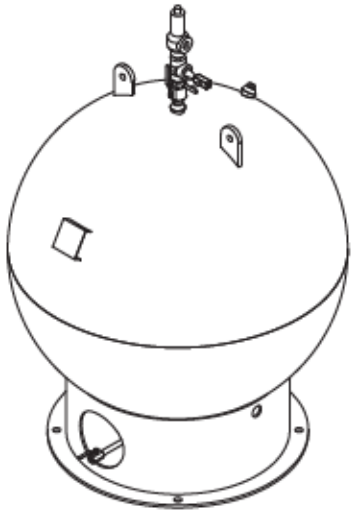
P.O. Box 14188 • Odessa, TX 79768 • Phone 432.367.6000 • Fax 432.367.3939 • www.alliedeq.com

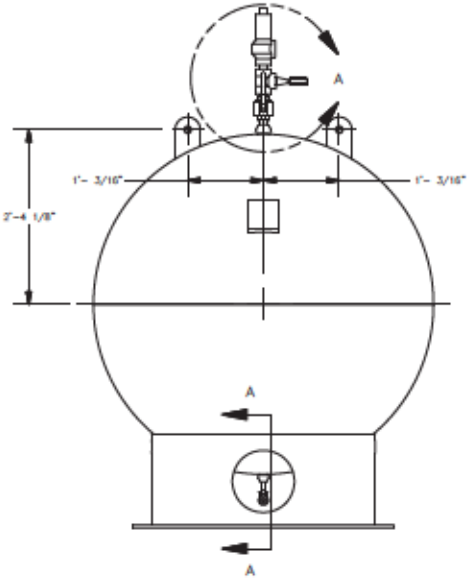


TOP VIEW

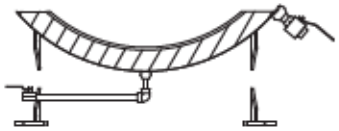


DETAIL A

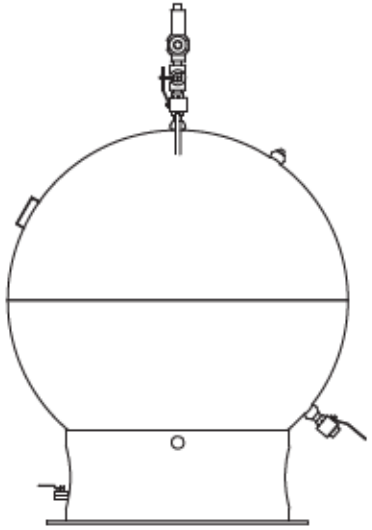




FRONT VIEW



SECTION A-A



RIGHT VIEW

REFERENCE DRAWINGS		REVISIONS					
NUMBER	DESCRIPTION	NO.		DATE	BY	CHK	APV
		B	MOVED LIFTING LUGS.	9/16/12	JED		

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ALLIED
EQUIPMENT, INC.
P.O. BOX 14188 — ODESSA, TEXAS 79768

DESCRIPTION: 48" I.D. SPHERE DETAIL

CUSTOMER:

SCALE: | W.O. NO.:

DRAWN: JED 9/16/2011 | CUSTOMER W.O.:

CHECK: | DWG. NO. 110602 | REV B

APVD:

Kraus Quotation # K2764 R00

Customer Name:	Clean Energy Fuels
Contact Name:	David Ulrich
Project Name:	Grand Junction, CO
Created By:	Dev Patel
Quotation Date:	August 23rd, 2016
Quotation Expiry:	September 23rd, 2016

1.0 Introduction

Kraus Global is a leading provider of alternative fuels dispensers for the global transportation market. Kraus has engineered and developed innovations, such as easy-to-use, LPG, CNG, LNG and Hydrogen dispensing systems, electronic registers, and automatic temperature compensation systems that have helped shape the industry.

Kraus is focused on the design and manufacturing of world-class dispensers, components and electronics for alternative fuels. Because of our history of designing and packaging reciprocating compressors, priority sequencing panels and the development of complete CNG stations, Kraus Global's dispenser designs are based on a thorough understanding of a CNG station.

More than 5000 Kraus dispensers are now installed in over 30 countries around the world. This global experience allows Kraus to be familiar with the varied customer requirements in each market.

To support this rapidly growing global market, Kraus has 44,000 square feet of dedicated production space and test facilities capable of full load testing of all dispensing equipment on natural gas or LPG at operating conditions. This ISO 9001:2008 registered facility is capable of producing 2000+ dispensers per year.

Collaborating with a worldwide network of proven component suppliers Kraus dispensers are recognized for their quality and performance. These suppliers are experts in their own field and bring new technology and advancements to their CNG components that are greater than any one company with limited resources can sustain. Kraus is able to leverage the production capacity of this global supply chain to spread the workload, minimize delivery times and add flexibility when demand suddenly increases due to tender awards or significant market growth. Should the need arise; our key component suppliers have a worldwide sales and service network which is available for field support. Finally, Kraus is able to leverage foreign currency advantages within the market by sourcing a smaller or larger percentage of supply through various countries to ensure competitive pricing.

Kraus Global offers the benefit of our experience and knowledge in the following quotation for equipment. It has been custom designed to suit your application, and was prepared with the skill and precision of our dedicated staff members. This quotation outlines the scope of work to be provided by Kraus Global for the proposed project and associated technical specifications.

2.0 Scope of Supply

In response to your request, Kraus Global Ltd. is pleased to present the following equipment quotation to suit your application:

KRAUS MODEL NUMBER	DESCRIPTION	QUANTITY OFFERED
SAM 1CHG-P62CG11SXX01 *Single Hose, Standard Duty, Fleet Series Dispenser*	2000 SCFM, single hose, single buffer line, CNG dispenser housed in a Kraus Fleet Series cabinet. This dispenser includes a standard holster, 3600 psi filling pressure, and one OPW CT1000 nozzle. The KAF402 series solenoid valves will be utilized for fill control.	1

All Kraus equipment fully complies with the following specifications:

CNG Codes	NFPA 52 Compressed Natural Gas Vehicular Fuel Systems Code
Electrical Code	NFPA 70 National Electric Code
Piping Code	ASME B31.3 – Piping Code
Weights & Measures	NCWM - NTEP W&M Approval

A note on posted Kraus Global dispenser flow rates:

Kraus Global's stated flow rates reflect the rate at which the internal piping system of the dispenser is capable of flowing compressed natural gas into the inlet of the nozzle at maximum pressure differential assuming full flow is available at the dispenser inlet. The actual flow rate into the vehicle system may be limited by the nozzle selection and the internal vehicle piping configuration.

3.0 Technical Specifications

3.1 CNG Dispenser

Model: SAM 1CHG-P62CG11SXX01

Description: Single hose, single buffer line, CNG dispenser in a Kraus Fleet Series cabinet. The dispenser is designed for a 2000 SCFM flow rate. Control via KAF 402 series solenoid valves.

Dispenser Control	Control via Micon 500C computerized register unit (with ability for internal or remote flow-rate based sequencing)
Number of Inlet Lines	One per hose
Flow Meters	Micro Motion CNG050
Flow Capacity Rating	**Hose 1:** 2000 SCFM **Hose 2:** n/a
Flow/Sequencing Control	**Hose 1:** Kraus KAF 402 pilot solenoid valve **Hose 2:** n/a
Dispenser Filters	One filter per inlet line, installed in dispenser
Temperature Compensation	Kraus PFS 3600 electronic temperature compensation, set to: **Hose 1:** 3 600 psig @ 70 °F **Hose 2:** n/a
Dispensing System Accuracy	± 1%
Pressure Rating	5 000 psig MAWP
Required Electrical Supply	120 VAC, 60 Hz
Electrical Rating	Class I, Division I, Group D hazardous locations
Cabinet	Kraus Fleet Series cabinet with SS columns and powder coated doors.
Breakaway	**Hose 1: Main Line** – Staubli BRW08 & **Vent Line** – Staubli BRW02 **Hose 2:** n/a
Hose	**Hose 1**: Parker ½" main line – ¼" vent line, 12 ft OAL, electrically conductive **Hose 2**: n/a
Nozzles	**Hose 1:** OPW CT1000 nozzle **Hose 2:** n/a
Venting	Captive venting for return to dispenser located at top or bottom of dispenser
Tubing	**Hose 1**: All process tubing ½" SS w/ double ferrule compression fittings **Hose 2:** n/a
Fill Pressure	**Hose 1:** 3600 psig compensated fill **Hose 2:** n/a
Pressure Relief Valves	ASME certified valves to be provided; one per hose
Holster Location	One on front side of dispenser
Approvals/Compliance	UL/CSA (components only), NFPA 52, NFPA70, ASME B31.3, NTEP W&M
Inclusions	• One external manual shutoff valve to be installed per hose • Modbus Communications • Inlet Ball Valve
Options Priced Separately	• Micon Info Pac Programmer
Exclusions	• ESD button not installed on dispenser

Kraus Fleet Series CNG Dispenser



The **Kraus Fleet Series** dispenser sets the industry standard for reliability, durability, and safety. Kraus continues to raise the bar by providing customers a lower cost alternative while delivering the continued performance expected from a dispenser built by Kraus. Featuring the industry leading **MICON™ 500 CNG** controller at the heart of its system, the **Kraus Fleet Series** dispenser is ideal for both commercial and retail CNG fueling applications.

Flexibility - The **Fleet Series** dispenser is designed to be used in fleet, private, and retail locations all while providing a full range of flow rate designs and inlet configurations. This provides scalability to use the **Fleet Series** dispenser in light duty applications right through to full flow trucking & transit applications. Our ability to customize solutions to suit our customers' unique and changing needs is a recognized strength of ours within the industry.

Connectivity -The **Fleet Series** dispenser provides simplified connections to all industry accepted external FMS/POS systems via a range of communications protocols. The optional Modbus communications package provides detailed real-time fill information to the station side electronics, allowing for enhanced monitoring and analysis of each transaction.

Hazardous Locations - The **Fleet Series** dispenser utilizes a full Class 1, Division 1, Group D design via flameproof and intrinsically safe protections methods.

Control - Featuring the industry leading MICON™ 500 CNG controller, the **Kraus Fleet Series** dispenser includes configurable set points providing you with greater control to optimize the dispenser to suit your specific filling needs.

Safety - The MICON™ 500 CNG controller features full temperature compensated fills for both hot and cold weather, adapting to its installation conditions while accounting for heat of compression during the fill process.

Reliability - Kraus prides itself on creating solutions to adapt to your station goals. We have the experience and know how to evaluate the entire station design, point out challenges, and create dispensing solutions to help you maximize your station output and efficiency.

KRAUS global | dispensing solutions

CNGF01.ART.R00
MICON™ is a trademark of Kraus Global Ltd.

Fleet Series CNG Dispenser

CNGF01.ART.R00

SPECIFICATIONS

STANDARD FEATURES:
Single and Dual hose configurations with Dual Front option available
Filling Protocol: Temperature compensated to 70°F (21°C); smart filling to compensate for Heat of Compression
Target Filling Pressure: 3,600 psi standard (3,000 psi, split pressure and other options available)
Maximum Allowable Working Pressure: All system components rated for a minimum 5,000 psi MAWP
Maximum recommended inlet pressure: 4,300 psi
Flow Rates: 1,000 SCFM, 2,000 SCFM, 3,500 SCFM, 4,500 SCFM, and Split Flow options available
Inlet Lines: Options for 1 per dispenser (buffer filling), 1 per hose, 2-bank sequencing, 3-bank sequencing; custom inlet options also available
Metering: Coriolis Mass Flow Technology; Accuracy of +/- 1%
Primary Display: Three line display of Total Sale, Total Volume/Mass, and Price per Unit located on a large, backlit LCD display for easy viewing
Coalescing Filters provided, one per inlet line; installed in dispenser or provided loose for remote monitoring depending on configuration
Start/Stop lever handle located on nozzle holster
Rated hose assemblies, electrically conductive, with in-line breakaways
Class I, Div. I Group D design via explosion proof and Intrinsically Safe protection methods

COMPUTING AND CONTROLS:
MICON TM 500C Controller with ability for internal or remote flow-rate based sequencing
Communication Interfaces: 2-wire or pulse connection to external FMS
Compatibility with industry leading POS/FMS/PLC devices via multiple communication interfaces
Available Modbus Communications package for connection to station PLC
NTEP and Measurement Canada certified register
MECHANICAL CONTROLS AND VALVES:
Internal Piping & Connections available in sizes ranging from 1/4" up to 1"
Tubing and Fittings: All process tubing in SS with double ferrule compression fittings
Control Valves: High flow Electronic Solenoid Valves or Full Port Actuated Ball Valves
Pressure Gauges: One panel mounted liquid filled pressure gauge installed per hose
High Pressure Check Valves installed between sequencing valves
One ASME rated Pressure Relief Valve installed per hose
PRV set to: 4,500 psi for 3,600 psi target fills/3,750 psi for 3,000 psi target fills
1" vent line, piped to top or bottom of dispenser with easy bulkhead connection

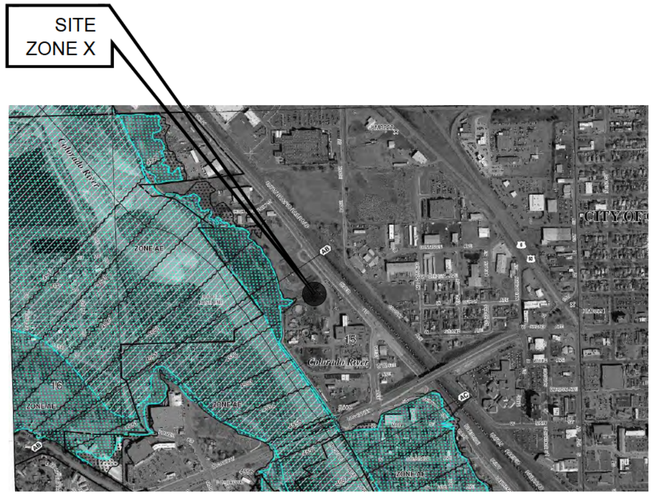
AVAILABLE OPTIONS:
NGV1 & NGV2 nozzle options
REGULATORY:
NTEP Certificate of Conformance
MC (Measurement Canada)
NRTL Certification Pending
Built to: NFPA 70, ASME B31.3, NFPA52
VOLTAGE:
120 VAC standard, 220/240 VAC available
Amperage: 5 to 10 Amps depending on options
Single Phase
60 Hz, 50 Hz available
+/- 10% Tolerence
DIMENSIONS:
Height: 84"
Width: 36"
Depth: 22"
Weight: 750 pounds, 340 Kilos
OPERATING ENVIRONMENT:
Ambient Temperature: -40°C to +50°C
Ambient Humidity: 10% to 95%, relative basis
Inlet Gas Temperature: -25°C to +75°C
Water Dew Point CNG: -32°C @ 250 Bar, maximum

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CANADA, R2J 3V9 - 204.663.3601

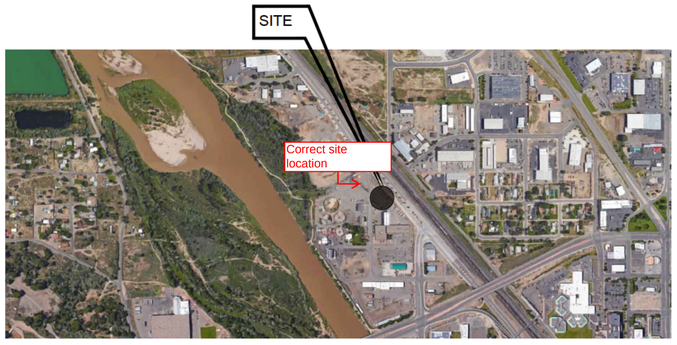
www.krausglobal.com

GRAND VALLEY TRANSIT
CNG FUELING FACILITY
333 WEST AVENUE,
GRAND JUNCTION, CO 81501

ZONE X AREAS DETERMINED
TO BE OUTSIDE 0.2% ANNUAL CHANCE FLOODPLAIN



FEMA FIRM MAP
NOT TO SCALE



VICINITY MAP
NOT TO SCALE

PROPERTY INFORMATION

OWNER ADDRESS:	PO BOX 20000, GRAND JUNCTION, CO 81502
SITE ADDRESS:	333 WEST AVENUE, GRAND JUNCTION, CO 81501
APN:	2945-152-00-941
ZONE:	I-1
OCCUPANCY:	M

PROJECT DESCRIPTION

PROJECT SCOPE IS TO INSTALL A CNG FUELING FACILITY AT THE EXISTING PROPERTY AT **333 WEST AVENUE, GRAND JUNCTION, CO 81501**

EQUIPMENT AT THE NATURAL GAS FACILITY INCLUDES: (1) 200 HP COMPRESSOR, (3) STORAGE SPHERES, (1) GAS DRYER, (1) CNG DISPENSER, ESD POSTS, BUFFER VALVE PANEL AND (10) TIME FILL POSTS WITH ASSOCIATED CONTROLS EQUIPMENT PADS, INTERCONNECTING PIPING, AND ELECTRICAL AND SAFETY SYSTEMS.

DRAWING INDEX

CS-1.0	COVER SHEET
	GENERAL
G-0.0	GENERAL NOTES
G-0.1	GENERAL NOTES
G-0.2	GENERAL NOTES
G-1.0	GENERAL ARRANGEMENT AND ELEVATIONS
G-1.1	GENERAL ARRANGEMENT AND ELEVATIONS
	CIVIL
C-1.0	SITE PLAN
C-1.1	CIRCULATION PLAN
C-2.0	FOUNDATION AND GRADING PLAN
C-3.0	SITE DETAILS
C-3.1	SITE DETAILS
C-3.2	SITE DETAILS
	PIPING
P-0.0	PIPING NOTES
P-1.0	PIPING AND INSTRUMENTATION DIAGRAM (P&ID)
P-1.1	PIPING AND INSTRUMENTATION SCHEDULE
P-1.2	PIPING AND INSTRUMENTATION DIAGRAM (EXISTING STATION)
P-2.0	PIPING PLAN
P-3.0	PIPING SECTIONS AND DETAILS
P-3.1	GAS CONNECTION LOCATION
P-4.0	SAFETY SIGNAGE
	ELECTRICAL
E-0.0	ELECTRICAL NOTES
E-1.0	ELECTRICAL SINGLE LINE DIAGRAM
E-1.1	ELECTRICAL LOAD SCHEDULE
E-2.0	ELECTRICAL PLAN
E-3.0	ELECTRICAL CONDUIT SCHEDULE
E-4.0	ELECTRICAL DETAILS

GENERAL NOTES

NOTE: THE TERM "CONTRACTOR" OR "CONTRACTORS" AS USED IN THESE GENERAL NOTES SHALL REFER TO THE PRIME CONTRACTOR AND ALL SUB-CONTRACTORS.

1. THIS SET OF CONSTRUCTION DOCUMENTS COVERS THE CNG SYSTEM IMPROVEMENTS ONLY AND MAY NOT SHOW ALL EXISTING SITE IMPROVEMENTS FOR THE FACILITY.
2. THE CONTRACTORS SHALL PRESERVE AND MAINTAIN ACCESS TO EXISTING EXITS AND MAKE EVERY EFFORT TO MINIMIZE DISRUPTIONS TO EXISTING OPERATIONS AT ALL TIMES DURING CONSTRUCTION.
3. THE CONTRACTORS SHALL BE RESPONSIBLE FOR VERIFYING THAT ALL MATERIALS, LABOR, INSTALLATION, FABRICATION, ETC. SHALL CONFORM TO ALL CODES AND REGULATIONS OF APPLICABLE GOVERNING AGENCIES.
4. THE CONTRACTOR SHALL VERIFY DIMENSIONS AND SITE CONDITIONS PRIOR TO COMMENCING ANY WORK. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCY CONTAINED WITHIN THESE CONSTRUCTION DOCUMENTS WHICH ARE RELATED TO THE CONTRACTOR'S SCOPE OF WORK. SHOULD AN ERROR APPEAR IN THESE CONSTRUCTION DOCUMENTS OR RELATED WORK PERFORMED BY OTHER CONTRACTORS AFFECTING THE CONTRACTOR'S SCOPE OF WORK, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AT ONCE FOR INSTRUCTIONS AS TO THE PROCEDURE FOR CONTINUATION OF WORK. SHOULD THE CONTRACTOR PROCEED WITH WORK AFTER IDENTIFYING SUCH A CONFLICT WITHOUT OBTAINING INSTRUCTIONS FROM THE ENGINEER, THE CONTRACTOR SHALL ASSUME THE FULL RESPONSIBILITY FOR ALL REMEDIAL WORK NECESSARY TO SATISFY THE REQUIREMENTS OF THESE CONSTRUCTION DOCUMENTS AND THE APPLICABLE BUILDING CODES.
5. THE CONTRACTOR SHALL REFER TO THE BID DRAWINGS AND WRITTEN TECHNICAL SPECIFICATIONS - IF ANY - FOR ADDITIONAL INFORMATION AND REQUIREMENTS WHICH ARE HEREBY INCORPORATED INTO THE PROJECT REQUIREMENTS BY REFERENCE.
6. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS WITH THOSE SHOWN ON THE DRAWINGS AND PROMPTLY REPORT ANY DISCREPANCIES TO THE ENGINEER. VERIFY EXISTING CONDITIONS WITHIN THE WORK AREA AND REVIEW MODIFICATIONS REQUIRED TO SUIT EXISTING CONDITIONS PRIOR TO FABRICATION AND INSTALLATION OF NEW WORK OR MODIFICATIONS TO EXISTING CONDITIONS.
7. THE CONTRACTOR SHALL MAINTAIN THE JOB SITE IN A CLEAN, ORDERLY CONDITION, FREE OF DEBRIS AND LITTER. EACH CONTRACTOR SHALL, IMMEDIATELY UPON COMPLETION OF EACH PHASE OF HIS WORK, REMOVE ALL TRASH AND DEBRIS THAT RESULTS FROM THE PERFORMANCE OF HIS WORK.
8. CONSTRUCTION MATERIALS STORED ON THE SITE SHALL BE PROPERLY STACKED AND PROTECTED TO PREVENT DAMAGE AND DETERIORATION UNTIL USED. FAILURE TO PROTECT MATERIALS MAY BE CAUSE FOR REJECTION OF WORK.
9. THE CONTRACTOR SHALL PROTECT NEW AND EXISTING FINISHES AND CONSTRUCTION FROM DAMAGE THAT MAY OCCUR DURING CONSTRUCTION. DAMAGE TO NEW AND/OR EXISTING FINISHES AND CONSTRUCTION SHALL BE REPAIRED OR REPLACED (THE OWNER'S DECISION) WITH IDENTICAL MATERIAL AT THE CONTRACTOR'S EXPENSE.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING THE OWNER WITH ACCURATE "AS-BUILT" RECORD DRAWINGS AT THE COMPLETION OF CONSTRUCTION. RECORD DRAWINGS WILL BE MADE BY "RED-LINING" FORMAL CONSTRUCTION DRAWINGS TO IDENTIFY ANY AND ALL CHANGES WHICH MAY HAVE BEEN MADE IN THE FIELD.
11. ALL WORK SHOWN ON THESE DRAWINGS SHALL BE CONSTRUED AS BEING NEW WORK AND PART OF THIS CONTRACT UNLESS NOTED BEING EXISTING OR OTHERWISE.
12. CONTRACTOR SHALL COMPLY WITH ALL NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) AND LOCAL JURISDICTION STORM WATER POLLUTION PREVENTION (SWPP) RULES AND REGULATIONS PRIOR TO THE COMMENCEMENT OF ANY WORK AND DURING ANY CONSTRUCTION ACTIVITIES.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL DIMENSIONS, MATERIALS & QUANTITIES AS PART OF THE CIVIL, STRUCTURAL, MECHANICAL, P&ID AND ELECTRICAL PLANS. NO EXCEPTIONS.
14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING A COMPLETE SET OF CONSTRUCTION PLANS TO ALL SUB-CONTRACTORS DISCIPLINES FOR REFERENCE AND USE.
15. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RE-ESTABLISHING ALL DAMAGED OR DISTURBED TEMPORARY AND PERMANENT BENCH MARKS AT THEIR OWN EXPENSE.

ABBREVIATIONS

AC	ASPHALT CONCRETE	MAX	MAXIMUM
AFG	ABOVE FINISHED GRADE	MCC	MOTOR CONTROL CABINET
AHJ	AUTHORITY HAVING JURISDICTION	MCP	MASTER CONTROL PANEL
		MIN	MINIMUM
BCW	BARE COPPER WIRE	MSA	METER SET ASSEMBLY (GAS UTILITY)
BLDG	BUILDING	MSB	MASTER SWITCH BOARD
CL	CENTER LINE	MTR	MOTOR
CNG	COMPRESSED NATURAL GAS	(N)	NEW
COMP	COMPRESSOR	N/A	NOT APPLICABLE
CONC	CONCRETE	NGV	NATURAL GAS VEHICLE
CMU	CONCRETE MASONRY UNIT	NTS	NOT TO SCALE
CONT	CONTINUOUS	NO	NUMBER
CU FT	CUBIC FEET	OC	ON CENTER
CS	CARBON STEEL	PL	PLATE
DIA OR Ø	DIAMETER	POC	POINT OF CONNECTION
DEPT	DEPARTMENT	PB	PUSH BUTTON
DWG	DRAWING	REF	REFERENCE
(E)	EXISTING	REINF	REINFORCEMENT
EA	EACH	(RR)	REMOVE AND REPLACE
ELEV OR EL	ELEVATION	SCH	SCHEDULE
EQ	EQUAL	SEC	SECTION
ENCL	ENCLOSURE	SIM	SIMILAR
ESD	EMERGENCY SHUT DOWN	SPR	SPRINKLERED
EXIST	EXISTING	SQ	SQUARE
FG	FINISH GRADE	SF	SQUARE FEET
FH	FIRE HYDRANT	SS	STAINLESS STEEL
FIG	FIGURE	STD	STANDARD
FOC	FACE OF CURB	THK	THICK
FP	FUEL POST (TIME FILLED)	THRU	THROUGH
FSSP	FUEL SYSTEM SUPPORT PANEL	TOC	TOP OF CURB
FX	FIRE EXTINGUISHER	XFMR	TRANSFORMER (ELECTRICAL UTILITY)
GALV	GALVANIZED	TYP	TYPICAL
GND	GROUND	UNO	UNLESS NOTED OTHERWISE
GRC	GALVANIZED RIGID CONDUIT	VERT	VERTICAL
HC	HANDICAP		
HP	HORSE POWER		
HORIZ	HORIZONTAL		

Please add note(s) stating Buy America Requirements for this project
Please add note(s) about DBE requirements for this project.
Please also include a note stating that the contractor is required to obtain and maintain all permits for this project.

RELEVANT CODES AND STANDARDS

THE WORK SHALL CONFORM TO THE MOST RECENT EDITION OF THE FOLLOWING CODES AND STANDARDS AS SUPPLEMENTED, AMENDED, OR OTHERWISE MODIFIED BY LOCAL REQUIREMENTS:

INTERNATIONAL BUILDING CODE (IBC) 2012
INTERNATIONAL FIRE CODE (IFC) 2012
INTERNATIONAL PLUMBING CODE (IPC) 2012
INTERNATIONAL MECHANICAL CODE (IMC) 2012
INTERNATIONAL FUEL GAS CODE 2012

NFPA 52 VEHICULAR FUEL SYSTEMS CODE 2013
NFPA 70 NATIONAL ELECTRICAL CODE (NEC) 2014
NFPA 79 ELECTRICAL STANDARD FOR MECHANICAL EQUIPMENT 2012

IN THE EVENT OF A CONFLICT BETWEEN DRAWINGS, WRITTEN SPECIFICATIONS, AND/OR REFERENCED STANDARDS, THE MOST STRINGENT SHALL GOVERN.

PROJECT TEAM

OWNER (S)

MESA COUNTY, COLORADO
ATTN: TODD HOLLENBECK
PO BOX 20000
GRAND JUNCTION, CO 81502
(970) 255-7168

PROJECT CONTACT(S)

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(949) 437-9017

ENGINEER OF RECORD

CLEAN ENERGY
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SURVEYOR

CITY OF GRAND JUNCTION
ATTN: TRENT PRALL
250 N. 5TH STREET
GRAND JUNCTION, CO 81501
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CIVIL ENGINEER

GREENBERG-FARROW
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ATLANTA, GA 30309
(404) 601-4000

GEOTECHNICAL

HUDDLESTON-BERRY ENGINEERING & TESTING, LLC
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MECHANICAL AND ELECTRICAL

CLEAN ENERGY
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(949) 437-9027

EXP. DATE: 10/31/2017
COLORADO LICENSED
RICHARD L. REMILLARD
0047005
PROFESSIONAL ENGINEER
DATE SIGNED:

REV	DATE	REVISIONS	BY
0	05/15/2017	ISSUED FOR PERMIT SUBMITTAL	HVT

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CNG FUELING FACILITY
GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
COVER SHEET

ASSET NO: 160-11-17307.02.00

DATE	DESIGNED BY HVT
05/01/2017	CHECKED BY MES
	APPROVED BY RLR
SCALE	AS NOTED
SHEET	CS–1.0

W:\Engineering Projects - Current\Grand Junction, CO- Grand Valley Transit (2082\00\02.0 Drawings and Engineering\001-CS1-COVER SHEET.dwg - PLOTTED: May 12, 2017 - 1:27pm

SPECIAL CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

A. THE CONTRACTOR SHALL PERFORM ALL WORK REQUIRED FOR THE CONSTRUCTION OF THE COMPRESSED NATURAL GAS (CNG) FUELING FACILITY AND RELATED STRUCTURES TO BE CONSTRUCTED HEREUNDER AS NECESSARY TO MAKE A COMPLETE AND WORKING INSTALLATION, EXCEPT FOR WORK SPECIFICALLY EXCLUDED.

B. ALL PHASES OF THE PROJECT SHALL BE CONSTRUCTED AND INSTALLED IN ACCORDANCE WITH THESE SPECIFICATIONS AND THE APPROVED CONSTRUCTION DRAWINGS. IF THERE IS ANY CONFLICT BETWEEN THIS DOCUMENT AND THE DRAWINGS, THE DRAWING(S) SHALL GOVERN AND THE ENGINEER SHALL BE NOTIFIED.

C. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ARRANGING FOR ALL REQUIRED INSPECTIONS AT THE APPROPRIATE STAGES OF CONSTRUCTION. IF ANY OF THE CONTRACTOR'S WORK FAILS ANY INSPECTION, THE CONTRACTOR SHALL TAKE THE APPROPRIATE MEASURES TO CORRECT ANY DEFICIENCY AT NO EXPENSE TO CLEAN ENERGY.

E. THE CONTRACTOR'S WORK SHALL CONFORM TO ALL APPLICABLE CODES, ORDINANCES, AND REGULATIONS OF THE STATE, COUNTY, AND CITY INVOLVED. APPROVED DRAWINGS AND PERMITS SHALL NOT BE CONSTRUED AS LICENSE TO CONSTRUCT WORK NOT CONFORMING WITH THE GOVERNING CODES AND SHALL NOT RELIEVE THE THE CONTRACTOR FROM COMPLYING WITH THE GOVERNING CODES, PLANS, AND SPECIFICATIONS.

1.2 MATERIALS

A. THE CONTRACTOR SHALL HANDLE AND INSTALL ALL MATERIAL AND EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS AND THE REQUIREMENTS IN THESE CONSTRUCTION SPECIFICATIONS.

B. CLEAN ENERGY SHALL PROVIDE THE CONTRACTOR WITH MAJOR EQUIPMENT ASSEMBLIES LISTED AS "CLEAN ENERGY FURNISHED" IN THIS SPECIFICATION OR THE DRAWINGS. CLEAN ENERGY FURNISHED EQUIPMENT AND MATERIAL WILL BE DELIVERED TO THE JOB SITE BY CLEAN ENERGY AND THE CONTRACTOR SHALL BE RESPONSIBLE FOR UNLOADING AND PROPERLY STORING THEM ON THE CONSTRUCTION SITE TO ENSURE NO DAMAGE IS DONE TO EQUIPMENT OR MATERIAL (I.E. RAIN, VANDALISM, ETC). ON-SITE STORAGE LOCATION(S) SHALL BE COORDINATED WITH CLEAN ENERGY.

1.3 MATERIAL HANDLING AND STORAGE

A. AFTER RECEIPT OF CLEAN ENERGY FURNISHED MATERIALS BY THE CONTRACTOR, ANY SHORTAGES OF AND/OR DAMAGES TO THE MATERIALS SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR SHALL BE FINANCIALLY ACCOUNTABLE FOR SUCH SHORTAGES, ERRORS, OR DAMAGES.

B. THE CONTRACTOR SHALL BE FINANCIALLY ACCOUNTABLE FOR LOST OR STOLEN CLEAN ENERGY FURNISHED EQUIPMENT.

C. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROPER STORAGE AND HANDLING OF ALL CLEAN ENERGY FURNISHED EQUIPMENT AND MATERIAL UNTIL THE INSTALLATION IS ACCEPTED BY CLEAN ENERGY'S REPRESENTATIVE.

D. THE CONTRACTOR SHALL BE RESPONSIBLE FOR HAULING AWAY ALL UNUSED CONTRACTOR SUPPLIED MATERIALS, WASTE, AND SPOILS. ALL CONSTRUCTION DEBRIS SHALL BE REMOVED FROM THE SITE DAILY AND DISPOSED OF IN A LEGAL MANNER.

E. ALL UNUSED CLEAN ENERGY SUPPLIED MATERIAL SHALL BE RETURNED TO CLEAN ENERGY UPON COMPLETION OF CONSTRUCTION.

1.4 USE OF SITE, TEMPORARY UTILITIES AND INSPECTIONS

A. THE CONTRACTOR'S ACTIVITIES SHALL BE RESTRICTED TO THE DESIGNATED CONSTRUCTION SITE AND STORAGE AREAS DURING EXECUTION OF THIS WORK.

B. PRIOR TO START OF CONSTRUCTION, THE CONTRACTOR SHALL OBTAIN APPROVAL FROM CLEAN ENERGY'S REPRESENTATIVE FOR ON-SITE DIRT REMOVAL OR STOCK PILING TO INSURE MINIMUM DISRUPTION OF EXISTING SITE OPERATION.

C. EVERY REQUEST FOR INSPECTION SHALL REQUIRE A FORTY-EIGHT (48) HOUR ADVANCE NOTICE BEFORE SUCH INSPECTION IS DESIRED.

1.5 START-UP PROCEDURES

A. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY TEMPORARY CLEARANCES TO RELEASE GAS AND ELECTRICAL SERVICE FOR START-UP. THIS WILL NOT INCLUDE FINAL INSPECTION BY AGENCIES WHICH REQUIRE A CERTIFICATE TO OPERATE.

B. THE CONTRACTOR SHALL NOTIFY CLEAN ENERGY'S PROJECT MANAGER A MINIMUM OF THREE (3) WEEKS BEFORE THE DATE THE SYSTEM CAN BE STARTED SO AS TO COORDINATE START-UP WITH THE EQUIPMENT VENDOR(S) AND/OR APPROVED REPRESENTATIVES.

C. THE CONTRACTOR SHALL HAVE QUALIFIED ELECTRICAL AND MECHANICAL REPRESENTATIVES PRESENT DURING START-UP TO MAKE ANY NECESSARY REPAIRS IN THE EVENT OF LEAKS OR FAILURES.

D. A WALK-THROUGH SHALL BE MADE AFTER START-UP WITH CLEAN ENERGY REPRESENTATIVES. THE ITEMS ON THE PUNCH LIST DEVELOPED DURING THIS WALK-THROUGH SHALL BE COMPLETED WITHIN TEN (10) WORKING DAYS.

E. FINAL WALK-THROUGH SHALL BE CONDUCTED WITH THE CLEAN ENERGY PROJECT MANAGER, ENGINEER OR THEIR AUTHORIZED REPRESENTATIVE, AND THE CONTRACTOR TO SIGN OFF THE COMPLETION OF THE PUNCH LIST ITEMS. ALL ITEMS SHALL BE COMPLETED AND SIGNED OFF BEFORE RETENTION MONEY WILL BE PAID TO THE CONTRACTOR.

1.6 DRAWINGS

A. FINAL INTERPRETATION OF ALL DRAWINGS WILL BE BY CLEAN ENERGY, IN CONSULTATION WITH THE ENGINEER, AND CLEAN ENERGY'S DECISION WILL BE FINAL.

B. TWO COMPLETE SETS OF "APPROVED FOR CONSTRUCTION" DRAWINGS WILL BE PROVIDED TO THE THE CONTRACTOR FIVE (5) WORKING DAYS PRIOR TO THE START OF CONSTRUCTION.

C. ALL DRAWINGS PREPARED BY THE CONTRACTOR SHALL BE SUBMITTED TO THE ENGINEER OF RECORD FOR APPROVAL PRIOR TO ADMITTING DRAWINGS INTO THE CONSTRUCTION DRAWING SET.

D. UPON SUBSTANTIAL COMPLETION OF CONSTRUCTION, THE CONTRACTOR SHALL MARK-UP ONE (1) COPY OF "APPROVED FOR CONSTRUCTION" DRAWINGS TO AS-BUILT CONDITIONS. AS-BUILT DRAWINGS SHALL SHOW ALL SIGNIFICANT CHANGES, DIMENSIONS (INCLUDING DEPTH), AND RELATIVE POINTS OF REFERENCE. THESE ALTERED DRAWINGS SHALL BE SUBMITTED TO CLEAN ENERGY WITHIN TWO (2) WEEKS (TEN (10) WORKING DAYS) AFTER COMPLETION OF CONSTRUCTION. RETENTION RELEASE IS CONTINGENT UPON RECEIVING ACCURATE AS-BUILT DRAWINGS.

1.7 MISCELLANEOUS EQUIPMENT

A. THE CONTRACTOR SHALL PROVIDE MASTER LOCK, PADLOCKS, HI VIS, ALUMINUM, PRO SERIES PICK RESISTANT 5 PIN LOCKING MECHANISM WITH 2 KEYS AT LOCATIONS SPECIFIED. ALL GATES, PANELS AND DOORS SHALL INCLUDE A BLACK MASTER LOCK, GRAINGER #4RD90 THAT IS KEYED TO 10G504. ALL SAFETY RELIEF VALVES SHALL INCLUDE A RED MASTER LOCK, GRAINGER #4RD94 THAT IS KEYED TO 10G502.

PART 2- CONCRETE & EARTHWORK

2.0 DESIGN PARAMETERS

A. THIS PROJECT HAS BEEN DESIGNED ACCORDING TO THE FOLLOWING CODES:

a. IBC 2012
b. ASCE 7-10
c. AISC MANUAL OF STEEL CONSTRUCTION 14TH EDITION
d. ACI 318-11
e. ACI 530-11
f. ACI 360-R (SLABS ON GRADE)
g. AWS D1.1-0
h. ASTM (AMERICAN SOCIETY FOR TESTING & MATERIALS)
i. C160 CRSI (CONCRETE REINFORCING STEEL INSTITUTE)
j. COLORADO DEPARTMENT OF TRANSPORTATION (CDOT) FOR ASPHALT PAVEMENT AND PAVEMENT MARKINGS

B. OPENINGS, POCKETS, ETC., LARGER THAN 6" SHALL NOT BE PLACED IN CONCRETE SLABS, DECKS, WALLS, UNLESS SPECIALLY DETAILED ON THE STRUCTURAL DRAWINGS. NOTIFY THE ENGINEER WHEN DRAWINGS BY OTHERS SHOW OPENINGS, POCKETS, ETC. LARGER THAN 6" NOT SHOWN ON THE DRAWINGS, BUT WHICH ARE LOCATED IN STRUCTURAL MEMBERS.

C. ASTM SPECIFICATIONS ON THE DRAWINGS SHALL BE OF THE LATEST REVISION.

D. DESIGN LOADS:
DEAD LOADS
EQUIPMENT:
a. COMPRESSOR = 14,500# / SKID (SINGLE)
b. DRYER = 2,470#

RISK CATEGORY: II

E. WIND ANALYSIS PER ASCE
BASIC WIND SPEED, (3-SECOND GUST): <120 MILES PER HOUR
WIND IMPORTANCE FACTOR: 1.0
WIND EXPOSURE: C
WIND LOAD: VARIES (SEE STRUCTURAL CALCULATIONS)

F. SEISMIC ANALYSIS PER ASCE UTILIZING THE EQUIVALENT LATERAL FORCE ANALYSIS
S_S = 80.0%g S_{DS} = 62.9%g
S_1 = 40.0%g S_{D1} = 42.7%g
SITE CLASS: D
SEISMIC DESIGN CATEGORY: D

2.1 CONCRETE

A. THE CONTRACTOR SHALL NOT MAKE ANY CONCRETE POURS WITHOUT FIRST NOTIFYING CLEAN ENERGY.

B. IF FOUNDATION SLABS AND FOOTINGS ARE POURED PRIOR TO TRENCHING FOR PIPING AND ELECTRICAL, SLEEVES ARE REQUIRED UNDER BLOCK WALL FOOTINGS OR EQUIPMENT FOUNDATIONS FOR ALL PROPOSED GAS PIPING OR ELECTRICAL CONDUITS PASSING UNDER FOOTINGS OR FOUNDATIONS.

C. CEMENT SHALL MEET IBC STANDARDS FOR PORTLAND CEMENT & BLENDED HYDRAULIC CEMENTS.

D. READY MIX CONCRETE SHALL BE MIXED AND DELIVERED IN ACCORDANCE WITH REQUIREMENTS OF IBC STANDARDS. BATCH TICKETS WILL BE RETURNED TO CLEAN ENERGY.

E. REINFORCED CONCRETE IS DESIGNED BY THE "ULTIMATE STRENGTH DESIGN METHOD".

F. CONCRETE NORMAL WEIGHT IS 150 PCF. UNLESS NOTED OTHERWISE.

G. CONCRETE MIXING OPERATION, ETC. SHALL CONFORM TO ASTM C94.

H. CONCRETE MIXES SHALL BE DESIGNED BY A QUALIFIED TESTING LABORATORY AND SHALL BEAR THE WET SEAL OF A CIVIL ENGINEER, LICENSED IN THE STATE THE PROJECT IS LOCATED, FOR REVIEW BY THE ENGINEER. THE MIX DESIGNS SHALL STATE THE PROJECT NAME AND THE INTENDED USAGE OF THE CONCRETE.

I. SCHEDULE OF STRUCTURAL CONCRETE 28-DAY STRENGTH AND TYPES:

LOCATION OF CONCRETE	STRENGTH, psi	TYPE
FOOTINGS	4500*	HARD ROCK
SLAB ON GRADE	4500*	HARD ROCK
MISCELLANEOUS	4500*	HARD ROCK

* DESIGN STRENGTH = 4500 psi
* PER TABLE 4.3.1 - CONCRETE MIX SHALL BE DESIGNED FOR EXPOSURE CLASSES F1 S0, P0 AND C0.

J. PORTLAND CEMENT SHALL CONFORM TO ASTM C150, TYPE V IN CONTACT WITH SOIL AND TYPE II ELSEWHERE. CEMENT SHALL HAVE AN EQUIVALENT ALKALINE CONTENT LESS THAN 0.6%.

K. AGGREGATE FOR HARDROCK CONCRETE SHALL CONFORM TO ALL REQUIREMENTS AND TESTS OF ASTM C33. AGGREGATE SHALL BE NON-REACTIVE

L. FLY ASH OR POZZOLANS, IF USED, SHALL CONFORM WITH ASTM C618. USAGE SHALL NOT EXCEED 15 PERCENT BY WEIGHT OF THE TOTAL OF CEMENTITIOUS MATERIALS. POZZOLANS USED TO MITIGATE THE EFFECT OF SULFATE CONTAINING SOILS SHALL BE DETERMINED BY TEST OR SERVICE RECORD.

M. PLACEMENT OF CONCRETE SHALL CONFORM TO SECTION 1905 OF THE BUILDING CODE.

O. ALL REINFORCING BARS, ANCHOR BOLTS AND OTHER CONCRETE INSERTS SHALL BE WELL-SECURED IN POSITION PRIOR TO PLACING CONCRETE.

P. MECHANICAL PIPES AND ELECTRICAL CONDUITS WHICH PASS THROUGH SLAB ON GRADE, DO NOT REQUIRE SLEEVES, UNLESS OTHERWISE NOTED. IF SLEEVES ARE REQUIRED, INSTALL SLEEVES BEFORE PLACING CONCRETE. DO NOT CUT ANY REINFORCING WHICH MAY INTERFERE WITH SLEEVE PLACEMENT. CORING OPENINGS IN CONCRETE IS NOT PERMITTED. NOTIFY THE ENGINEER IN ADVANCE OF CONDITIONS NOT SHOWN ON THE STRUCTURAL DRAWINGS.

Q. CONTRACTOR SHALL SUBMIT MINIMUM OF TWO COPIES OF REBAR SHOP DRAWINGS SHOWING ALL BENDS, LAPS, HOOKS AND CHAINS REQUIRED FOR THE PROPER CONSTRUCTING OF THE REINFORCING ON PLANS.

R. ALL CONCRETE SLABS WILL BE A SMOOTH TROWEL FINISH ON ALL CURB FACES AND EDGES WITH BROOM FINISH ON ALL FLAT SURFACES EXCEPT WHEN MATCHING EXISTING CONCRETE SURFACES. ALL SLAB FINISHES SHALL BE FREE OF STAINS, DISCOLORATION, VOIDS, CRACKS, OR SURFACE DISCONTINUITIES. IF ANY OF THESE CONDITIONS EXIST, CLEAN ENERGY WILL REQUIRE THE CONTRACTOR TO REPLACE THE SLAB. THE CONTRACTOR SHALL VERIFY WITH CLEAN ENERGY WHICH TYPE OF BROOM FINISH WHICH WILL BE ACCEPTABLE.

2.2 REINFORCING STEEL

A. REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF BUILDING CODE AND ASTM 615 OR ASTM A706 GRADE 60.

B. BARS SHALL BE CLEAN OF RUST, GREASE, OR OTHER MATERIALS LIKELY TO IMPAIR BOND. ALL REINFORCING BAR BENDS SHALL BE MADE COLD.

C. REINFORCING BAR SPLICES SHALL BE MADE AS INDICATED ON THE DRAWINGS. LAP ALL HORIZONTAL BARS AT CORNERS AND INTERSECTIONS. STAGGER ALL SPLICES UNLESS NOTED OTHERWISE ON PLANS.

D. ALL BARS SHALL BE MARKED SO THEIR IDENTIFICATION CAN BE MADE WHEN THE FINAL IN-PLACE INSPECTION IS MADE.

E. BARS IN SLABS SHALL BE SECURELY SUPPORTED ON WELL-CURED CONCRETE BLOCKS OR APPROVED METAL CHAIRS, PRIOR TO PLACING CONCRETE.

F. REINFORCING STEEL SHALL BE DETAILED IN ACCORDANCE WITH THE ACI 318 AND ACI 530 MANUALS.

G. MILL TEST REPORTS FOR GRADE 60 BARS SHALL BE SUBMITTED PRIOR TO PLACEMENT OF CONCRETE.

H. CONCRETE PROTECTION FOR REINFORCEMENT

	MIN COVER (INCHES)
a. CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH:	3
b. CONCRETE EXPOSED TO EARTH OR WEATHER:	
NO. 6 THROUGH NO. 18 BARS	2
NO. 5 BAR, W31 OR D31 WIRE AND SMALLER	1½
c. CONCRETE NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND:	
SLABS, WALLS, JOISTS:	
NO 14. AND NO. 18 BARS	1½
NO. 11 BAR AND SMALLER	¾
BEAMS, COLUMNS: PRIMARY REINFORCEMENT, TIES, STIRRUPS, AND SPIRALS	1½

I. DEVELOPMENT AND SPLICES OF REINFORCEMENT SHALL CONFORM TO ACI 318, CHAPTER 12 FOR CONCRETE AND ACI 530 FOR MASONRY. FOR CONCRETE, SEE PLANS AND DETAILS.

GreenbergFarrow
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ATLANTA, GA 30309
PHONE: (404) 601-4000
FAX: (404) 601-3970

EXP. DATE: 10/31/2017
COLORADO LICENSED PROFESSIONAL ENGINEER
PE 0046745
DATE SIGNED:

REV	DATE	REVISIONS	BY
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CNG FUELING FACILITY
GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
GENERAL NOTES

ASSET NO: 160-11-17307.02.00

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SHEET	G–0.0	

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2.3 EARTHWORK AND FOUNDATION DESIGN

A. EARTHWORK SHALL BE PER GEOTECHNICAL ENGINEERING REPORT PREPARED BY HUDDLESTON-BERRY ENGINEERING & TESTING, LLC DATED JANUARY 25, 2017; PROJECT NO. 00580-0055.

B. EXCAVATION SHALL BE PERFORMED AT SPECIFIED LOCATIONS AS REQUIRED PER APPROVED DRAWINGS. ALL FOOTINGS SHALL BE PLACED ON UNDISTURBED NATURAL EARTH OR ON PREPARED SUBGRADE, PER THE GEOTECHNICAL ENGINEERING REPORT IN SECTION 2.3.D OR COMPACTED TO 95% PROCTOR.

C. THE CONTRACTOR SHALL NOTIFY CLEAN ENERGY IN WRITING FOR ANY POTENTIAL TRENCHING DEVIATION FROM APPROVED PLANS OR EXCAVATING PROBLEMS PRIOR TO START OF CONSTRUCTION. NEGLIGENCE SHALL NOT CONSTITUTE A CHANGE ORDER.

D. ANY MATERIALS USED FOR BACKFILL SHALL BE CLEAN AND FREE OF ALL DEBRIS (WOOD SCRAPS, WELDING ROD, PIPE SCRAPS, OR OTHER DELETERIOUS SUBSTANCES). NO LUMPS OR ROCK LARGER THAN 4 INCHES IN DIAMETER ARE ALLOWED WITHIN TWELVE (12) INCHES OF ANY FOUNDATION. BACKFILL MATERIAL SHALL BE AS PER GEOTECHNICAL REPORT.

E. ALL BACKFILL UNDER FOUNDATIONS AND SLABS SHALL BE COMPACTED TO A MINIMUM OF 95% MODIFIED PROCTOR AT THE OPTIMUM MOISTURE CONTENT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COST OF OBTAINING A COMPACTION REPORT AND SUBMITTING THE RESULT TO THE CLEAN ENERGY.

F. ALL TRENCHES FOR GAS PIPES SHALL HAVE A MINIMUM COVER OF EIGHTEEN (18) INCHES ABOVE THE TOP OF PIPE (OR SLEEVE) FROM FINISH GRADE. A MINIMUM OF TWELVE (12) INCHES OF SAND SHALL BE PROVIDED BELOW THE PIPE AND SIX (6) INCHES ABOVE THE PIPE.

G. ALL TRENCHES FOR ELECTRICAL CONDUITS SHALL HAVE A MINIMUM COVER OF TWENTY-FOUR (24) INCHES ABOVE THE TOP OF CONDUIT FROM FINISH GRADE. BACKFILL SHALL BE CLEAN NATURAL SOIL UNLESS OTHERWISE SPECIFIED.

H. EXPANSIVE SOILS SHALL REQUIRE THAT ELECTRICAL CONDUIT(S) TRENCHES BE FILLED WITH SAND A MINIMUM SIX (6) INCHES ABOVE THE TOP OF CONDUIT.

I. SLURRY BACKFILL MAY BE USED AT THE CONTRACTOR'S EXPENSE INSTEAD OF SOIL FOR BACKFILL TO EXPEDITE COMPLETION OF TRENCHES WITH CLEAN ENERGY'S PRIOR WRITTEN APPROVAL.

J. EXISTING ASPHALT SHALL BE SAWCUT TO ALLOW PLACEMENT OF FOOTINGS AND SLABS. ASPHALT SHALL BE PATCHED TO MATCH THE EXISTING ORIGINAL GRADE. THE CONTRACTOR SHALL ENSURE THAT PATCHED AREAS DO NOT POND. ALL SURFACES, BOTH VERTICAL AND HORIZONTAL, TO RECEIVE ASPHALT PATCHING SHALL HAVE AN ACCEPTABLE BONDING AGENT, SUCH AS SS1 OR AR4000, APPLIED PRIOR TO APPLICATION OF ASPHALT.

K. THE CONTRACTOR SHALL PROTECT OPEN TRENCHES OR EXCAVATIONS FROM WATER RUN OFF OR RAIN. THE CONTRACTOR SHALL ANTICIPATE AND BE PREPARED TO AVOID ANY DELAYS DUE TO WATER INFILTRATION OR RAIN.

L. THE CONTRACTOR SHALL PROPERLY DISPOSE OF ALL CONTAMINATED SOILS, HAZARDOUS WASTE, AND / OR OTHER MATERIALS DUE TO CONTRACTOR'S WORK AT CONTRACTOR'S EXPENSE. PACKAGE AND TRANSPORT ALL HAZARDOUS MATERIALS TO AN APPROVAL WASTE FACILITY. THE CONTRACTOR SHALL COMPLY WITH ALL FEDERAL, STATE, AND LOCAL RULES, REGULATIONS, AND REQUIREMENTS AND SHALL BE RESPONSIBLE FOR THE HAZARDOUS WASTE MANIFEST SHIPPING FROM THE POINT OF GENERATION, THROUGH TRANSPORTATION, TO THE FINAL APPROVED TREATMENT, STORAGE, AND DISPOSAL FACILITY.

M. THE CONTRACTOR SHALL INVESTIGATE THE SITE DURING CLEARING AND EARTHWORK OPERATIONS FOR FILLED EXCAVATIONS OR BURIED STRUCTURES SUCH AS CESSPOOLS, CISTERNS, FOUNDATIONS, ETC. IF ANY SUCH STRUCTURES ARE FOUND, THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY.

N. FOOTINGS ARE DESIGNED BASED ON THE FOLLOWING INFORMATION:

ALLOWABLE BEARING* = 1,500 PSF

* VALUES MAY BE INCREASED BY 1/3 FOR WIND OR SEISMIC LOAD CASES.

FOOTINGS SHALL BEAR ON FIRM NATURAL SOILS. MINIMUM DEPTH OF FOOTINGS BELOW LOWEST ADJACENT FINAL GRADE SHALL BE 40"; MINIMUM WIDTH OF FOOTING SHALL BE 18", UNLESS NOTED OTHERWISE ON PLAN OR IN SOILS REPORT.

O. CONTRACTOR SHALL PROVIDE FOR DESIGN AND INSTALLATION OF ALL CRIBBING, SHEATHING AND SHORING REQUIRED AND SHALL BE SOLELY RESPONSIBLE FOR ALL EXCAVATION PROCEDURES INCLUDING LAGGING, SHORING AND PROTECTION OF ADJACENT PROPERTY, STRUCTURES, STREETS AND UTILITIES IN ACCORDANCE WITH ALL NATIONAL, STATE AND LOCAL SAFETY ORDINANCES.

P. EXCAVATION FOR FOOTINGS SHALL BE APPROVED BY THE INSPECTOR OR ENGINEER PRIOR TO PLACING THE CONCRETE AND REINFORCING. CONTRACTOR TO NOTIFY THE INSPECTOR WHEN INSPECTION OF EXCAVATION IS READY.

Q. ALL EXCAVATIONS SHALL BE PROPERLY BACKFILLED. DO NOT PLACE BACKFILL BEHIND RETAINING WALLS BEFORE CONCRETE OR GROUT HAS ATTAINED FULL DESIGN STRENGTH. CONTRACTORS SHALL BRACE OR PROTECT ALL BUILDING AND PIT WALLS BELOW GRADE FROM LATERAL LOADS UNTIL ATTACHING FLOORS ARE COMPLETELY IN PLACE AND HAVE ATTAINED FULL STRENGTH. CONTRACTOR SHALL PROVIDE FOR DESIGN, PERMITS AND INSTALLATION OF SUCH BRACING.

R. FOUNDATIONS SHALL BE PLACED AND ESTIMATED ACCORDING TO DEPTHS SHOWN ON DRAWINGS. SHOULD SOIL ENCOUNTERED AT THESE DEPTHS NOT BE APPROVED BY THE INSPECTOR OR ENGINEER, FOUNDATION ELEVATIONS WILL BE ALTERED BY CHANGE ORDER.

S. FOOTING BACKFILL AND UTILITY TRENCH BACKFILL WITHIN THE BUILDING PERIMETER SHALL BE MECHANICALLY COMPACTED IN LAYERS IN ACCORDANCE WITH THE SOILS REPORT AND APPROVED BY THE ENGINEER. FLOODING WILL NOT BE PERMITTED. ALL FILLS USED TO SUPPORT FOUNDATIONS SHALL BE INSPECTED BY THE ENGINEER REPRESENTATIVE.

T. SLABS ON GRADE SHALL BE SUPPORTED ON COMPACTED FILL AS PER THE RECOMMENDATIONS OF THE SOILS REPORT.

2.4 STRUCTURAL STEEL

1. STRUCTURAL STEEL SHALL BE DESIGNED, DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE ACIS 'SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS' AND 'CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES'.

2. MATERIALS:

WIDE FLANGE	ASTM A992 G50
ANGLES, CHANNELS, PLATES AND BARS	ASTM A36
PIPES	ASTM 53 GR B, Fy=35ksi
HSS SECTIONS	ASTM A500 GR B, Fy=46ksi
BOLTS	ASTM A325N
ANCHOR BOLTS	ASTM F1554, UNO.

3. STRUCTURAL STEEL SURFACES THAT ARE NOT EXPOSED TO WEATHER SHALL BE LEFT UNPAINTED.

4. WELDED JOINTS SHALL CONFORM TO THE PREQUALIFIED JOINT DETAILS AS INDICATED IN THE STRUCTURAL WELDING CODE (AWS D1.1) BY THE AMERICAN WELDING SOCIETY. WELDS SHALL BE MADE USING A FILLER METAL HAVING 70 KSI MINIMUM TENSILE STRENGTH, FILLER METAL SHALL HAVE A MINIMUM CHARPY V-NOTCH TOUGHNESS OF 20 FT-LBS AT 0 DEGREES FAHRENHEIT, UNLESS NOTED OTHERWISE.

5. WELD LENGTHS CALLED FOR ON PLANS ARE THE NET EFFECTIVE LENGTH REQUIRED. WELD SIZE SHALL BE AISC MINIMUM UNLESS A LARGER SIZE IS NOTED.

6. WELDING TESTS AND INSPECTIONS, SEE SPECIFICATIONS.

7. PAINT PRIME OR GALVANIZE EXPOSED STEEL.

2.5 POST INSTALLED ANCHORS

1. EXPANSION AND SCREW ANCHORS SHALL BE IN CONFORMANCE WITH ACI 318, APPENDIX D AND ICC-ES ACCEPTANCE CRITERIA AC 193.

2. ANCHORS SHALL BE INSTALLED PER THE MANUFACTURER'S INSTRUCTIONS.

3. HOLES DRILLED INTO REINFORCED CONCRETE SHALL NOT DAMAGE OR CUT EXISTING REINFORCING STEEL. HOLES DRILLED INTO PRE-STRESSED OR POST-TENSIONED CONCRETE SHALL HAVE A CLEARANCE OF 1" MINIMUM FROM TENDONS. LOCATE EXISTING TENDONS USING NON-DESTRUCTIVE METHODS PRIOR TO DRILLING.

4. EPOXY ADHESIVE USED FOR SETTING DOWELS AND ANCHORS SHALL BE IN CONFORMANCE WITH ACI318 APPENDIX D AND ICC-ES ACCEPTANCE CRITERIA AC 308.

5. ANCHORS OR DOWELS EMBEDDED IN EPOXY SHALL BE INSTALLED PER THE MANUFACTURER'S INSTRUCTIONS.

6. HOLES RECEIVING EPOXIED ANCHORS SHALL BE CLEAN AND FREE OF DUST PRIOR TO APPLYING EPOXY ADHESIVE.

7. EPOXY ANCHORS SHALL NOT BE INSTALLED IN THE UNDERSIDE OF FLOORS OR ROOFS.

8. EXPANSION AND EPOXY ANCHORS SHALL BE AS NOTED ON PLANS.

9. APPROVED ANCHORING METHODS ARE TO BE USED FOR ANCHORING EQUIPMENT AS SPECIFIED ON DRAWINGS. CLEAN ENERGY AND ENGINEER SHALL BE NOTIFIED AND CONSULTED FOR ANY REQUIRED CORRECTION METHODS FOR MISPLACED BOLTS OR ANCHORS.

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HARRISON VAN TIENHOVEN
PE 0046745
PROFESSIONAL ENGINEER
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TABLE 1705.3
REQUIRED SPECIAL INSPECTIO ~~TESTS OF CONCRETE CONSTRUCTION~~

Check

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD[a]	IBC REFERENCE
1. Inspect reinforcement, including prestressing tendons, and verify placement.	—	X	ACI 318 Ch. 20, 25.2, 25.3, 26.5.1-26.5.3	1908.4
2. Reinforcing bar welding: a. Verify weldability of reinforcing bars other than ASTM A 706; b. Inspect single-pass fillet welds, maximum $^5/_{16}$"; and c. Inspect all other welds.	— X	X X 	AWS D1.4 ACI 318: 26.5.4	—
3. Inspect anchors cast in concrete.	—	X	ACI 318: 17.8.2	—
4. Inspect anchors post-installed in hardened concrete members.[b] a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads. b. Mechanical anchors and adhesive anchors not defined in 4.a.	 X 	 X	 ACI 318: 17.8.2.4 ACI 318: 17.8.2	—
5. Verify use of required design mix.	—	X	ACI 318: Ch. 19, 26.4.3, 26.4.4	1904.1, 1904.2, 1908.2, 1908.3
6. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	X	—	ASTM C 172 ASTM C 31 ACI 318: 26.4.5, 26.12	1908.10
7. Inspect concrete and shotcrete placement for proper application techniques.	X	—	ACI 318: 26.4.5	1908.6, 1908.7, 1908.8
8. Verify maintenance of specified curing temperature and techniques.	—	X	ACI 318: 26.4.7-26.4.9	1908.9
9. Inspect prestressed concrete for: a. Application of prestressing forces; and b. Grouting of bonded prestressing tendons.	 X X	 — —	 ACI 318: 26.9.2.1 ACI 318: 26.9.2.3	—
10. Inspect erection of precast concrete members.	—	X	ACI 318: Ch. 26.8	—
11. Verify in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	—	X	ACI 318: 26.10.2	—
12. Inspect formwork for shape, location and dimensions of the concrete member being formed.	—	X	ACI 318: 26.10.1(b)	—

For SI: 1 inch = 25.4 mm.

a. Where applicable, see also Section 1705.12, Special inspections for seismic resistance.

b. Specific requirements for special inspection shall be included in the research report for the anchor issued by an approved source in accordance with 17.8.2 in ACI 318, or other qualification procedures. Where specific requirements are not provided, special inspection requirements shall be specified by the registered design professional and shall be approved by the building official prior to the commencement of the work.

TABLE 1705.6
REQUIRED SPECIAL I TIONS AND TESTS OF SOILS

Check

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	—	X
2. Verify excavations are extended to proper depth and have reached proper material.	—	X
3. Perform classification and testing of compacted fill materials.	—	X
4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill.	X	—
5. Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.	—	X

Table Cut off

SPECIAL INSPECTIONS

1. SPECIAL INSPECTIONS SHALL BE IN CONFORMANCE WITH SECTION 1704 OF THE BUILDING CODE AND LOCAL AMENDMENTS.
2. INSPECTIONS SHALL BE PERFORMED BY AN INDEPENDENT INSPECTION COMPANY APPROVED BY THE AGENCY WITH JURISDICTION OVER THE PROJECT LOCATION. FORWARD ALL INSPECTION CORRESPONDENCE TO THE ENGINEER OF RECORD.
3. SPECIAL INSPECTION IS REQUIRED AS SHOWN ON THIS SHEET.

SPECIAL INSTALLATION CRITERIA

1. THE FOUNDATION STRUCTURES UNDER THE COMPRESSOR SHALL BE WITHIN ¼" MEASURED ACROSS ITS LENGTH, WIDTH, AND CORNER TO CORNER. THE FLATNESS OF THE FINISHED CONCRETE SHALL BE WITHIN ⅛" ON A 10'-0" DIAMETER CIRCLE MEASURED USING THE STRAIGHT EDGE METHOD. PROVIDE AT LEAST A SMOOTH HAND TROWLED FINISH ACROSS WITH A LIGHT BROOM FINISH ON THE OUTER 2'-0" OF THE PERIMETER OF THE FOUNDATION PAD.

Table Cut off

TABLE 1705.7
REQUIRED SPECIAL INSPECTIONS AN S OF DRIVEN DEEP FOUNDATION ELEMENTS

Check

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INS
1. Verify element materials, sizes and lengths comply with the requirements.	X	—
2. Determine capacities of test elements and conduct additional load tests, as required.	X	—
3. Inspect driving operations and maintain complete and accurate records for each element.	X	—
4. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any damage to foundation element.	X	—
5. For steel elements, perform additional special inspections in accordance with Section 1705.2.	—	—
6. For concrete elements and concrete-filled elements, perform tests and additional special inspections in accordance with Section 1705.3.	—	—
7. For specialty elements, perform additional inspections as determined by the registered design professional in responsible charge.	—	

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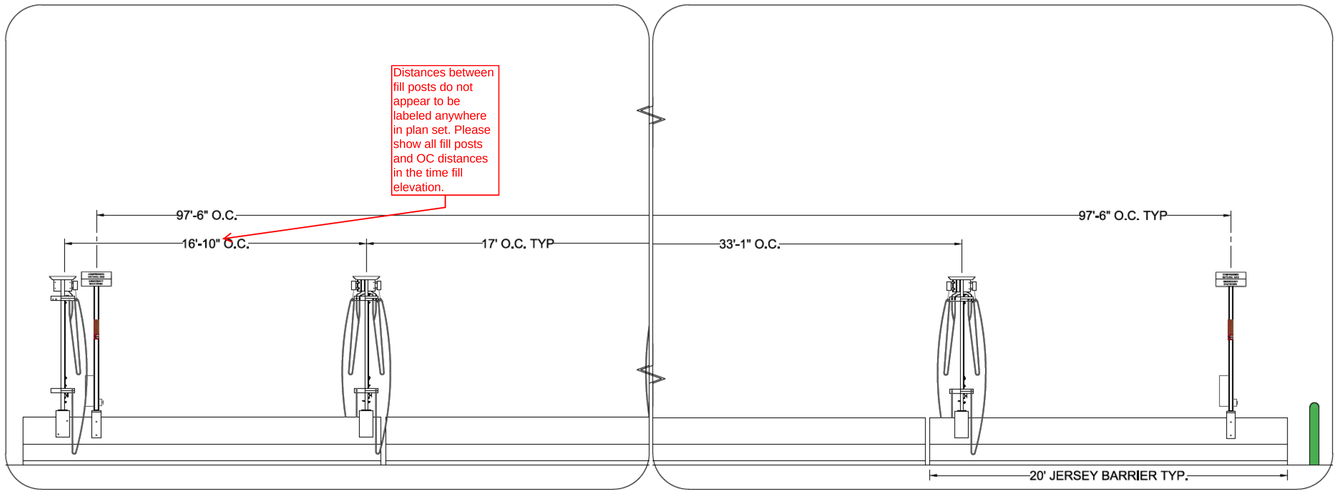
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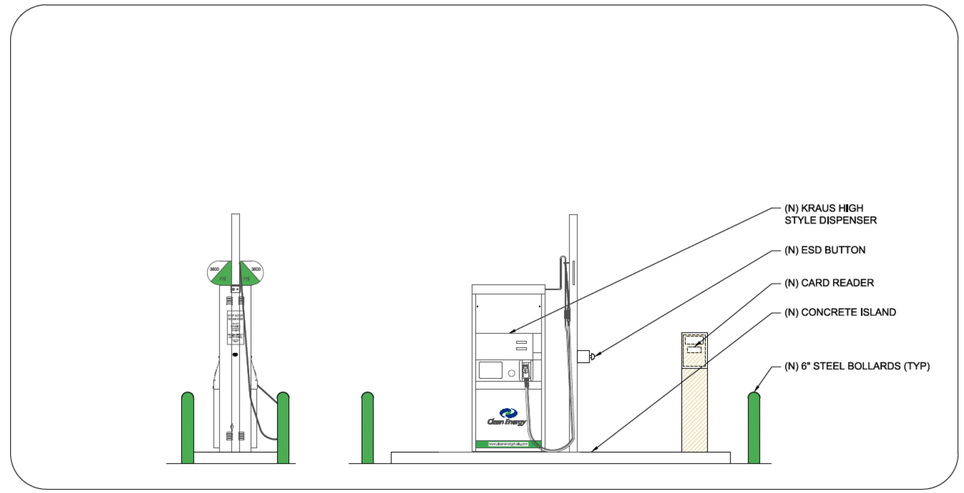
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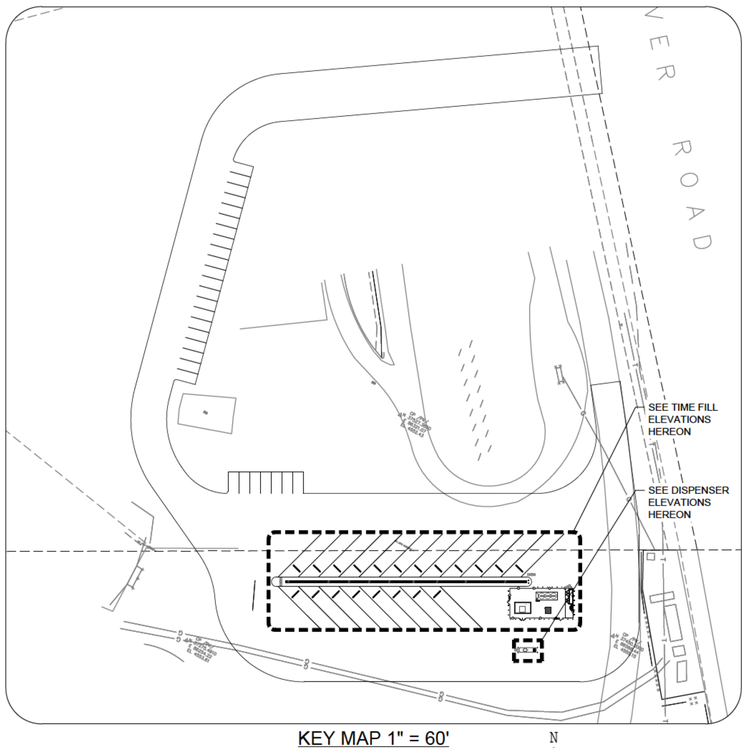
TIME FILL ELEVATIONS 1"=4'

4' 2' 0' 4' 8'

GRAPHIC SCALE



DISPENSER ISLAND ELEVATION 1"=3'

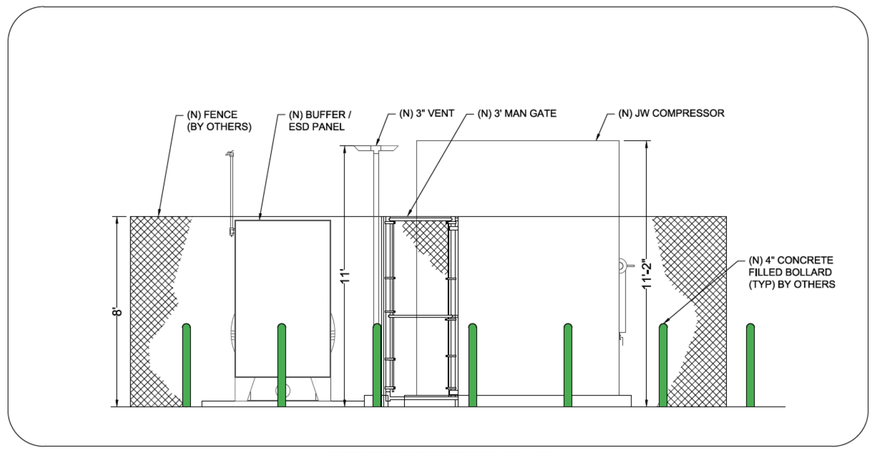


KEY MAP 1" = 60'

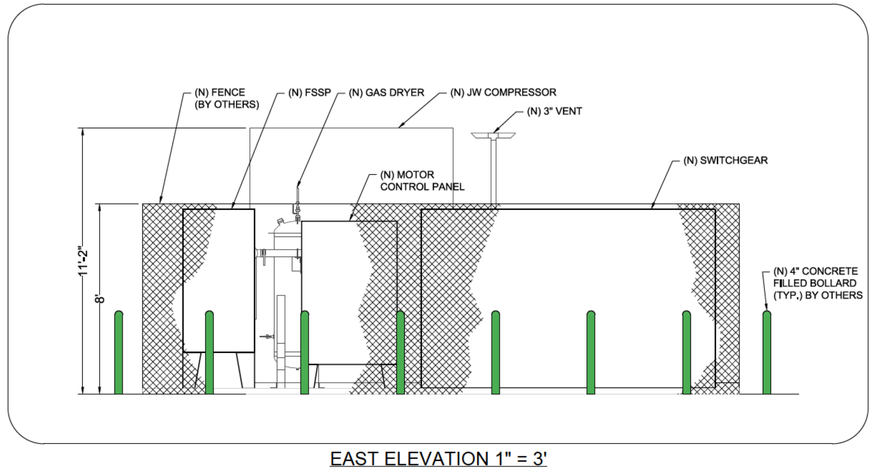
60 30' 0' 60' 120'

GRAPHIC SCALE

N W E S



WEST ELEVATION 1" = 3'



EAST ELEVATION 1" = 3'

3' 1.5' 0' 3' 6'

GRAPHIC SCALE

COLOR CHART		
ITEM	COLOR	
CANOPY	WHITE	
BOLLARDS / COVERS	GREEN -PANTONE 361 EC (SEE NOTE 1)	

NOTES

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3. CONTRACTOR SHALL PRIME ALL BOLLARDS USING PLASTIC COVERS FOR CORROSION PROTECTION.
4. PERIMETER FENCING SLATS TO MATCH EXISTING COLOR.

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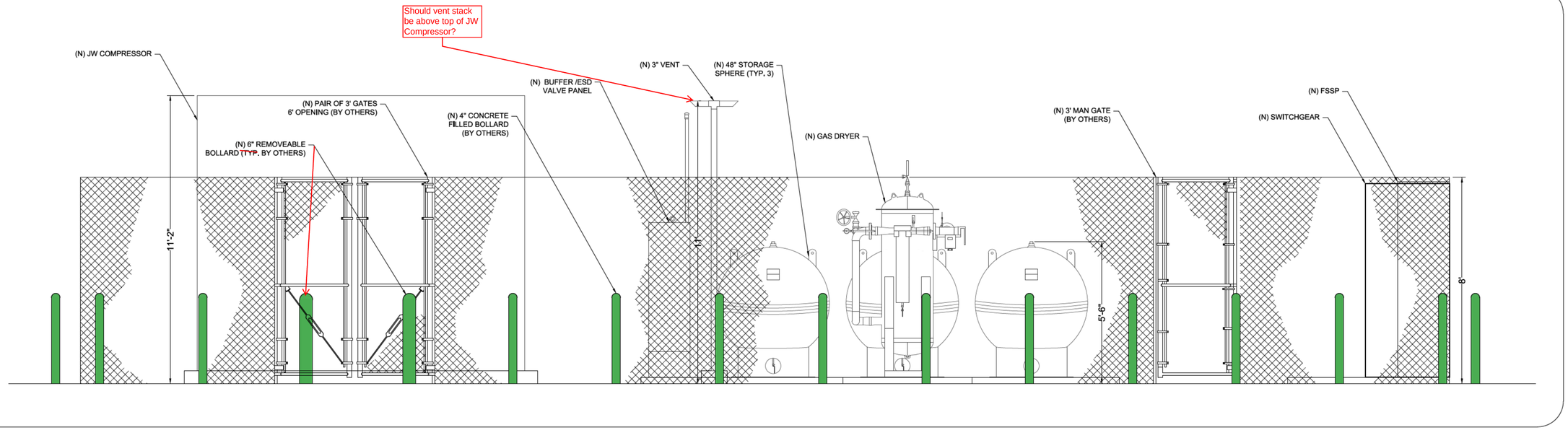
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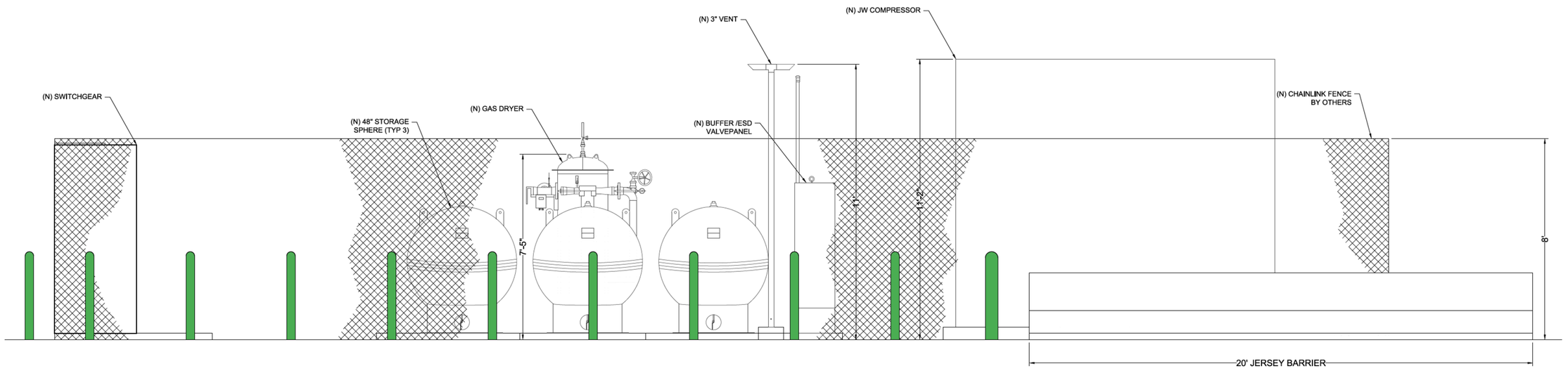
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SOUTH ELEVATION 1" = 2'



NORTH ELEVATION 1" = 2'

COLOR CHART

ITEM	COLOR	
CANOPY	WHITE	
BOLLARDS / COVERS	GREEN -PANTONE 361 EC (SEE NOTE 1)	

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3. CONTRACTOR SHALL PRIME ALL BOLLARDS USING PLASTIC COVERS FOR CORROSION PROTECTION.
4. PERIMETER FENCING SLATS TO MATCH EXISTING COLOR.

3' 1.5' 0' 3' 6'
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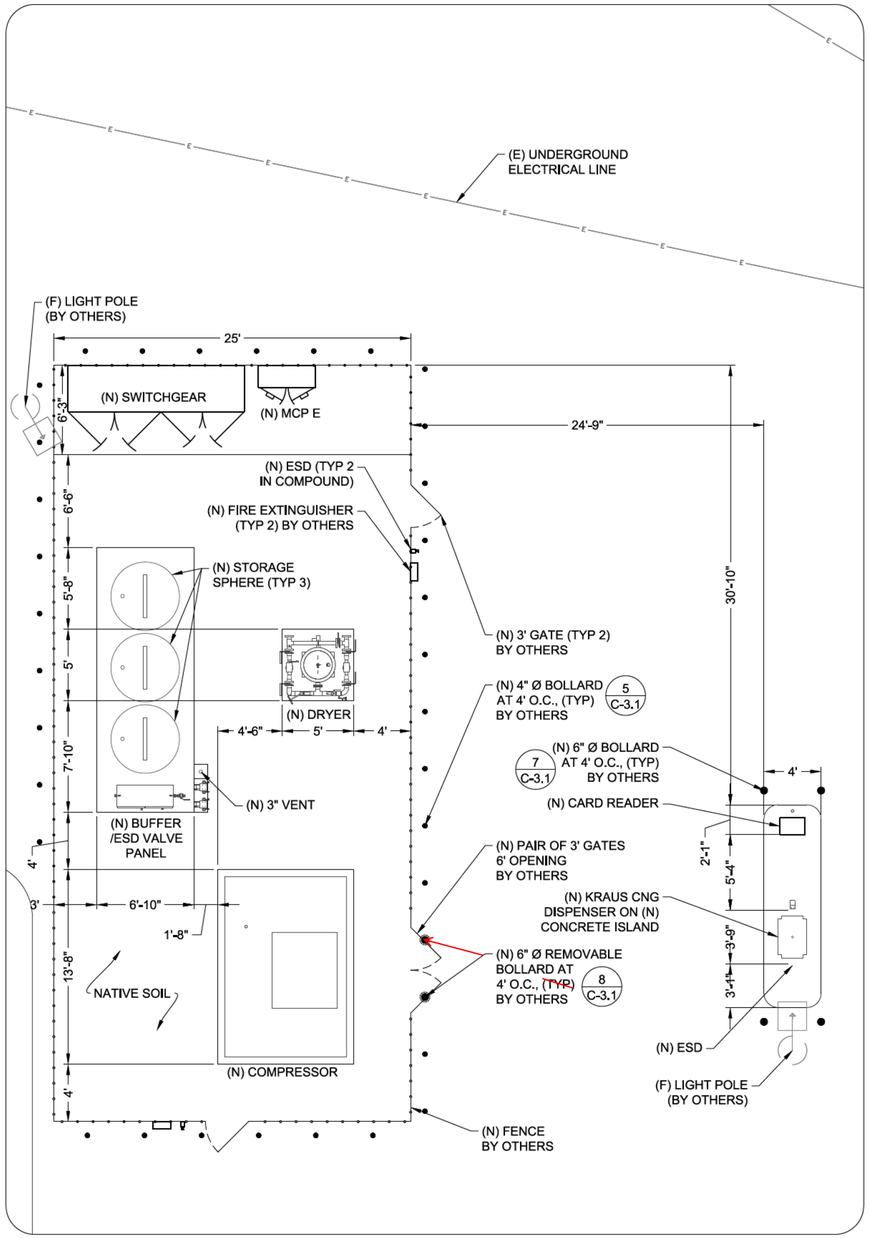
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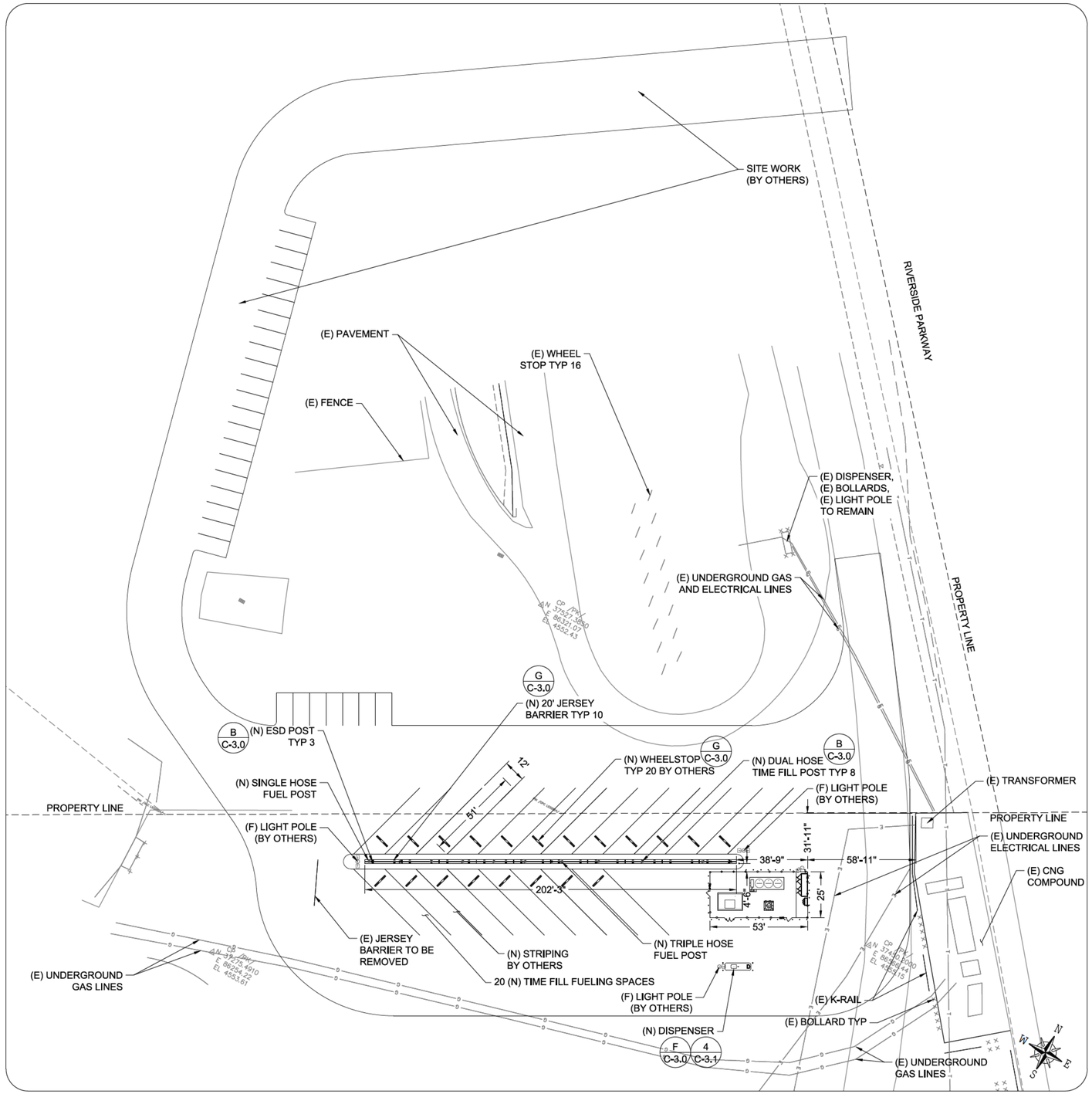
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EQUIPMENT COMPOUND LAYOUT (1" = 5')

5' 2.5' 0' 5' 10'

GRAPHIC SCALE



CIVIL SITE PLAN (1"=30')

30' 15' 0' 30' 60'

GRAPHIC SCALE

GENERAL NOTES

1. ALL 3' GATES SHALL BE SPACED TO OPEN FREELY AND MISS ANY BOLLARDS WHEN OPENED
2. CONTRACTOR IS RESPONSIBLE FOR THE PROTECTION OF ALL PROPERTY CORNERS.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRS TO DAMAGE TO ANY EXISTING IMPROVEMENTS DURING CONSTRUCTION, SUCH AS, BUT NOT LIMITED TO, DRAINAGE, UTILITIES, PAVEMENT, STRIPING, CURB, ETC. REPAIRS SHALL BE EQUAL TO OR BETTER THAN EXISTING CONDITIONS.
4. ALL PAVEMENT PAINT SHALL BE SHERWIN WILLIAMS "PROMAR TRAFFIC MARKING", WHITE ON ASPHALT, YELLOW ON CONCRETE. PAINT SHALL BE APPLIED IN TWO (2) COATS TO A CLEAN, DRY SURFACE USING TEMPLATE OR STRIPING MACHINE. STRIPES SHALL BE 4" WIDE UNLESS OTHERWISE NOTED.

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SITE PLAN

ASSET NO: 160-11-17307.02.00

W:\Engineering Projects - Current\Grand Junction, CO - Grand Valley Transit (20820.00)\3.0 Drawings and Engineering\04-CIVIL\SITE PLAN.dwg - PLOTTED: May 12, 2017 - 1:28pm

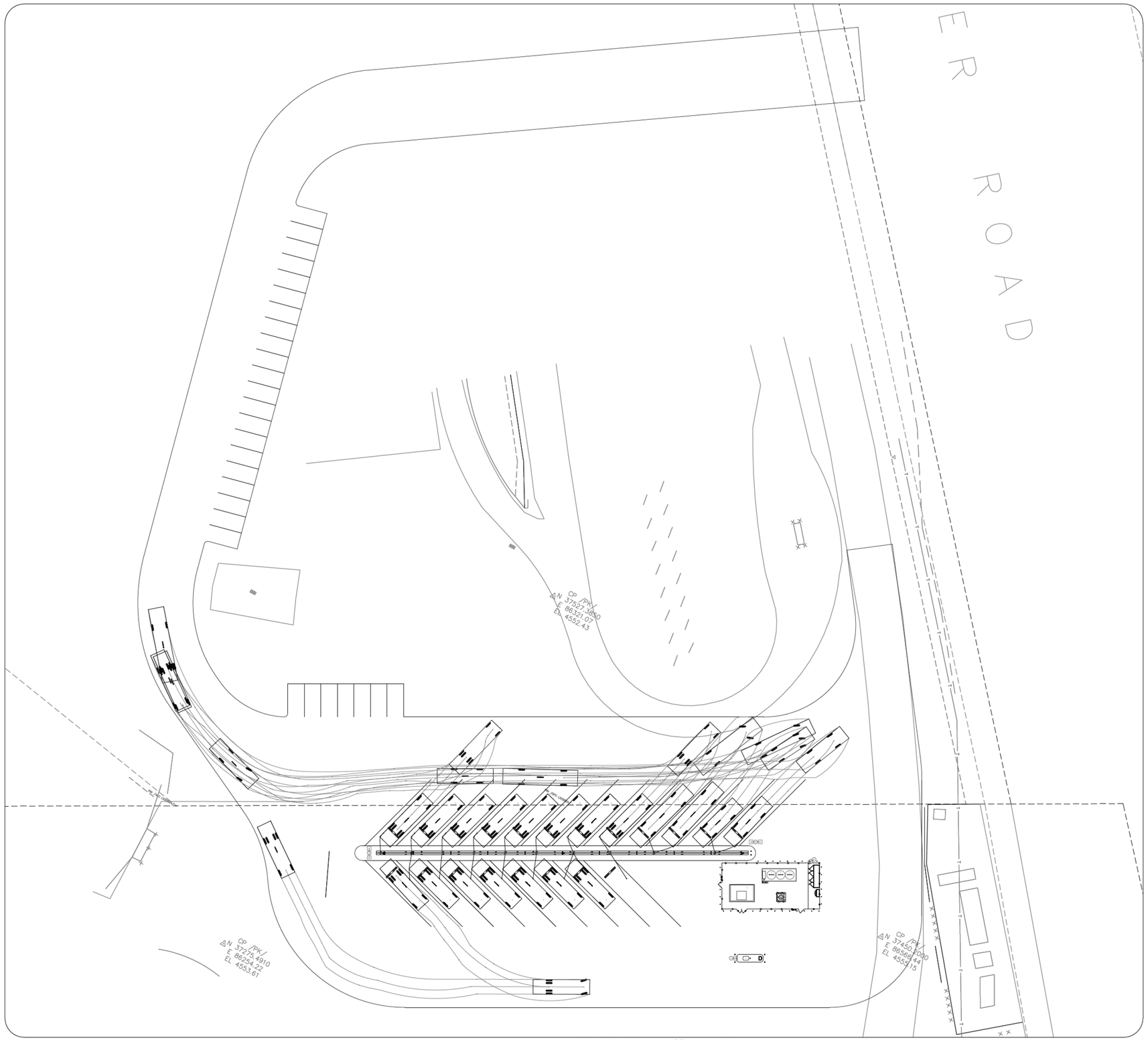
EXP. DATE: 10/31/2017

COLORADO LICENSED PROFESSIONAL ENGINEER — PE 0046745

DATE SIGNED:

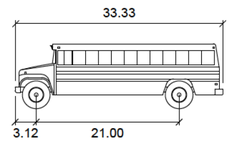
GreenbergFarrow
1430 W. PEACHTREE ST., NW SUITE 200
ATLANTA, GA 30309
PHONE: (404) 601-4000
FAX: (404) 601-3970

DATE	05/01/2017
DESIGNED BY	HVT
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APPROVED BY	KLR
SCALE	AS NOTED
SHEET	C–1.0



CIRCULATION PLAN (1"=26') 26' 13' 0' 26' 52'

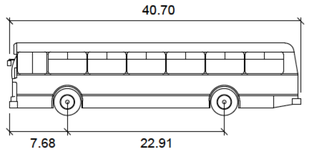
GRAPHIC SCALE



33' Gaval Entourage

		feet
Width	:	8.00
Track	:	8.00
Lock to Lock Time	:	6.0
Steering Angle	:	37.6

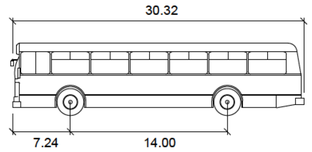
(1) – (8)



40' Axess

		feet
Width	:	8.50
Track	:	8.50
Lock to Lock Time	:	6.0
Steering Angle	:	34.4

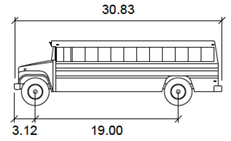
(9) – (10)



32' EZ Rider II

		feet
Width	:	8.23
Track	:	8.23
Lock to Lock Time	:	6.0
Steering Angle	:	34.4

(11) – (12)



31' Gaval Entourage

		feet
Width	:	8.00
Track	:	8.00
Lock to Lock Time	:	6.0
Steering Angle	:	37.6

(13) – (20)

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CNG FUELING FACILITY
GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
CIRCULATION PLAN

ASSET NO: 160-11-17307.02.00

DATE	DESIGNED BY	HVT
05/01/2017	CHECKED BY	MES
	APPROVED BY	RLR

SCALE: AS NOTED

SHEET: C–1.1

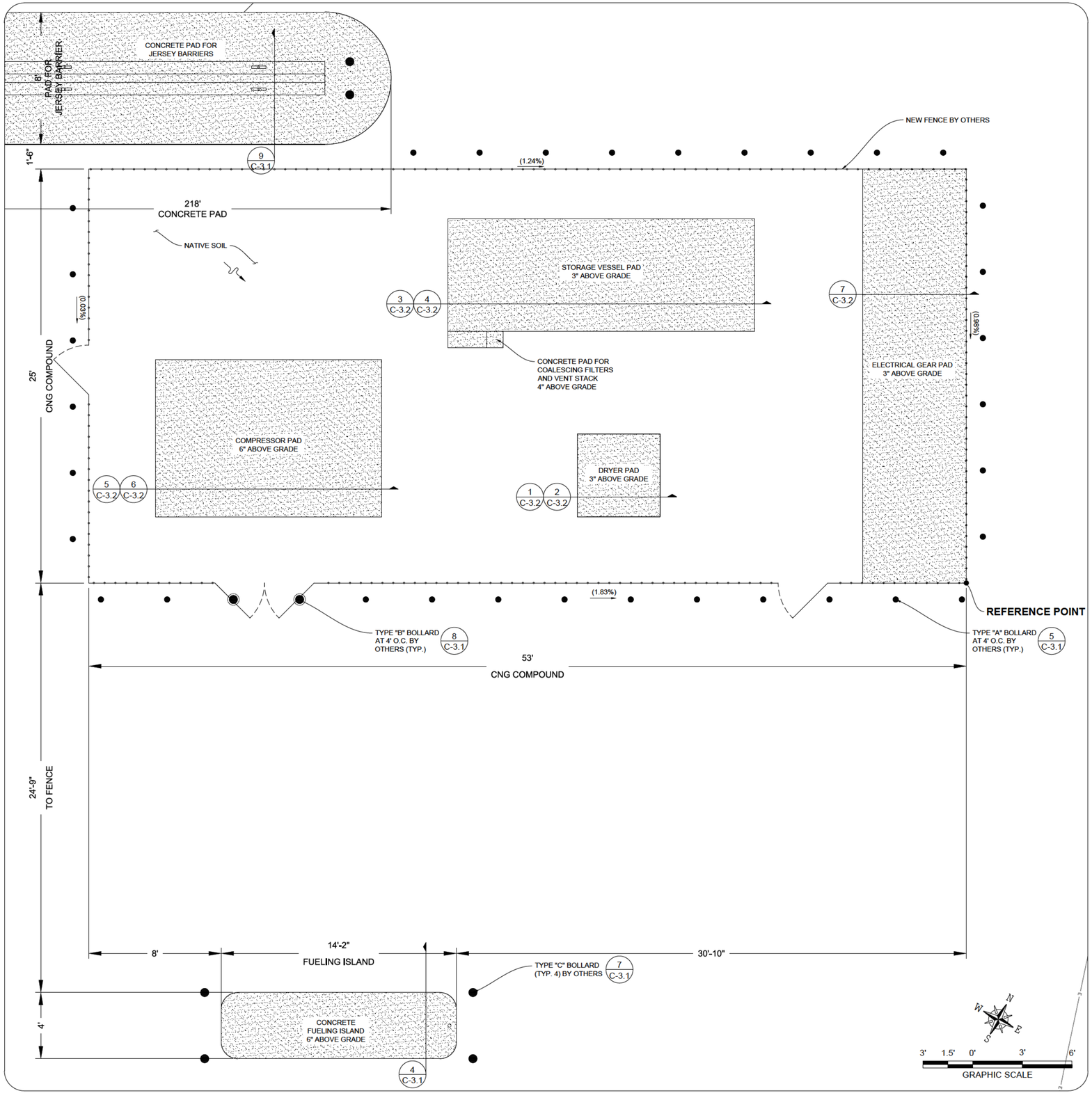
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COLORADO LICENSED PROFESSIONAL ENGINEER PE 0046745

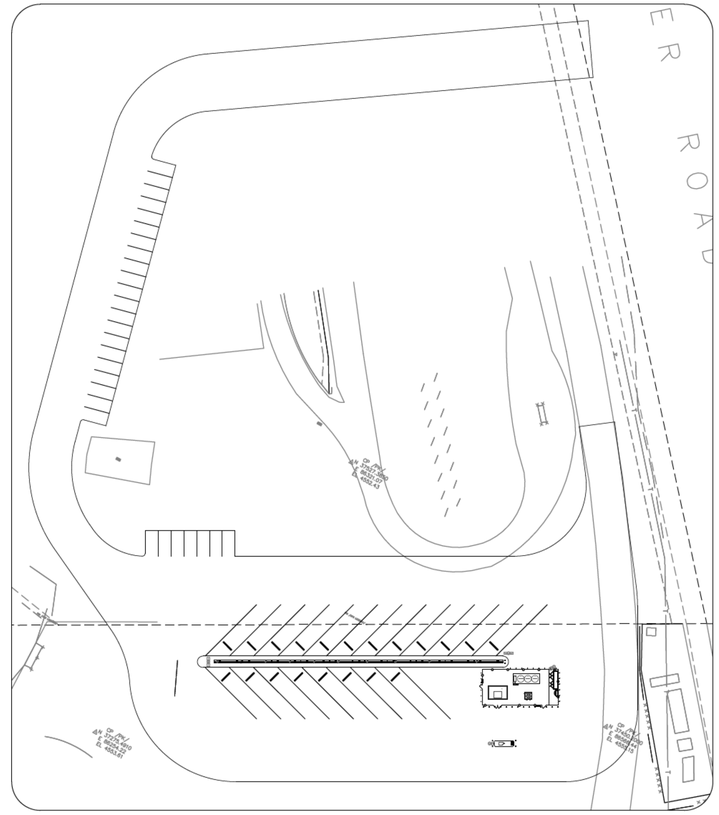
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FOUNDATION AND GRADING PLAN (1" = 3')



KEY MAP (1" = 50')

GENERAL NOTES

1. CONTRACTOR SHALL COMPLY WITH ALL NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) AND LOCAL JURISDICTION STORM WATER POLLUTION PREVENTION (SWPP) RULES AND REGULATIONS PRIOR TO THE COMMENCEMENT OF ANY WORK AND DURING ANY CONSTRUCTION ACTIVITIES.
2. EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO THE COMMENCEMENT OF ANY WORK.
3. CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES HAVING UNDERGROUND UTILITIES ON SITE OR IN RIGHT-OF-WAY PRIOR TO EXCAVATION. CONTRACTOR SHALL CONTACT UTILITY LOCATING COMPANY AND LOCATE ALL UTILITIES PRIOR TO GRADING START.
4. ALL EXISTING STRUCTURES, PAVEMENT, VEGETATION, DEBRIS, STOCKPILED SOIL, TREES AND ASSOCIATED ROOT SYSTEMS, RUBBLE, LOOSE MATERIALS, ETC. WITHIN CONSTRUCTION AREA, SHALL BE REMOVED AND DISPOSED OF OFF SITE UNLESS OTHERWISE NOTED. RESULTING EXCAVATIONS SHALL BE BACKFILLED WITH ENGINEERED FILL.
5. PRIOR TO PLACEMENT OF FILL MATERIAL, ALL UNEVEN SURFACE FEATURES SHALL BE REMOVED, LOOSE MATERIALS SHALL BE MOISTURE CONDITIONED AND COMPACTED TO 90% RELATIVE COMPACTION.
6. ALL PROPOSED SPOT ELEVATIONS ARE SHOWN AT FINISHED SURFACE ELEVATIONS. REFER TO SITE PLAN AND REFERENCED PAVEMENT SECTIONS FOR DEPTHS OF EXCAVATIONS.
7. AFTER COMPLETING THE OVER EXCAVATION AND ANY CORRECTIVE WORK, ALL EXPOSED SUBGRADE SOILS SHALL BE SCARIFIED AND COMPACTED TO A DEPTH OF 8 INCHES . THE MOISTURE CONTENT OF THE SCARIFIED SOIL SHOULD BE ADJUSTED TO AT LEAST ITS OPTIMUM VALUE, AS DETERMINED BY ASTM D1557 (CURRENT EDITION), PRIOR TO BEING COMPACTED TO AT LEAST 90% OF ITS DRY DENSITY.
8. DEPENDING UPON DEPTH OF EXCAVATION AND SEASONAL CONDITIONS GROUNDWATER MAY BE ENCOUNTERED IN EXCAVATION ON THE SITE. PUMPING FROM SUMPS MAY BE UTILIZED TO CONTROL WATER WITHIN EXCAVATIONS. WELL POINTS MAY BE REQUIRED FOR SIGNIFICANT GROUNDWATER FLOW, OR WHERE EXCAVATIONS PENETRATE GROUNDWATER TO A SIGNIFICANT DEPTH.

ABBREVIATIONS

GB	GRADE BREAK
TC	TOP OF CURB
BC	BASE OF CURB
TP	TOP OF PAD
BP	BASE OF PAD
TF	TOP OF FOUNDATION
TG	TOP OF GRATE
EG	EXISTING GRADE
FG	FINISHED GRADE
EP/ EC	EDGE OF PAVEMENT
OHE	OVERHEAD ELEC
PP	POWER POLE

LEGEND

SYMBOL	DESCRIPTION
14	EXISTING CONTOUR
14	PROPOSED CONTOUR
	PROPOSED DRAINAGE PATTERN
	PROPERTY LINE
	PROPOSED CONCRETE

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HARRISON SHIRKMANDAM
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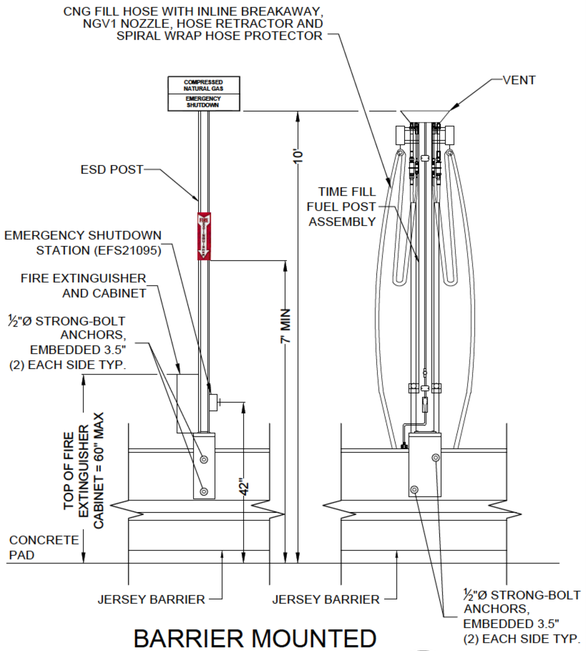
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GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
FOUNDATION AND GRADING PLAN

ASSET NO. 160-11-17307.02.00

DATE	05/01/2017
DESIGNED BY	HVT
CHECKED BY	MES
APPROVED BY	RLR
SCALE	AS NOTED
SHEET	C–2.0

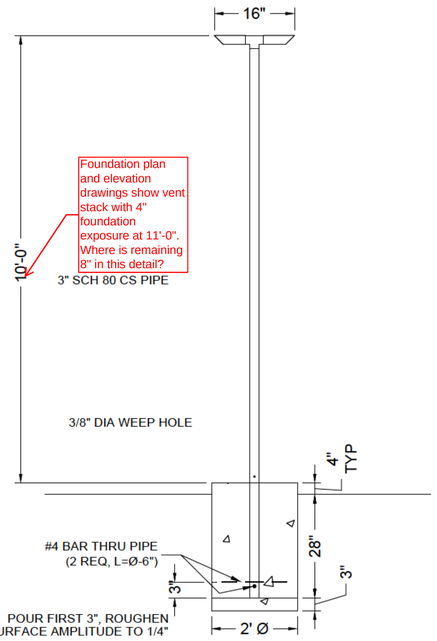
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BARRIER MOUNTED ESD & FUEL POSTS

B

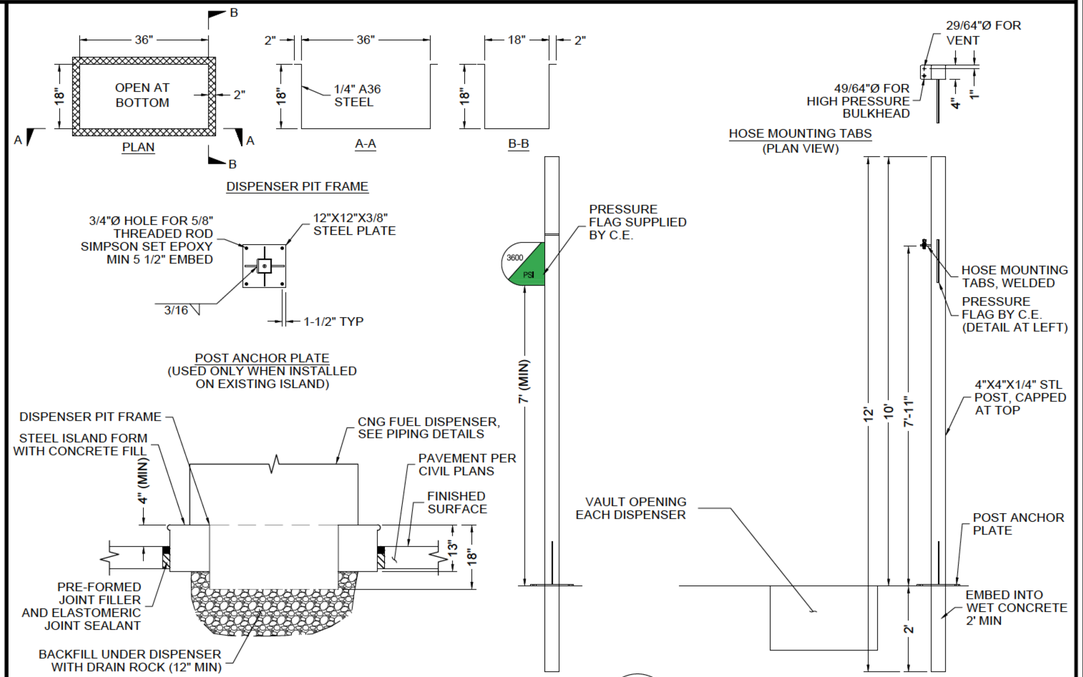
N.T.S.



3" VENT STACK

D

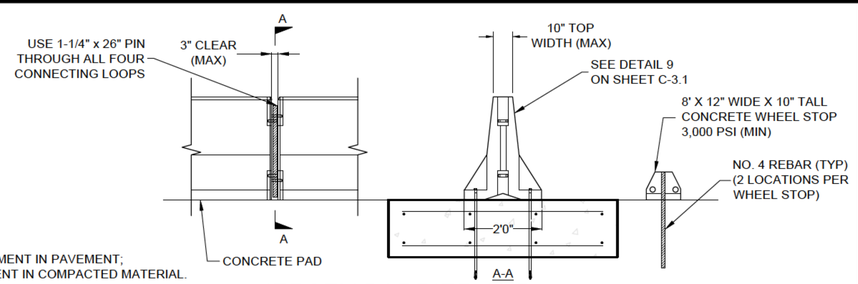
N.T.S.



DISPENSER DETAILS

F

N.T.S. (KRAUS ENCORE DISPENSER)



NOTES:
1. 2' EMBEDMENT IN PAVEMENT; 3' EMBEDMENT IN COMPACTED MATERIAL.

2. CONTRACTOR SHALL INSTALL WHEEL STOPS IN ORDER TO PROVIDE 2' MINIMUM CLEARANCE FROM JERSEY BARRIER TO ANY VEHICLE.

JERSEY BARRIER AND WHEEL STOP ANCHORAGE

G

N.T.S.

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SITE DETAILS

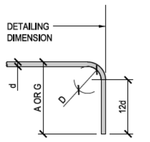
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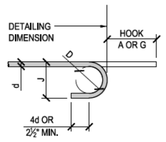
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DATE SIGNED:

DATE 05/01/2017	DESIGNED BY HVT CHECKED BY MES APPROVED BY RLR
SCALE	AS NOTED
SHEET	C–3.0

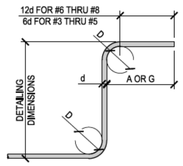
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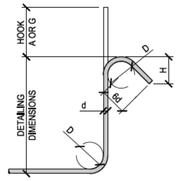
A 90° STANDARD HOOK



B 180° STANDARD HOOK



C 90° STIRRUP/TIE HOOK



D 135° STIRRUP/TIE HOOK

RECOMMENDED END HOOK DIMENSIONS
ALL GRADES OF STEEL; D = FINISHED INSIDE BEND DIAMETER (INCLUDES SPRINGBACK)

BAR SIZE	D, (1N.)	180° HOOKS, (ET+#s) A OR G	180° HOOKS, (ET+#s) J	90° HOOKS, (ET+#s) A OR G
#3	2¼	0-5	0-3	0-6
#4	3	0-6	0-4	0-8
#5	3¾	0-7	0-5	0-10
#6	4½	0-8	0-6	1-0
#7	5¼	0-10	0-7	1-2
#8	6	0-11	0-8	1-4

NOTES:
1. ALL BAR BENDS SHALL BE MADE COLD.
2. #14 AND #18 BARS SHALL BE BEND TESTED AND LAB APPROVED PRIOR TO BENDING.

RECOMMENDED STIRRUP/TIE HOOK DIMENSIONS
ALL GRADES OF STEEL; D = FINISHED INSIDE BEND DIAMETER

BAR SIZE	D, (1N.)	90° HOOKS, (ET+#s) A OR G	180° HOOKS, (ET+#s) A OR G	180° HOOKS, (ET+#s) H (APPROX.)
#3	1½	0-4	0-4	0-2½
#4	2	0-4½	0-4½	0-3
#5	2½	0-6	0-5½	0-3¼
#6	4½	1-0	0-8	0-4½
#7	5¼	1-2	0-9	0-5¼
#8	6	1-4	0-10½	0-6

1 CONCRETE REINFORCING BAR BENDS
NTS

LAP SPLICE TABLE, ℓ

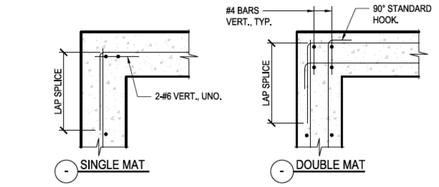
BAR SIZE	LAP CLASS	f'c=2500 PSI CASE 1	f'c=2500 PSI CASE 2	f'c=3000 PSI CASE 1	f'c=3000 PSI CASE 2	f'c=4000 PSI CASE 1	f'c=4000 PSI CASE 2	f'c=4500 PSI CASE 1	f'c=4500 PSI CASE 2
#3	A	18"	27"	18"	25"	15"	22"	14"	21"
	B	24"	36"	22"	33"	19"	29"	18"	27"
#4	A	24"	36"	22"	33"	19"	29"	18"	27"
	B	32"	48"	29"	43"	25"	38"	24"	36"
#5	A	30"	45"	28"	42"	24"	36"	23"	34"
	B	40"	60"	37"	54"	32"	47"	30"	45"
#6	A	36"	54"	33"	50"	29"	43"	27"	41"
	B	48"	72"	44"	65"	38"	57"	36"	54"

NOTES:
1. TOP BARS ARE NOT INDICATED IN THIS TABLE. TOP BARS ARE HORIZONTAL BARS WITH MORE THAN 12" OF FRESH CONCRETE CAST BELOW THE BAR, FOR TOP BAR USE 1.3ℓ.
2. CLASS A - HALF OR LESS OF THE BARS ARE SPLICED WITHIN A REQUIRED LAP LENGTH. CLASS B - MORE THAN HALF OF THE BARS ARE SPLICED WITHIN A REQUIRED LAP LENGTH.
3. CASES 1 AND 2 ARE DEFINED AS FOLLOWS:

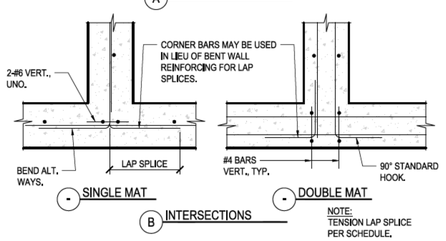
   CASE 1: ALIGN CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN db, CLEAR COVER NOT LESS THAN db, AND STIRRUPS OR TIES THROUGHOUT ℓd NOT LESS THAN THE CODE MINIMUM, OR CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN 2db AND CLEAR COVER NOT LESS THAN db.

   CASE 2: OTHER CASES.

2 TYPICAL CONCRETE DEVELOPMENT AND LAP SPLICE REINFORCEMENT



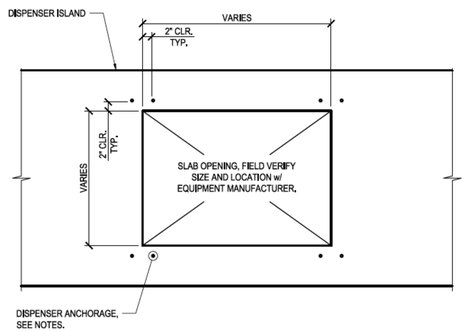
A CORNERS



B INTERSECTIONS

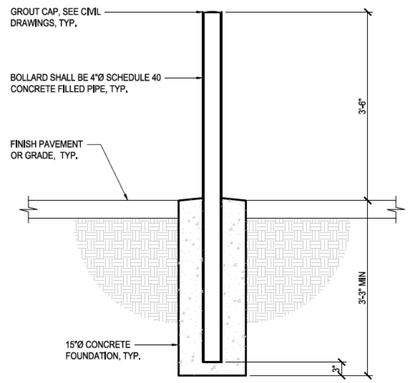
NOTE:
TENSION LAP SPLICE PER SCHEDULE.

3 CONCRETE INTERSECTIONS
3/4"=1'-0"

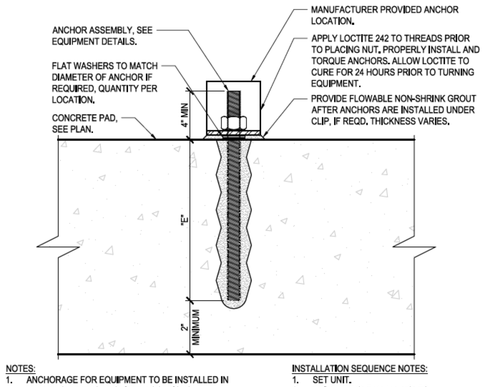


NOTE:
1. DISPENSER ANCHORAGE SHALL BE (4) ⅜"Ø HILTI KWIK BOLT TZ SS304 (ESR 1917) OR GALVANIZED ROD w/ HILTI HIT-RE 500-SD EOPXY (ESR 2322) w/ 2½" MIN EMBEDMENT.
2. SEE "TYPICAL EQUIPMENT ANCHORAGE DETAIL" FOR BALANCE OF INFORMATION.
3. INSTALLATION TORQUE = 25 FT LBS FOR HILTI KWIK BILT TZ

4 TYPICAL DISPENSER ISLAND ANCHORAGE
3/4" = 1'-0"



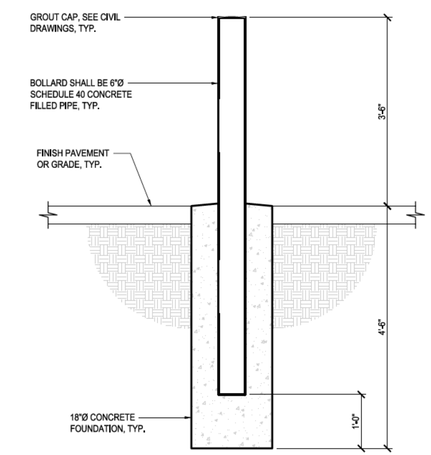
5 BOLLARD TYPE A - TYPICAL
3/4" = 1'-0"



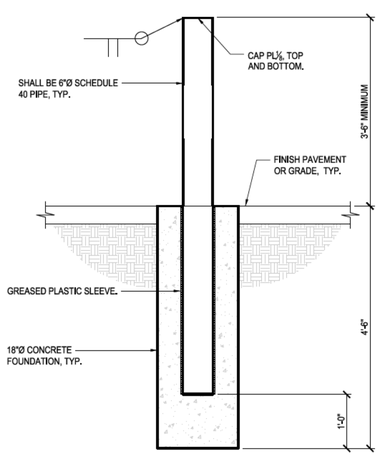
NOTES:
1. ANCHORAGE FOR EQUIPMENT TO BE INSTALLED IN MANUFACTURER'S PROVIDED LOCATIONS.
2. NUMBER OF ANCHORS PROVIDED IN THE EQUIPMENT DETAILS ARE THE MINIMUM REQUIRED TO RESIST ENVIRONMENTAL LOADS. ALL ANCHORAGE LOCATIONS PROVIDED BY MANUFACTURER TO BE ANCHORED PER THIS DETAIL, UNO.
3. CONTRACTOR TO VERIFY MAT REINFORCING PRIOR TO DRILLING HOLES. DO NOT DAMAGE MAT REINFORCING.

INSTALLATION SEQUENCE NOTES:
1. SET UNIT.
2. DRILL AND CLEAN ALL HOLES.
3. SHIM UNDER CLIP WITH WASHERS.
4. INSTALL ANCHORS PER PUBLISHED ICC REPORT AND TORQUE BOLTS.
5. GROUT.

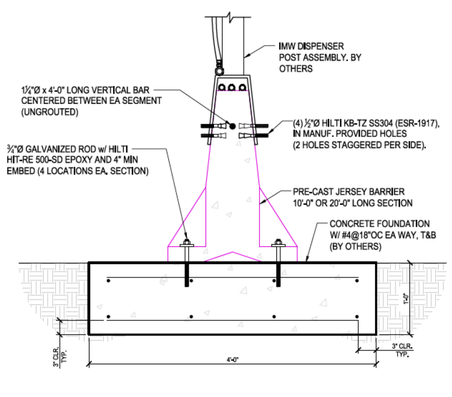
6 TYPICAL EQUIPMENT ANCHORAGE DETAIL
3"=1'-0"



7 BOLLARD TYPE C - DISPENSERS
3/4" = 1'-0"



8 BOLLARD TYPE B - REMOVABLE
3/4" = 1'-0"



9 FILL / ESD POST ANCHORAGE TO JERSEY BARRIER

GreenbergFarrow
1430 W. PEACHTREE ST. NW SUITE 200
ATLANTA, GA 30309
PHONE: (404) 601-4000
FAX: (404) 601-3970

EXP. DATE: 10/31/2017
COLORADO LICENSED
PE 0046745
PROFESSIONAL ENGINEER
DATE SIGNED:

REV	DATE	REVISIONS	BY
0	05/15/2017	ISSUED FOR PERMIT SUBMITTAL	HVT

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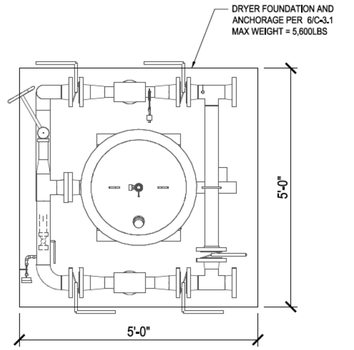
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BY CLEAN ENERGY DESIGN PARTNERS

CNG FUELING FACILITY
GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
SITE DETAILS

ASSET NO: 160-11-17307.02.00

DATE 05/01/2017	DESIGNED BY HVT CHECKED BY MES APPROVED BY RLR
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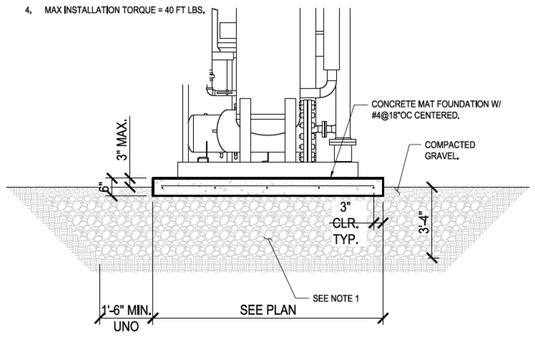
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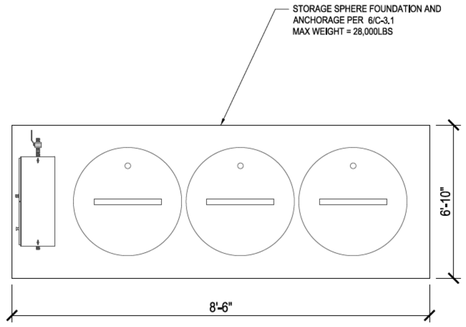
1 DRYER PAD PLAN - PSB 21-4
NTS

NOTES:
1. STRUCTURAL BACKFILL COMPACTED TO 95% MAXIMUM DRY DENSITY PER ASTM D1557. FILL SHALL BE COMPACTED IN MAXIMUM 8" LIFTS OR AS REQUIRED PER THE GEOTECHNICAL REPORT.
2. DRYER ANCHORAGE SHALL BE (4) ½" Ø GALVANIZED RODS w/ HILTI HIT-RE 500-SD EPOXY (ESR 2322) w/ 3" MIN EMBEDMENT.
3. SEE "TYPICAL EQUIPMENT ANCHORAGE DETAIL" FOR BALANCE OF INFORMATION.
4. MAX INSTALLATION TORQUE = 40 FT LBS.

does this fill need to be frost resistant like under spheres?

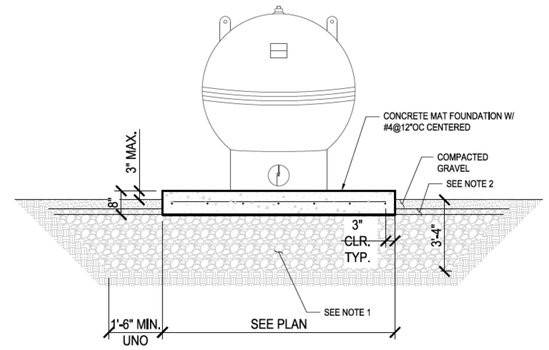


2 DRYER PAD SECTION



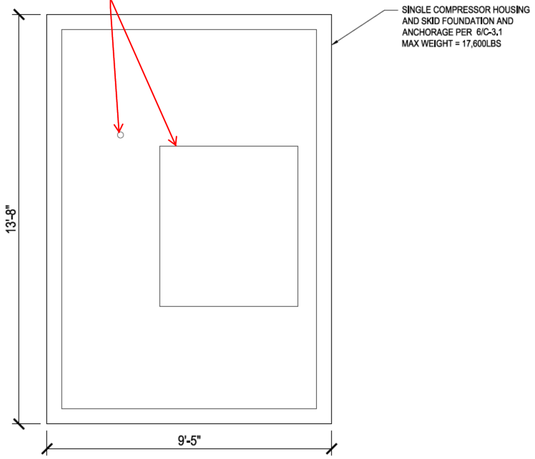
3 STORAGE SPHERE PAD PLAN
NTS

NOTES:
1. STRUCTURAL FROST-RESISTANT BACKFILL STRUCTURAL FROST-RESISTANT BACKFILL COMPACTED TO 95% MAXIMUM DRY DENSITY PER ASTM D1557. FILL SHALL BE COMPACTED IN MAXIMUM 8" LIFTS.



4 STORAGE SPHERE PAD SECTION
1/2" = 1'-0"

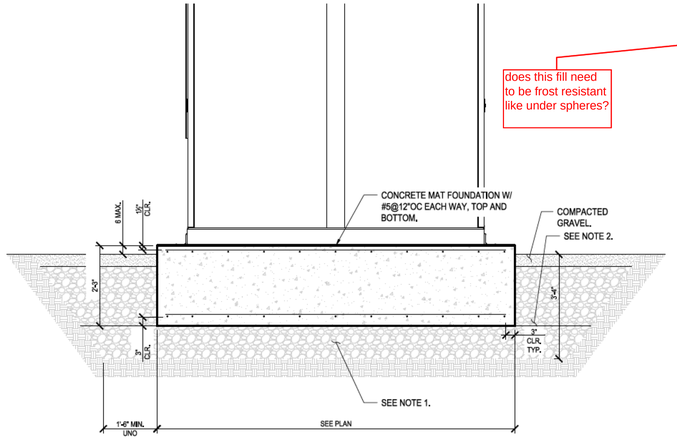
What is this?
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5 IMW SINGLE COMPRESSOR PAD PLAN
NTS

does this fill need to be frost resistant like under spheres?

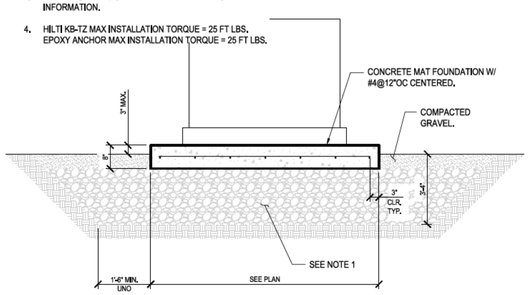
NOTES:
1. STRUCTURAL BACKFILL COMPACTED TO 95% MAXIMUM DRY DENSITY PER ASTM D1557. FILL SHALL BE COMPACTED IN MAXIMUM 8" LIFTS OR AS REQUIRED PER THE GEOTECHNICAL REPORT.
2. STRUCTURAL BACKFILL COMPACTED TO 90% MAXIMUM DRY DENSITY PER ASTM D1557. FILL SHALL BE COMPACTED IN MAXIMUM 8" LIFTS OR AS REQUIRED PER THE GEOTECHNICAL REPORT, TYP. AT SIDES OF MAT FOUNDATION.
3. COMPRESSOR ANCHORAGE SHALL BE AS FOLLOWS:
   - (16) ¾"Ø GALVANIZED RODS w/ HILTI HIT-RE 500-SD EPOXY (ESR 2322) w/ 6" MIN EMBEDMENT AT SKID PAD.
4. SEE "TYPICAL EQUIPMENT ANCHORAGE DETAIL" FOR BALANCE OF INFORMATION.
5. MAX INSTALLATION TORQUE = 100 FT LBS.
6. SOIL SUBGRADE MODULUS k=150psi



6 COMPRESSOR PAD SECTION

NOTES:
1. STRUCTURAL BACKFILL COMPACTED TO 95% MAXIMUM DRY DENSITY PER ASTM D1557. FILL SHALL BE COMPACTED IN MAXIMUM 8" LIFTS OR AS REQUIRED PER THE GEOTECHNICAL REPORT.
2. ELECTRICAL EQUIPMENT ANCHORAGE SHALL BE ⅜" Ø HILTI KWIK-BOLT TZ SS304 (ESR 1917) OR ⅜"Ø GALVANIZED ROD w/ HILTI HIT-RE 500-SD EPOXY (ESR 2322) w/ 2½" MIN EMBED. ANCHORS SHALL BE LOCATED IN ALL MANUFACTURER PROVIDED LOCATIONS.
3. SEE "TYPICAL EQUIPMENT ANCHORAGE DETAIL" FOR BALANCE OF INFORMATION.
4. HILTI KB-TZ MAX INSTALLATION TORQUE = 25 FT LBS.
   EPOXY ANCHOR MAX INSTALLATION TORQUE = 25 FT LBS.

does this fill need to be frost resistant like under spheres?



7 ELECTRICAL EQUIPMENT PAD SECTION

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SITE DETAILS

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DATE	DESIGNED BY	HVT
05/01/2017	CHECKED BY	MES
	APPROVED BY	RLR
SCALE	AS NOTED	
SHEET	C–3.2	

PART 3- PIPING AND EQUIPMENT INSTALLATION

3.1 GENERAL

A. THIS SECTION OF THE SPECIFICATIONS, TOGETHER WITH ANY SPECIAL CONDITIONS AND THE CONSTRUCTION DRAWINGS, COVER THE WORK OF FABRICATING, INSTALLING, AND TESTING THE PIPING SYSTEMS REQUIRED FOR THIS PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR UNDERSTANDING THE INTENT OF THE CONSTRUCTION DRAWINGS AND PROVIDING A COMPLETE WORKING SYSTEM. ANY OMISSIONS OR DISCREPANCIES AMONG THE DRAWINGS, SPECIFICATIONS, AND OTHER CONTRACT PROVISIONS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER FOR CLARIFICATION.

B. PIPING SYSTEMS COVERED BY THESE SPECIFICATIONS INCLUDE ALL UNDERGROUND AND ABOVEGROUND PIPING, INCLUDING VENTS AND ALL STAINLESS STEEL PRESSURE TUBING.

C. CONSTRUCTION AND INSTALLATION SHALL CONFORM TO THE FOLLOWING CODES AND STANDARDS AS ADOPTED OR AMENDED BY THE AUTHORITIES HAVING JURISDICTION.

ANSI (AMERICAN NATIONAL STANDARDS INSTITUTE)
B31.3 - PROCESS PIPING
B16.5 - STEEL PIPE FITTING AND FLANGES
ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)
OHSA (OCCUPATIONAL HEALTH AND SAFETY ADMINISTRATION)
INTERNATIONAL FUEL GAS CODE
INTERNATIONAL FIRE CODE
NFPA (NATIONAL FIRE PROTECTION ASSOCIATION) 52 - VEHICULAR GASEOUS FUEL SYSTEMS CODE

D. THE CONTRACTOR SHALL INSPECT THE SITE FOR, AND VERIFY THE LOCATIONS OF ANY EXISTING SUBSTRUCTURES AND UNDERGROUND UTILITIES, AND SHALL NOT RELY ON THESE PLANS OR DRAWINGS ALONE. THE CONTRACTOR SHALL TAKE ALL MEASURES NECESSARY TO PROTECT EXISTING UNDERGROUND UTILITIES AND SUBSTRUCTURES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE DURING CONSTRUCTION, IRRESPECTIVE OF WHETHER OR NOT THE DAMAGED UTILITY WAS SHOWN ON THE DRAWINGS.

E. THE CONTRACTOR SHALL NOTIFY CLEAN ENERGY OF ANY DAMAGE TO ANY EXISTING UNDERGROUND WET OR DRY UTILITIES, OR TO ANY CONDUITS DAMAGED DURING TRENCHING, AND SHALL REPAIR THEM IMMEDIATELY ACCORDING TO THE STANDARDS OF THE AGENCIES and Owner DICTION OVER THEM.

3.2 PIPING DESIGN CONDITIONS

A. THIS CNG FUELING STATION HAS BEEN DESIGNED FOR THE FOLLOWING PRESSURE AND TEMPERATURE CONDITIONS:

OPERATING PRESSURE:	4,500 PSIG
DESIGN PRESSURE:	5,000 PSIG
DESIGN TEMPERATURE:	-20°F TO 130°F
PNEUMATIC TEST PRESSURE:	5,500 PSIG (FOR CNG PIPING)

3.3 ACCEPTABLE PRODUCT MANUFACTURING LOCATIONS

A. GAS PIPING MATERIALS (PIPE, STAINLESS STEEL TUBE, GAS VALVES, FITTINGS AND INSTRUMENTATION) SHALL BE MANUFACTURED IN ANY OF THE FOLLOWING REGIONS: NORTH AMERICA, THE EUROPEAN UNION, SOUTH KOREA, JAPAN, AND REPUBLIC OF CHINA (TAIWAN).

B. GAS PIPING MATERIALS MANUFACTURED IN ANY REGION OUTSIDE THOSE LISTED ABOVE SHALL NOT BE USED OR INSTALLED.

3.4 PIPE SPECIFICATIONS

A. ALL UNDERGROUND CARBON STEEL PIPE SHALL BE PROPERLY CLEANED AND EPOXY-COATED PRIOR TO BURIAL, ELECTRICALLY INSULATED FROM ABOVEGROUND PIPING OR STRUCTURES, AND CATHODICALLY PROTECTED IN ACCORDANCE WITH THIS SPECIFICATION AND CURRENT INDUSTRY STANDARDS.

B. ALL CARBON STEEL PIPE MATERIAL CONVEYING NATURAL GAS SHALL BE SEAMLESS ASTM A106, GRADE B MATERIAL. PIPE FITTINGS SHALL BE USED AS FOLLOWS.

1. SCHEDULE 40 PIPE SHALL BE JOINED USING WROUGHT STEEL SCHEDULE 40 ASTM A234 GR. WPB BUTT WELDING FITTINGS. FLANGED FITTINGS FOR SCHEDULE 40 PIPE SHALL BE RAISED-FACE WELDNECK-TYPE, ANSI B16.5, EITHER CLASS 150 OR CLASS 300, PER THE DRAWINGS, USING ASTM A105 FORGED CARBON STEEL.

2. SCHEDULE 80 PIPE SHALL BE JOINED USING WROUGHT STEEL SCHEDULE 80 ASTM A234 BUTT WELDING FITTINGS. FLANGED FITTINGS FOR SCHEDULE 80 PIPE SHALL BE RAISED-FACE WELDNECK-TYPE, ANSI B16.5, EITHER CLASS 300 OR CLASS 600, PER THE DRAWINGS, USING ASTM A105 FORGED CARBON STEEL.

3.4 STAINLESS STEEL TUBING

A. STAINLESS STEEL PRESSURE TUBING SHALL BE SEAMLESS, BRIGHT-ANNEALED TUBE FOR GENERAL SERVICE, MANUFACTURED AND TESTED ACCORDING TO ASTM A269, USING MATERIAL DUAL-CERTIFIED AS TYPE TP316 AND TP316L. TUBE SHALL BE COLD-FINISHED AND FREE OF SCRATCHES. UPON REQUEST, THE TUBE SUPPLIER SHALL FURNISH MILL CERTIFICATES DOCUMENTING COMPLIANCE WITH THIS SPECIFICATION.

B. ALL BENDS SHALL BE MADE USING TUBING BENDERS, EXCEPT WHEN TUBE IS PULLED UNDERGROUND THROUGH A SLEEVE. BEND ANGLE SHOULD BE 90° WHENEVER POSSIBLE. TUBING SHALL BE ROUTED PARALLEL WITH THE VERTICAL AND HORIZONTAL AXES OF THE EQUIPMENT. UNDERGROUND TUBING SHALL BE CONTINUOUS OR WELDED, AND ROUTED COMPLETELY WITHIN A WATERTIGHT PVC, HDPE OR ENT SLEEVE. AT NO TIME SHALL MECHANICAL FITTINGS BE PLACED UNDERGROUND.

C. ALL ABOVEGROUND TUBING SHALL BE FABRICATED USING STRAIGHT STICKS, AND ANCHORED PER CODE TO PREVENT BENDING OR EXCESSIVE VIBRATION. SUITABLE RESILIENT ANCHORS, SUCH AS PARKER PARKLAMP OR UNISTRUT KUSH-A-CLAMP, SHALL BE USED.

D. REQUIRED TUBE WALL THICKNESS FOR CNG SERVICE (INCHES):

OUTSIDE DIA. [IN.]	WALL THICKNESS [IN.]	BASIS
1/4	0.049	AVG WALL THK.
3/8	0.065	AVG WALL THK.
1/2	0.083	AVG WALL THK.
5/8	0.095	AVG WALL THK.
3/4	0.109	AVG WALL THK.
1	0.120	MIN. WALL THK.

E. TUBE FITTINGS SHALL BE TYPE 316 STAINLESS STEEL, WITH A MAWP OF NOT LESS THAN 5,500 PSIG. ACCEPTABLE PRODUCTS ARE LISTED BELOW. NO OTHER PRODUCTS MAY BE USED WITHOUT PRIOR APPROVAL BY THE ENGINEER. ALL SWAGED FITTINGS FURNISHED BY THE THE CONTRACTOR SHALL BE INTERCHANGEABLE PRODUCTS OF A SINGLE MANUFACTURER.

1. SWAGELOK
2. HOKE "GYROLOK"

F. BALL VALVES: HIGH PERFORMANCE, PARKER, SWAGELOK, SVF OR HOKE, 316 STAINLESS STEEL BODY AND TRIM, SUITABLE FOR COMPRESSED NATURAL GAS SERVICE.

G. NEEDLE VALVES: SWAGELOK OR HOKE, 316 STAINLESS STEEL BODY AND TRIM, SUITABLE FOR COMPRESSED NATURAL GAS SERVICE, 5500 PSI, OR APPROVED EQUAL.

H. SLEEVE (FOR BURIED TUBING): PVC CONDUIT, FLEXIBLE ENT CONDUIT, OR PEP (POLYETHYLENE) PIPE. SIZED AS SHOWN ON THE DRAWINGS.

3.5 POLYETHYLENE (PEP) PIPE: DR 7, 9, OR 11

A. POLYETHYLENE PIPE TO BE DESIGNED IN ACCORDANCE WITH PPI HANDBOOK OF PE PIPE, 2 ND EDITION, RATED FOR NOT LESS THAN THE MAXIMUM PRESSURE OF THE SUPPLY SYSTEM, AND NOT USED WITH PRESSURES GREATER THAN 150PSIG.

B. PEP SHALL BE WARRANTED FOR NATURAL GAS DISTRIBUTION AND MANUFACTURED ACCORDING TO PPI DESIGNATION PE 4710 AND ASTM D 2513; CP CHEM YELLOW STRIPE 8300 OR APPROVED EQUAL. PEP SHALL BE JOINED USING BUTT FUSION IN COMPLIANCE WITH PIPE MANUFACTURER'S INSTALLATION MANUAL.

C. A COATED COPPER CLAD STEEL TRACER WIRE (#12 GAUGE OR LARGER) SHALL BE INSTALLED WITH ALL BURIED PEP. TRACER WIRE TO BE LAID WITHIN 6" DIRECTLY ABOVE THE PEP WHERE PRACTICAL. WRAPPING OF THE TRACER WIRE AROUND PEP IS PROHIBITED.

1. CONTRACTOR TO USE AS FEW CONNECTIONS AS POSSIBLE

2. CONNECTIONS TO BE MADE USING CSA CERTIFIED PRESSURE TYPE, DIRECT BURY (PER UL 486D) MECHANICAL CONNECTORS

3. A MINIMUM 5' OF ADDITIONAL TRACER WIRE TO BE COILED, BURIED, AND TERMINATED AT THE ENDS OF UNDERGROUND PEP

4. TRACER WIRE TO FOLLOW PEP ABOVEGROUND USING TRACER WIRE CLAMPS ALONG EACH ANODELESS RISER

3.6 INSTRUMENTATION AND SPECIALTY ITEMS

A. PRESSURE GAUGES: LIQUID FILLED, RANGE TO BE 150-200% OF MAXIMUM PRESSURE EXPECTED, TO BE MOUNTED ON BLEED/BLOCK VALVE UNLESS OTHERWISE SPECIFIED.

B. ESD VALVE (AV-1): FLANGED, FIRE-RATED BALL VALVE WITH ACTUATOR, FACTORY ASSEMBLED, PILOT-GAS-TO-OPEN, SPRING CLOSED.

C. FIRE EXTINGUISHER(S): AMEREX CORPORATION, COMPLIANCE FLOW MODEL #592 WITH A 4A:80B:C MINIMUM RATING, CURRENTLY CERTIFIED AND TAGGED WITH LOCAL INSPECTION TAG, MOUNTED IN A LOCKABLE WEATHER-PROOF ENCLOSURE, UNLESS OTHERWISE SPECIFIED.

3.7 INSTALLATION

A. THE CONTRACTOR SHALL USE ONLY TUBING INSTALLERS WHO ARE TRAINED AND CERTIFIED BY THE TUBE FITTING MANUFACTURER TO INSTALL TUBE AND ASSOCIATED FITTINGS PER THE MANUFACTURER'S INSTALLATION INSTRUCTIONS. THE CONTRACTOR SHALL PROVIDE PROOF OF CERTIFICATION TO CLEAN ENERGY'S PROJECT MANAGER PRIOR TO COMMENCING WORK.

B. ALL PIPING SHALL BE INSTALLED NEATLY AND IN A WORKMAN-LIKE MANNER. ALL PIPING SHALL BE PROPERLY ANCHORED, SUPPORTED, OR PITCHED ACCORDING TO THESE CONSTRUCTION SPECIFICATIONS AND THE DRAWINGS, OR IN THE ABSENCE OF SPECIFIC DETAIL, PER DIRECTION OF THE ENGINEER. ALL PIPING SHALL RUN TRUE TO VERTICAL AND HORIZONTAL AXES OF THE EQUIPMENT AND FACILITY. THE CONTRACTOR SHALL PROVE ALL PIPING IS FREE OF OBSTRUCTION AND DEBRIS, PRIOR TO CONNECTING TO ABOVEGROUND EQUIPMENT. AT NO TIME SHALL ANY GAS OR CNG PIPING BE CONSTRUCTED OVERHEAD UNLESS OTHERWISE NOTED ON THESE PLANS, OR AS APPROVED BY THE ENGINEER, NO EXCEPTIONS.

C. ALL VALVES SHALL BE INSTALLED NEATLY AND IN A WORKMAN-LIKE MANNER. ALL VALVES SHALL BE ACCESSIBLE FOR EASY OPERATION AND MAINTENANCE.

D. CLEAN THE INTERNAL PIPE SURFACE OVER ITS ENTIRE LENGTH, REMOVING ALL DIRT, DEBRIS, AND LOOSE CORROSION OR SCALE, BEFORE THE PIPE IS FITTED OR ALIGNED FOR WELDING. OPEN ENDS OF ALL PIPE RUNS SHALL BE KEPT SECURELY CLOSED TO PREVENT THE ENTRANCE OF DIRT, DEBRIS, WATER, OR ANIMALS INTO THE PIPE. ALL END CLOSURES SHALL BE APPROVED BY CLEAN ENERGY.

E. ALL CARBON STEEL PIPE WELDS SHALL INCLUDE A TIG (TUNGSTEN INERT GAS) ROOT. THE FILLER PASSES SHALL BE STICK SHIELDED METAL ARC WELDING (SMAW).

F. TUBE AND PIPE CONNECTIONS TO ALL EQUIPMENT REQUIRING MAINTENANCE ACCESS SHALL BE REMAKEABLE USING FLANGED, THREADED OR SWAGED FITTINGS. WELDED OR OTHER PERMANENT FITTINGS SHALL NOT BE USED AT THESE LOCATIONS.

3.8 FABRICATION, HANDLING AND STORAGE

A. ALL VALVES, PRE-FABRICATED PIPING, FLANGES, ETC. SHALL BE PROTECTED DURING STORAGE, TRANSIT, AND ERECTION WITH PLYWOOD COVERS 1/2" THICK AND SECURED WITH BOLTS FOR CLOSURE, OR EQUAL. SHOP FABRICATED SECTIONS SHALL NOT BE LEFT WITH OPEN ENDS EXPOSED TO ATMOSPHERE DURING STORAGE, TRANSIT, OR ERECTION. SUITABLE CAPS SHALL BE PROVIDED ON ALL MECHANICAL CONNECTIONS.

B. TEMPORARY SUPPORTS SHALL BE PROVIDED AND INSTALLED DURING ERECTION TO AVOID OVER-STRESSING PIPING OR EQUIPMENT TO WHICH PIPING IS CONNECTED.

3.9 TRENCHES

A. SEE GENERAL NOTE ON SHEET G-0.0

3.10 WELDING

A. WELDING PROCEDURES SHALL BE IN ACCORDANCE WITH ANSI B31.3-2008, "PROCESS PIPING, CHAPTER V, "FABRICATION, ASSEMBLY, AND ERECTION".

B. THE CONTRACTOR SHALL SUBMIT WELDING PROCEDURE SPECIFICATIONS (WPS) TO THE ENGINEER FOR APPROVAL, PRIOR TO STARTING WORK. EACH WPS SHALL BE IDENTIFIED WITH THE THE CONTRACTOR'S NAME AND IDENTIFICATION NUMBER. WELDING SHALL NOT COMMENCE UNTIL THE PROCEDURE IS APPROVED.

C. EACH WELDER MUST PROVIDE A COMPLETE PROCEDURE QUALIFICATION RECORD (PQR) SIGNED BY AN AUTHORIZED OFFICER OF THE TESTING LABORATORY OR DEPUTY WELDING INSPECTOR AND THE CONTRACTOR'S AUTHORIZED REPRESENTATIVE. PREVIOUS WELDING CERTIFICATION (ACTIVE CERTIFICATION WITHIN THE PREVIOUS SIX (6) MONTHS) MAY BE SUBMITTED FOR APPROVAL.

D. WELD TESTS SHALL BE PERFORMED PER ANSI B31.3, AND APPROVED BY THE ENGINEER.

1. NOT LESS THAN 5% OF ALL BUTT WELDS BY EACH WELDER PERFORMING WORK AT THE SITE SHALL BE RANDOMLY SELECTED AND RADIOGRAPHED.

2. RADIOGRAPHS SHALL BE EVALUATED BY A CERTIFIED RADIOGRAPHIC INTERPRETER. THE RADIOGRAPHIC INTERPRETER'S WRITTEN REPORT OF HIS EVALUATION SHALL BE SUBMITTED TO CLEAN ENERGY BEFORE THE WELDS ARE BURIED.

3.11 PIPE COATING AND PAINTING

A. ALL UNDERGROUND CARBON STEEL PIPE SHALL BE FACTORY-COATED WITH FUSION-BONDED EPOXY (FBE), TO MEET ALL CODE REQUIREMENTS INCLUDING THOSE ESTABLISHED BY LOCAL UTILITY COMPANY OR JURISDICTIONS.

1. FACTORY COATING SHALL BE DESIGNED TO RESIST DISBONDMENT WHEN EXPOSED TO CATHODIC PROTECTION CURRENTS.

2. FACTORY COATING SHALL BE 3M SCOTCHKOTE FUSION-BONDED EPOXY COATING 6233P. NO OTHER COATING IS ACCEPTABLE WITHOUT PRIOR APPROVAL BY THE ENGINEER

B. WELDED PIPE JOINTS AND FITTINGS FOR UNDERGROUND PIPING SYSTEMS SHALL BE FIELD-COATED IN ACCORDANCE WITH CURRENT CODES AND THE COATING MANUFACTURER'S APPLICATION MANUAL. FIELD COATING SHALL BE APPROVED BY THE DESIGNATED INSPECTOR PRIOR TO BURIAL. FIELD COATING SHALL BE 3M SCOTCHKOTE LIQUID EPOXY COATING 323P.

C. PRIOR TO BURIAL, COATED PIPE SHALL BE TESTED ALONG ITS ENTIRE LENGTH WITH AN ELECTRIC HOLIDAY DETECTOR. ANY HOLIDAYS DETECTED SHALL BE REPAIRED PER "B" ABOVE FOR 6" ON EITHER SIDE OF THE HOLIDAY. AFTER ALL HOLIDAYS ARE REPAIRED, THE ENTIRE LENGTH OF PIPE SHALL BE TESTED AGAIN.

D. EXPOSED PIPING, VALVES, FITTINGS, FLANGES AND RELATED MATERIAL SHALL BE PRIMED AND PAINTED WITH AN INDUSTRIAL MAINTENANCE COATING, IN ACCORDANCE WITH THE PAINT MANUFACTURER'S INSTRUCTION MANUAL. PRIMER SHALL BE DEVOE DEVPRIME 1407, AND FINISH , DEVCRYL 1449. FINISH COLOR SHALL BE SAFETY YELLOW. AT UNDERGROUND PIPE RISERS, EPOXY COATING SHALL EXTEND A MINIMUM OF 2 INCHES ABOVE THE FINISHED GROUND SURFACE.

3.12 CATHODIC PROTECTION

A. ALL BURIED STEEL PORTIONS OF THE PIPING SYSTEM SHALL BE ELECTRICALLY ISOLATED (USING DIELECTRIC FITTINGS) AND CATHODICALLY PROTECTED IN ACCORDANCE WITH CURRENT CODES AND NACE INTERNATIONAL STANDARD RP0169, CURRENT EDITION TO INSURE A -850 MILLIVOLT PIPE-TO-SOIL POTENTIAL FOR A MINIMUM OF 30 YEARS. SOIL RESISTIVITY TEST SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

B. THE CONTRACTOR SHALL FURNISH ALL PERMANENT MATERIALS FOR TEST LEADS, INCLUDING WIRE, CONDUIT AND FITTINGS, TERMINAL POST, TERMINAL UNITS, CAD WELD THERMITE CARTRIDGES, ETC. PER INDUSTRY ACCEPTED PRACTICES.

C. ELECTRICAL TEST LEADS SHALL BE TERMINATED IN A FRAME AND COVERED AT FINISHED GRADE.

3.13 PNEUMATIC PRESSURE TEST

A. WHEN ASSEMBLY (WELDED OR MECHANICAL) OF A GAS PIPING OR TUBING SYSTEM IS COMPLETE, A PNEUMATIC PRESSURE TEST SHALL BE PERFORMED IN ACCORDANCE WITH ASME/ANSI B31.3. THE CONTRACTOR SHALL NOTIFY CLEAN ENERGY'S PROJECT MANAGER THAT A TEST IS SCHEDULED, NOT LESS THAN 48 HOURS BEFORE THE TEST IS SCHEDULED TO BEGIN.

B. AT NO TIME SHALL THE TUBING ASSEMBLY BE HYDROSTATICALLY TESTED, NO EXCEPTIONS.

THE PRESSURE TEST PRESSURE SHALL BE AS FOLLOWS:

PIPE	PRESSURE
CNG PIPING AND TUBING (AFTER COMPRESSOR)	5,500 PSIG
NATURAL GAS PIPING (BEFORE COMPRESSOR)	40 PSIG
VENT PIPING (V)	N/A

C. IN THE EVENT THAT COLD WEATHER LIMITS ACHIEVABLE TEST PRESSURES TO BELOW THOSE SPECIFIED ABOVE, THE CONTRACTOR SHALL SUBMIT AN ALTERNATIVE COLD WEATHER PRESSURE TEST PLAN TO CLEAN ENERGY FOR APPROVAL.

D. REMOVE ALL PRESSURE SENSITIVE DEVICES FROM SYSTEM TO BE TESTED.

E. CONNECT A SOURCE OF HIGH-PRESSURE INERT GAS (NITROGEN) WITH APPROPRIATE REGULATOR, GAUGES, VALVES AND FITTINGS TO ONE END OF THE SYSTEM TO ALLOW SYSTEM TO BE SAFELY PRESSURIZED AND DEPRESSURIZED.

F. INTRODUCE INERT GAS INTO THE SYSTEM. SLOWLY INCREASE PRESSURE TO 500 PSIG AND CHECK FOR LEAKS. IF NO LEAKS ARE DETECTED, CONTINUE TO INCREASE PRESSURE, IN 500 PSIG INCREMENTS, HOLDING AT EACH STAGE LONG ENOUGH TO ALLOW RESIDUAL STRESSES TO EQUALIZE, UNTIL MAXIMUM PRESSURE IS REACHED. HOLD FOR 30 MINUTES, THEN REDUCE PRESSURE TO STATED DESIGN PRESSURE. RECORD BOTH PRESSURES.

G. INSPECT AND LEAK TEST ALL JOINTS AND FITTINGS WITH A SUITABLE LEAK TEST SOLUTION. IDENTIFY LEAKS, IF ANY AND BLEED OFF THE GAS IN A CONTROLLED AND SAFE MANNER. IF A LEAK IS FOUND, REPAIR THE LEAK(S) AND REPEAT THE LEAK TEST.

H. ISOLATE THE PRESSURIZED PIPE AT DESIGN PRESSURE FROM THE PRESSURE SOURCE. RECORD PRESSURE READINGS AND AMBIENT TEMPERATURES AT 10 MINUTE INTERVALS. RECORD DATA WITH THE PIPING SYSTEM UNDISTURBED FOR NOT LESS THAN 1/2 HR. PIPING SYSTEM SHALL SHOW NO LOSS OF PRESSURE, CORRECTED FOR TEMPERATURE CHANGES, DURING THE TEST. SUBMIT TEST DATA TO CLEAN ENERGY'S PROJECT MANAGER FOR APPROVAL, PRIOR TO BURYING THE PIPE OR TUBING.

I. UPON COMPLETION OF THE PNEUMATIC PRESSURE TEST, ALL PRESSURE SENSITIVE DEVICES SHALL BE REINSTALLED IN THE SYSTEM, THE SYSTEM PRESSURIZED TO NORMAL OPERATING PRESSURES AND THEIR CONNECTIONS TESTED FOR LEAKS.

J. THE CONTRACTOR SHALL USE AN APPROVED LEAK DETECTION SOLUTION (SNOOP OR EQUAL), TO TEST ALL PIPE FITTINGS AND CONNECTIONS DURING TESTING AND AT START-UP.

3.14 PURGING AND PRESSURIZING

D. ALL PURGING AND PRESSURIZING SHALL BE PERFORMED BY THE CONTRACTOR AND OBSERVED BY THE ENGINEER OR THE ENGINEER'S DESIGNATED REPRESENTATIVE. THE ESD SYSTEM SHALL BE OPERATIONAL BEFORE THE PIPING SYSTEM IS PRESSURIZED WITH NATURAL GAS. NATURAL GAS SHALL NOT BE INTRODUCED INTO THE SYSTEM WITHOUT PRIOR AUTHORIZATION BY CLEAN ENERGY'S CONSTRUCTION MANAGER. ALL AIR SHALL BE PURGED FROM THE ENTIRE SYSTEM TO THE SATISFACTION OF CLEAN ENERGY'S CONSTRUCTION MANAGER, AND IN ACCORDANCE WITH THE EQUIPMENT MANUFACTURER'S INSTRUCTIONS, BEFORE THE SYSTEM MAY BE PRESSURIZED.

E. ALL FABRICATION, WELD TESTING, PRESSURE TESTING AND WORK REQUIRING FLAME OR SPARKING DEVICES SHALL BE COMPLETED BEFORE INTRODUCING NATURAL GAS TO ANY PIPING SYSTEM.

EXP. DATE: 10/31/2017
COLORADO LICENSED
RICHARD L. REMILLARD
0047005
PROFESSIONAL ENGINEER
DATE SIGNED:

REV	DATE	REVISIONS	BY
0	05/15/2017	ISSUED FOR PERMIT SUBMITTAL	HVT

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CNG FUELING FACILITY
GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
PIPING NOTES

ASSET NO: 160-11-17307.02.00

DATE	DESIGNED BY HVT
05/01/2017	CHECKED BY MES
	APPROVED BY RLR
SCALE	AS NOTED
SHEET	P–0.0

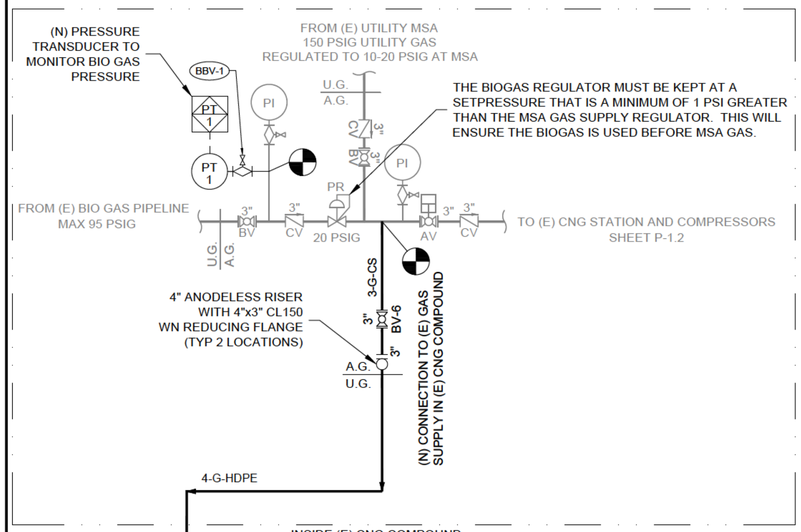
W:\Engineering Projects - Current\Grand Junction, CO - Grand Valley Transit (2802.00)\2.0 Drawings and Engineering\07-P00-PIPING NOTES.dwg - PLOTTED: May 12, 2017 - 1:29pm

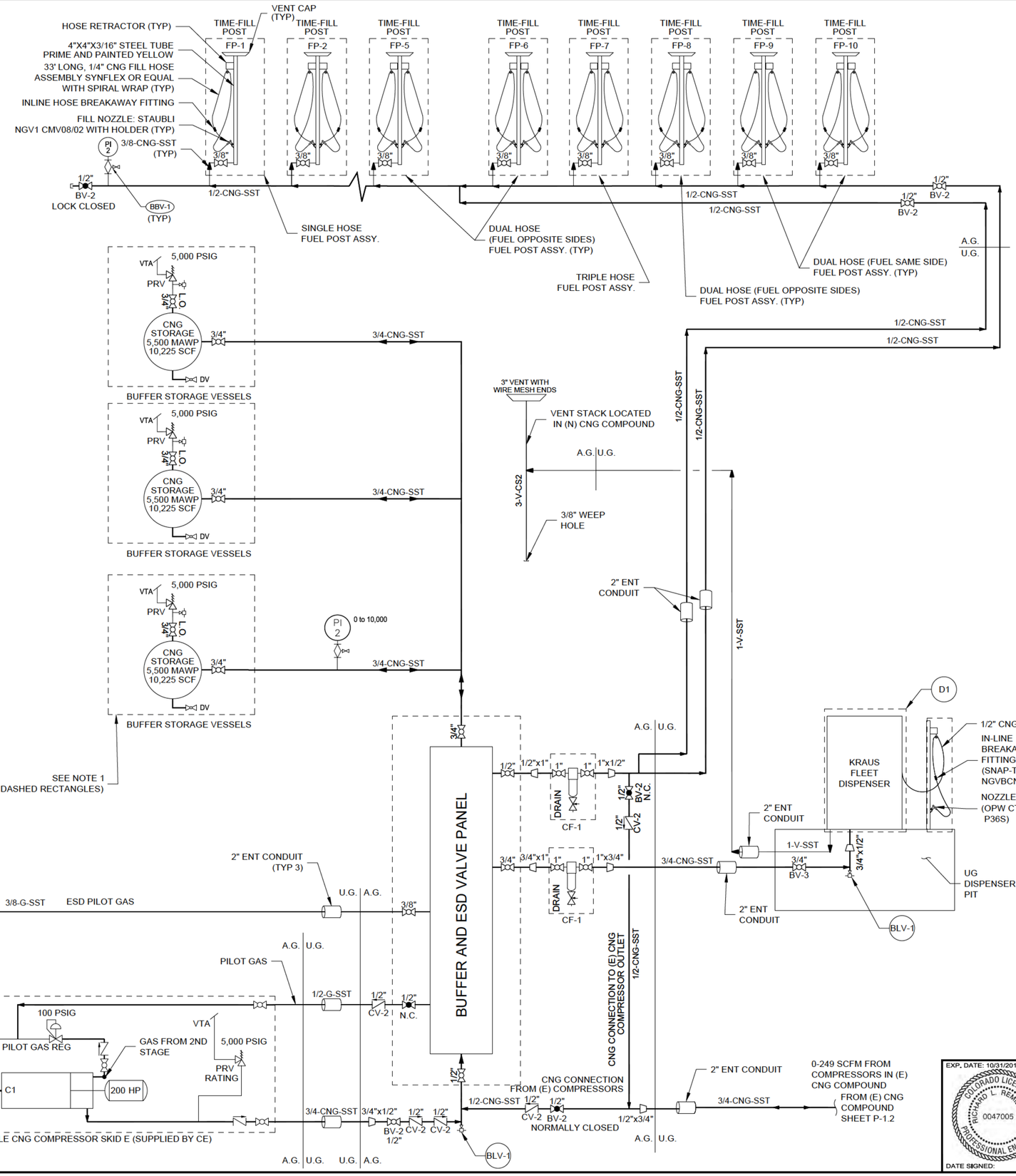
GENERAL NOTES:

1. EQUIPMENT INSIDE THE DASHED LINE IS PART OF THE MANUFACTURER'S FACTORY ASSEMBLY PROVIDED BY CLEAN ENERGY.
2. CLEAR SPACE OF AT LEAST 3 FEET SHALL BE PROVIDED FOR ACCESS TO ALL VALVES AND FITTINGS OF MULTIPLE GROUPS OF CONTAINERS.
3. EMERGENCY SHUT-OFF DISCONNECT WILL DISCONNECT ELECTRICAL POWER AND STOP DISPENSING OPERATIONS.
4. SELF CLOSING VALVES ON THE INLET OF THE COMPRESSORS SHALL SHUT OFF THE GAS SUPPLY TO THE COMPRESSOR WHEN ONE OF THE FOLLOWING OCCURS:
   - 4.1. AN EMERGENCY SHUTDOWN DEVICE IS ACTIVATED.
   - 4.2. A POWER FAILURE OCCURS.
   - 4.3. THE POWER TO THE COMPRESSOR IS SWITCHED TO THE OFF POSITION .
5. VALVE PANEL IS EQUIPT WITH AN OVER-PRESSURE PROTECTION DEVICE IN THE FUELING TRANSFER SYSTEM TO PREVENT OVERPRESSURE IN THE VEHICLE PER 2013 NFPA 52.
6. CONTROL CIRCUIT SHALL BE ARRANGED SO THAT, WHEN AN EMERGENCY SHUTDOWN DEVICE IS ACTIVATED OR ELECTRICAL POWER IS CUT OFF, SYSTEMS THAT SHUT DOWN SHALL REMAIN DOWN UNTIL MANUALLY ACTIVATED OR RESET AFTER A SAFE CONDITION IS RESTORED PER 2013 NFPA 52.
7. IF MSA OUTLET PRESSURE EXCEEDS 100PSIG PLASTIC PIPE CANNOT BE USED. PLEASE CONTACT CE ENGINEERING TO DETERMINE AN APPROVED SUBSTITUTE.

PROPERTY SYSTEM PERFORMANCE	
MSA OUTLET PRESSURE [PSIG]	FLOW RATE [SCF/MIN]
20	580

NEW COMPRESSOR SYSTEM PERFORMANCE	
INLET FLANGE PRESSURE [PSIG]	FLOW RATE [SCF/MIN]
17	331





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EXP. DATE: 10/31/2017
COLORADO LICENSED RICHARD L. REMLEY 0047005 PROFESSIONAL ENGINEER
DATE SIGNED:

CNG FUELING FACILITY
GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
PIPING AND INSTRUMENTATION DIAGRAM

ASSET NO: 160-11-17307.02.00

DATE	DESIGNED BY ARY
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EQUIPMENT SCHEDULE

ITEM NO	MARK	QTY.	DESCRIPTION	MFR.	MODEL NO.	MAWP [PSIG]	SERVICE PRESSURE [PSIG]	SIZE OR CAPACITY
1		1	GAS DRYER	PSB	NG-SV-10-3	200	15-20	3" INLET & OUTLET 525 SCF/MIN @ 20 PSIG
2	SKID E	1	CNG COMPRESSOR SKID	J-W POWER	CNG2200-4Q-C5	13-23 (INLET) 5,000 (OUTLET)	15-20 (INLET) 4,500 (OUTLET)	200 HP 331 SCF/MIN @ 17 PSIG
3	CF-1	2	SINGLE COALESCING FILTER ASSY.	FILTER: PARKER FILTER RACK: CEC	JN4C-4CN 506772	5,000	4,500	1" INLET & OUTLET
4	V-1	3	CNG STORAGE VESSEL (SPHERE)	ALLIED	48" SPHERE	5,500	4,500	48" SPHERE (63"H X 56"W) 10,225 SCF @ 100°F (33.5 ACF)
5		1	BUFFER/ESD VALVE PANEL	CEC	3C-2D-1TF-1S-1/2"	5,000	4,500	1/2", 2 INLETS, 3 OUTLETS 1,000 SCF/MIN MAX
6	D1	1	LIGHT DUTY CNG DISPENSER	KRAUS	HIGH STYLE SAM 1CHG-P62CG11SXX01	4,500	4,500	(1) 1/2" INLET (1) 1/2" HOSE
7	FP 7	1	FUEL POST W/ (3) FUEL HOSE ASSY.	CEC	(1) TRIPLE FUEL POST (3) 506615 FUEL HOSES	4,500	4,500	TRIPLE FUEL POST (3) 1/4"x33' HOSES
8	FP 2-6 FP 8	6	FUEL POST W/ (2) FUEL HOSE ASSY.	CEC	(1) 506685 (2) 506615 FUEL HOSES	4,500	4,500	TWIN OPPOSITE-SIDE FUEL POST (2) 1/4"x33' HOSES
9	FP 9,10	2	FUEL POST W/ (2) FUEL HOSE ASSY.	CEC	(1) 506684 (2) 506615 FUEL HOSE	4,500	4,500	TWIN SAME-SIDE FUEL POST (2) 1/4"x33' HOSES
10	FP 1	1	FUEL POST W/ (1) FUEL HOSE ASSY.	CEC	(1) 506686 (1) 506615 FUEL HOSE	4,500	4,500	SINGLE FUEL POST (1) 1/4"x33' HOSE

VALVE AND INSTRUMENTATION SCHEDULE

MARK	SIZE	CONNECTION	MATERIAL	DESCRIPTION	MFR.	PART NO.	MAWP [PSIG]	SERVICE PRESSURE [PSIG]	NOTE
AV-1	3"	CL 150 RFF	CS	ACTUATED BALL VALVE	SVF	B41C4466AGRF10300000	285	125-150	FIRE-RATED
	400		VARIOUS	PNEUMATIC ACTUATOR	SVF	A2S-400-10	120	110	GAS-ACTUATED, SPRING RETURN
BLV-1	1/2"	MPT	316 SS	BLEED VALVE	SWAGELOK	SS-BVM8	9,290	4,500	
BBV-1	1/4"	MPT	316 SS	BLOCK & BLEED VALVE	WIKA	4339747	10,000	15-4500	
BV-1	3/8"	SWAGED	316 SS	CNG BALL VALVE	SWAGELOK	SS-AFSS6-LH	6,000	95-4,500	LOCKABLE HANDLE
BV-2	1/2"	SWAGED	316 SS	CNG BALL VALVE	SWAGELOK	SS-AFSS8-LH	6,000	4,500	LOCKABLE HANDLE
BV-3	3/4"	SWAGED	316 SS	CNG BALL VALVE	SWAGELOK	SS-AFSS12	5,800	4,500	
BV-6	3"	CL 150 RFF	CS	GAS BALL VALVE	SVF	B41C4466AGRF10300000	285	15-20	FIRE-RATED
BV-7	4"	CL 150 RFF	CS	GAS BALL VALVE	SVF	B41C4466AGRF10400000	285	15-20	FIRE-RATED
CV-1	3/8"	SWAGED	316 SS	CNG CHECK VALVE	SWAGELOK	SS-CHS6-25	5,000	4,500	
CV-2	1/2"	SWAGED	316 SS	CNG CHECK VALVE	SWAGELOK	SS-CHS8-25	5,000	4,500	
FH-1	4"	CL 150 RFF	SS	FLEX HOSE	UNISOURCE "SUPERFLEX"	SF22CSA-400-49-49-36	285	15-20	CSA-LISTED
IS-1	3"	CL 150 RFF	CS	INLET Y-STRAINER	KECKLEY	32RFY-CSM40L36-SBB-SA7	285	15-20	
IS-2	4"	CL 150 RFF	SS	INLINE CONE STRAINER	FPS	CS-S04-150-40_W40	185	15-20	
PI-1	2.50"	1/4" MPT	316 SS	PRESSURE GAUGE	WIKA	9831873	60	15-20	GLYCERIN-FILLED
PI-2	2.50"	1/4" MPT	316 SS	PRESSURE GAUGE	WIKA	9832004	10,000	1,000-4,500	GLYCERIN-FILLED
PT-1	1/4"	MPT	SS	PRESSURE TRANSDUCER	WIKA	N10200PSI420MA14NPT12C6'CBL	0-200	20-95	
PV-1	1/2"	MPT	316 SS	PURGE VALVE	SWAGELOK	SS-4PM8	3720	15-20	

PIPE AND TUBING SCHEDULE

MARK	SIZE	BASIS	SCH	WALL THK [IN]	MATERIAL	SPECIFICATION	MAWP [PSIG]	SERVICE PRESSURE [PSIG]	SERVICE TEMP. [°F]	NOTE
1-V-SST	1"	OD	316 SS	0.120	316 SS	ASTM A269	5,280	5,000	30-130	0.120" MIN. WALL SEAMLESS TUBE
1-V-CS2	1"	NPS	80	0.179	CS	ASTM A106B	3,470	0-3,000	30-130	SEAMLESS PIPE
3-V-CS2	3"	NPS	80	0.300	CS	ASTM A106B	2,360	0-1,000	30-130	SEAMLESS PIPE
3-G-CS	3"	NPS	40	0.216	CS	ASTM A106B	1,460	15-20	30-110	SEAMLESS PIPE
4-G-CS	4"	NPS	40	0.237	CS	ASTM A106B	1,300	15-20	30-110	SEAMLESS PIPE
4-G-HDPE	4"	NPS	SDR 11	0.409	HDPE	ASTM D2513	100	15-20	50-70	HDPE, PE4710
3/8-CNG-SST	3/8"	OD	(TUBE)	0.065	316 SS	ASTM A269	6,820	90-4,500	30-130	SEAMLESS TUBE
1/2-CNG-SST	1/2"	OD	(TUBE)	0.083	316 SS	ASTM A269	6,810	120-4,500	30-130	SEAMLESS TUBE
3/4-CNG-SST	3/4"	OD	(TUBE)	0.109	316 SS	ASTM A269	5,880	120-4,500	30-130	SEAMLESS TUBE
1-CNG-SST	1"	OD	(TUBE)	0.120	316 SS	ASTM A269	5,280	120-4,500	30-130	0.120" MIN. WALL SEAMLESS TUBE

LEGEND

LINE DESIGNATION

LINE SIZE — 3-G-HDPE — PRODUCT / MATERIAL

ABBREVIATIONS

A.G.	ABOVE GROUND	RR	REMOVE AND REPLACE
CNG	COMPRESSED NATURAL GAS	S	SOLENOID
CS	CARBON STILL (SCH. 40)	SS	STAINLESS STEEL
CS2	CARBON STEEL (SCH. 80)	SST	STAINLESS STEEL TUBE
XXS	CARBON STEEL (SCH. XXS)	(TYP)	TYPICAL
D	DRAIN	U.G.	UNDERGROUND
ESD	EMERGENCY SHUTDOWN	V	VENT
(E)	EXISTING		
(F)	FUTURE		
FP	FUEL POST		
FMT	FUEL MNGMNT. TERMINAL		
G	NATURAL GAS (0-400 PSIG)		
H	HIGH		
L	LOW		
L.O.	LOCKED OPEN		
L.C.	LOCKE CLOSED		
M	METER		
(N)	NEW		
N.C.	NORMALLY CLOSED		
N.O.	NORMALLY OPEN		
PI	PRESSURE INDICATOR		
PEP	POLYETHYLENE PIPE		
PRV	PRESSURE RELIEF VALVE		

SYMBOLS

BALL VALVE	RELIEF VALVE
NORMALLY CLOSED VALVE	FLEXIBLE HOSE
CHECK VALVE	PLUG
NEEDLE VALVE	CAP
PLUG VALVE	UNION
3-WAY VALVE	HOSE COUPLING
BLOCK AND BLEED VALVE	THREADED PLUG
PRESSURE REGULATOR (SETTING AS NOTED)	FILTER
BLEED OR PURGE VALVE	FLEX CONNECTOR
GAS-ACTUATED VALVE	PRESSURE INDICATOR (RANGE AS NOTED)
SOLENOID VALVE	PIPE REDUCTION/ EXPANSION CONICAL
SOLENOID VALVE (3-WAY)	STRAINER (BUILT-IN)
LOCAL INSTRUMENT OR GAUGE	PRIMARY LOCATION PROGRAMMABLE LOGIC CONTROL
PANEL MOUNTED INSTRUMENT OR GAUGE	ELECTRICAL SIGNAL
POINT OF CONNECTION	PNEUMATIC SIGNAL

EXP. DATE: 10/31/2017

COLORADO LICENSED — RICHARD L. REMILL — 0047005 — PROFESSIONAL ENGINEER

DATE SIGNED:

REV	DATE	REVISIONS	BY
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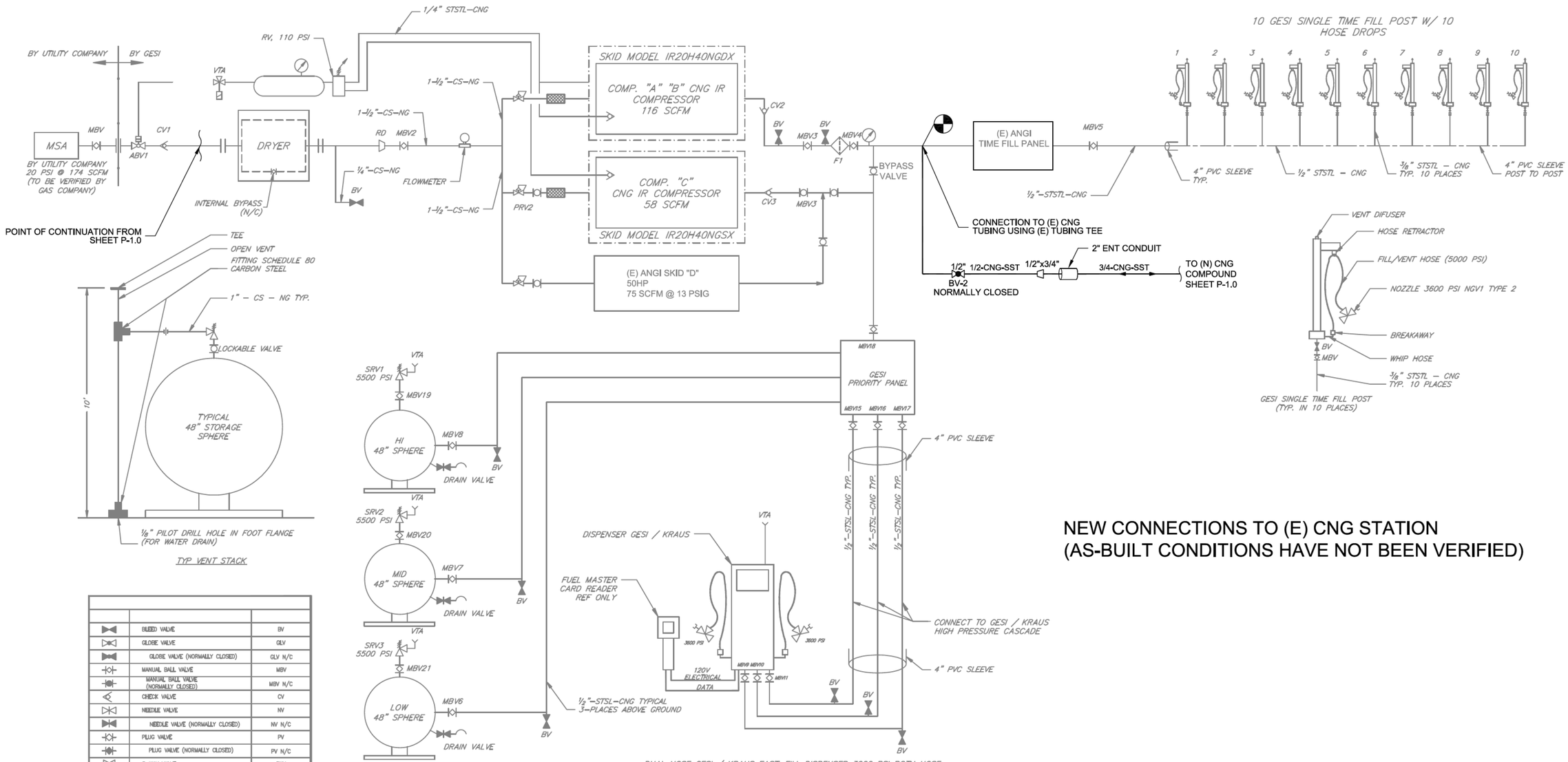
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CNG FUELING FACILITY
GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
PIPING AND INSTRUMENTATION SCH.

ASSET NO: 160-11-17307.02.00

DATE 05/01/2017	DESIGNED BY xxx CHECKED BY MES APPROVED BY RLR
SCALE	AS NOTED
SHEET	P–1.1

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NEW CONNECTIONS TO (E) CNG STATION
(AS-BUILT CONDITIONS HAVE NOT BEEN VERIFIED)

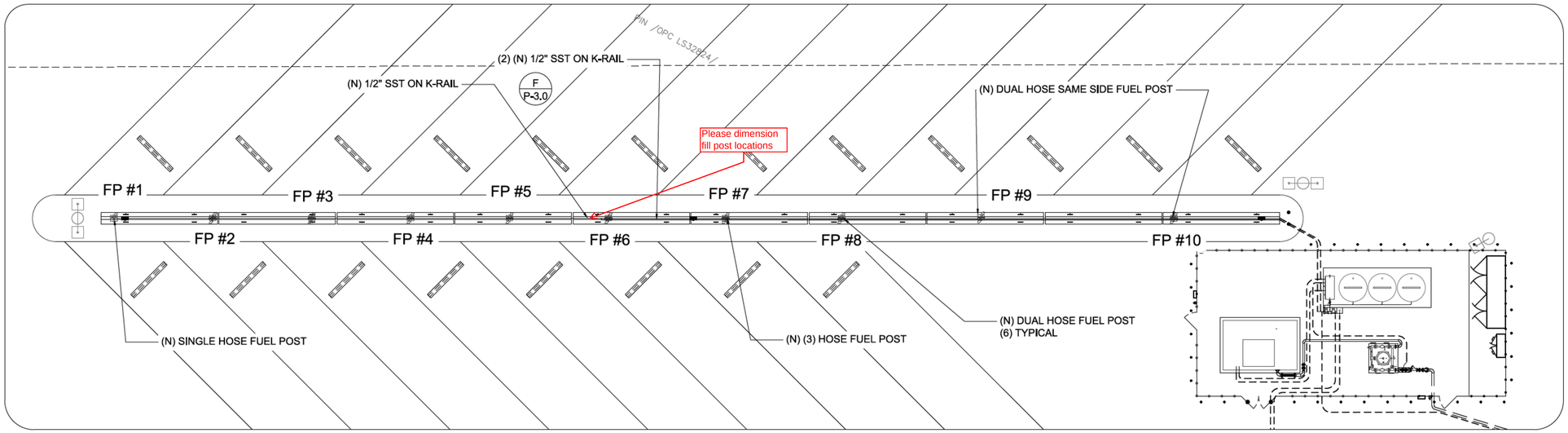
	BLEED VALVE	BV
	GLOBE VALVE	GLV
	GLOBE VALVE (NORMALLY CLOSED)	GLV N/C
	MANUAL BALL VALVE	MBV
	MANUAL BALL VALVE (NORMALLY CLOSED)	MBV N/C
	CHECK VALVE	CV
	NEEDLE VALVE	NV
	NEEDLE VALVE (NORMALLY CLOSED)	NV N/C
	PLUG VALVE	PV
	PLUG VALVE (NORMALLY CLOSED)	PV N/C
	3-WAY VALVE	3WV
	PRESSURE REGULATOR	PRV
	GAS ACTIVATED VALVE	GAV
	SOLENOID VALVE (2-WAY)	SV
	SOLENOID VALVE (3-WAY)	3WSV
	REDUCER	RD
	RELIEF VALVE	RV OR SRV
	FLEXIBLE HOSE	FH
	CAP	CP
	PLUG	PLG
	UNION	UN
	LOCAL INSTRUMENT OR GAUGE	PG
	PANEL MOUNTED INSTRUMENT OR GAUGE	PM
	POINT OF CONNECTION	PC
	FLANGE	FG
	BELOW GRADE	--
	ACTUATED BALL VALVE	ABV
	NOWATA COALESCER	F1
	FLOWMETER	
	FITTING SCHEDULE 80 CARBON STEEL	

TABLE

SYMBOL	QTY	DESCRIPTION	GESI PART NUMBER
MBV1	1	BALL VALVE ¼"	BY UTILITY
CV1	1	CHECK VALVE	KF SERIES 35
MBV2	1	BALL VALVE 1-1/2"	APOLLO 489-100
MBV3	1	BALL VALVE ½"	7223G8Y
BV	9	BLEED VALVE	667098Y316
CV2-CV3	1	½" CHECK VALVE	625398Y316
PG1	1	PRESSURE GAUGE	K6K6GF-6000
MBV4 - MBV11	9	BALL VALVE ½" GYROLOK OR EQUAL	7223G8Y
SRV1 - SRV3	3	SAFETY RELIEF VALVE 5500 PSI (ALLIED)	SUPPLIED WITH 48" VESSEL
MBV12 - MBV18	7	BALL VALVE (HALE HAMILTON)	PART OF PRIORITY PANEL
MBV 19 - MBV21	3	1" BALL VALVE FEMALE NPT.	HBEV766DTSE1
ABV	1	ACTUATED VALVE	JAMESBURY
F1	1	COALESCER	NOWATA
--	--	--	--

PIPING TABLE

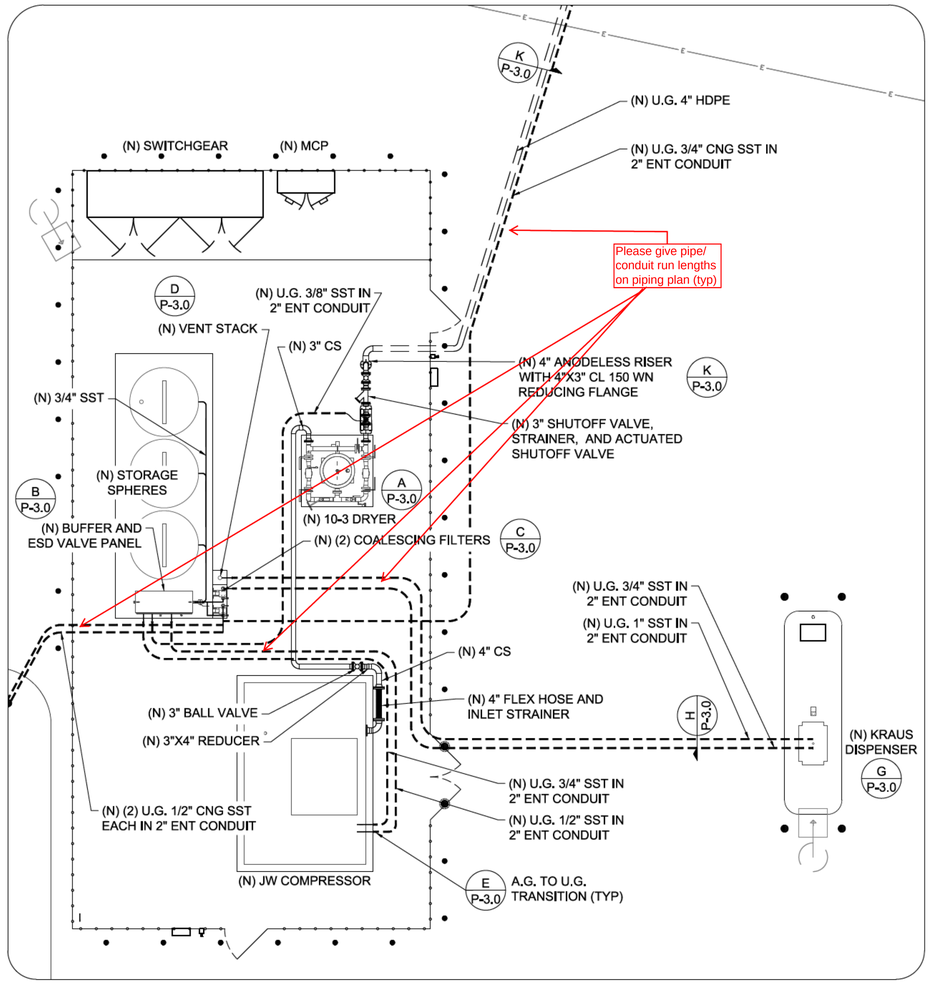
ABBREVIATION	DESCRIPTION
PLP	PE PIPE (PLASTIC)
STSTL	STAINLESS STEEL
NG	NATURAL GAS (INLET)
CS	CARBON STEEL SCH 40.
CNG	COMPRESSED NATURAL GAS
CS2	CARBON STL SCH 80
PVC	PVC PIPE



TIME FILL PIPING PLAN (1"=10')

10 5 0' 10 20

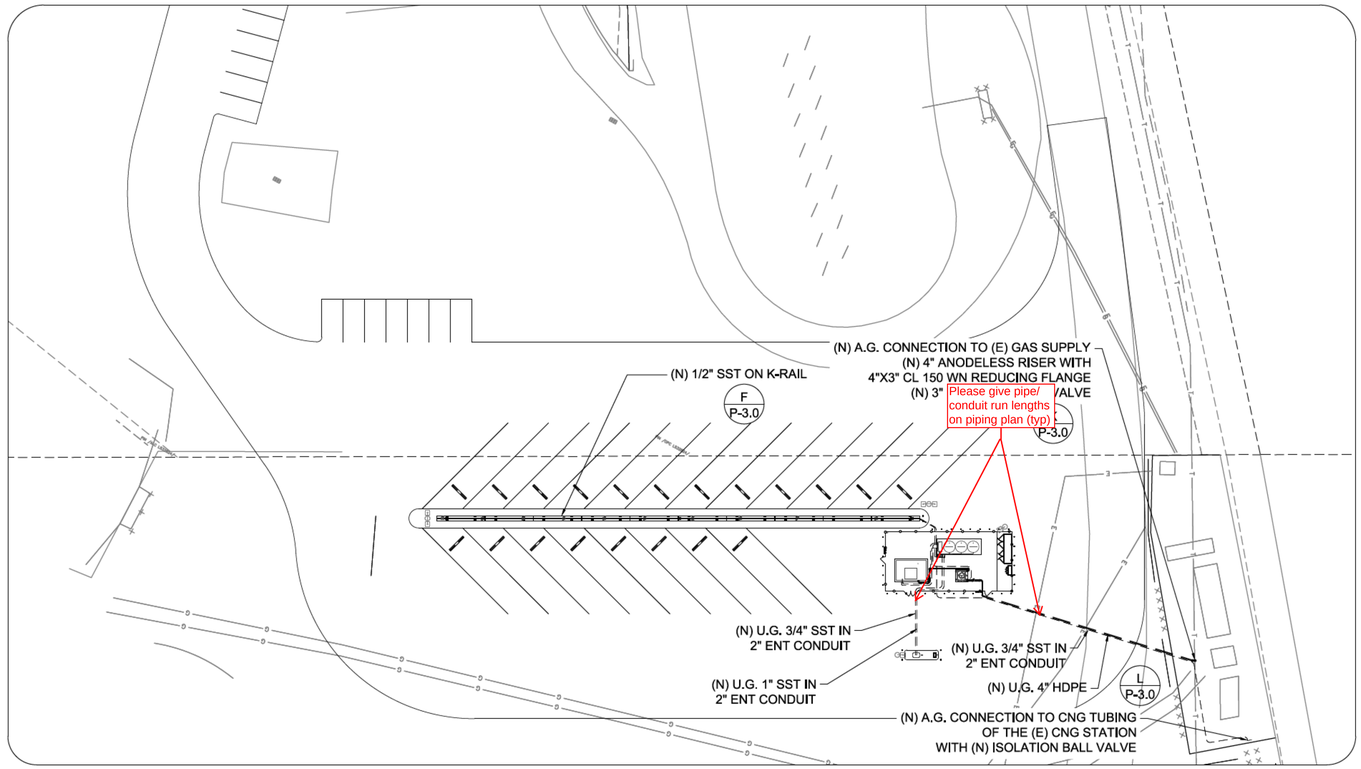
GRAPHIC SCALE



EQUIPMENT COMPOUND PIPING PLAN (1" = 5')

5' 2.5' 0' 5' 10'

GRAPHIC SCALE



OVERALL PIPING PLAN (1"=30')

30' 15' 0' 30' 60'

GRAPHIC SCALE

GENERAL PIPING NOTES

1. SEE DRAWING P-0.0 FOR ADDITIONAL REQUIREMENTS.
2. MAINTAIN 10' MINIMUM CLEAR DISTANCE OF NEW GAS METER SET TO ELECTRICAL MAIN SWITCHBOARD AND SIMILAR EQUIPMENT.
3. EQUIPMENT TIE-INS AND ROUTING SHOWN IS APPROXIMATE AND MAY VARY AS MUCH AS 5 FEET IN ANY DIRECTION TO ACCOMMODATE FIELD CONDITIONS. REFER TO VENDORS' CERTIFIED DRAWINGS AND INSTALLATION INSTRUCTIONS FOR FURTHER INFORMATION.
4. ALL BURIED STAINLESS STEEL TUBING SHALL BE RUN IN CONTINUOUS PVC OR ENT SLEEVE(S). TUBING SHALL BE CONTINUOUS WITH NO VALVES, UNIONS, OR FITTINGS BURIED OR INACCESSIBLE.
5. SEE DRAWING P-4.0 FOR SAFETY SIGNAGE DETAILS AND LOCATIONS.
6. FIRE EXTINGUISHER(S): 4A: 80B:C MINIMUM RATING, CURRENTLY CERTIFIED AND TAGGED WITH LOCAL INSPECTION TAG, MOUNTED IN A LOCKABLE WEATHER-PROOF ENCLOSURE, UNLESS OTHERWISE SPECIFIED, AND WITHIN 50-FEET OF DISPENSERS AND AT THE EQUIPMENT COMPOUND.
7. RUN TIME FILL PIPING ABOVE GROUND ON JERSEY BARRIER. PROVIDE UNISTRUT SUPPORTS 6' MAX O.C.

REV	DATE	REVISIONS	BY
0	05/15/2017	ISSUED FOR PERMIT SUBMITTAL	HVT

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REDUCED PLAN
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PATENTS

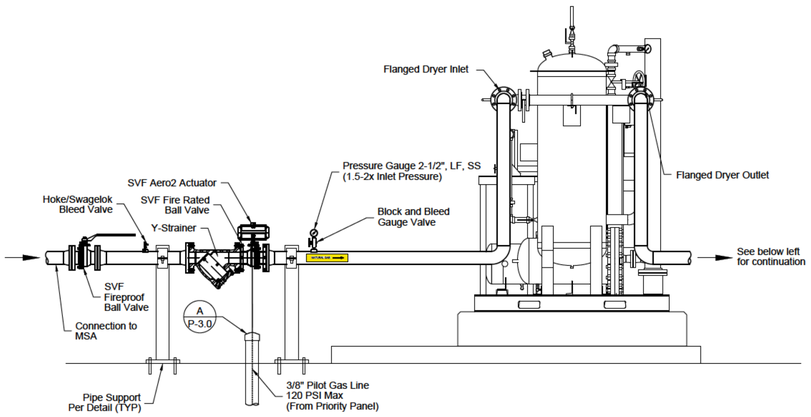
CNG FUELING FACILITY
GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
PIPING PLAN

ASSET NO: 160-11-17307.02.00

EXP. DATE: 10/31/2017
COLORADO LICENSED
RICHARD L. REMILLARD
0047005
PROFESSIONAL ENGINEER
DATE SIGNED:

DATE 05/01/2017	DESIGNED BY ARY CHECKED BY MES APPROVED BY RLR
SCALE	AS NOTED
SHEET	P–2.0

W:\Engineering Projects - Current\Grand Junction, CO - Grand Valley Transit (2302.00)\2.0 Drawings and Engineering\01\P02-PIPING PLAN.dwg - PLOTTED: May 12, 2017 - 1:20pm

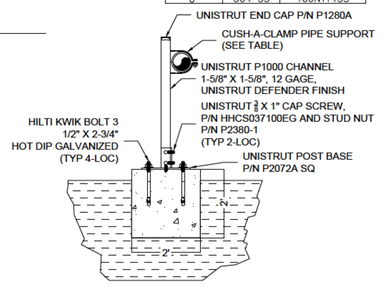


SCHEMATIC INLET PIPING DETAIL

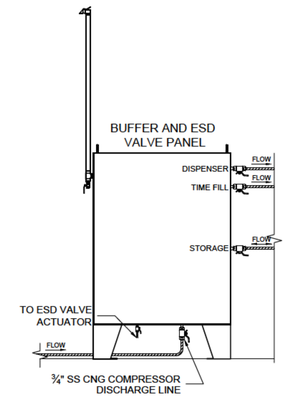
N.T.S.

A P-2.0

UNISTRUT "CUSH-A-CLAMP" PART NUMBERS		
PIPE SIZE [NPS]	MATERIAL	PART NO.
3"	304 SS	056N0626SS
4"	304 SS	072N0800SS
6"	304 SS	106N1145SS



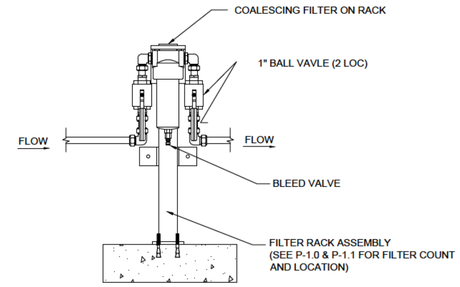
PIPE SUPPORT AND FOUNDATION



VALVE PANEL CONNECTION(S)

N.T.S.

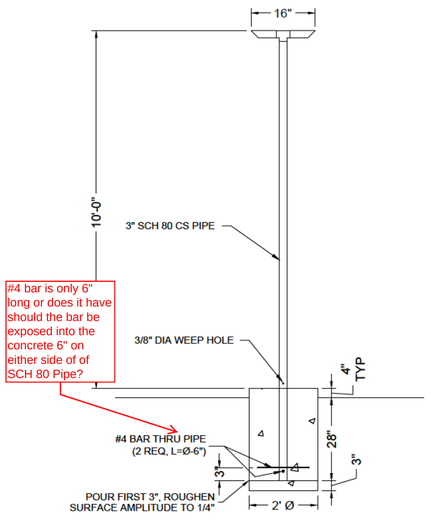
B P-2.0



COALESCING FILTER CONNECTION(S)

N.T.S.

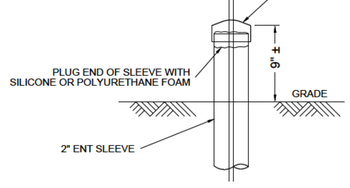
C P-2.0



VENT STACK

N.T.S.

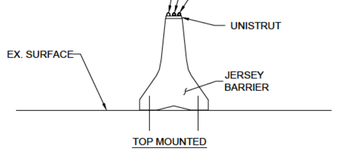
D P-2.0



TYPICAL SLEEVE TRANSITION

N.T.S.

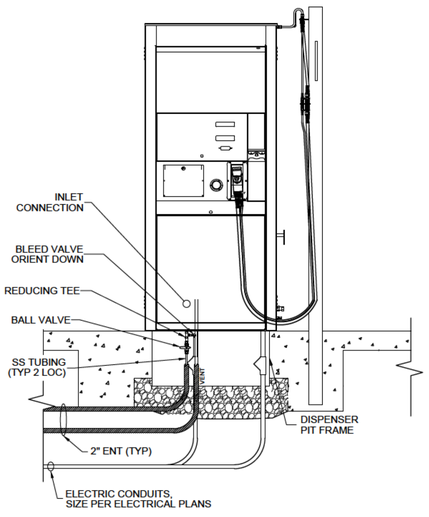
E P-2.0



PIPING SUPPORT ON BARRIER

N.T.S.

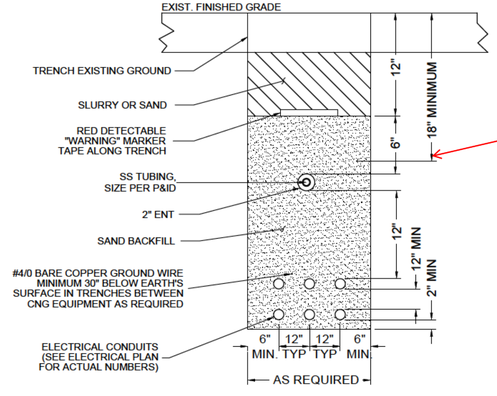
F P-2.0



DISPENSER ELEVATION

FRONT VIEW SHOWN N.T.S.

G P-2.0

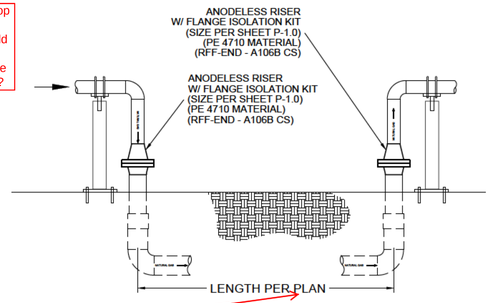


18" Minimum to top of SS Tubing conduit? Or should there be an additional distance shown below 18"?

TYPICAL TRENCH

N.T.S.

H P-2.0



Please identify which sheet

DETAIL OF ANODELESS RISER

N.T.S.

K P-2.0

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CNG FUELING FACILITY
GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
PIPING SECTIONS AND DETAILS

ASSET NO: 160-11-17307.02.00

EXP. DATE: 10/31/2017

COLORADO LICENSED RICHARD L. REMILLARD 0047005 PROFESSIONAL ENGINEER

DATE SIGNED:

DATE	DESIGNED BY	ARY
05/01/2017	CHECKED BY	MES
	APPROVED BY	RLR

SCALE: AS NOTED

SHEET: P-3.0

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AT THE SHOWN LOCATION, THE INLET GAS FOR THE (N) STATION WILL BE CONNECTED BY REPLACING THE (E) PIPING SPOOL WITH A SPOOL THAT HAS A TEE FOR THE NEW CONNECTION. A WELDOLET FOR THE (E) PRESSURE GAUGE SHALL BE ADDED AS WELL.

THE BIO GAS PRESSURE WILL BE MONITORED BY ADDING A PRESSURE TRANSDUCER TO THE SHOWN LOCATION

INLET GAS CONNECTION K P-2.0

N.T.S.



THE CNG LINE INTERCONNECTING THE CNG STATIONS WILL BE CONNECTED AT THE (E) TUBING TEE

CNG GAS CONNECTION L P-2.0

N.T.S.

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COLORADO LICENSED RICHARD L. REMILLARD 0047005 PROFESSIONAL ENGINEER
DATE SIGNED:

CNG FUELING FACILITY
GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
PIPING SECTIONS AND DETAILS

ASSET NO: 160-11-17307.02.00

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SCALE: AS NOTED

SHEET: P–3.1

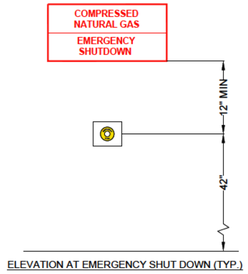
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SIGN #	SYMBOL	SIGN SPECIFICATION
A	DANGER THIS EQUIPMENT STARTS AUTOMATICALLY	QTY: SUPPLIED BY: CONTRACTOR MATERIAL: 10" X 14" X 1/8", ALUMINUM FASTENED WITH SCREWS OR STRAPS. GRAINGER ITEM#: 4T689, 1M158,1M374, 1K911 CODE REFERENCE: CAGI B19.1-2010 LOCATION: CNG EQUIPMENT COMPOUND ENTRANCES
B	GAS SHUTOFF VALVE	QTY: SUPPLIED BY: CONTRACTOR MATERIAL: METAL TAG WITH RED BACKGROUND AND 1" WHITE LETTERING. CODE REFERENCE: 2000 UPC 1212.4, 2001 CPC LOCATION: TIED TO BODY OF BLOCK VALVE (BV) IMMEDIATELY DOWNSTREAM OF METER SET ASSEMBLY (MSA).
C	COMPRESSED NATURAL GAS EMERGENCY SHUTDOWN	QTY: SUPPLIED BY: CONTRACTOR MATERIAL: 14" X 10" X 1/8" THICK ALUMINUM, ROUNDED CORNERS FASTENED WITH SCREWS OR STRAPS, 2" HIGH RED LETTERS WITH WHITE BACKGROUND. CODE REFERENCE: NFPA 52 SECTION 7.11.5.2 LOCATION: ABOVE EACH ESD
D	FIRE EXTINGUISHER	QTY: SUPPLIED BY: CONTRACTOR MATERIAL: 14" X 3.5" X 1/8" METAL DECAL, FASTENED WITH SCREWS OR STRAPS, 0.875" HIGH RED LETTERS WITH WHITE BACKGROUND. GRAINGER ITEM#: 4FP26 LOCATION: ABOVE EACH FIRE EXTINGUISHER / ESD POST
E	STOP MOTOR NO SMOKING FLAMMABLE GAS NATURAL GAS VEHICLE FUEL CYLINDERS SHALL BE INSPECTED AT INTERVALS NOT EXCEEDING 3 YEARS TO ENSURE SAFE OPERATION OF THE VEHICLE. NATURAL GAS FUEL CYLINDERS PAST THEIR END OF LIFE DATE SHALL NOT BE REFUELED AND SHALL BE REMOVED FROM SERVICE	QTY: SUPPLIED BY: CONTRACTOR MATERIAL: 20"W X 20"H ON 1/8" THICK SHEET METAL, ROUNDED CORNERS FASTENED WITH SCREWS OR STRAPS, RED LETTERS WITH WHITE BACKGROUND. CODE REFERENCE: NFPA 52 SECTION 7.14.12 LOCATION: AT DISPENSING POINTS
F	4 / 1 0 / CNG	QTY: SUPPLIED BY: CONTRACTOR MATERIAL: 11" X 11" X 1/8" THICK FIBERGLASS, FASTENED WITH SCREWS, BLACK CHARACTERS WITH NFPA HAZARD WITH WHITE DIAMOND BACKGROUND. GRAINGER ITEM#:5AZ67 COLOR CODE: GRAINGER ITEM# SIZE 1 - BLUE 5AX79 4" 4 - RED AD851 4" 0 - YELLOW 5AH22 4" CNG- WHITE *C*-4T746 2" *N*-4T757 2" *G*-4T750 2" CODE REFERENCE: NFPA 704 SECTION 4.2.3.3 LOCATION: OUTSIDE FENCE FACING STREET / VISIBLE SIDES OF STORAGE VESSEL(S)
G	NO SMOKING FLAMMABLE GAS	QTY: SUPPLIED BY: CONTRACTOR MATERIAL: MIN. 3" ADHESIVE LETTERING, BLACK LETTERS WITH WHITE BACKGROUND CODE REFERENCE: NFPA 52 SECTION 7.14.12.1, 2010 CFC 2703.7.1 LOCATION: ON STORAGE VESSEL(S)
H	CAUTION HEARING PROTECTION MUST BE WORN IN THIS AREA	QTY: SUPPLIED BY: CONTRACTOR MATERIAL: SAFETY SIGN 10" X 14" SIZE ROUNDED CORNERS FASTENED WITH SCREWS OR STRAPS, GRAINGER ITEM#: 4T661, 1M112, 1M328, 1K991 LOCATION: CNG EQUIPMENT COMPOUND ENTRANCES
J	CAUTION EYE PROTECTION REQUIRED	QTY: SUPPLIED BY: CONTRACTOR MATERIAL: SAFETY SIGN 10" X 14" SIZE ROUNDED CORNERS FASTENED WITH SCREWS OR STRAPS, GRAINGER ITEM#: 4T648, 1M244, 1M460, 1M016 LOCATION: CNG EQUIPMENT COMPOUND ENTRANCES
K	NOTICE AUTHORIZED PERSONNEL ONLY	QTY: SUPPLIED BY: CONTRACTOR MATERIAL: SAFETY SIGN, 10" X 14" ROUNDED CORNERS FASTENED WITH SCREWS OR STRAPS, GRAINGER ITEM#: 4T633, 1M276, 1M492, 1M054 LOCATION: CNG EQUIPMENT COMPOUND ENTRANCES

SIGN #	SYMBOL	SIGN SPECIFICATION
L	DANGER NO SMOKING NO OPEN FLAMES NO SPARKS	QTY: SUPPLIED BY: CONTRACTOR MATERIAL: SAFETY SIGN, SIZE 10" X 14" ROUNDED CORNERS FASTENED WITH SCREWS OR STRAPS, GRAINGER ITEM#: 4T678, 1M152, 1M368, 1K905 LOCATION: CNG EQUIPMENT COMPOUND ENTRANCES
M	THIS AREA IS UNDER 24 HOUR TV SURVEILLANCE TRESPASSERS WILL BE PROSECUTED	QTY: SUPPLIED BY: CONTRACTOR MATERIAL: SECURITY SIGN SIZE 10" X 14" MATERIAL, 65 MIL THICK. 0.875" HIGH LETTERING BLACK LEGEND COLOR, WHITE BACKGROUND, FOUR MOUNTING HOLES. GRAINGER ITEM#: 3JE44 LOCATION: DRIVEWAY
N	Clean Energy Call toll-free 24 hour emergency 1-866-278-3674* Mission Chevron 70-001	QTY: SUPPLIED BY: CLEAN ENERGY MATERIAL: 12" X 18" X 1/8", ALUMINUM FASTENED WITH SCREWS OR STRAPS. LOREN ELECTRIC SIGNS ITEM#: CLEN-AP-00034 LOCATION: CNG COMPOUND ENTRANCES / CNG DISPENSER AREA FOR FAST FILL ONLY
P	EMERGENCY STOP	QTY: SUPPLIED BY: CONTRACTOR MATERIAL: GRAINGER ITEM #2LCC3 LEGEND PLATE, EMERGENCY STOP, BLACK/YELLOW LOCATION: ESD PUSH BUTTONS
Q	IN CASE OF FIRE, SPILL OR RELEASE: 1. Use Emergency Pump Shutoff ! 2. Report the Accident ! Clean Energy Telephone No.: 1-866-278-3674 Fire Department Telephone No.: Facility Address:	QTY: SUPPLIED BY: CONTRACTOR MATERIAL: 18"W X 12"H ON 1/8" THICK SHEET METAL, ROUNDED CORNERS FASTENED WITH SCREWS OR STRAPS, RED LETTERS WITH WHITE BACKGROUND. LOCATION: ON CANOPY COLUMN / CNG EQUIPMENT COMPOUND ESD BUTTON(S)
R	NATURAL GAS	QTY: SUPPLIED BY: CONTRACTOR ASME A13.1 MATERIAL: ADHESIVE PIPE LABEL TAPE BLACK LETTERING, SIZE PER ASME A13.1 TABLE 3 SAFETY YELLOW BACKGROUND VENDOR: GRAINGER 4T609/4T561 <2"Ø PIPE LOCATION: GAS PIPING, 20' OC MAX
S	EXIT	QTY: SUPPLIED BY: CONTRACTOR MATERIAL: POLYCARBONATE SHIELD WITH WHITE THERMOPLASTIC FRAME SELF LUMINOUS 6" WHITE LETTERING WITH 3/4" STROKE RED BACKGROUND LOCATION: INSIDE 3' GATES (TEXAS ONLY)

SIGNAGE NOTES

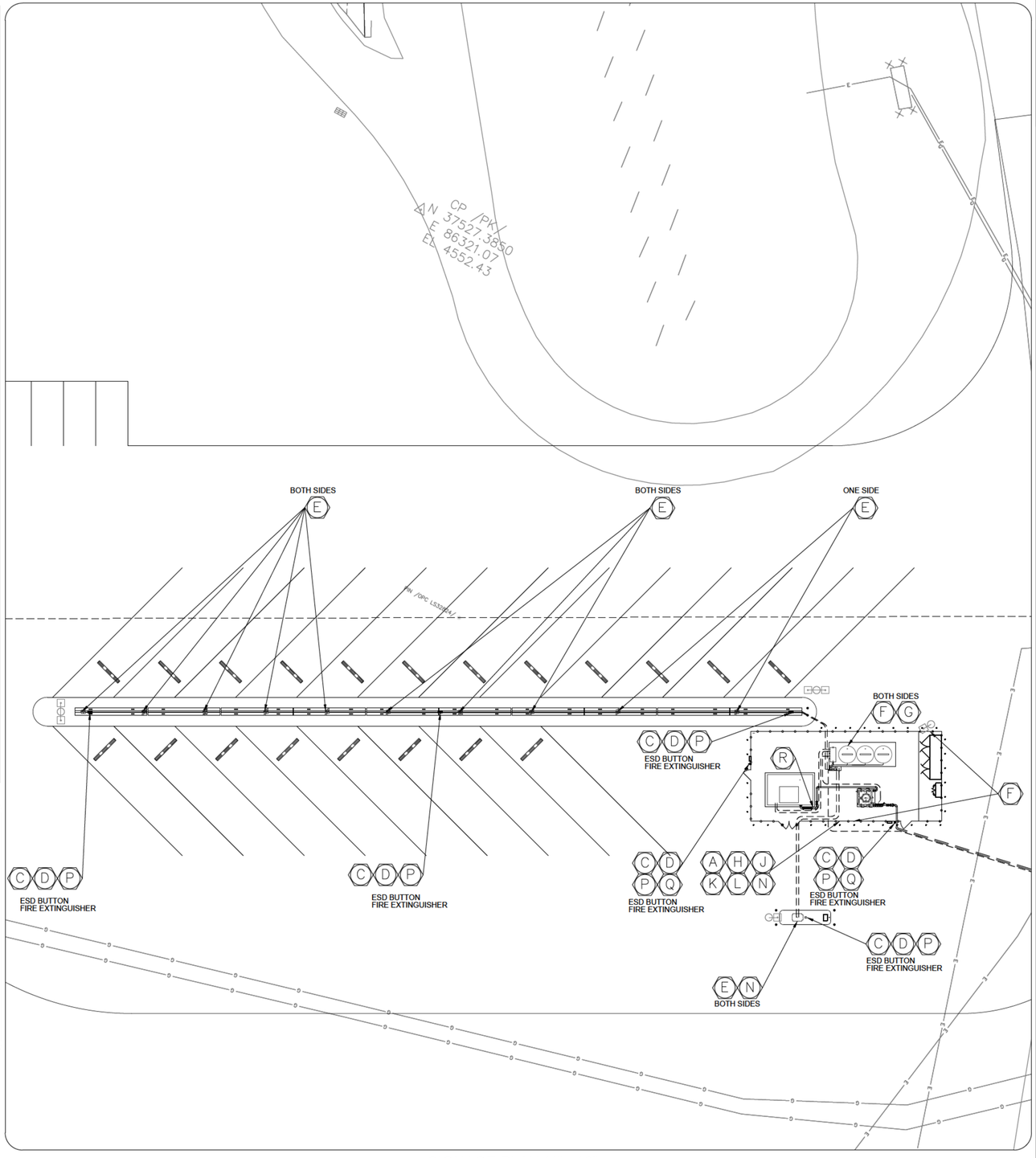
1. ALL SIGNS SHALL BE IN ACCORDANCE WITH OSHA SPECIFICATIONS 1910.145 AND ANSI SPECIFICATION Z535.
2. ALL SIGNS SHALL BE SUITABLE FOR OUTDOOR USE.
3. SIGNS SHALL BE MADE OF 0.08 INCH THICK ALUMINUM WITH BAKED ENAMEL BACKGROUND UNLESS OTHERWISE NOTED. LETTERS SHALL BE BAKED ENAMEL OR 3M WEATHERIZED VINYL - SIZE, COLOR AND FONT AS NOTED.
4. VENDORS LISTED ARE FOR ESTABLISHING STANDARDS OF QUALITY AND PERFORMANCE. OTHER MANUFACTURERS MAY BE SUBSTITUTED UPON APPROVAL.
5. CONTRACTOR SHALL PROVIDE AND INSTALL SIGNAGE AS SHOWN ON THE DRAWINGS. IN ADDITION, CONTRACTOR SHALL TAG ALL EQUIPMENT AND VALVES AND SHALL LABEL ALL LINES IN ACCORDANCE WITH ANSI A13.1-1987.
6. SIGNS SHALL BE PROVIDED AND INSTALLED WITH NECESSARY BRACKETS, SUPPORTS AND HARDWARE. BRACKETS, SUPPORTS AND HARDWARE SHALL BE GALVANIZED. ALL HARDWARE SHALL BE VANDAL AND TAMPER RESISTANT.
7. WHERE SIGNAGE IS TO BE ATTACHED TO EXTERIOR SURFACE OF EQUIPMENT, SUCH AS COMPRESSOR ENCLOSURE OR DISPENSER FRONT PANEL, SIGN MATERIAL SHALL BE SELF ADHESIVE VINYL.
8. SIGNS SHALL BE LOCATED FOR EASY VISIBILITY FROM ALL SIDES.



ELEVATION AT EMERGENCY SHUT DOWN (TYP.)



ELEVATION AT EQUIPMENT AREA (TYP.)



SIGNAGE PLAN (1" =16')



16' 8' 0' 16' 32'

GRAPHIC SCALE

EXP. DATE: 10/31/2017

COLORADO LICENSED
RICHARD L. REMILLARD
0047005
PROFESSIONAL ENGINEER

DATE SIGNED:

REV	DATE	REVISIONS	BY
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CNG FUELING FACILITY
GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
SAFETY SIGNAGE

ASSET NO: 160-11-17307.02.00

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DATE	DESIGNED BY HVT
05/01/2017	CHECKED BY MES
	APPROVED BY RLR
SCALE	AS NOTED
SHEET	P-4.0

PART 4 - ELECTRICAL

4.1 GENERAL

A. ELECTRICAL EQUIPMENT, MATERIALS, WORKMANSHIP AND TESTING SHALL BE PROVIDED OR PERFORMED AS DESCRIBED HEREIN. WORK COVERED BY THESE SPECIFICATIONS INCUDES THE FOLLOWING:

1. INSTALLATION OF A NEW 480 VOLT SWITCHBOARD(S).
2. INSTALLATION OF INSTRUMENTATION, CONDUIT AND WIRE AS SHOWN ON THE DRAWINGS.
3. INSTALLATION OF EQUIPMENT GROUNDING SYSTEM AS SHOWN ON THE DRAWINGS.
4. INSTALLATION OF POWER AND LIGHTING CONDUITS AND WIRE AS REQUIRED FOR THIS PROJECT.

B. DRAWINGS: THE CONTRACTOR SHALL PROVIDE ALL ELECTRICAL EQUIPMENT AND INCIDENTALS, UNLESS NOTED OTHERWISE, AS NEEDED TO COMPLETE THE WORK INDICATED IN THE SPECIFICATIONS AND DESIGN DRAWINGS.

C. CODES

1. MATERIALS, EQUIPMENT, AND INSTALLATION PROVIDED AND PERFORMED UNDER THIS SECTION SHALL CONFORM TO THE LATEST REQUIREMENTS OF THE FOLLOWING CODES:

   NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) 70, NEC
   NFPA 70E - STANDARD FOR ELECTRICAL SAFETY IN THE WORKPLACE.
   NFPA 52 - VEHICULAR GASEOUS FUEL SYSTEM CODE.
   LOCAL CODES AND REGULATIONS.

2. IN CASE OF DIFFERENCES AMONG BUILDING CODES, SPECIFICATIONS, STATE AND FEDERAL LAWS, LOCAL ORDINANCES, INDUSTRY STANDARDS AND ELECTRICAL DEPARTMENT REGULATIONS AND THE CONTRACT DRAWINGS, THE MOST STRINGENT SHALL GOVERN. THE CONTRACTOR SHALL PROMPTLY NOTIFY CLEAN ENERGY IN WRITING UPON DISCOVERY OF ANY SUCH DIFFERENCES.

4.2. WORKMANSHIP

A. ALL CABLES, CONDUITS, PIPING OR EQUIPMENT LOCATIONS AND ELEVATIONS ARE APPROXIMATE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD CHECKING AND MAKING ALL NECESSARY OFFSETS, AS REQUIRED TO AVOID EXISTING INTERFERENCES AND TO COORDINATE WITH OTHER TRADES.

B. THE DRAWINGS OR SPECIFICATIONS ARE NOT INTENDED TO ALLOW A VIOLATION OF ELECTRICAL WORKING SPACE AROUND ELECTRICAL EQUIPMENT. A 30"W MIN x 48"D x 6'-6"H SPACE SHALL BE CLEAR TO THE FLOOR IN FRONT OF ALL ELECTRICAL PANELS, CONTROLS OR ITEMS THAT REQUIRE MAINTENANCE OR ACCESS WHILE ENERGIZED. ANY DEVIATION FROM THIS MINIMUM SHALL BE APPROVED IN WRITING BY THE ENGINEER.

C. THE ELECTRICAL DESIGN IS BASED ON TYPICAL VENDOR EQUIPMENT. THE CONTRACTOR SHALL COORDINATE EQUIPMENT INSTALLATION WITH THE ACTUAL EQUIPMENT FURNISHED.

D. THE CONTRACTOR SHALL PROVIDE ALL FUSES REQUIRED FOR PROJECT POWER, INCLUDING ANY FUSES BLOWN DURING INITIAL TESTING.

E. BONDING JUMPERS SHALL BE INSTALLED TO INSURE CONTINUITY WHERE CONDUIT CONNECTIONS AT CONCENTRIC KNOCKOUTS ARE TO SERVE AS A GROUND.

F. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DAMAGE TO ALL WALLS, FLOORS AND PAVING CAUSED BY CONTRACTOR. CONTRACTOR SHALL COORDINATE WITH CLEAN ENERGY TO PATCH, PAINT AND REPAIR TO MATCH EXISTING CONDITIONS.

G. NOTHING IN THESE DRAWINGS AND SPECIFICATIONS SHALL BE CONSTRUED AS ALLOWING WORK THAT VIOLATES GOVERNING CODES. THIS SHALL NOT BE CONSTRUED AS RELIEVING THE CONTRACTOR FROM COMPLYING WITH ANY REQUIREMENTS OF THE PLANS OR SPECIFICATIONS WHICH MAY COMPLY WITH, BUT EXCEED THOSE OF GOVERNING CODES.

H. SHOULD ANY DEVIATIONS FROM WORK INDICATED ON THE DRAWINGS OR DESCRIBED IN SPECIFICATIONS BE NECESSARY IN ORDER TO MEET CONDITIONS AT THE SITE, THEY SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO BID OR IMMEDIATELY IN WRITING FOR APPROVAL OF THE DEVIATION REQUESTED.

4.3 MATERIALS

A. GENERAL

1. ALL MATERIALS SHOWN ON THE DRAWING PLANS AND DETAILS ARE THE MAIN ITEMS OF CONSTRUCTION AND ARE NOT TO BE CONSTRUED AS ALL-INCLUSIVE. THE CONTRACTOR SHALL MAKE COMPLETE ALL ELECTRICAL INSTALLATIONS IN A NEAT, PROFESSIONAL, AND WORKMAN-LIKE MANNER.

2. THESE DESIGN DRAWINGS ARE SCHEMATIC AND DO NOT SHOW ALL OFFSETS, BENDS, ELBOWS, OR OTHER SPECIFIC ELEMENTS WHICH MAY BE NEEDED FOR PROPER INSTALLATION. EXCEPT WHERE SHOWN IN DIMENSIONAL DETAIL, THE LOCATIONS OF SWITCHES, RECEPTACLES, LIGHTS, MOTORS, OUTLETS, AND OTHER EQUIPMENT ON PLANS ARE APPROXIMATE. SUCH ITEMS SHALL BE PLACED SO AS TO ELIMINATE INTERFERENCE WITH DUCTS, PIPING, AND EQUIPMENT. THE EXACT LOCATION SHALL BE DETERMINED IN THE FIELD.

3. EQUIPMENT SIZES SHOWN ON THE DRAWINGS ARE MINIMUM UNLESS OTHERWISE INDICATED. BEFORE INSTALLING ANY WIRE OR CONDUIT, THE CONTRACTOR SHALL OBTAIN THE EXACT EQUIPMENT REQUIREMENTS AND SHALL INSTALL WIRE, CONDUIT, DISCONNECT SWITCHES, MOTOR STARTERS, HEATERS, CIRCUIT BREAKERS, AND OTHER ITEMS OF THE CORRECT SIZE FOR THE EQUIPMENT ACTUALLY INSTALLED. HOWEVER, WIRE AND CONDUIT SIZES SHOWN ON THE DRAWINGS SHALL BE TAKEN AS A MINIMUM AND SHALL NOT BE REDUCED WITHOUT WRITTEN APPROVAL.

4. ELECTRICAL AND INSTRUMENTATION MATERIALS AND EQUIPMENT SHALL CONFORM TO THE REQUIREMENTS OF UNDERWRITERS LABORATORIES (UL) AND BE LISTED AND LABELED FOR THE INTENDED APPLICATION.

5. MATERIALS AND EQUIPMENT FURNISHED BY THE THE CONTRACTOR SHALL BE NEW, AND BE IN COMPLIANCE WITH THESE SPECIFICATIONS. MATERIALS AND EQUIPMENT SHALL BE PRODUCTS THAT HAVE BEEN IN SATISFACTORY COMMERCIAL OR INDUSTRIAL USE AT LEAST TWO YEARS PRIOR TO AWARD OF CONTRACT.

6. ALL CONDUIT, CONDUIT FITTINGS, AND ENCLOSURES SHALL BE PROPERLY PROTECTED FROM ANY MOISTURE DURING STORAGE. THE CONTRACTOR SHALL ENSURE THAT AT THE TIME OF USE, THE MATERIALS ARE CLEAN, DRY AND SUITABLE FOR THEIR INTENDED USE.

7. MAIN CIRCUIT BREAKERS FEEDING SYSTEMS RATED 1000 AMPS AND ABOVE SHALL INCLUDE GROUND FAULT (GFI) PROTECTION.

8. MAIN SWITCHBOARD SHALL BE NEMA 3R, WITH AN INTERRUPTING CAPACITY OF 65KAIC, FULLY RATED. ROOF OF SWITCHBOARD SHALL SLOPE AWAY FROM THE SWITCHBOARD'S FRONT.

9. ELECTRICAL EQUIPMENT SHALL BE LISTED BY AN ELECTRICAL TESTING LABORATORY ACCEPTED BY THE AHJ.

B. CABLE AND WIRE

1. CABLE AND WIRE FOR POWER AND CONTROL CIRCUITS AT 600 VOLTS AND BELOW SHALL BE 600 VOLT COPPER, TYPE THWN-2. WIRE SIZES #12 AWG AND SMALLER MAY BE SOLID OR STRANDED; ALL LARGER SIZES SHALL BE STRANDED.

2. IF ALLOWED BY THE ELECTRIC UTILITY COMPANY, ALUMINUM CONDUCTORS MAY BE USED FOR THE MAIN UTILITY FEEDER. CONTRACTOR SHALL SUBMIT WIRE DATA AND CALCULATIONS FOR APPROVAL BY THE ENGINEER.

3. GROUND WIRE SHALL BE MEDIUM DRAWN BARE STRANDED COPPER . ALL GROUND CONNECTIONS AND FITTINGS SHALL BE CAST OR FORGED COPPER ALLOY BODY.

4. INSTRUMENT WIRING SHALL BE AS CALLED FOR ON THE PLANS.

C. GROUNDING

A MINIMUM OF (5) 3/4 INCH DIAMETER BY 10 FOOT LONG COPPER CLAD STEEL GROUND RODS SHALL BE INSTALLED. GROUNDING RODS SHALL NOT BE LESS THAN 1.8M (6 FT) APART. CONNECTIONS TO GROUND RODS AND THE MAIN GROUND GRID SHALL BE MADE WITH BURNDY "HYGROUND" IRREVERSIBLE COMPRESSION CONNECTORS. CONNECTIONS TO EQUIPMENT SHALL BE MADE WITH COPPER OR BRONZE SPLIT BOLT CONNECTORS. SPLIT BOLT CONNECTORS SHALL BE ATTACHED TO EQUIPMENT STRUCTURE THAT HAS BEEN STEEL-BRUSHED TO BRIGHTNESS AND LUBRICATED WITH AN ELECTRICALLY CONDUCTING COMPOUND MADE FOR THAT PURPOSE. WIRE SIZES WILL BE AS CALLED FOR ON THE DRAWINGS.

D. CONDUIT

1. ABOVEGROUND CONDUIT FOR POWER CONDUCTORS IN PERMANENTLY INSTALLED NON-FLEXING SERVICE SHALL BE THREADED RIGID METAL CONDUIT (RMC) OR THREADED STEEL INTERMEDIATE CONDUIT (IMC). UNDERGROUND CONDUIT SHALL BE SCHEDULE 40 PVC, UNLESS NOTED OTHERWISE IN THE DRAWINGS.

2. UNDERGROUND PVC CONDUIT SHALL BE EQUIPPED WITH RMC RISERS EXCEPT WHERE ENTERING A PANEL OR SWITCHGEAR.

2. FLEXIBLE CONDUIT SHALL BE STEEL LIQUID-TIGHT WITH A PVC JACKET SUITABLE FOR THE AREA CLASSIFICATION IN WHICH IT IS TO BE INSTALLED.

3. CONDUIT INSTALLED WITHIN CLASSIFIED AREAS SHALL BE THREADED IMC OR RMC. PROVIDE CONDUIT SEALS WHERE CONDUIT CROSSES BOUNDARIES OF HAZARDOUS AREAS, OR AS OTHERWISE REQUIRED BY CODE.

E. CONDUIT FITTINGS

1. STANDARD FITTINGS WITH COVERS SHALL HAVE GASKETS AND NON-CORRODING ATTACHING SCREWS WHERE BURIED. CONDUIT FITTINGS SHALL BE PVC COATED AND MADE OF NON-CORRODING FERROUS ALLOY.

2. CONDUIT BUSHINGS ON RISERS INTO SWITCHGEAR SHALL BE INSULATING TYPE.

F. CABLE AND WIRE TERMINATIONS

1. ALL POWER CABLE SHALL BE TERMINATED WITH COMPRESSION LUGS OR MECHANICAL LUGS .

2. CONTROL, ALARM AND SIGNAL WIRE SHALL BE TERMINATED WITH COMPRESSION SPADE OR RING LUGS WHERE SCREW TERMINALS ARE PROVIDED. SOLDER CONNECTIONS ARE NOT ALLOWED.

3. CABLES AND CONDUCTORS SHALL BE CONTINUOUS BETWEEN TERMINALS, AND NOT JOINED BY SPLICES OR WIRE NUTS, EXCEPT AS NECESSARY TO CONNECT TWO OR MORE WIRING BRANCHES TOGETHER IN A JUNCTION BOX.

G. ENCLOSURES

1. ENCLOSURES FOR EQUIPMENT AND DEVICES SHALL BE UL LISTED, NEMA 3R OR NEMA4 IN NON-HAZARDOUS AREAS, AND NEMA 7 IN CLASS 1 , DIV 1 OR DIV 2 AREAS.

2. ENCLOSURES IN NON-HAZARDOUS AREAS SHALL BE PROVIDED WITH WATER TIGHT CONDUIT HUBS ON TOP AND VERTICAL SURFACES. GASKETS AND O-RINGS SHALL BE INSTALLED AS INSTRUCTED BY MANUFACTURER, TO MAINTAIN WEATHER TIGHTNESS.

3. PULL BOXES AND JUNCTION BOXES SHALL BE UL LISTED FOR NEMA 3R IN NON-HAZARDOUS AREAS, AND NEMA 7 IN CLASS 1, DIV 1 EXTERIOR AREAS. ALL PULL BOXES INSTALLED WHEREVER TRAFFIC MIGHT COME IN CONTACT SHALL BE TRAFFIC RATED. ALL IN-GROUND PULL BOXES SHALL BE EQUIPPED WITH LOCK DOWN DEVICES.

H. EQUIPMENT MOUNTING

1. EQUIPMENT SHALL BE SECURED WITH CORROSION-PROOF BOLTS, STRAPS, HANGERS, AND SUCH OTHER HARDWARE AND DEVICES AS ARE NECESSARY OR APPROPRIATE.

I. SPECIALTY EQUIPMENT

1. ESD PUSH BUTTONS: BUTTONS SHALL BE MAINTAINED PUSH-PULL TYPE WITH LARGE, RED, MUSHROOM HEAD PUSH BUTTON THAT IS NORMALLY CLOSED. ESD SHOULD HAVE ELECTRICAL CLASSIFICATION APPROPRIATE TO THE HAZARDOUS CLASSIFICATION OF THE LOCATION.

2. EMERGENCY PHONE: FURNISH EMERGENCY TELEPHONE(S) WHERE SHOWN IN THE DRAWINGS. FURNISH STANDARD INDUSTRIAL DIAL-OUT PHONE WITH WEATHER PROOF ENCLOSURE FOR OUTDOOR USE. CEE CO EMERGENCY TELEPHONE, PART NO. WPP-331-D-R.

4.4 INSTALLATION REQUIREMENTS

A. GENERAL

1. INSTALL THE SWITCHBOARD ON THE FOUNDATIONS AS INDICATED BY THESE DRAWINGS. INSTALL CONDUITS, WIRE, LIGHTING FIXTURES, GROUND GRID, ETC., AS SHOWN ON THE DRAWINGS.

B. GROUNDING

1. ALL EQUIPMENT GROUNDS SHOULD BE THROUGH SLAB, HIDDEN WHERE POSSIBLE AND PROTECTED BY PVC CONDUIT.

2. GROUNDING SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH NEC ARTICLE 250, PART III. SYSTEM GROUND SHALL CONSIST OF 4/0 BARE COPPER STRANDED WIRE GROUND RING 30" BELOW GRADE, ENCIRCLING THE EQUIPMENT COMPOUND WITH INTERCONNECTING RUNS BETWEEN MAJOR EQUIPMENT COMPONENTS. ALL WIRE TO WIRE CONNECTIONS SHALL BE MADE USING BURNDY "HYGROUND" IRREVERSIBLE COMPRESSION FITTINGS. A MINIMUM OF TWO GROUND RODS SHALL BE CONNECTED TO THE SYSTEM AT OPPOSITE SIDES OF THE EQUIPMENT AREA. ADDITIONAL GROUND RODS TO BE INSTALLED AS NECESSARY. GROUND RING TO BE EXTENDED TO FUELING AREAS AND OTHER EQUIPMENT AREAS REMOTE FROM EQUIPMENT COMPOUND, WITH GROUND RODS INSTALLED PER CLEAN ENERGY SPECIFICATIONS.

C. CONNECTIONS AND CONTROLS

1. THE CONTRACTOR SHALL WIRE ALL CONTROL DEVICES FURNISHED BY OTHERS IN ACCORDANCE WITH SCHEMATIC AND WIRING DIAGRAMS FURNISHED WITH THE EQUIPMENT, THIS SPECIFICATION, AND THE CONSTRUCTION DRAWINGS.

D. IDENTIFICATION AND LABELING

1. INSTALL NON-CORRODING METAL-STRIP CONDUIT TAGS WITH EMBOSSED CONDUIT NUMBERS AT END POINTS OF ALL CONDUITS, AND AT PENETRATIONS INTO SLABS, GROUND, AND THE EQUIPMENT, ATTACHED WITH DOUBLE METAL BANDS.

2. IDENTIFY EACH CONDUCTOR USING BRADY-TAGS PROTECTED BY HEAT-SHRINKABLE SLEEVES. CONDUCTORS SHALL BE MARKED WHEREVER THEY TERMINATE IN AN EQUIPMENT ENCLOSURE, AND SHALL BE MARKED WITH THE TERMINAL ID NO. PROVIDED IN THE EQUIPMENT MANUFACTURER'S SHOP DRAWING(S).

3. IDENTIFY EACH ITEM OF ELECTRICAL EQUIPMENT WITH A 1 INCH X 2.5 INCH ENGRAVED NAMEPLATE. THE LETTERING SHALL BE 3/16 INCH HIGH, WITH BLACK TEXT ON A WHITE BACKGROUND.

4. ALL SPARE CONDUCTORS SHALL BE TAPED AT EACH END AND IDENTIFIED AS SPARE.

5. THE INSULATION OF A SINGLE-CONDUCTOR WIRE SHALL BE COLORED AS FOLLOWS:

120/208 VOLT CIRCUITS		CONTROL CIRCUITS		277/480 VOLT CIRCUITS	
WIRE	COLOR	WIRE	COLOR	WIRE	COLOR
NEUTRAL	WHITE	24VDC (+)	ORANGE	NEUTRAL	GRAY
PHASE A	BLACK	24VDC (-)	YELLOW	PHASE A	BROWN
PHASE B	RED	24VDC SIGNAL	BLUE	PHASE B	ORANGE
PHASE C	BLUE	120VAC SIGNAL	RED	PHASE C	YELLOW
GROUND	GREEN			GROUND	GREEN/YELLOW

FOR LARGE CONDUCTORS AVAILABLE ONLY WITH BLACK INSULATION, APPLY SUITABLY COLORED ELECTRICAL TAPE NEAR TERMINATIONS.

E. TESTING AND DEFICIENCIES

1. WHEN DEFICIENCIES ARE FOUND, THE DEFICIENCY SHALL BE CORRECTED AND THE TEST RE-RUN. THIS PROCEDURE SHALL BE REPEATED UNTIL THE DEFICIENCY IS CLEARED. TESTS SHALL BE PERFORMED BY QUALIFIED AND EXPERIENCED PERSONS.

2. ALL INSTALLATIONS AND WIRING SHALL BE THOROUGHLY TESTED TO DETERMINE PROPER POLARITY, PHASING, FREEDOM FROM SHORT CIRCUITS, FOR CONTINUITY AND OPERATION OF CONTRACTOR SUPPLIED EQUIPMENT, RELAYS, INSTRUMENTS, ETC. THE CONTRACTOR SHALL OPERATE ALL CIRCUIT BREAKERS, HAND SWITCHES AND PUSH BUTTONS BY HAND TO DEMONSTRATE PROPER MECHANICAL FUNCTION.

3.

4. COMPLETE TEST AND INSPECTION RECORDS SHALL BE MADE BY THE THE CONTRACTOR AND INCORPORATED INTO A REPORT, WHICH SHALL BE GIVEN TO THE CLEAN ENERGY. ALL READINGS TAKEN SHALL BE RECORDED.

4. ALL TESTS SHALL BE PERFORMED IN THE PRESENCE OF CLEAN ENERGY'S PROJECT MANAGER OR REPRESENTATIVE UNLESS INSTRUand Owner OTHERWISE.

6. AUTHORIZATION MUST BE OBTAINED FROM CLEAN ENERGY BEFORE ANY WORK IS DONE ON AN ENERGIZED CIRCUIT. THERE SHALL BE NO INTERRUPTION OF ENERGIZED CIRCUITS WITHOUT PRIOR AUTHORIZATION.

7. ALL CABLES AND EQUIPMENT INDICATED FOR 480V SERVICE, INCLUDING MOTORS AND TRANSFORMERS, SHALL BE TESTED FOR GROUND AND SHORTS BY MEANS OF A MEGGER INSULATION TESTING INSTRUMENT, WHICH SHALL IMPRESS A VOLTAGE OF NOT LESS THAN 500 VOLTS UPON THE CIRCUIT UNDER TEST.

8. WHERE TESTS INDICATE THAT INSULATION WAS DAMAGED BY HANDLING OR DURING INSTALLATION, NEW CABLE SHALL BE INSTALLED AT THE THE CONTRACTOR'S EXPENSE.

9. AFTER THE GROUNDING SYSTEM HAS BEEN INSTALLED, THE CONTRACTOR SHALL PERFORM THE FOLLOWING:

   a. TESTS MUST BE COMPLETED AND THE GROUNDING SYSTEM APPROVED BEFORE GROUND RODS ARE COVERED.

10. ALL ABOVE GRADE CONNECTIONS SHALL BE ACCESSIBLE FOR INSPECTION AND TESTING. INTERLOCKING CONTROL AND INSTRUMENTATION WIRING FOR EACH SYSTEM AND/OR PART OF A SYSTEM SHALL BE CAREFULLY CHECKED TO ASCERTAIN THAT THE SYSTEM WILL FUNCTION PROPERLY AS INDICATED BY THE WIRING DIAGRAMS, SCHEMATIC DIAGRAMS, DESCRIPTION OF OPERATION, ETC.

11. CLEAN ENERGY PERSONNEL SHALL SET CIRCUIT BREAKERS AND RELAYS PROPERLY COORDINATED SO THAT EQUIPMENT WILL BE IN PROPER OPERATING CONDITION BEFORE BEING PLACED IN SERVICE.

12. UPON COMPLETION OF PRELIMINARY CHECKS, ALL EQUIPMENT SHALL BE TESTED FOR SATISFACTORY OPERATION. CLEAN ENERGY PERSONNEL SHALL START EQUIPMENT AS DIRECTED BY CLEAN ENERGY'S PROJECT MANAGER OR OTHER AUTHORIZED REPRESENTATIVE.

F. ENCLOSURES AND SUPPORTS

1. SUPPORTS AND ENCLOSURES SHALL BE PROVIDED FOR ALL CONTRACTOR FURNISHED EQUIPMENT.

2. BOLT ELECTRICAL EQUIPMENT TO RACKS, PLATES WELDED TO RACKS, PLATES WELDED OR BOLTED TO OTHER STRUCTURES, BUILDINGS, OR WHERE PERMITTED, TO EQUIPMENT. DO NOT WELD TO ELECTRICAL EQUIPMENT. PROVIDE BACKING PLATES WHERE EQUIPMENT IS ATTACHED TO METAL THAT IS LESS THAN 1/8" INCH THICK. CONDUIT BOXES UP TO 6 INCHES SQUARE MAY BE SUPPORTED IN CONDUIT RUNS WITHOUT ADDITIONAL SUPPORT; HOWEVER, BOXES ON FREE-STANDING STUB-UPS SHALL BE PROVIDED WITH EXTRA SUPPORT.

3. SUPPLEMENTARY SUPPORTS, CLIPS, AND BRACKETS SHALL BE CONSTRUCTED FROM STANDARD ROLLED STEEL SHAPES, HOT DIPPED GALVANIZED AFTER FABRICATION. ANGLES, PLATES, CHANNELS, UNI-STRUT, POWER STRUT OR RODS MAY BE USED FOR THIS PURPOSE. WELDING TO A GALVANIZED STRUCTURE SHALL NOT BE PERMITTED. USE CORROSION-PROOF BOLTS, STRAPS, ETC.

4. RACKS SHALL BE STRUCTURAL SHAPES WELDED OR BOLTED TOGETHER AND SUPPORTED FROM OTHER STRUCTURES, OR INDEPENDENTLY SUPPORTED BY CONCRETE FOUNDATIONS.

G. UNDERGROUND CONDUITS

1. MINIMUM BURIAL DEPTH FOR UNDERGROUND CONDUIT SHALL BE 24 INCHES BELOW TOP OF FINISHED GRADE. WHERE POWER CONDUIT IS INSTALLED IN THE SAME TRENCH AS GAS PIPE, INSTALL GAS PIPE AT LEAST 6" ABOVE THE CLOSEST POWER CONDUIT. ALL UNDERGROUND CONDUIT RUNS MUST BE CLEAR OF CROSSING PIPES OR STRUCTURES BY AT LEAST 6 INCHES; THUS, MINIMUM DEPTHS MAY BE REQUIRED THAT ARE GREATER THAN 24 INCHES TO BE PROPERLY SEPARATED FROM UNDERGROUND STRUCTURES .

2. CONDUITS PLACED UNDERGROUND SHALL BE RUN AS SHOWN ON DRAWINGS AND SUPPORTED A MINIMUM OF EVERY 10 FEET, USING FABRICATED DUCT SPACERS, TO PREVENT SAGGING WHILE WAITING FOR ENCASEMENT OR BACKFILL. CONDUITS RUN IN MULTIPLE SHALL BE SEPARATED AT LEAST 2 INCHES CLEAR. THEY SHALL BE SEPARATED EVENLY THROUGHOUT THE RUN, EXCEPT WHERE IT IS NECESSARY TO FAN OUT AT RISERS AND TRANSITIONS. CHANGE OF HORIZONTAL DIRECTIONS OF CONDUIT RUNS SHALL BE MADE IN LONG, GENTLE SWEEPS. INSTALL SPARE CONDUITS AS SHOWN ON DRAWINGS. BACKFILL AND TRENCHING SHALL BE CONSISTENT WITH THE PROVISIONS OF THIS SPECIFICATION.

3. add space MINIMUM HORIZONTAL CLEARANCE BETWEEN INCOMING UNDERGROUND UTILITIES (GAS OR ELECTRIC) AND OTHER PIPING OR CONDUITS.

4. WHERE MULTIPLE CONDUITS COME TO THE SURFACE, THROUGH SLABS OR PADS, CONDUIT SHALL CONTINUE TO 6 INCHES ABOVE THE SURFACE BEFORE INSTALLATION OF FITTINGS OR SEALS, WHEREVER PRACTICAL.

5. WHERE A SINGLE CONDUIT COMES TO THE SURFACE THROUGH SLABS OR PADS, CONCRETE ENCASEMENT SHALL TERMINATE AT THE SLAB OR PAD SURFACE. IF RISING INTO SLAB-MOUNTED OR PAD MOUNTED SWITCHBOARDS, MOTOR CONTROL CENTERS, AND SIMILAR EQUIPMENT, EXTEND THE CONDUIT UP 3 INCHES AND BUSH WITH AN INSULATED GROUNDING BUSHING.

6. ALL PVC CONDUIT RUNS COMING UP TO A CONCRETE SLAB, PAD, OR ABOVE GRADE CONDUIT RUN SHALL BE TERMINATED WITH A RIGID STEEL CONDUIT RISER AND THE APPROPRIATE ADAPTER FOR THIS TRANSITION OR AS NOTED ON PLANS.

H. ABOVEGROUND CONDUITS

1. ARRANGEMENT AND GROUPING OF DUCTS SHALL BE RUN AS-SHOWN ON THE DRAWINGS, FROM PLACE-TO-PLACE, AND SHALL BE INSTALLED AT ELEVATIONS IN ABOVE GRADE CONDUIT.

2. SUPPORT EXPOSED CONDUIT ON MAXIMUM SIX (6) FOOT CENTERS AND WITHIN TWO (2) FEET OF ANY CONNECTION POINT. CONDUIT AND FITTINGS MAY BE SUPPORTED FROM MACHINERY SUPPORTING STRUCTURES ADEQUATE FOR ADDITIONAL WEIGHT. CONDUIT AND FITTINGS CAN NOT BE CLAMPED OR WELDED OR BOLTED TO VESSELS FOR MACHINERY EXCEPT AS SPECIFICALLY PERMITTED BY CLEAN ENERGY OR AS SHOWN ON THE DRAWINGS.

3. FACTORY 90 DEGREE CONDUIT BENDS SHALL BE USED FOR CONDUIT SIZED 1-1/2 INCHES AND ABOVE. RADIUS OF FIELD BENDS SHALL NOT BE LESS THAN 10 TIMES DIAMETER OF CONDUIT. CONDUIT BENDS AND OFFSETS SHALL BE AVOIDED WHERE POSSIBLE. CONDUIT FLATTENED OR WRINKLED DURING BENDING SHALL NOT BE USED.

4. ENDS OF ALL CONDUITS TERMINATING IN OTHER THAN WIRING DEVICE BOXES SHALL BE PROVIDED WITH INSULATING BUSHINGS. INSULATED GROUNDING BUSHINGS WITH THROUGH-TERMINALS FOR NO.6 AWG WIRE SHALL BE PROVIDED ON ALL CONDUITS RISING INTO MOTOR CONTROL CENTERS AND SWITCHBOARDS.

5. INSTALL LIQUID-TIGHT FLEXIBLE METALLIC CONDUIT BETWEEN RIGID CONDUIT AND MOTORS, VIBRATING EQUIPMENT, MOVABLE EQUIPMENT, AND INSTRUMENTS. MINIMUM ONE (1) FOOT AND MAXIMUM THREE (3) FEET IN LENGTH.

6. INSTALL CONDUIT SEALS WHERE REQUIRED. POUR SEALS WITH THE SEAL MANUFACTURER'S SPECIFIED COMPOUND AFTER SYSTEMS ARE FUNCTIONAL AND HAVE BEEN ACCEPTED BY CLEAN ENERGY AND THE JURISDICTION. SEAL FITTING PLUGS SHALL NOT BE INSTALLED FOR 24 HOURS AFTER POURING SEALING COMPOUND.

7. OPEN ENDS OF CONDUITS SHALL BE CAREFULLY PLUGGED DURING CONSTRUCTION TO PREVENT THE ENTRANCE OF FOREIGN MATERIALS. AFTER CONDUITS ARE INSTALLED, PULL A MANDREL THROUGH EACH CONDUIT TO CLEAR THE CONDUIT OF DEBRIS. FOLLOW THE MANDREL WITH WIRE BRUSHES AND SWABS TO COMPLETELY CLEAN THE CONDUIT. IMMEDIATELY AFTER A CONDUIT IS CLEANED, PLUG OR CAP THE RUN. INSTALL PULL STRINGS IN ALL SPARE CONDUITS, 3/16" NYLON MIN.

8. COVERED OPENINGS ON CONDUIT FITTINGS SHALL NOT BE BLOCKED BY STRUCTURAL STEEL OR PIPE WHICH WOULD NECESSITATE DISASSEMBLY OF PIPE, OR OTHER EXTREME MEASURES, FOR ACCESS TO THE INTERIOR OF FITTINGS FOR FUTURE WIRE REPLACEMENT AND PULLING.

9. ON MASONRY AND CONCRETE STRUCTURES, CONDUITS SHALL BE ATTACHED WITH ONE-HOLE PIPE STRAPS AND CLAMP-BACKS USING SCREW ANCHORS OR EXPANSION BOLTS.

10. EXPOSED CONDUIT SHALL BE INSTALLED PARALLEL TO STRUCTURAL MEMBERS AND SURFACES.

11. TWO OR MORE CONDUITS IN THE SAME GENERAL ROUTING SHALL BE PARALLEL WITH SYMMETRICAL BENDS.

12. CONDUITS SHALL BE INSTALLED AT LEAST 6 INCHES FROM HIGH TEMPERATURE PIPING, DUCTS, AND FLUES.

13. CONDUIT CONNECTIONS TO SHEET METAL ENCLOSURES SHALL BE SECURELY FASTENED BY LOCKNUTS INSIDE AND OUTSIDE.

14. CONDUITS SHALL BE INSTALLED BETWEEN THE REINFORCING STEEL IN WALLS OR SLABS WHICH HAVE REINFORCEMENT IN BOTH FACES. IN SLABS WHICH HAVE ONLY A SINGLE LAYER OF REINFORCING STEEL, CONDUITS SHALL BE CLEAR OF THE STEEL AND THE CONCRETE SURFACE.

15. UPON COMPLETION, ENSURE THAT EQUIPMENT IS CLEAN; STRUCTURAL ELEMENTS ARE COMPLETE AND TIGHT; ARE PROPERLY HARNESSED, SECURED, AND IDENTIFIED; CONDUITS ARE BUSHED, TAGGED, AND SUPPORTED; SEALS ARE IN PLACE; GROUND WIRES ARE PROVIDED AND CONNECTED; TAGS, LABEL PLATES, AND INSTRUCTION PLATES ARE ATTACHED AND SECURE.

EXP. DATE: 10/31/2017
COLORADO LICENSED
RICHARD L. REMILLARD
0047005
PROFESSIONAL ENGINEER
DATE SIGNED:

REV	DATE	REVISIONS	BY
0	05/15/2017	ISSUED FOR PERMIT SUBMITTAL	HVT

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CNG FUELING FACILITY
GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
ELECTRICAL NOTES

ASSET NO: 160-11-17307.02.00

DATE	05/01/2017
DESIGNED BY	HVT
CHECKED BY	MES
APPROVED BY	RLR
SCALE	
SHEET	E-0.0

W:\Engineering Projects - Current\Grand Junction, CO - Grand Valley Transit (2360\00\02.0 Drawings and Engineering\01-3-E00-ELECTRICAL NOTES.dwg - PLOTTED: May 12, 2017 - 1:29pm

UTILITY

(E) T-1 300 KVA
XXkV-480Y-277V
UTILITY TRANSFORMER
3Ø, 4W
Z= 5.0% (ASSUMED)
(1)

UTILITY

SHORT CIRCUIT AVAILABLE: 7,000A

CLEAN ENERGY

C400

(N) INTEGRATED MAIN SWITCHBOARD "MSB" NEMA 3R, 65KAIC PANEL FULLY RATED, Isc=8,000A INCLUDING 1,000A MOTOR CONTRIBUTION

M (2)

#3/0 GND

CONFIGURATION #7
800AF/800AT
3P W/ LOCKING DEVICE
65KAIC, LSIG (GFP)

480/Y277V, 800A COPPER BUS, 3Ø, 4W

600AF
600AT
3P, LSI
65KAIC

600AF
600AT
3P, LSI
65KAIC

125AF
30AT
3P
65KAIC

125AF
40AT
3P
65KAIC

XFMR
480-208/120V
3Ø, 15KVA
Z=5.25% (ASSUMED)

SPD

#3/0 GND

3/4"X10' GND ROD

C410

C420

(E) SWITCHBOARD "MSCG" TO BE BACK FED
FROM (N) 800AMP SWITCHGEAR "MSB"

(E) CT & METER CABINET WILL BE REMOVED
(E) CONDUCTORS TO BE REMOVED AND (E) CONDUIT
TO BE CAPPED BELOW GROUND PER UTILITY REQUIREMENTS.

C200

60A
3P

50A, 3P

15A, 2P

15A, 2P

15A, 2P

15A, 2P

15A, 1P

PANEL "LA"

LIGHTING CONTACTORS

(SEE NOTE 4)

PC

C210

(F)
DISPENSERLIGHT

C211

(F) YARD
LIGHTS
1.5 KW MAX
CONNECTED LOAD

CAP CONDUIT WITH PULL STRING
FOR FUTURE INSTALLATION

CAP CONDUITS AT BASE OF
EACH (F) LOCATION WITH
PULL STRING FOR
FUTURE INSTALLATION

CT & METER CABINET

(E) SWITCHBOARD "MSCG"
480/277V 3 P 4W SCCR = 18KAIC

600 AMP
3P

600 AMP BUS 3Ø, 4 WIRE

70 AMP
3P

70 AMP
3P

70 AMP
3P

30 AMP
3P

110 AMP
3P

60 AMP
3P

SYSTEM GROUND

HL-PC001

1" D SPARE

1" D SPARE

E-HL-PC001

30 KVA, 5.1 % Z

MAIN
100A
3-P

TO COMPRESSOR
ENCLOSURE
COMPRESSOR A&B

SINGLE POLE WALL
SWITCH +43"A.F.F. TO TOP
MOUNTED PANEL

HL-PC005

FAST FILL LIGHT

HL-PC002

E-NHL-PC002

80 WATT POLE MTD.
AREA LIGHT 120V

TO BOLLARD LIGHTS AND
RECEPTACLES

FAST FILL CARD
READER POWER

HL-PC003
HL-PC004

FAST FILL
DISPENSER AND
ESD LOOP POWER

E-NDC-UTILITY-1

E-HL-PC001

E-HL-PC002

HL-PC001

HL-PC002

HL-PC001

E-HL-PC003

STARTER

FAN

LIGHT

SW

STARTER

CONTROLS

CONTROLS

STARTER

NG
DRYER

480V/3P
19FLA/60HZ

CONTROLS

STARTER

40
HP

40
HP

40
HP

50
HP

TO SUB
PANEL

(E) COMPRESSOR "A"
480V/3P/52FLA/60HZ

(E) COMPRESSOR "B"
480V/3P/52FLA/60HZ

(E) COMPRESSOR "C"
480V/3P/52FLA/60HZ

(E) COMPRESSOR "D" (ANGI)
480V/3P/65FLA/60HZ

#4/0 BC
GND
LOOP

DISCONNECT

(N) MOTOR CONTROL PANEL MCP "E" NEMA 4,
Δ480V, SUPPLIED BY COMPRESSOR
MANUFACTURER, CE COMPRESSION.
SCCR=65KAIC.

350 A
3P

30 A
3P

20A
3P

SS1 W/
BYPASS
&O/L

SOFTSTART

C411

C412

C413

#2/0 GND

#2/0 GND

#4/0 BC GROUND LOOP

3/4"X10' GND ROD

J-BOX

200HP
COMPRESSOR
(240 FLA)

10
HP
COOLER/
VENT FAN
MOTOR
(14,2 FLA)

1
HP
PRELUBE
MOTOR
(1,8 FLA)

OIL
HEATER
(2.4 FLA)

(N) COMPRESSOR SKID E SUPPLIED BY MFR (CE COMPRESSION)

#2/0 GND

#2/0 GND

#4/0 BC GND LOOP

3/4"X10' GND ROD

3/4"X10' GND ROD

SHEET NOTES:

(1) UTILITY COMPANY TRANSFORMER. CONTRACTOR TO PROVIDE REQUIRED SLAB BOX AND ALL ASSOCIATED UNDERGROUND CONDUITS AND GROUNDING PER UTILITY COMPANY CONSTRUCTION DOCUMENTS.

(2) LOCATION AND TYPE OF UTILITY METER TO BE COORDINATED WITH LOCAL UTILITY COMPANY.

(3) ALL PROTECTIVE DEVICES ARE FULLY RATED.

(4) REFER TO PANELBOARD SCHEDULE ON SHEET E-1.1 FOR BREAKER SIZING AND COUNT.

BY	REVISIONS	DATE	REV
KVT	ISSUED FOR PERMIT SUBMITTAL	05/15/2017	0

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CNG FUELING FACILITY
GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
ELECTRICAL SINGLE LINE DIAGRAM

ASSET NO: 163-11-17307.02.00

EXP. DATE: 10/31/2017
COLORADO LICENSED
RICHARD L. REMILLARD
0047005
PROFESSIONAL ENGINEER
DATE SIGNED:

DATE	DESIGNED BY ARY
05/01/2017	CHECKED BY MES
	APPROVED BY RLR
SCALE	AS NOTED
SHEET	E–1.0

W:\Engineering Projects - Current\Grand Junction, CO - Grand Valley Transit (20820.00)\0\2-D Drawings and Engineering\01\14-E01-SINGLE LINE DIAGRAM.dwg - PLOTTED: May 12, 2017 - 1:48pm

SCHEDULE OF LOADS IN SWITCHBOARD "MSB" 480Y/277V, 3-ϕ, 4-WIRE (SERVICE LOAD CALCULATION)		
DESCRIPTION	LOAD [KVA]	FLA
FEEDER "C410" TO MCP "E"	206.50	259.0
PANELBOARD "LA"	15.0	18.0
(E) SWITCHBOARD "MSCG"	233.5	280.8
SUBTOTAL LOAD	455.0	557.8
25% OF LARGEST MOTOR LOAD	47.8	60.0
TOTAL LOAD - SWITCHBOARD "MSB"	502.8	617.8

SCHEDULE OF LOADS IN MCP "E" Δ480V, 3-ϕ, 3-WIRE			
DESCRIPTION	LOAD [HP]	LOAD [KVA]	FLA
FEEDER "C410" LOADS			
COMPRESSOR E	200	191.2	240
COOLER FAN MOTOR E1	10	11.3	14.2
PRELUBE MOTOR	1.0	1.4	1.80
OIL HEATER (CONTINUOUS)		2.0	2.4
25% OF HEATER LOAD		0.5	0.6
SUBTOTAL LOAD	211.0	206.5	259.0
25% OF LARGEST MOTOR LOAD	50.0	47.8	60.0
TOTAL LOAD - FEEDER "C410"	261.0	254.3	319.0

SCHEDULE OF LOADS IN (E) SWITCHBOARD "MSCG" 480Y/277V, 3-ϕ, 4-WIRE (SERVICE LOAD CALCULATION)			
DESCRIPTION	LOAD [HP]	LOAD [KVA]	FLA
COMPRESSOR A	40.0	43.2	52
COMPRESSOR B	40.0	43.2	52
COMPRESSOR C	40.0	43.2	52
COMPRESSOR D "ANGI"	50	54.0	65.0
30KVA XFMR		30	36.1
CNG DRYER		15.8	19
GAS DRYER (CONTINUOUS)		3.9	4.8
SUBTOTAL LOAD		233.5	280.8
25% OF LARGEST MOTOR LOAD	12.5	13.5	16.3
TOTAL LOAD - SWITCHBOARD "MSB"		247.0	297.1

(FUTURE BY OTHERS)

LIGHTING FIXTURE SCHEDULE						
TYPE	DESCRIPTION	LAMPS	VOLTAGE	WATTAGE	QTY.	TOTAL WATTAGE
A	METAL HALIDE LIGHT WITH (2) ARMS MOUNTED @ 180°. CEW LIGHTING MFG. MODEL: FPS8417-M LIGHTS MOUNTED ON A 4"X4"X20'H POLE 8.25" X 8.25" BASE MOUNT.	175W,	208V	2 X 175 W	2	700W
B	METAL HALIDE LIGHT WITH (1) ARMS MOUNTED. CEW LIGHTING MFG. MODEL: FPS8417-M LIGHTS MOUNTED ON A 4"X4"X20'H POLE 8.25" X 8.25" BASE MOUNT.	175W,	208V	175 W	2	350W

CONDUIT AND WIRE SCHEDULE (SEE NOTE 2)								
I. D. NO.	CONDUIT(S)	JW CONDUIT	FILL [%]	CONDUCTORS/CONDUIT	AMPACITY	REQ'D AMPACITY	LENGTH [ft]	VOLTAGE DROP [%]
C210	3/4"		10.7%	(2) #12 + #12 GND	25.0	1.1	100	0.2%
C211	3/4"		10.7%	(2) #12 + #12 GND	25.0	5.3	250	2.1%
C400	(3) 4"		14.5%	(4) 300 KCMIL	855.0	617.8	200(EST)	0.9%
C410	(2) 3"		23.5%	(3) 350 KCMIL + #1 GND	620.0	319.0	30	0.1%
C411	3"	E1	23.5%	(3) 350KCMIL + #1 GND	310.0	300.0	40	0.3%
C412	1"	E2	20.4%	(3) #10 + (1)#10 GND	28.0	17.8	40	0.3%
				(3) #12 + (1)#12 GND	20.0	2.3		
C413	3/4"	E3	14.3%	(3) #12 + (1)#12 GND	25.0	3	40	0.1%
C420	(2) 3"		23.5%	(3) 350 KCMIL + #1 GND	620.0	297.1	150	0.4%

PANELBOARD 'LA'

MAIN: 208/120 VOLT / 3 PHASE / 4 WIRE — MAIN BREAKER: 60A — MOUNTING: SURFACE
BUS: 1 SECTION: SINGLE LUGS — BUS: 250A — A.I.C. RATING: 10K

LOAD VA	LOAD DESCRIPTION	OUTLETS M	OUTLETS R	OUTLETS L	CB / P	CKT #	PHASE	CKT #	CB / P	OUTLETS L	OUTLETS R	OUTLETS M	LOAD DESCRIPTION	LOAD VA
	MAIN BREAKER					1	A	2	15/2				SPARE	150
	MAIN BREAKER				60/3	3	B	4					SPARE	150
	MAIN BREAKER					5	C	6	15/2				DISPENSER LIGHTING	88
2000	(F) FUEL SYSTEM SUPPORT PANEL					7	A	8					DISPENSER LIGHTING	88
2000	(F) FUEL SYSTEM SUPPORT PANEL				50/3	9	B	10	15/2				YARD LIGHTING	438
2000	(F) FUEL SYSTEM SUPPORT PANEL					11	C	12					YARD LIGHTING	438
2400	SKID CONTROL POWER				30/1	13	A	14	20/1				CARD READER POWER	500
100	DEWPOINT SENSOR POWER				15/1	15	B	16	15/1				LIGHTING CONTACTOR	300
	SPARE				20/1	17	C	18	20/1				RECEPTACLE	1920

PHASE	A	B	C
PHASE TOTAL VA:	5138	2988	4446
PANEL TOTAL: CONNECTED	12572	VA	
(L.C.L.) @125%:	0	VA	
(K.E.L.) @ 65%:	0	VA	
(LARGEST MOTOR) 125%:	0	VA	
GEN. RECEPT. DEMAND	0	VA	
REMAINING @100%	12572	VA	
PANEL TOTAL W/ DEMAND:	12572	VA	

PANEL LOCATION: CNG EQUIPMENT YARD
AREA SERVED: CNG EQUIPMENT YARD
FED FROM: MAIN SWITCHBOARD

15.1 FULL LOAD AMPS @ 480V 3ϕ

SINGLE LINE DIAGRAM SYMBOLS

SYMBOL	DESCRIPTION
M	UTILITY KWHR METER
	GROUND CONNECTION
	MAGNETIC STARTER WITH NEMA SIZE INDICATED
	SPACE HEATER
	SOLENOID
	UNIT WIRING
	FIELD WIRING
G	STATUS INDICATING LAMP (W/ COLOR INDICATED)
MOMENTARY	MOMENTARY PUSHBUTTON
MAINTAINED	MAINTAINED PUSHBUTTON W/ MUSHROOM HEAD
F	FUSE (F=FUSE SIZE)
NO / NC	GENERAL CONTACT STARTER, RELAY, ETC
	CIRCUIT BREAKER
	THERMAL OVERLOAD ELEMENT
AF / AT, P	MOLDED CASE CIRCUIT BREAKER WITH BREAKER FRAME & TRIP AMP RATING, NO. OF POLES
AS / P / AF	FUSED SWITCH WITH SWITCH AMP RATING, NO. OF POLES, FUSE AMP RATING
K	KIRK KEY

SYMBOL	DESCRIPTION
	POWER TRANSFORMER
GFP	GROUND FAULT PROTECTION
	EXPOSED CONDUIT
	SEALTIGHT FLEXIBLE CONDUIT
	"T" TYPE FITTING
	"L" TYPE FITTING
	CONDUIT WITH CONDUIT SEAL FITTING
	GROUND WIRE
	3/4" DIA x 10'-0" LONG COPPER CLAD GROUND ROD
	SINGLE NON LOCKING RECEPTACLE 20A, 120V, 2P, 3W. GNDG.
GFI	GROUNDING TYPE DUPLEX OUTLET WITH GROUND FAULT INTERRUPTING
C	CONTACTOR
HP	THREE PHASE MOTOR
	SINGLE PHASE MOTOR
	LIGHTING OR POWER PANEL
	ESD - EMERGENCY SHUT DOWN DEVICE CLASS 1 DIV 2 GROUP D FUSED DISCONNECT SWITCH, SIZE NOTED ON PLANS. NON FUSED DISCONNECT SWITCH, SIZE NOTED ON PLANS.
	HOME RUN TO PANEL
J	JUNCTION BOX
CXXX	CABLE/CONDUIT RUN IDENTIFICATION #
PC	PHOTOCELL
SPD	SURGE PROTECTION DEVICE
UPS	UNINTERRUPTIBLE POWER SUPPLY
ATS	AUTOMATIC TRANSFER SWITCH
MTS	MANUAL TRANSFER SWITCH

SHEET NOTES:

1. CONDUCTOR SIZES ARE SUITABLE FOR AMBIENT TEMPERATURES UP TO 40°C (104°F).
2. ALL CONDUITS SHALL BE SCH 40 PVC UNDERGROUND, AND RMC ABOVE GROUND. CONDUIT FILLS SHOWN ARE FOR SCH 40 PVC.

DESIGN INTENT:

SIZE POWER FEEDERS AND SELECT OVER-CURRENT PROTECTION BASED ON EQUIPMENT LAYOUT, ENGINEERING DATA, MOTOR CONTROL PANEL DESIGN AND EQUIPMENT LOADS PROVIDED BY CLEAN ENERGY AND THE EQUIPMENT MANUFACTURER.

EXP. DATE: 10/31/2017
COLORADO LICENSED RICHARD L. REMILLARD 0047005 PROFESSIONAL ENGINEER
DATE SIGNED:

REV	DATE	REVISIONS	BY
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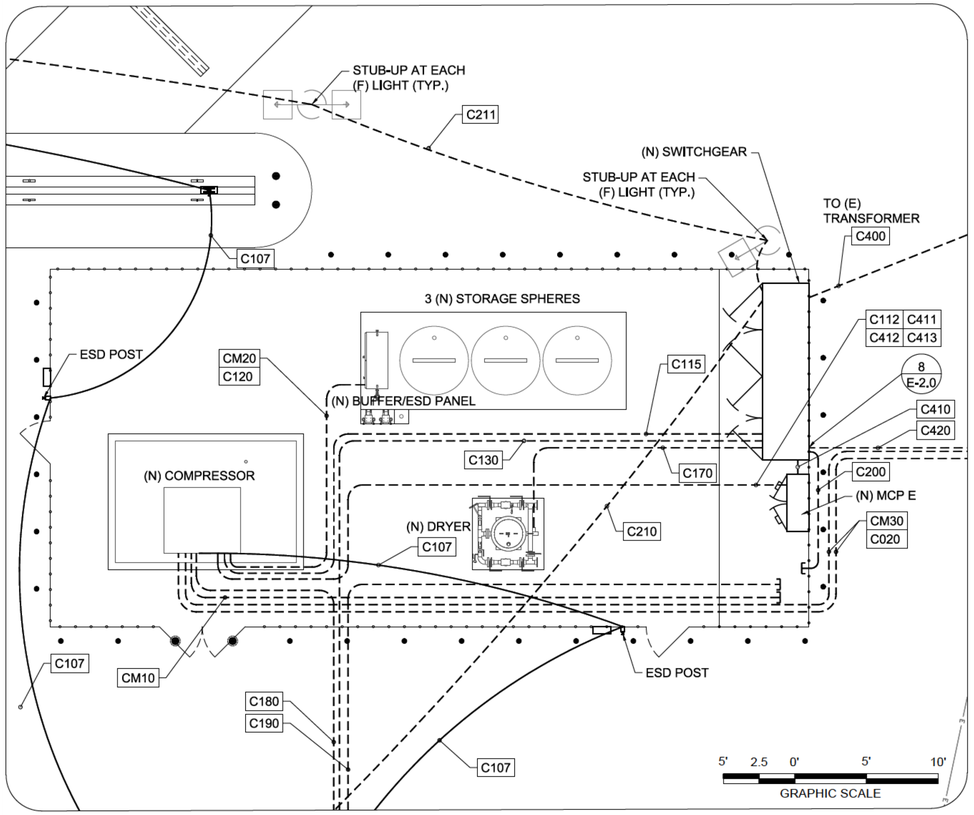
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GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
ELECTRICAL LOAD SCHEDULE

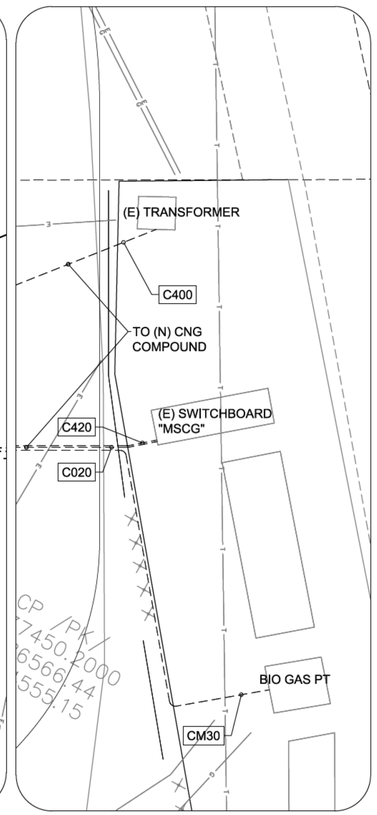
ASSET NO: 160-11-173/07.02.00

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05/01/2017	CHECKED BY	MES
	APPROVED BY	RLR
SCALE	AS NOTED	
SHEET	E–1.1	

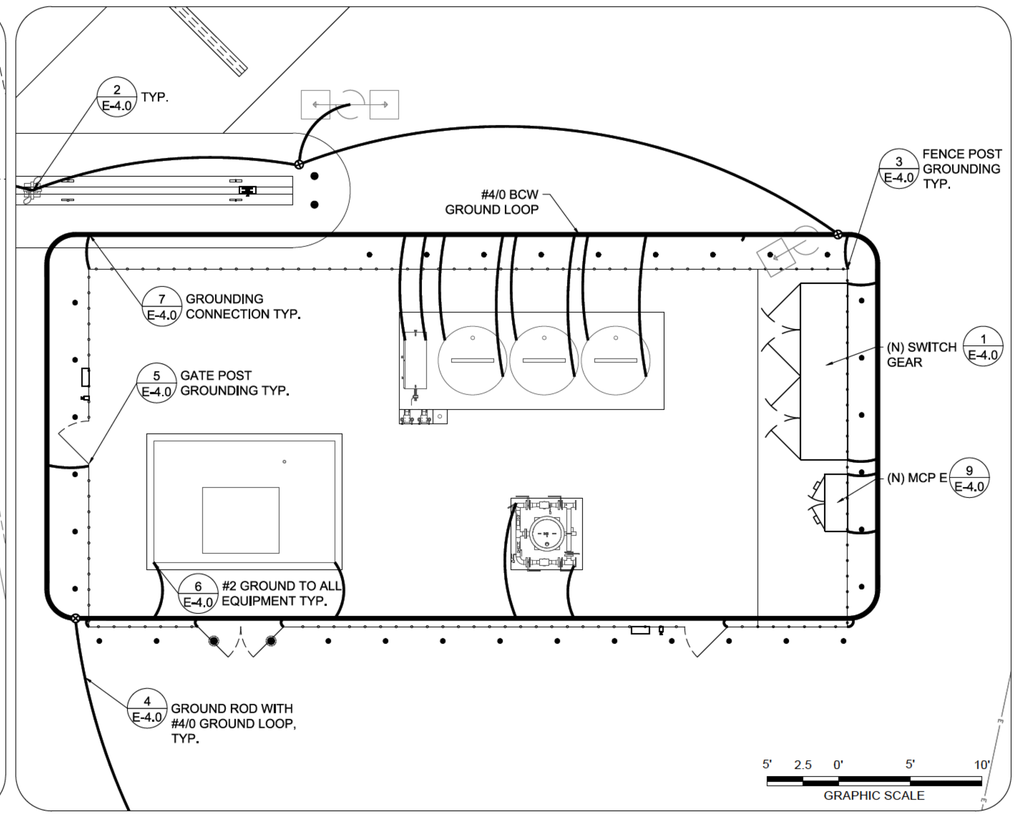
W:\Engineering Projects - Current\Grand Junction, CO - Grand Valley Transit (2803.00)\2.0 Drawings and Engineering\01\E01.1-ELECTRICAL LOAD SCHEDULE.dwg - PLOTTED: May 12, 2017 - 1:29pm



EQUIPMENT COMPOUND ELECTRICAL LAYOUT (1"=5')



CONNECTION TO (E) EQUIPMENT (1"=12')



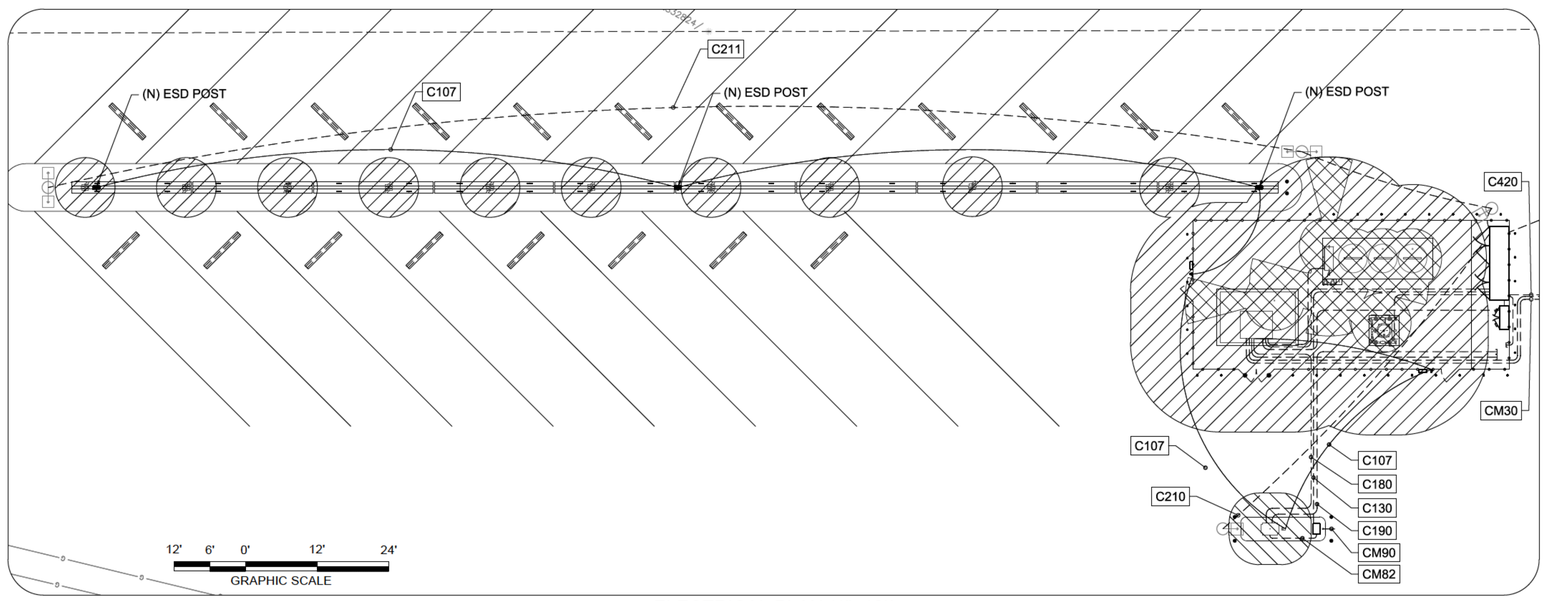
EQUIPMENT COMPOUND GROUNDING LAYOUT (1"=5')

ELECTRICAL NOTES

1. PROVIDE #2 PIGTAIL FOR ALL EQUIPMENT GROUNDING. CONNECT ALL #2 PIGTAILS TO MAIN GROUND BUS.
2. ALL BURIED GROUND CONNECTIONS SHALL BE CAD-WELDED.
3. CADWELD #2 PIGTAIL TO COMPRESSOR SLAB REBAR: 2 LOCATIONS MINIMUM.
4. HOME RUN ROUTING TO BE DETERMINED IN THE FIELD.
5. SEE TYPICAL GROUND WELL DETAIL ON SHEET E-4.0.
6. POLE RISER AND UTILITY TRANSFORMER GROUNDING SHALL BE DONE BY THE UTILITY COMPANY.
7. ALL ELECTRICAL WIRING SHALL CONFORM TO NEC SECTION 501.10(A) FOR CLASS 1 DIVISION 1 AREAS AND SECTION 501.10(B) FOR CLASS 1 DIVISION 2 AREAS.
8. CONTRACTOR SHALL PROVIDE CONDUIT SEALS WHERE REQUIRED BY CHAPTER 500 OF THE NEC FOR CLASSIFIED AREAS.
9. REFER TO NFPA 52 TABLE 8.4.2.0 AND NEC ARTICLE 514 FOR EXTENT OF CLASSIFIED AREA(S) FOR PROPOSED CNG AS WELL AS EXISTING LIQUID AND PROPANE FUELS (IF ANY).
10. CLASSIFIED AREA(S) IN PLAN VIEW ARE SHOWN HATCHED. AREA EXTENDING OVER TOP OF UNPIERCED WALL(S) SHOWN AS DASHED LINE.
11. COMPRESSOR SKID WITH EMERGENCY SHUTDOWN (ESD) PUSH BUTTON IS FACTORY INSTALLED.
12. COORDINATE PHONE SERVICE REQUIREMENTS WITH OWNER.
13. COORDINATE EQUIPMENT INSTALLATION AND CONDUIT ROUTING WITH OTHER WORK.
14. CONTRACTOR SHALL VERIFY LOCATION OF EXISTING UTILITIES AND UNDERGROUND PIPING AND CONDUITS PRIOR TO START OF EXCAVATION.
15. COORDINATE ROUTING AND INSTALLATION OF ELECTRIC SERVICE WITH LOCAL UTILITY.
16. EQUIPMENT DIMENSIONS AND TIE-IN POINTS ARE APPROXIMATE. COORDINATE INSTALLATION IN THE FIELD BASED UPON ACTUAL EQUIPMENT AND EQUIPMENT INSTALLATION MANUALS PROVIDED.
17. EMERGENCY SHUTDOWN (ESD) PUSH BUTTONS SHALL BE LOCATED WITHIN 10 FEET AND ALSO GREATER THAN 25-FEET FROM DISPENSING AREAS. (NFPA 52 8.11.5)
18. UNDERGROUND CONDUIT SHALL BE BURIED NOT LESS THAN 24-INCHES BELOW GRADE. MAINTAIN 3 FT MINIMUM HORIZONTAL CLEARANCE BETWEEN INCOMING UNDERGROUND UTILITIES (GAS OR ELECTRIC) AND OTHER PIPING OR CONDUITS RUNNING PARALLEL TO THEM AND 1FT MINIMUM VERTICAL CLEARANCE WHERE CROSSING.
19. REFER TO CONDUIT SCHEDULE AND SINGLE LINE FOR CONDUIT AND CONDUCTOR SIZING AND TYPES. ALL NEW CONDUCTORS SHALL BE TYPE THHN UNLESS OTHERWISE NOTED.
20. ALL CONDUIT RUNS SHOWN ARE SCHEMATIC.

ELECTRICAL LEGEND

C400	DENOTES CONDUITS LISTED ON SHEET E-2.0
	CLASS 1, DIV I SPACE
	CLASS 1, DIV 2 SPACE SEE NOTES 7, 8, 9, 10



ELECTRICAL PLAN (1"=12')

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EXP. DATE: 10/31/2017
COLORADO LICENSED
RICHARD L. REMILL
0047005
PROFESSIONAL ENGINEER
DATE SIGNED:

CNG FUELING FACILITY
GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
ELECTRICAL PLAN

ASSET NO: 160-11-17307.02.00

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SCALE	AS NOTED
SHEET	E-2.0

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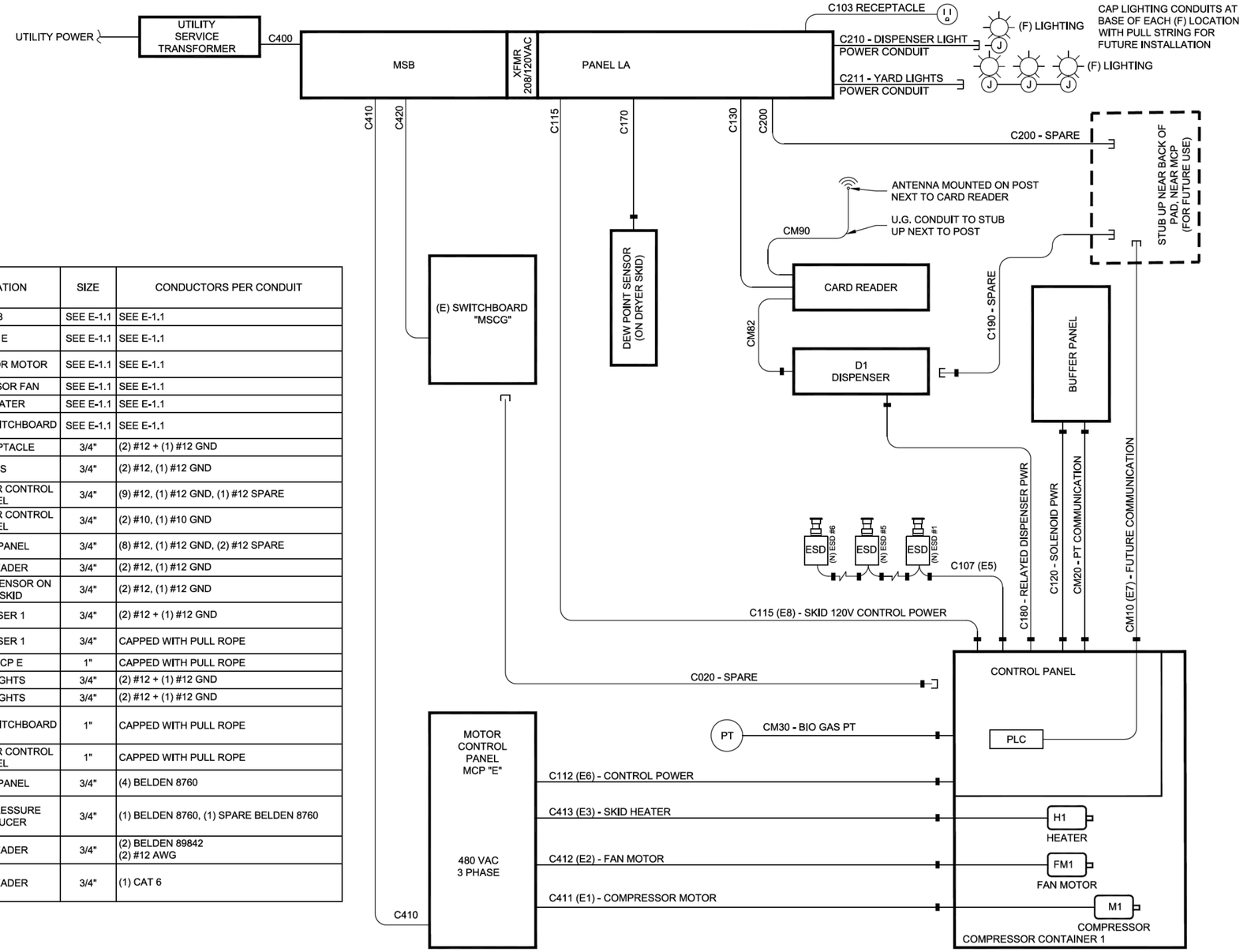
1. SEE JW POWER CNG MANUFACTURER'S DRAWING SHEET FOR ALL REQUIRED FEEDERS AND COMMUNICATION LINES FROM MOTOR CONTROL PANEL TO COMPRESSOR CONTAINER EQUIPMENT. PROVIDE ALL REQUIRED CONNECTIONS. FIELD COORDINATE WITH EQUIPMENT DRAWING.

NOTES:

2. SEE JW POWER CONTROL PANEL DRAWING FOR WIRING TERMINATIONS.

3. INDICATES —|— CONDUIT SEAL FITTING REQUIRED.

CKT NO.	JW CKT. NO.	DESCRIPTION	VOLTAGE [V]	#-ϕ	ORIGIN	DESTINATION	SIZE	CONDUCTORS PER CONDUIT
C400	-	UTILITY POWER	480	3	UTILITY XFMR	MSB	SEE E-1.1	SEE E-1.1
C410	-	POWER TO MCP E	480	3	MSB	MCP E	SEE E-1.1	SEE E-1.1
C411	E1	COMPRESSOR MOTOR CONDUIT	480	3	MCP E	COMPRESSOR MOTOR	SEE E-1.1	SEE E-1.1
C412	E2	POWER TO JUNCTION BOX #930	480	3	MCP E	COMPRESSOR FAN	SEE E-1.1	SEE E-1.1
C413	E3	DRYER POWER	480	3	MCP E	SKID HEATER	SEE E-1.1	SEE E-1.1
C420	-	POWER TO (E) "MSCG" SWITCHBOARD	480	3	MCP E	(E) "MSCG" SWITCHBOARD	SEE E-1.1	SEE E-1.1
C103	-	POWER TO WP RECEPTACLE	120	1	PANEL "LA"	WP RECEPTACLE	3/4"	(2) #12 + (1) #12 GND
C107	E5	ESD LOOP	24	1	COMPRESSOR CONTROL PANEL	ESD'S	3/4"	(2) #12, (1) #12 GND
C112	E6	CONTROL POWER	120	1	MCP E	COMPRESSOR CONTROL PANEL	3/4"	(9) #12, (1) #12 GND, (1) #12 SPARE
C115	E8	CONTROL POWER	120	1	PANEL "LA"	COMPRESSOR CONTROL PANEL	3/4"	(2) #10, (1) #10 GND
C120	-	BUFFER PANEL SOLENOID PWR	120	1	COMPRESSOR CONTROL PANEL	BUFFER PANEL	3/4"	(8) #12, (1) #12 GND, (2) #12 SPARE
C130	-	CARD READER POWER	120	1	PANEL "LA"	CARD READER	3/4"	(2) #12, (1) #12 GND
C170	-	DEW POINT SENSOR PWR	120	1	PANEL "LA"	DEW POINT SENSOR ON DRYER SKID	3/4"	(2) #12, (1) #12 GND
C180	-	RELAYED POWER TO DISPENSER	120	1	COMPRESSOR CONTROL PANEL	DISPENSER 1	3/4"	(2) #12 + (1) #12 GND
C190	-	SPARE CONDUIT	-	-	NEAR MCP E	DISPENSER 1	3/4"	CAPPED WITH PULL ROPE
C200	-	SPARE PWR CONDUIT	-	-	PANEL "LA"	NEAR MCP E	1"	CAPPED WITH PULL ROPE
C210	-	(F) POWER TO DISPENSER LIGHT	208	1	PANEL "LA"	YARD LIGHTS	3/4"	(2) #12 + (1) #12 GND
C211	-	(F) POWER TO YARD LIGHTS	208	1	PANEL "LA"	YARD LIGHTS	3/4"	(2) #12 + (1) #12 GND
C020	-	SPARE CONDUIT	-	-	COMPRESSOR SKID	(E) "MSCG" SWITCHBOARD	1"	CAPPED WITH PULL ROPE
CM10	E7	SPARE CONDUIT - FUTURE LAN COMMUNICATION	(DATA)	-	NEAR MCP E	COMPRESSOR CONTROL PANEL	1"	CAPPED WITH PULL ROPE
CM20	-	BUFFER PANEL PRESSURE TRANSDUCERS	(DATA)	-	COMPRESSOR CONTROL PANEL	BUFFER PANEL	3/4"	(4) BELDEN 8760
CM30	-	BIO GAS PRESSURE TRANSDUCER	(DATA)	-	COMPRESSOR CONTROL PANEL	BIO GAS PRESSURE TRANSDUCER	3/4"	(1) BELDEN 8760, (1) SPARE BELDEN 8760
CM82	-	CARD READER COMMUNICATION	RS-485 24VDC	1	DISPENSER 1	CARD READER	3/4"	(2) BELDEN 89842 (2) #12 AWG
CM90	-	CARD READER ANTENNA COMMUNICATION TO ELECTRICAL ROOM	(DATA)	1	DISPENSER 1	CARD READER	3/4"	(1) CAT 6



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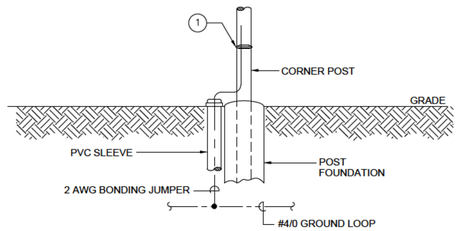
CNG FUELING FACILITY
GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
ELECTRICAL CONDUIT SCHEDULE

ASSET NO: 160-11-17307.02.00

EXP. DATE: 10/31/2017
COLORADO LICENSED RICHARD L. REMILLARD 0047005 PROFESSIONAL ENGINEER
DATE SIGNED:

DATE 05/01/2017	DESIGNED BY ARY CHECKED BY MES APPROVED BY RLR
SCALE	AS NOTED
SHEET	E-3.0

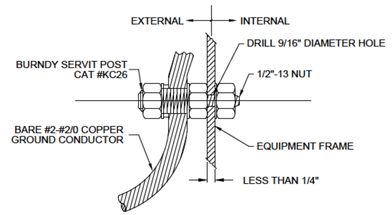
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ITEM	QTY	DESCRIPTION
1	1	CONNECTOR, GROUND, BURNDY, TYPE GAR OR EQUAL

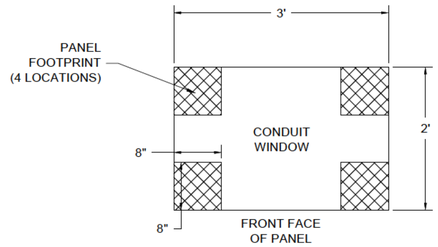
FENCE POST GROUNDING 3 E-2.0

N.T.S.



BOLTED EQUIPMENT GROUNDING 6 E-2.0

N.T.S.

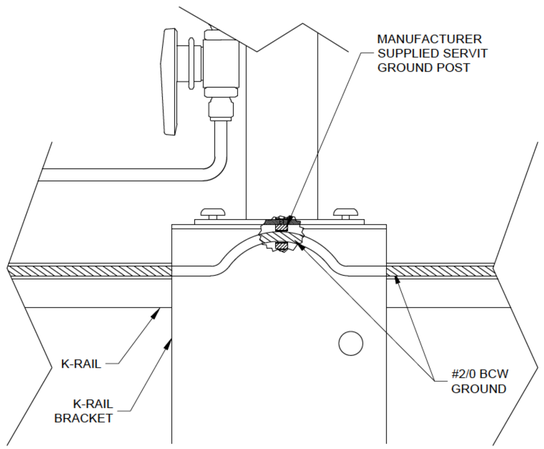


FUEL SYSTEM SUPPORT PANEL CONDUIT WINDOW 10 E-2.0

N.T.S.

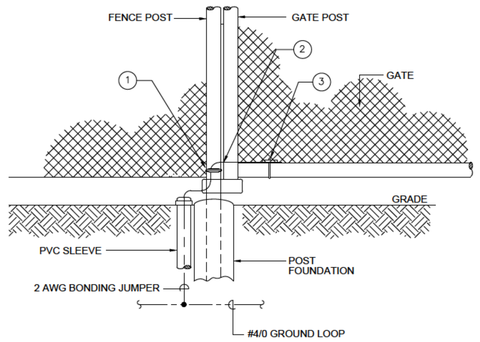
GROUNDING NOTES

1. FOR ELECTRICAL ABBREVIATIONS, LEGEND, NOTES & SPECIFICATIONS, SEE DRAWING E-0.0.
2. CONDUIT ROUTING IS SHOWN DIAGRAMMATICALLY ONLY AND IS NOT INTENDED TO SHOW EXACT EQUIPMENT LOCATION OR CONDUIT ROUTING. THE ELECTRICAL CONTRACTOR SHALL DETERMINE, IN THE FIELD, THE BEST ROUTING TO AVOID ANY INTERFERENCE WITH EXISTING UNDERGROUND UTILITIES, EXISTING ABOVEGROUND STRUCTURES OR OTHER EQUIPMENT.
3. THE ELECTRICAL CONTRACTOR SHALL FOLLOW EQUIPMENT MANUFACTURER'S RECOMMENDATIONS FOR INSTALLATION AND TERMINATION OF CONDUIT AND WIRING.
4. GROUND CONNECTIONS AT MAIN GROUND LOOP SHALL BE MADE USING BURNDY "HYGROUND" IRREVERSIBLE COMPRESION FITTINGS, OR APPROVED EQUAL. THE NEW GROUND LOOP CABLE SHALL BE CONTINUOUS.
5. GROUNDING CABLE SHALL BE INSTALLED WITHOUT SHARP BENDS OR KINKS, AND WHERE BENDS OR LOOPS ARE REQUIRED, THEY SHALL BE MADE WITH AS LARGE A RADIUS AS POSSIBLE.
6. ALL CONNECTIONS TO BE GROUNDED, CONNECTED OR BONDED MUST BE MADE TO CLEAN AND BRIGHT METAL SURFACES.
7. ELECTRICAL CONTRACTOR SHALL VERIFY GROUND CONNECTION POINTS ON COMPRESSOR AND DRYER SKIDS.
8. UNDERGROUND GROUND WIRE SHALL BE A MINIMUM OF 30 INCHES BELOW FINISHED GRADE.
9. GROUNDING SHALL BE PERFORMED AS SPECIFIED IN THE PER NEC, ARTICLE 250.
10. GROUND WIRES THRU CONCRETE SHALL HAVE A SLEEVE THAT EXTENDS 4" ABOVE GRADE. THE SLEEVES SHALL BE SCHEDULE 40 PVC PIPE FILLED WITH GE RTV SILICONE, AFTER GROUND WIRE HAS BEEN INSTALLED.
11. #4/0 BARE COPPER GROUND RING WIRE SHALL BE BURIED AT A DEPTH THE EARTH'S SURFACE OF NOT LESS THAN 30" WITH POWER CONDUITS AND CONTROL CONDUITS.
12. USE COUPLING AND DRIVING STUD TO DRIVE GROUND ROD TO AVOID MUSHROOMING.
13. BOND TOGETHER ALL CONDUIT STUB-UPS IN SAME LOCATION AND CONNECT TO MAIN GROUND CABLE.
14. THE NEW GROUNDING SYSTEM SHALL BE TESTED TO SHOW A RESISTANCE TO GROUND OF NO MORE THAN 25 OHMS. GROUND TESTS CALLED FOR IN THIS NOTE SHALL BE CARRIED OUT USING A "DEDICATED GROUND TESTER".
15. REMOVABLE GUARD POSTS HAVE SUBSTANTIAL CONCRETE FOOTING. ELECTRICAL CONTRACTOR SHALL COORDINATE LOCATION OF GROUND LOOP TO AVOID THESE FOOTINGS.
16. EACH VESSEL SHALL BE GROUNDED.
17. ALL CONDUITS IN PULL BOXES SHALL BE BONDED TOGETHER AND CONNECTED TO THE MAIN GROUND LOOP WITH #2 AWG COPPER WIRE.



TIME-FILL GROUNDING 2 E-2.0

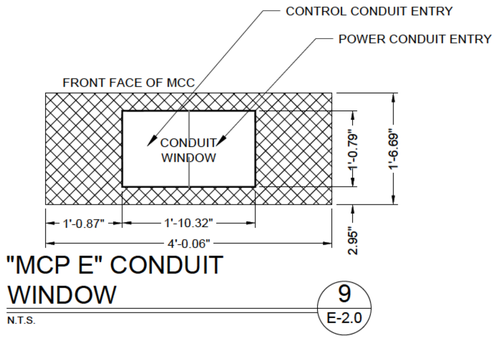
N.T.S.



ITEM	QTY	DESCRIPTION
1	1	CONNECTOR, GROUND, BURNDY, TYPE GAR OR EQUAL
2	12"	BRAID, COPPER, FLEXIBLE, BURNDY TYPE B
3	1	CONNECTOR, GROUND, BURNDY, FOR COPPER BRAID, BURNDY TYPE GG

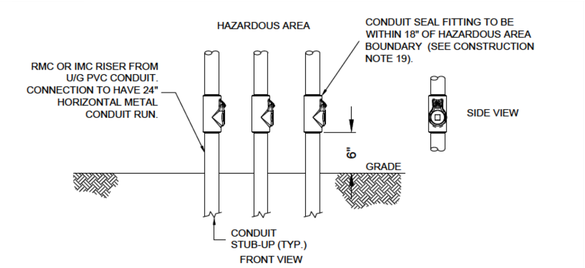
GATE POST 5 E-2.0

N.T.S.



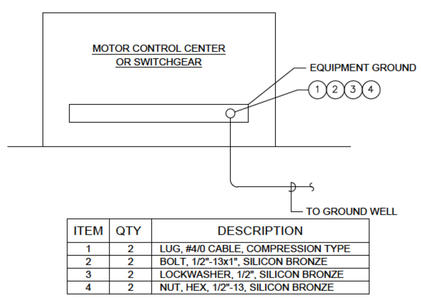
"MCP E" CONDUIT WINDOW 9 E-2.0

N.T.S.



CONDUIT SEAL AT STUBUP 8 E-2.0

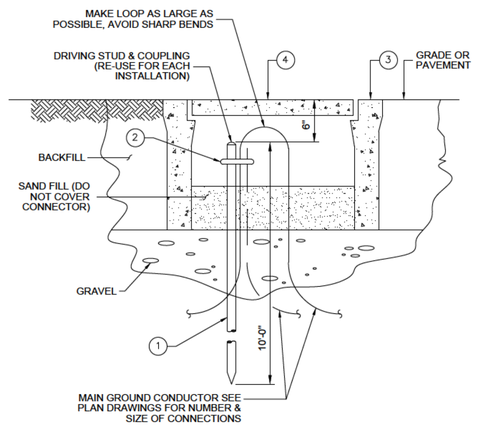
N.T.S.



ITEM	QTY	DESCRIPTION
1	2	LUG, #4/0 CABLE, COMPRESSION TYPE
2	2	BOLT, 1/2"-13x1", SILICON BRONZE
3	2	LOCKWASHER, 1/2", SILICON BRONZE
4	2	NUT, HEX, 1/2"-13, SILICON BRONZE

EQUIPMENT GROUND BUS DETAIL 1 E-2.0

N.T.S.

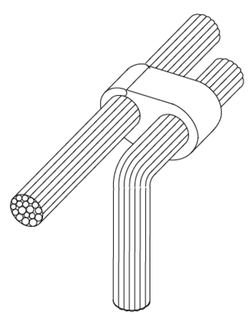


ITEM	QTY	DESCRIPTION
1	-	SECTIONAL GROUND ROD, 3/4"x10'-0", COPPER CLAD STEEL
2	-	CONNECTOR, 3 #4/0 THRU 250KCMIL TO 3/4" ROD
3	-	CONCRETE BOX, 10"x17"x12" DEEP
4	-	BOX COVER (CONCRETE), MARKED "GROUND"

DETAIL - GROUND WELL 4 E-2.0

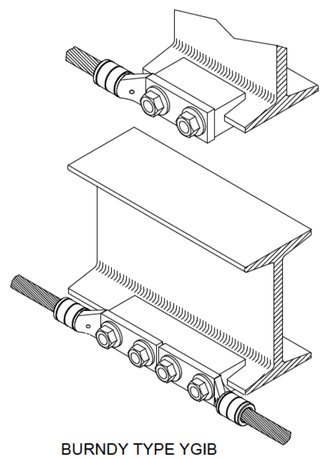
N.T.S.

CABLE TO CABLE



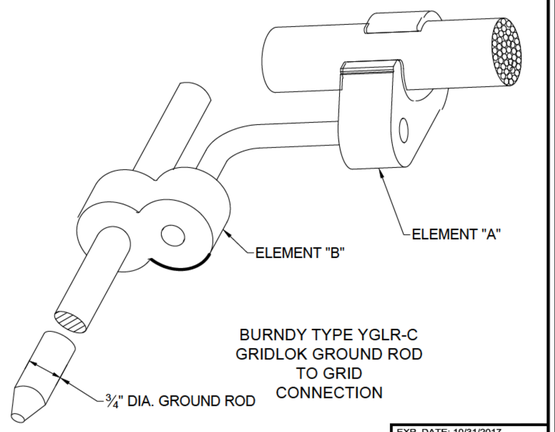
BURNDY TYPE YGHP-C HYTAP CONNECTOR

CABLE TO FLANGE



BURNDY TYPE YGIB GROUNDLINK CONNECTOR

CABLE TO GROUND ROD



BURNDY TYPE YGLR-C GRIDLOK GROUND ROD TO GRID CONNECTION

GROUNDING CONNECTION DETAIL 7 E-2.0

N.T.S.

EXP. DATE: 10/31/2017
COLORADO LICENSED
RICHARD L. REMILL
0047005
PROFESSIONAL ENGINEER
DATE SIGNED:

REV	DATE	REVISIONS	BY
0	05/15/2017	ISSUED FOR PERMIT SUBMITTAL	HVT

Know what's below. CALL 811 before you dig.

REDUCED PLAN
CAUTION: THIS DRAWING MAY BE REDUCED
0 1" 2" 3"
3" IN ORIGINAL DRAWING

Clean Energy®

4675 MAC ARTHUR CO
TEL (949) 437-1414 FAX (949) 437-1420 | NEWPORT BEACH, CA 92660
WWW.CLEANENERGYFUELS.COM

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CNG FUELING FACILITY
GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
ELECTRICAL DETAILS

ASSET NO: 160-11-17307.02.00

DATE	DESIGNED BY	HVT
05/01/2017	CHECKED BY	MES
	APPROVED BY	RLR
SCALE	AS NOTED	
SHEET	E-4.0	

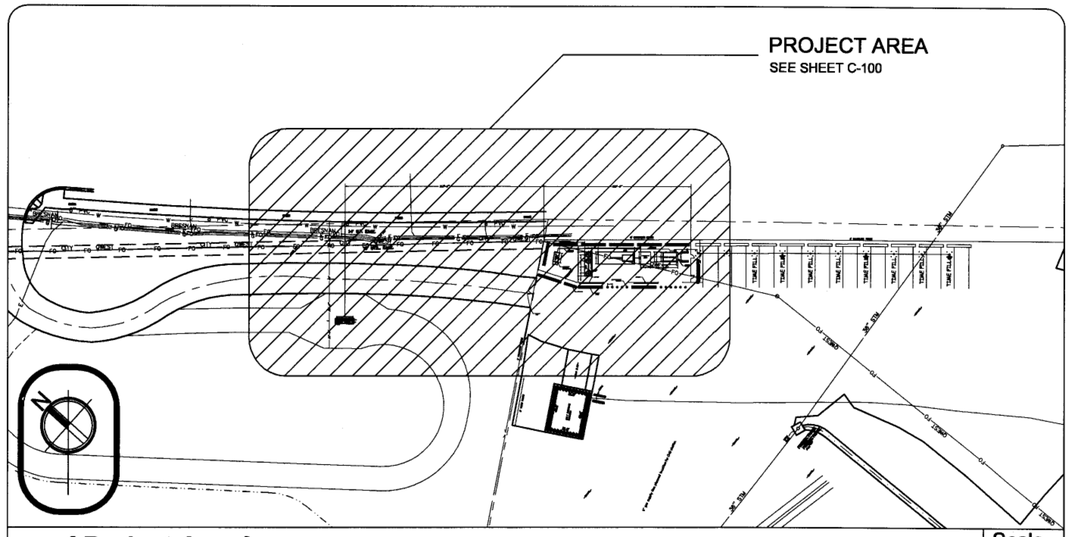
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CITY OF GRAND JUNCTION, CO

UPGRADE FOR FAST FILL TO EXISTING CNG STATION

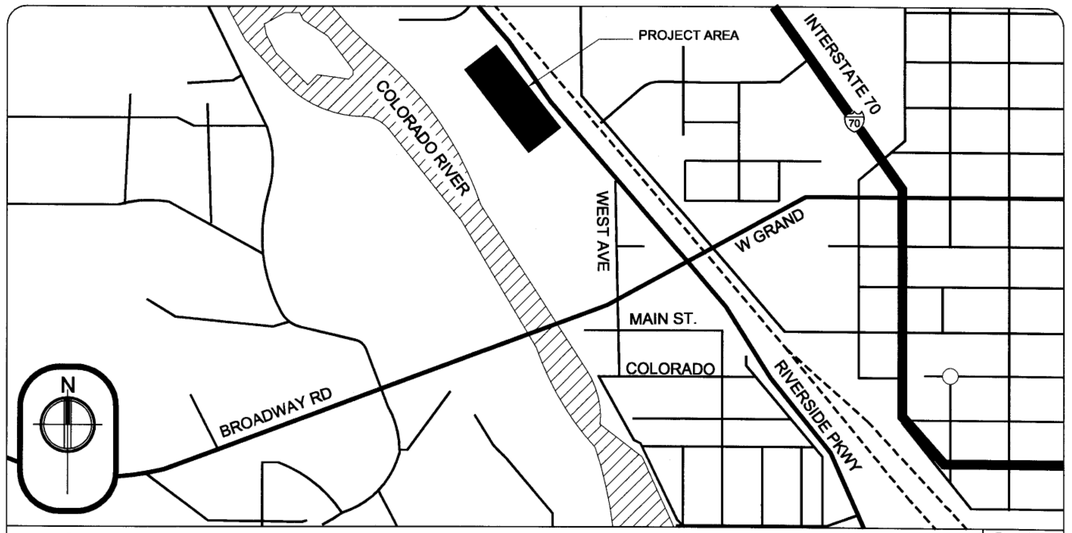
333 WEST AVENUE

GRAND JUNCTION, CO 81501



{ Project Area }

Scale
N.T.S.



{ Vicinity Map }

Scale
N.T.S.

Project Summary:

Project Summary:

City Of Grand Junction
333 West Avenue
Grand Junction, CO 81501

Project Description:

Upgrade for Fast Fill to existing CNG Station

Equipment:

-CNG Compressor 1-58 CFM GESI Natural Gas Compressor Skid
-3 x CNG Storage Tanks
-Priority Panel

Fast Fill:

-Dual GESI/Kraus Fast Fill dispenser dual hose 3600 PSI
-Card Reader Fuelmaster

ALL EQUIPMENT PER SUBMITTAL DOCUMENTS

General Notes:

1. The contractor shall verify and be responsible for; all contract documents, omissions and/or conflicts between various elements of contract documents, and all dimensions elevations and conditions at the site.
2. Contractor is responsible for any and all permits required for this project.
3. Contractor is responsible for the project design compliant with the scope of work (this page).
4. All work shall conform to the minimum standards of all regulating agencies having jurisdiction over any or all portions of the work including the state of california.
5. All work to conform to the best practices prevailing in the various trades at the time of the work.
6. Specific notes and details shall take precedence over general notes and typical details. do not scale dimensions from drawings.
7. It is the responsibility of the contractor to locate all existing utilities whether shown on these drawings or not, and to protect them from damage. the contractor shall bear all cost of repair or replacement due to such damage in the execution of his work.
8. Contractor shall assume sole and complete responsibility for the job site conditions during the course of the construction of the project, including safety of all persons and not limited to normal working hours. the contractor shall indemnify and hold the owner and the engineer harmless from any and all liability real or alleged in the connection with the performance of work on the project, excepting for liability rising from the sole negligence of the owner or the engineer.
9. The contract structural drawings and specifications represent the finished structure. they do not indicate the method of construction. the contractor shall provide all measures necessary to protect the structure during construction. such measures shall include but are not limited to bracing, shoring for loads due to construction equipment, temporary structural and partial structures, and partially completed work, etc. observation visits to the site by the structural engineer shall not include inspection of these protection measures.
10. Contractor shall verify all measurements and take all necessary field measurements prior to fabrication.
11. Contractor's scope of work includes the coordinating of the work of all subcontractors and consultants.
12. Any damage to the existing building and its contents during the execution of this work shall be repaired or restored to original condition at the contractor's expense.
13. Contractor shall maintain a set of as-built drawings of all work as it progresses on the job site.
14. Access to fire safety equipment must be provided and maintained serviceable prior to and during construction.
15. Contractor to remove all excavated material and debris.
16. New concrete to be 2500 PSI strength after 28 days.
17. Parking lot striping is the responsibility of others.

Build Codes:

The system shall be designed in full compliance with the latest edition of the applicable sections of the following codes, standards, and guidelines. Where conflict exists, contractor shall follow the most stringent requirements. in case of a conflict between the uniform fire code, national fire prevention association and Cal-OSHA standards, the most stringent condition shall apply:

2010 National Fire Protection Association (NFPA)-#52-2010
National Electric Code (NEC)
Underwriters Laboratory (UL) or Factory Mutual (FM)

Sheet #	Description:
CS-100	Cover Sheet & Layout
C-100	Site layout
C-101	Enlarged Site Layout
C-102	Fast Fill Site Layout
C-200	Concrete Specs
M-100	Mechanical P&ID Details
M-200	Compressor
M-300	Dispenser Card Reader Details
M-400	CNG Storage Tank Details
E-100	Electrical Single Line Diagram

Owner:
City Of Grand Junction
333 West Avenue
Grand Junction, CO 81501

Revisions:

01	11/12/2010	80% Preliminary
02	11/19/10	90% Preliminary
03	11/30/10	Final

Drawn By:	J.V.
Checked By:	B.B.
Date:	11/30/10
Scale:	As Noted
Job No.	

Site Information:

GRAND JUNCTION
UPGRADE FOR FAST FILL TO EXISTING CNG STATION
333 WEST AVENUE
GRAND JUNCTION, CO 81501

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Seal:

Plans Prepared By:

GAS EQUIPMENT SYSTEMS, INC.
Specialists in Gas Compression Equipment for NGV's
8753 LION STREET
RANCHO CUCAMONGA, CA 91730
OFFICE: (909) 466-6626
LICENSE# 783360

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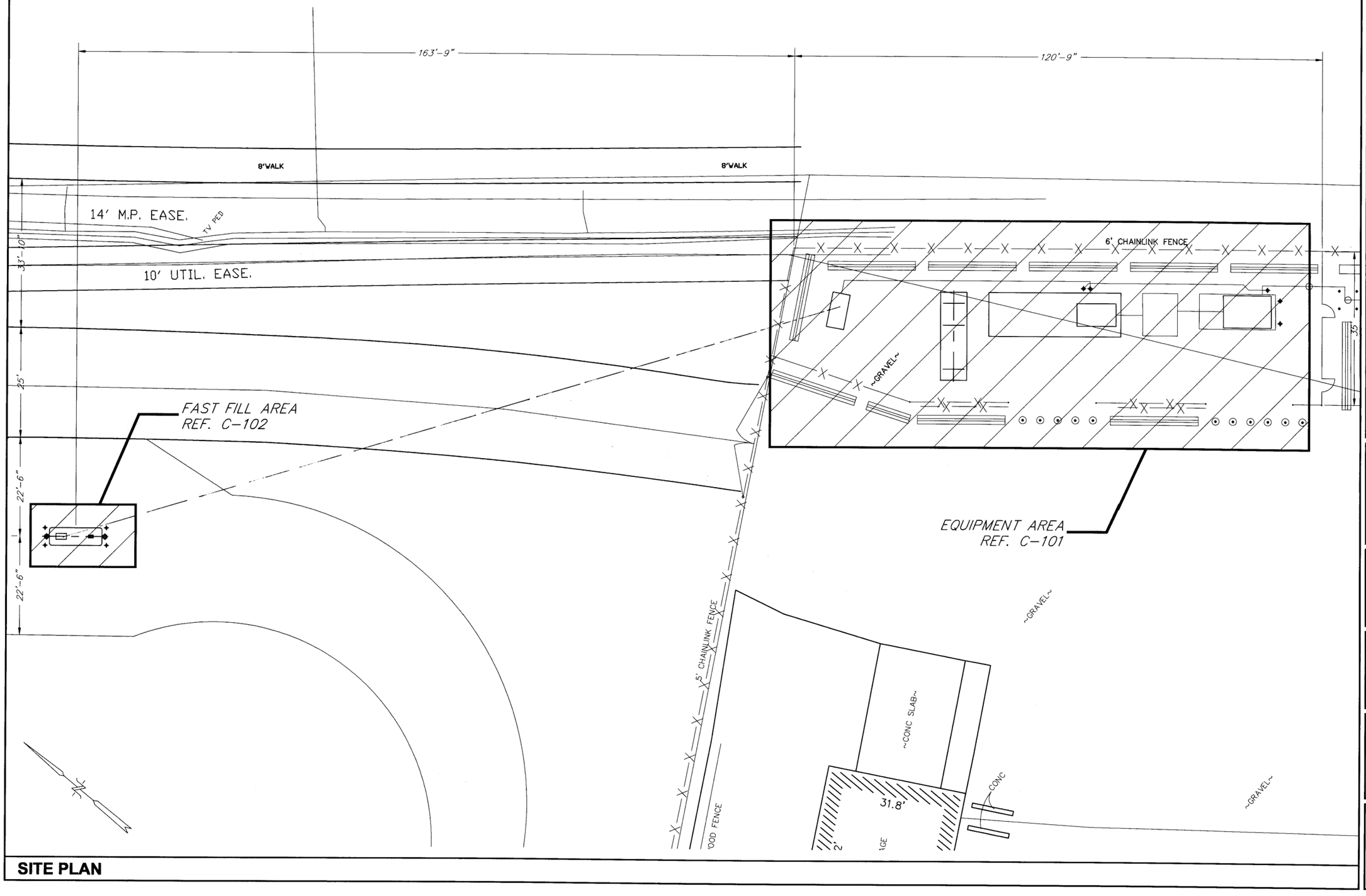
COVER SHEET

Sheet Number:

CS-100

CONSTRUCTION WARNING:

THE EXISTENCE AND LOCATION OF UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THE PLANS WERE MADE BY SEARCHING AVAILABLE EXISTING RECORDS. HOWEVER, NO GUARANTEE IS MADE THAT SUBSTRUCTURES OR THEIR LOCATIONS ARE EXACT. THE CONTRACTOR SHALL TAKE DUE PRECAUTIONARY MEASURES TO PROTECT ALL UTILITY LINES INCLUDING THOSE NOT SHOWN OR NOT ON RECORD BY CALLING USA 48 HOURS BEFORE EXCAVATING. CONTRACTOR SHALL EXPOSE AND POT HOLE (HAND DIG) ALL EXISTING UTILITIES WITHIN CONSTRUCTION ZONE.



SITE PLAN

Owner:

City Of Grand Junction
333 West Avenue
Grand Junction, CO 81501

Revisions:

01	11/12/2010	80% Preliminary
02	11/19/10	90% Preliminary
03	11/30/10	Final

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UPGRADE FOR FAST FILL TO EXISTING CNG STATION
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GRAND JUNCTION, CO 81501

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Plans Prepared By:

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Specialists in Gas Compression Equipment for NGV's
8753 LION STREET
RANCHO CUCAMONGA, CA 91730
OFFICE: (909) 466-8829
LICENSE# 783360

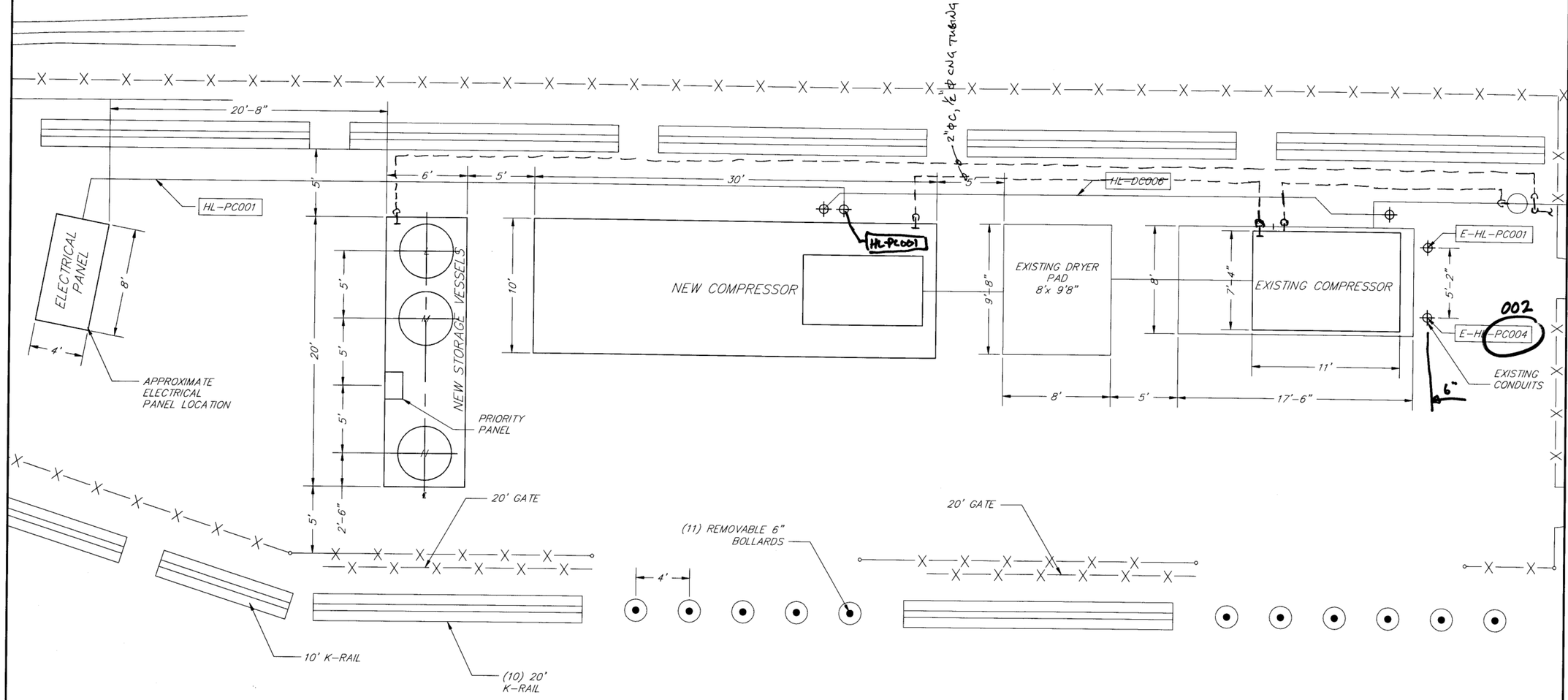
Sheet Title:

SITE LAYOUT

Sheet Number:

C-100

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SITE PLAN

0 1' 2' 4'

SCALE 1/4" = 1'-0"

1

Owner:
City Of Grand Junction
333 West Avenue
Grand Junction, CO 81501

Revisions:

01	11/12/2010	80% Preliminary
02	11/19/10	90% Preliminary
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Drawn By:	J.V.
Checked By:	B.B.
Date:	11/30/10
Scale:	As Noted
Job No.	

Site Information:

GRAND JUNCTION

UPGRADE FOR FAST FILL TO EXISTING CNG STATION
333 WEST AVENUE
GRAND JUNCTION, CO 81501

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Plans Prepared By:

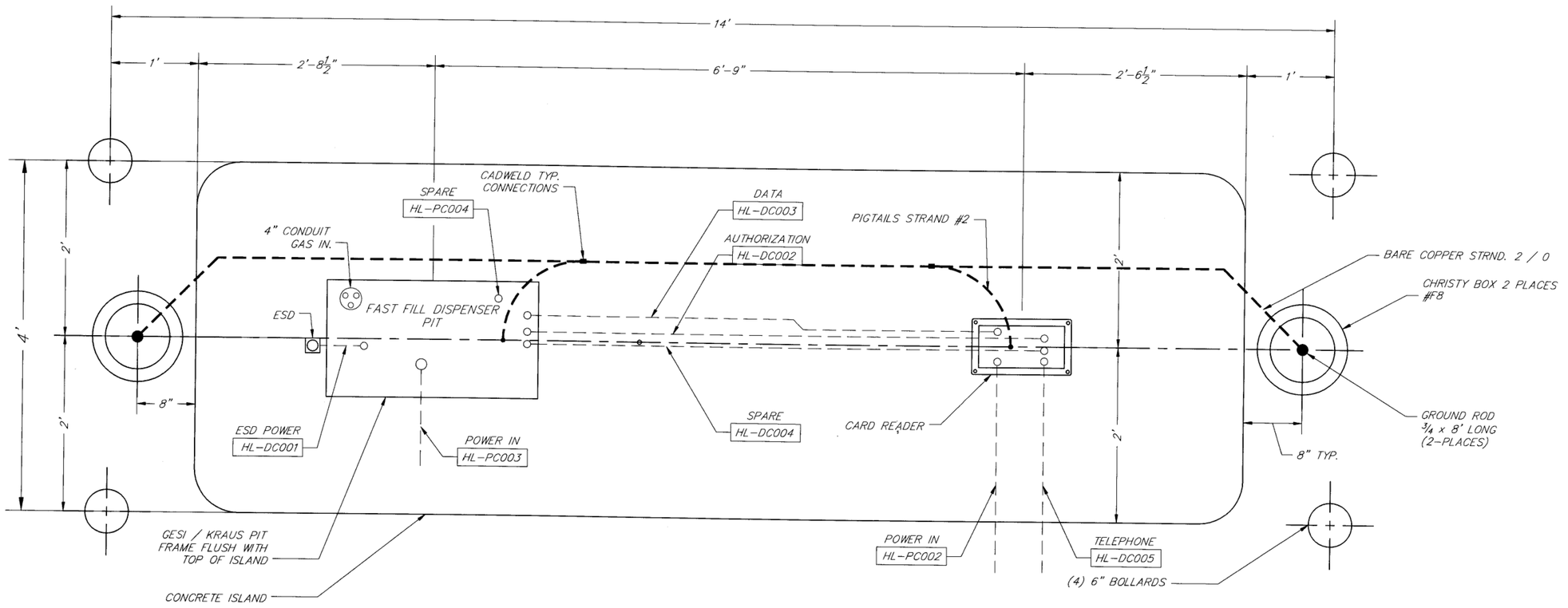
GAS EQUIPMENT SYSTEMS, INC.
Specialists in Gas Compression Equipment for NGV's
8753 LION STREET
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LICENSE# 783360

Sheet Title:

CIVIL LAYOUT

Sheet Number:

C-101

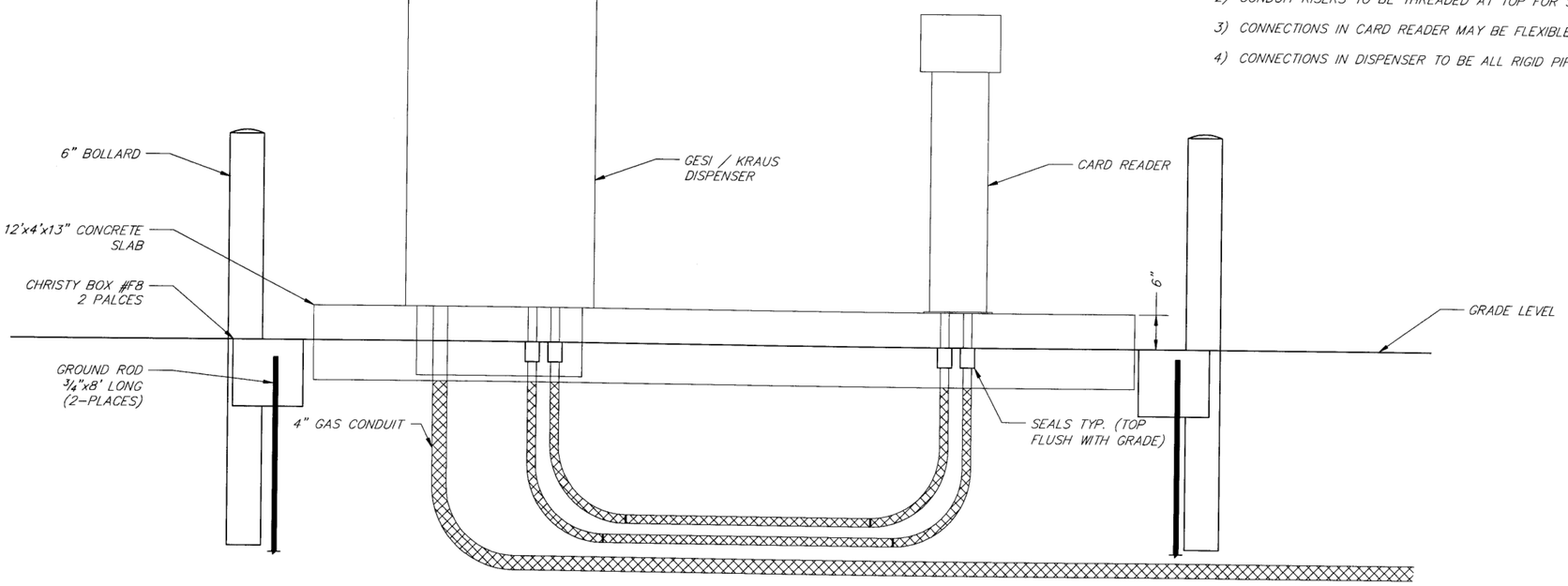


FAST FILL ISLAND LAYOUT

SCALE N.T.S. 1

NOTE:

1) TRANSITION FROM PVC TO RIGID STEEL TO BE HORIZONTAL.
2) CONDUIT RISERS TO BE THREADED AT TOP FOR SEALS.
3) CONNECTIONS IN CARD READER MAY BE FLEXIBLE CONDUIT UL.
4) CONNECTIONS IN DISPENSER TO BE ALL RIGID PIPE.



FAST FILL ISLAND ELEVATION

SCALE N.T.S. 1

Owner:
City Of Grand Junction
333 West Avenue
Grand Junction, CO 81501

Revisions:

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GRAND JUNCTION, CO 81501

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Seal:

Plans Prepared By:

GAS EQUIPMENT SYSTEMS, INC.
Specialists in Gas Compression Equipment for NGV's
8753 LION STREET
RANCHO CUCAMONGA, CA 91730
OFFICE: (909) 466-6920
LICENSE# 783360

Sheet Title:

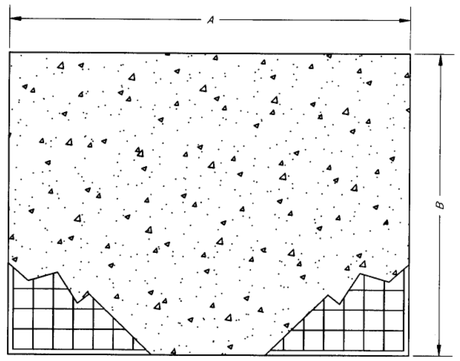
FAST FILL LAYOUT

Sheet Number:

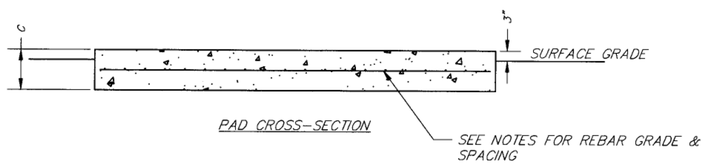
C-102

EQUIPMENT PAD FOUNDATIONS LIST

ID	DESCRIPTION	"A"	"B"	"C"	BOLT	MATTE LOCATION
P1	STORAGE VESSEL	20'-0"	6'0"	18"	3/4"Ø	#5-8" O/C-MID. HT.
P3	FAST FILL DISPENSER	12'-0"	4'-0"	13"	N/A	#5-12" O/C-MID. HT.
P3	CARD READER	12'-0"	4'-0"	13"	3/8"Ø	#5-12" O/C-MID. HT.



PAD PLAN VIEW



PAD CROSS-SECTION

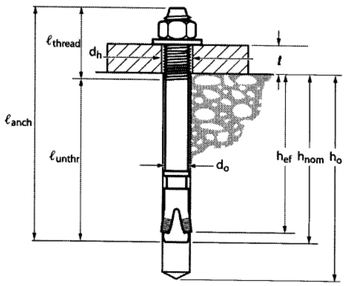
EQUIPMENT PAD NOTES:
1. CONCRETE DESIGNED FOR 2500 PSI AFTER 28 DAYS, USE 3000 PSI, NO SPECIAL INSPECTION REQUIRED. 2% SLOPE WITH BROOM FINISH.
2. POSITION REBAR NO CLOSER THAN 3" TO EDGE.
3. ALL EQUIPMENT WILL BE ANCHORED AFTER PLACEMENT.

SLAB DETAIL

SCALE N.T.S. | 1

SETTING INFORMATION	Symbol	Units	Nominal anchor diameter (in.)													
			3/8			1/2			5/8				3/4			
Anchor O.D.	d_o	in. (mm)	0.375 (9.5)			0.5 (12.7)			0.625 (15.9)				0.75 (19.1)			
Nominal bit diameter	d_{bit}	in.	3/8			1/2			5/8				3/4			
Effective min. embedment	h_{ef}	in. (mm)	2 (51)			2 (51)	3-1/4 (83)		3-1/8 (79)	4 (102)			3-3/4 (95)	4-3/4 (121)		
Min. hole depth	h_o	in. (mm)	2-5/8 (67)			2-5/8 (67)	4 (102)		3-3/4 (95)	4-3/4 (121)			4-5/8 (117)	5-3/4 (146)		
Min. thickness of fixture[1]	t_{min}	in. (mm)	1/4 (6)			3/4 (19)	1/4 (6)		3/8 (9)	3/4 (19)			1/8 (3)	1-5/8 (41)		
Max. thickness of fixture	t_{max}	in. (mm)	2-1/4 (57)			4 (101)	2-3/4 (70)		5-5/8 (143)	4-3/4 (121)			4-5/8 (117)	3-5/8 (92)		
Installation torque	T_{inst}	ft-lb (Nm)	25 (34)			40 (54)			60 (81)				110 (149)			
Min. dia. of hole in fixture	d_h	in. (mm)	7/16 (11.1)			9/16 (14.3)			11/16 (17.5)				13/16 (20.6)			
Available anchor lengths	l_{anch}	in. (mm)	3 (76)	3-3/4 (95)	5 (127)	3-3/4 (95)	4-1/2 (114)	5-1/2 (140)	7 (178)	4-3/4 (121)	6 (152)	8-1/2 (216)	10 (254)	5-1/2 (140)	8 (203)	10 (254)
Threaded length including dog point	l_{thread}	in. (mm)	7/8 (22)	1-5/8 (41)	2-7/8 (73)	1-5/8 (41)	2-3/8 (60)	3-3/8 (86)	4-7/8 (178)	1-1/2 (38)	2-3/4 (70)	5-1/4 (133)	6-3/4 (171)	1-1/2 (38)	4 (102)	6 (152)
Unthreaded length	l_{unthr}	in. (mm)	2-1/8 (54)			2-1/8 (54)			3-1/4 (83)				4 (102)			
Installation embedment	h_{nom}	in. (mm)	2-1/4 (57)			2-3/8 (60)		3-5/8 (92)		3-5/8 (92)		4-1/2 (114)		4-3/8 (111)		5-3/8 (137)

1 The minimum thickness of the fastened part is based on use of the anchor at minimum embedment and is controlled by the length of the thread. If a thinner fastening thickness is required, increase the anchor embedment to suit.



EQUIPMENT INSTALLATION NOTES:
1. USE HILTI KWIK BOLT TZ ANCHORS.
2. TRANSFER DRILL HOLES THRU EQUIPMENT MOUNTING BRACKETS. DRILL HOLE SAME SIZE AS THE NOMINAL DIAMETER OF THE KWIK BOLT TZ ANCHOR. HOLE DEPTH MUST EXCEED THE ANCHOR EMBEDMENT BY AT LEAST 1/4".
3. CLEAN OUT DRILLED HOLE USING COMPRESSED AIR.
4. DRIVE THE ANCHOR INTO THE HOLE USING A HAMMER. THE ANCHOR MUST BE DRIVEN UNTIL AT LEAST FOUR (4) THREADS ARE BELOW THE SURFACE OF THE MOUNTING BRACKET.
5. TIGHTEN THE NUT TO THE RECOMMENDED INSTALLATION TORQUE.

EQUIPMENT ANCHOR INSTALLATION INSTRUCTIONS

SCALE N.T.S. | 2

Owner:
City Of Grand Junction
333 West Avenue
Grand Junction, CO 81501

Revisions:

01	11/12/2010	80% Preliminary
02	11/19/10	90% Preliminary
03	11/30/10	Final

Drawn By:	J.V.
Checked By:	B.B.
Date:	11/30/10
Scale:	As Noted
Job No.	

Site Information:

GRAND JUNCTION
UPGRADE FOR FAST FILL TO EXISTING CNG STATION
333 WEST AVENUE
GRAND JUNCTION, CO 81501

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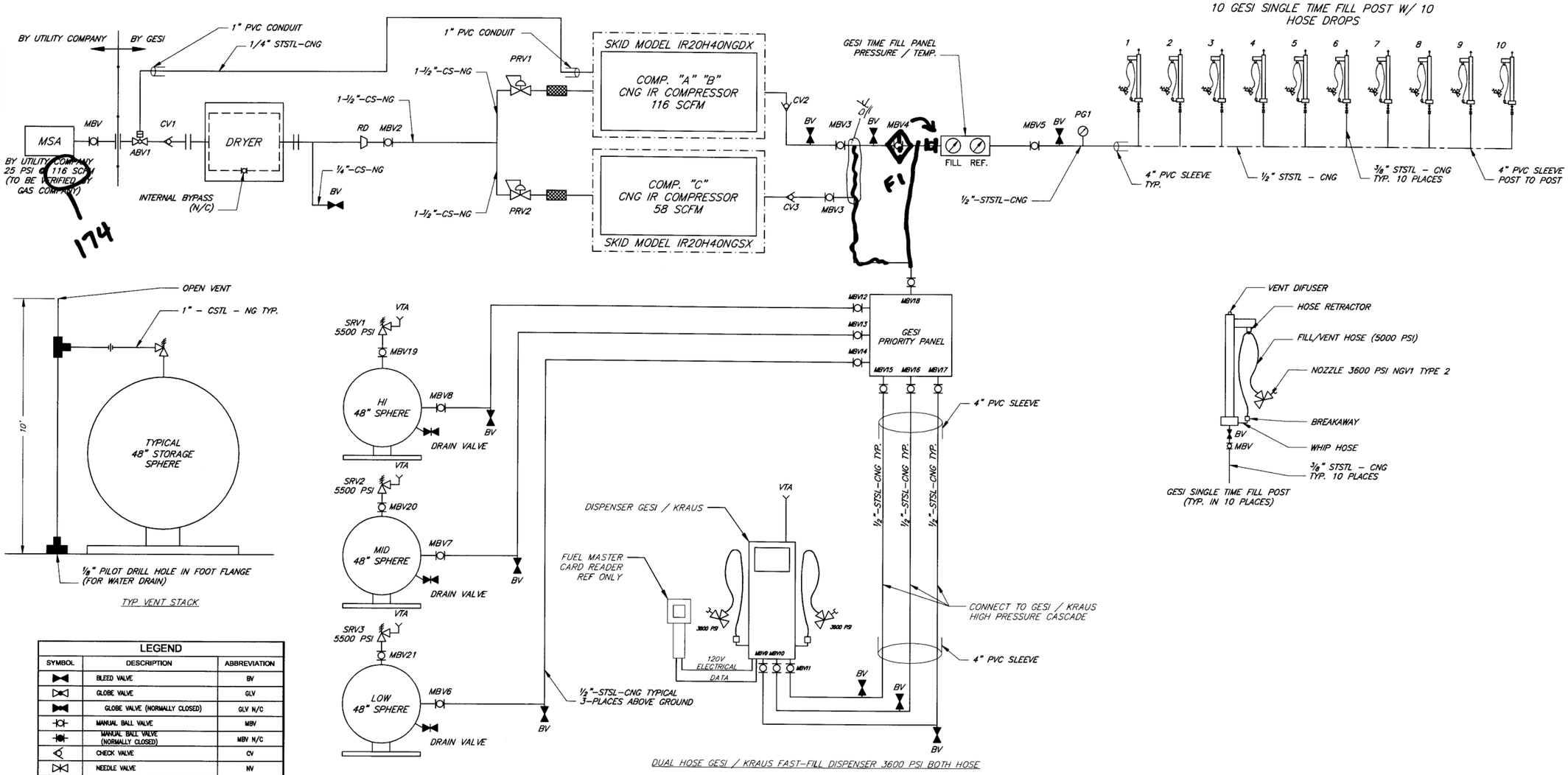
GAS EQUIPMENT SYSTEMS, INC.
Specialists in Gas Compression Equipment for NGV's
8753 LION STREET, RANCHO CUCAMONGA, CA 91730
OFFICE: (909) 466-8826
LICENSE# 783366

Sheet Title:

CONCRETE SPECS

Sheet Number:

C-200



LEGEND

SYMBOL	DESCRIPTION	ABBREVIATION
	BLEED VALVE	BV
	GLOBE VALVE	GLV
	GLOBE VALVE (NORMALLY CLOSED)	GLV N/C
	MANUAL BALL VALVE	MBV
	MANUAL BALL VALVE (NORMALLY CLOSED)	MBV N/C
	CHECK VALVE	CV
	NEEDLE VALVE	NV
	NEEDLE VALVE (NORMALLY CLOSED)	NV N/C
	PLUG VALVE	PV
	PLUG VALVE (NORMALLY CLOSED)	PV N/C
	3-WAY VALVE	3WV
	PRESSURE REGULATOR	PRV
	GAS ACTIVATED VALVE	GAV
	SOLENOID VALVE (2-WAY)	SV
	SOLENOID VALVE (3-WAY)	3WSV
	REDUCER	RD
	RELIEF VALVE	RV OR SRV
	FLEXIBLE HOSE	FH
	CAP	CP
	PLUG	PLG
	UNION	UN
	LOCAL INSTRUMENT OR GAUGE	PG
	PANEL MOUNTED INSTRUMENT OR GAUGE	PM
	POINT OF CONNECTION	PC
	FLANGE	FG
	BELOW GRADE	–
	ACTUATED BALL VALVE	ABV

TABLE

SYMBOL	QTY	DESCRIPTION	GESI PART NUMBER
MBV1	1	BALL VALVE ¼"	BY UTILITY
CV1	1	CHECK VALVE	KF SERIES 35
MBV2	1	BALL VALVE 1-1/2"	APOLLO 489-100
MBV3	1	BALL VALVE ½"	7223G8Y
BV	9	BLEED VALVE	667098Y316
CV2-CV3	1	½" CHECK VALVE	625398Y316
PG1	1	PRESSURE GAUGE	K6K6GF-6000
MBV4 – MBV11	9	BALL VALVE ½" GYROLOK OR EQUAL	7223G8Y
SRV1 – SRV3	3	SAFETY RELIEF VALVE 5500 PSI (ALLIED)	SUPPLIED WITH 48" VESSEL
MBV12 – MBV18	7	BALL VALVE (HALE HAMILTON)	PART OF PRIORITY PANEL
MBV 19 – MBV21	3	1" BALL VALVE FEMALE NPT.	HBEV766DTSE1
ABV	1	ACTUATED VALVE	JAMESBURY
–	–	–	–
–	–	–	–

PIPING TABLE

ABBREVIATION	DESCRIPTION
PLP	PE PIPE (PLASTIC)
STSTL	STAINLESS STEEL
NG	NATURAL GAS (INLET)
CS	CARBON STEEL SCH 40.
CNG	COMPRESSED NATURAL GAS
CS2	CARBON STL SCH 80
PVC	PVC PIPE

TYPICAL EXAMPLE – 2"-PLP-NG
IS 2" PIPE X PE MATERIAL X NATURAL GAS.

TIME FILL DETAILS

SYMBOL	QTY	DESCRIPTION	GESI PART NUMBER
MBV	10	BALL VALVE ¼"	7115G4Y
BV	10	BLEED VALVE	6610M6Y316
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
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Owner:
City Of Grand Junction
333 West Avenue
Grand Junction, CO 81501

Revisions:

01	11/12/2010	80% Preliminary
02	11/19/10	90% Preliminary
03	11/26/10	1/4" CNG Line Added
04	11/30/10	Final

Drawn By:	J.V.
Checked By:	B.B.
Date:	11/30/10
Scale:	As Noted
Job No.	

Site Information:

GRAND JUNCTION

UPGRADE FOR FAST FILL TO EXISTING CNG STATION
333 WEST AVENUE
GRAND JUNCTION, CO 81501

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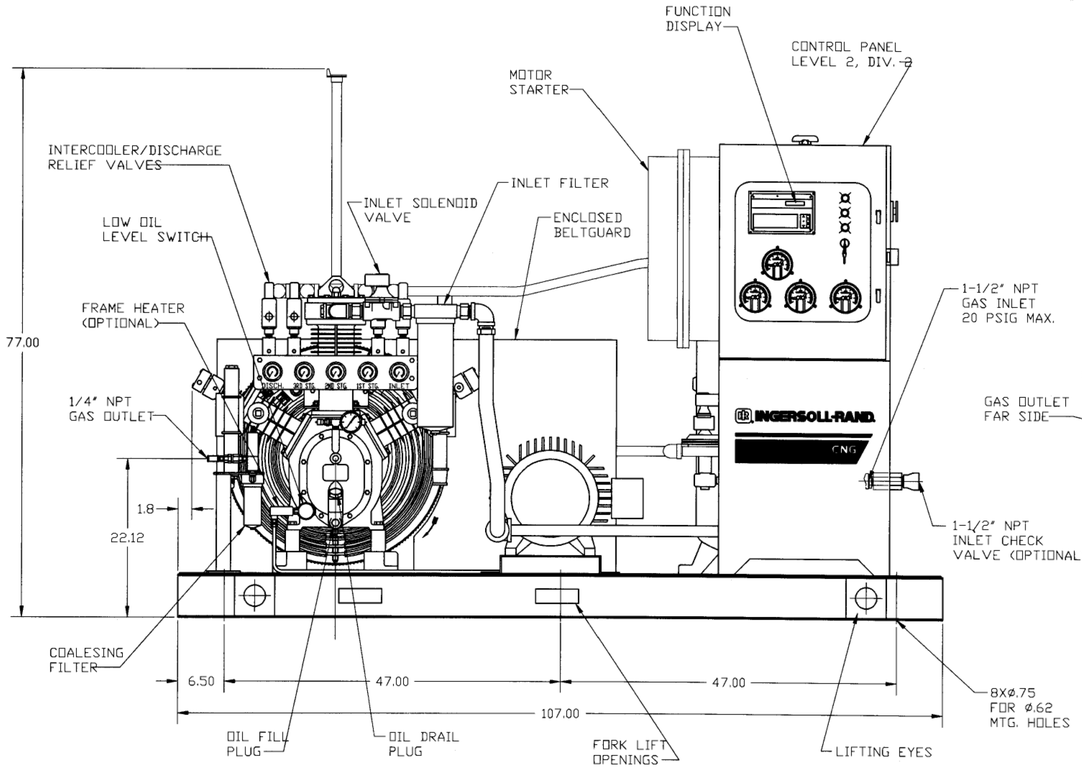
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OFFICE: (909) 466-8620
LICENSE# 783360

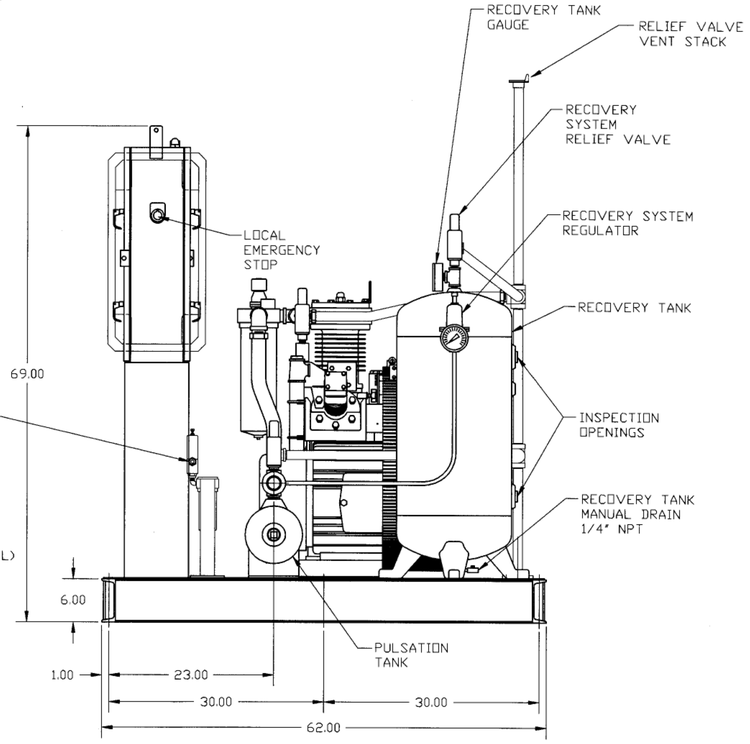
Sheet Title:

P&ID

Sheet Number:

M-100





NOTES:
1. FOUNDATION OR FLOOR MUST BE LEVEL AND SUPPORT THE UNIT EQUALLY; IF NECESSARY SHIM OR GROUT.
2. FOUNDATION BOLTS SHOULD PROJECT THRU NUTS AT LEAST 1/2" TO ALLOW FOR LEVELING.
3. APPROXIMATE NET WEIGHT: 3,100 LBS.
4. SKID ELECTRICS CLASS I, DIVISION 2.
5. ALL DIMENSIONS ±.12 UNLESS OTHERWISE NOTED.

INGERSOLL-RAND Co.
RECIPROCATING COMPRESSOR DIVISION
SMALL COMPRESSOR BUSINESS UNIT
CAMPBELLSVILLE, KY

REF. SIMPLEX CNG, (LEVEL II, DIV. 2)

TITLE
GENERAL ARRANGEMENT, 20H40NGSX

Owner:
City Of Grand Junction
333 West Avenue
Grand Junction, CO 81501

Revisions:

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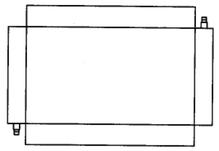
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OFFICE: (909) 466-6620
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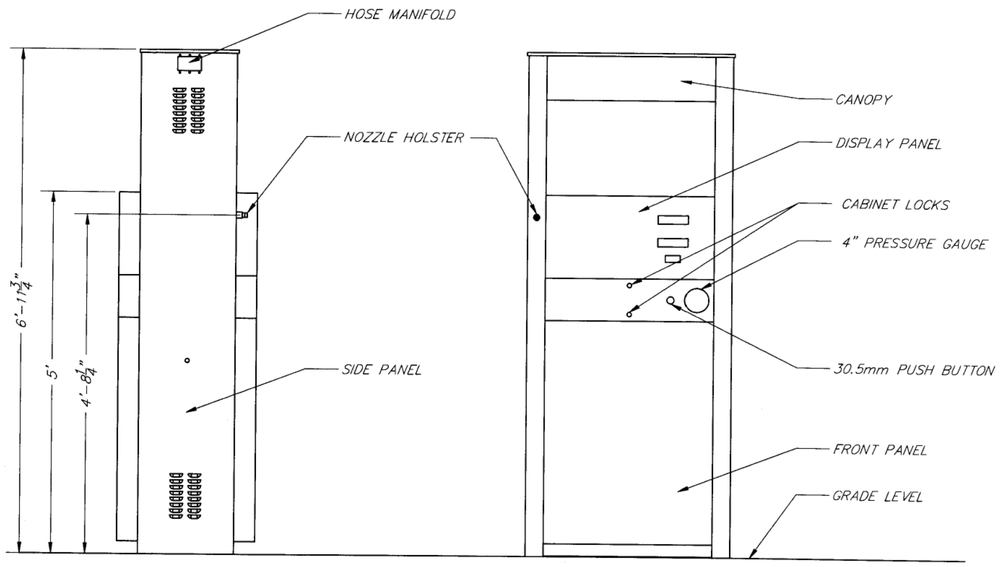
COMPRESSOR

Sheet Number:

M-200

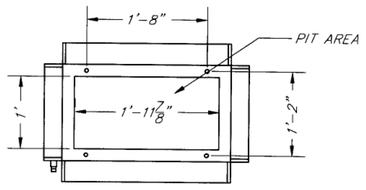


TOP VIEW



SIDE VIEW

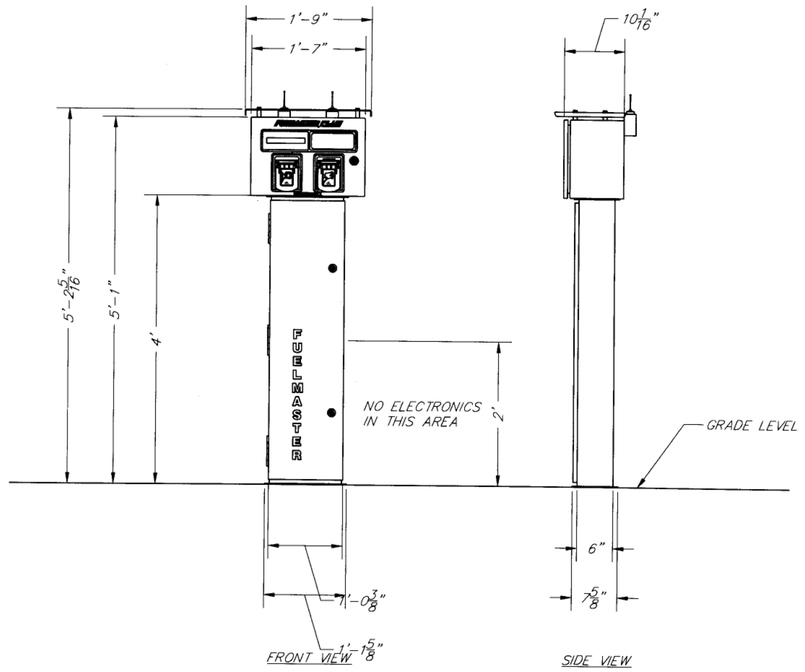
FRONT VIEW



BOTTOM VIEW

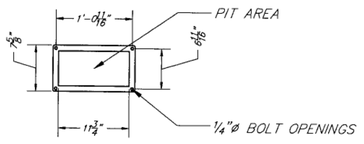
KRAUS /GESI DISPENSER

NOTE:
THIS DRAWING SHOWS A GEN3 CABINET WITH FRONT CONTROLS EQUIPPED WITH TYPICAL SIDE PANELS. CANOPY COVER & BRACKETS, DASH PANELS AND DISPLAY PANELS.



FRONT VIEW

SIDE VIEW



MOUNTING BRACKET

FUELMASTER CARD READER

Owner:
City Of Grand Junction
333 West Avenue
Grand Junction, CO 81501

Revisions:

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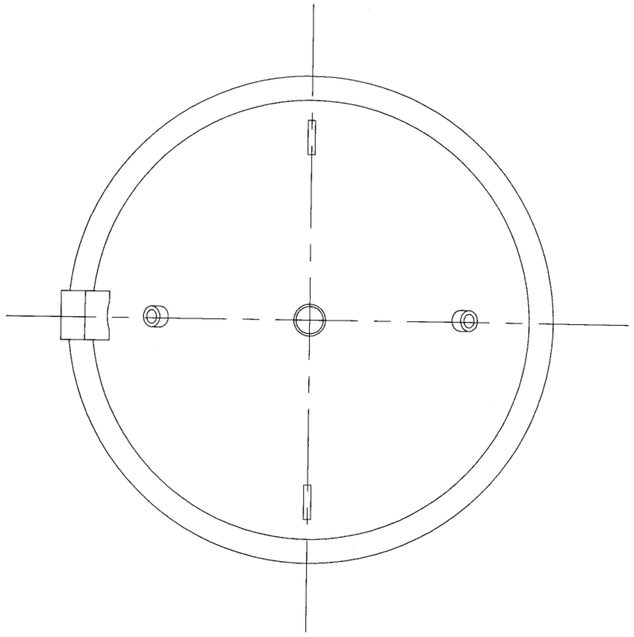
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Specialists in Gas Compression Equipment for NGV's
8753 LION STREET
RANCHO CUCAMONGA, CA 91730
OFFICE: (909) 466-6926
LICENSE# 783360

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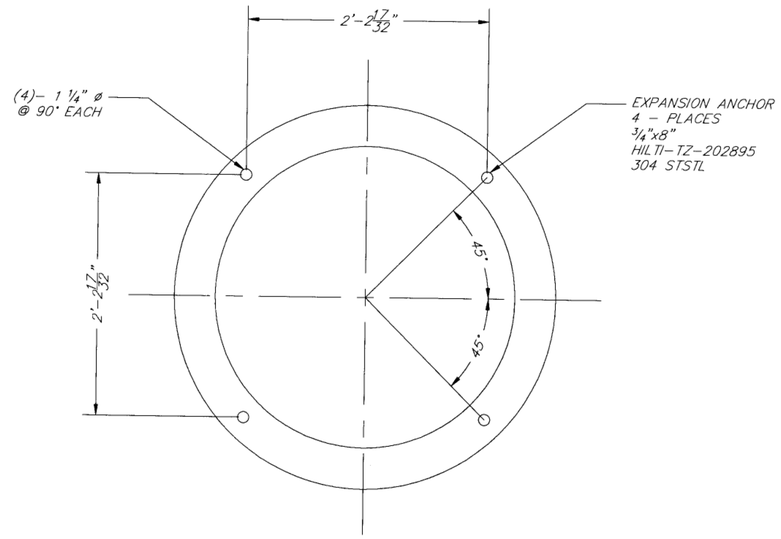
DISPENSER / CARD READER

Sheet Number:

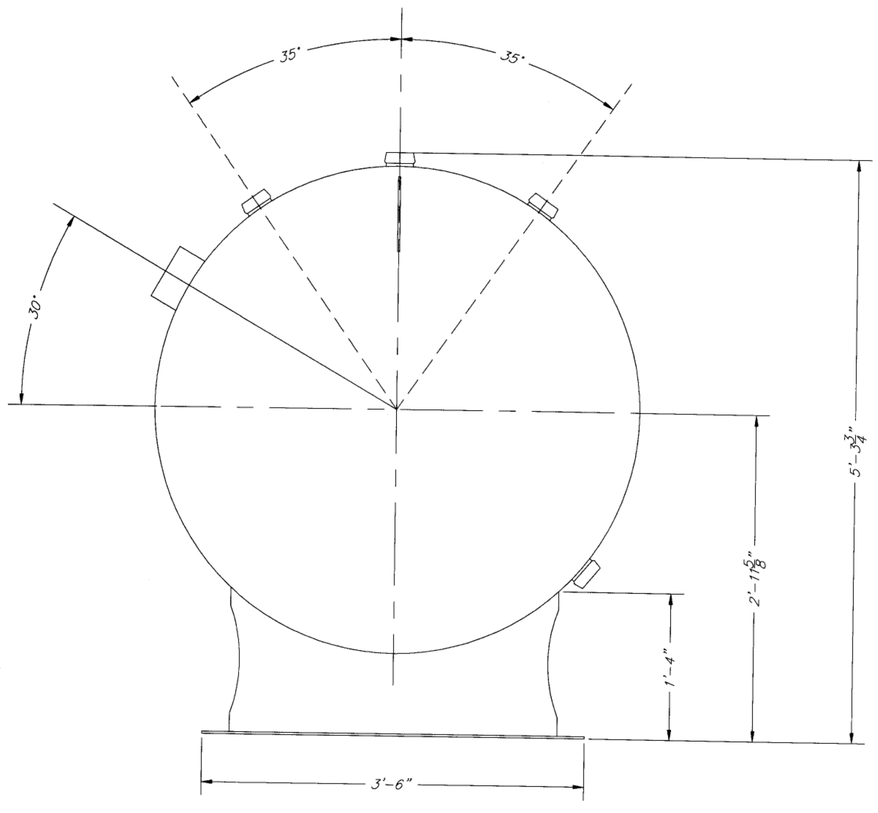
M-300



TOP VIEW



MOUNTING
LAYOUT



SIDE VIEW

CNG STORAGE

Owner:
City Of Grand Junction
333 West Avenue
Grand Junction, CO 81501

Revisions:

01	11/12/2010	80% Preliminary
02	11/19/10	90% Preliminary
03	11/30/10	Final

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Specialists in Gas Compression Equipment for NGV's
8753 LION STREET
RANCHO CUCAMONGA, CA 91730
OFFICE: (909) 466-6920
LICENSE# 783360

Sheet Title:

CNG STORAGE

Sheet Number:

M-400

ELECTRICAL POWER CONDUIT SCHEDULE

#	SIZE	WIRE	FROM	TO	NOTES
E-NHL-UTILITY.1	(2) 3"	4 x #350MCM 1 X1 (GRD) IN EACH	UTILITY TRANSFORMER	CT's & METER	VERIFY ALL REQUIREMENTS WITH LOCAL UTILITY COMPANY
E-NHL-UTILITY.2	(2) 3"	4 x #350MCM 1 X1 (GRD) IN EACH	CT's & METER	SERVICE "MSCG"	-
E-HL-PC001	1 1/4"	3 x #4 1 x#8 (GRD)	SERVICE "MSCG"	COMPRESSOR #1	-
E-HL-PC002	1 1/4"	3 x #4 1 x#8 (GRD)	SERVICE "MSCG"	COMPRESSOR #2	-
E-HL-PC003	-	-	MINI PANEL "LV1"	AREA LIGHT FIXTURES	REFER TO ES-1-3 FOR ALL CONDUIT, CONDUCTOR AND CIRCUIT BREAKER REQUIREMENTS
E-NHL-PC001	1"	2 x #6 1 x#10 (GRD)	SERVICE "MSCG"	TRANSFORMER IN MINI PANEL "LV1"	-
E-NHL-PC002	3/4"	2 x #10 1 x#10	MINI PANEL "LV1"	AREA POLE LIGHTING	SEE SITE PLAN FOR LOCATIONS
HL-PC001	1 1/4"	3 x#4 1 x#8 (GND)	SERVICE "MSCG"	COMPRESSOR #3	-
HL-PC002	3/4"	2 x#12 1 x#12 (GND)	MINI PANEL "LV1"	CARD READER	-
HL-PC003	3/4"	3 x#12 1 x#12 (GND)	MINI PANEL "LV1"	FAST FILL DISPENSER	-
HL-PC004	3/4"	NOT APPLICABLE	MINI PANEL "LV1"	FAST FILL DISPENSER	VERIFY ALL REQUIREMENTS WITH LOCAL UTILITY COMPANY
HL-PC005	3/4"	3 x#12 1 x#12 (GND)	MINI PANEL "LV1"	FAST FILL ISLAND LIGHT	-

ELECTRICAL DATA CONDUIT SCHEDULE

#	SIZE	WIRE	FROM	TO	NOTES
E-HL-DC001	3/4"	2 x#16 1 x#16 (GND)	CNG CONTROL PANEL	EMERGENCY ESD PUSH BUTTONS	REMOTE LOCATION SEE E-100
HL-DC001	3/4"	2 x#16 1 x#16 (GND)	CNG CONTROL PANEL	EMERGENCY ESD PUSH BUTTONS	REMOTE LOCATION SEE E-100
HL-DC002	3/4"	5 X #14 (RD,RD,GN,BE,BE)	CARD READER	FAST FILL DISPENSER	-
HL-DC003	3/4"	2 x BELDEN #9180 OR EQUAL	FAST FILL DISPENSER	CARD READER	DATA / MONITORING
HL-DC004	3/4"	NOT APPLICABLE	CARD READER	FAST FILL DISPENSER	CONDUIT ONLY
HL-DC005	3/4"	(1) CAT5E CABLE	CARD READER	OWNER'S TELEPHONE BACKBOARD	COMMUNICATION
HL-DC006	3/4"	REQUIRED COMMUNICATION AND MONITORING CABLES	CNG CONTROL PANEL #1	CNG CONTROL PANEL #2	DATA / MONITORING

LOAD SUMMARY:

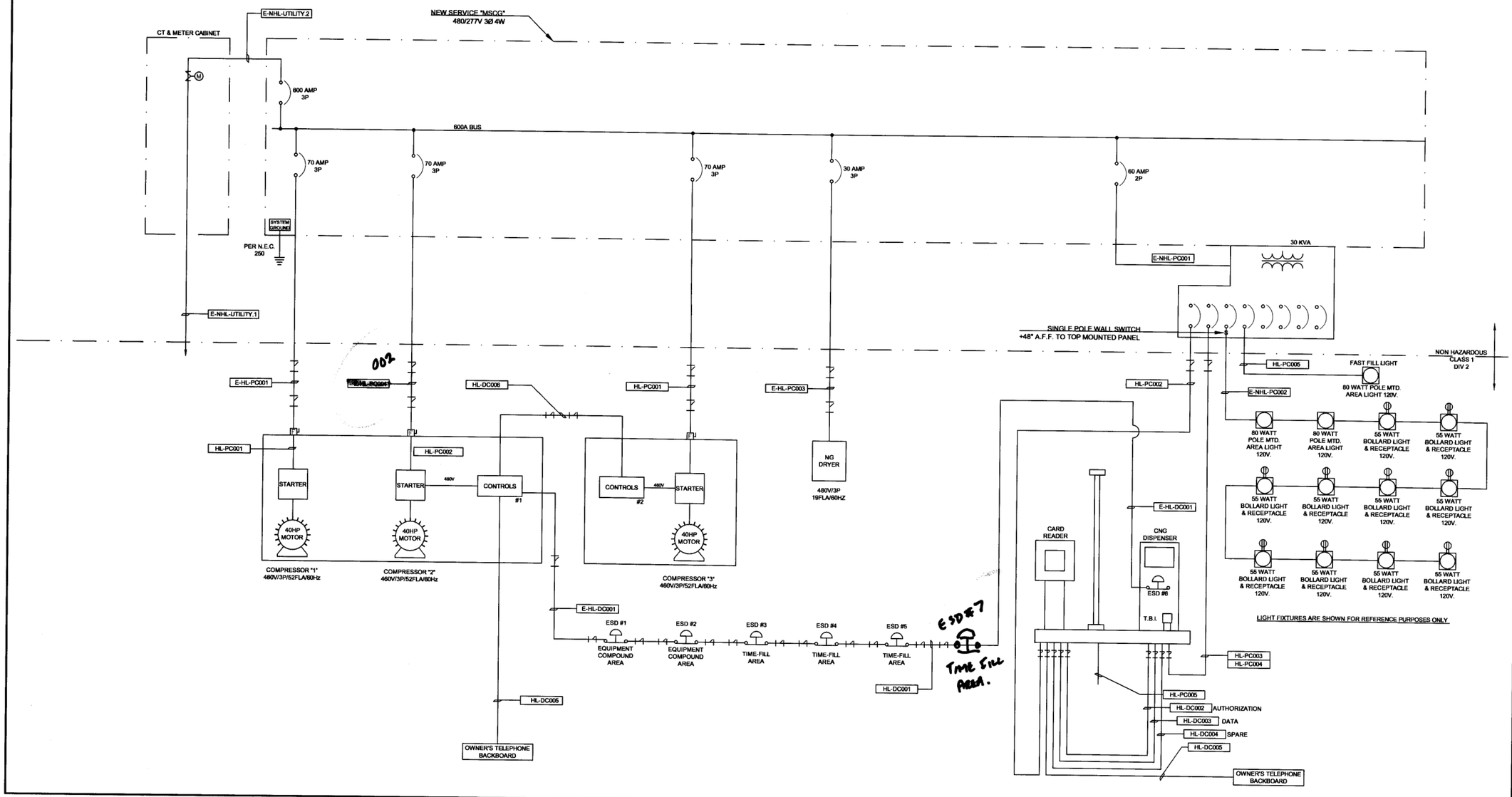
COMPRESSOR 1	= [illegible]	KVA
COMPRESSOR 2	= 43.9	KVA
COMPRESSOR 3	= 43.9	KVA
DRYER	= 15.8	KVA
MIN LOW VOLTAGE PANEL LV1	= 30.0	KVA
CONNECTED LOAD	= 177.0	KVA
43.4 KVA x 25% (LCL PER N.E.C.)	= 14.7	KVA
TOTAL LOAD	= 191.7	KVA

230.0 AMPS

@ 480/277V. 3Ø 4W.

NOTES:

1. ALL WIRE TO BE THWN, CU, STRANDED UNLESS OTHERWISE NOTED
2. ALL CALLOUTS NOTED WITH "N-HL, HL-PL & HL-DC" SHALL BE NEW AND SHALL FOR NEW ADDITIONS (COMPRESSOR #3 AND FAST FILL SYSTEM)
3. ALL SWITCHBOARDS CONFORM TO U.L, ANSI, AND NEMA STANDARDS
4. ALL CIRCUIT BREAKERS ARE LOCKABLE



Owner:
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Grand Junction, CO 81501

Revisions:

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02	11/19/10	90% Preliminary
03	11/22/10	Updated Conduit Line
04	11/30/10	Final

Drawn By:	J.V.
Checked By:	B.B.
Date:	11/30/10
Scale:	As Noted
Job No.	

Site Information:

GRAND JUNCTION
UPGRADE FOR FAST FILL TO EXISTING CNG STATION
333 WEST AVENUE
GRAND JUNCTION, CO 81501

OWNERSHIP & USE OF DOCUMENTS

All drawings, specifications, documents, designs, ideas, arrangements and copies thereof furnished by Gas Equipment Systems, inc. are and shall remain its property. No part thereof shall be copied, disclosed to others, or used in connection with any other work or project without the written consent of the above. Submission or distribution to meet official regulatory requirements or for other purposes in connection with this project is not to be construed as publication in derogation of Gas Equipment Systems, Inc. Common law copyright or other reserved rights. Visual contact with these prints shall constitute conclusive evidence of these restrictions.

Seal:

Plans Prepared By:

GAS EQUIPMENT SYSTEMS, INC.
Specialists in Gas Compression Equipment for NGV's
8753 I.ON STREET
RANCHO CUCAMONGA, CA 91730
OFFICE: (909) 466-8920
LICENSE# 783360

Sheet Title:
ELECTRICAL SINGLE LINE DIAGRAM

Sheet Number:
E-100

	Pri Dig (scfm)	Raw To CNG (scfm)	Pipline (scfm)	%CH4Avg (% methane)	Gallons (GGE) (CNG GGE)	Tailgas (scfm)	Gas To Flare (scfm)
Total 7/14/20	78829	90824	36261	90.76	292.1	65755	288
Total 7/13/20	79448	86285	31223	89.28	247.4	59246	4935
Total 7/12/20	77360	80234	12550	86.80	96.7	21488	41319
Total 7/11/20	74545	80390	32849	90.82	264.8	56642	288
Total 7/10/20	79976	77558	31540	90.66	253.8	54978	225
Total 7/9/20	81925	91186	37330	90.79	300.8	65443	171
Total 7/8/20	82555	90563	36916	90.71	297.2	65852	24
Total 7/7/20	81577	89651	35859	90.71	288.7	65379	213
Total 7/6/20	81068	87647	33377	89.67	265.6	61267	2802
Total 7/5/20	81194	91789	569	76.63	3.9	1125	74417
Total 7/4/20	81155	83209	6224	84.16	46.5	10240	56495
Total 7/3/20	81067	94670	38387	90.78	309.3	64306	2038
Total 7/2/20	82961	87769	34529	91.25	279.7	59337	3071
Total 7/1/20	82525	82071	33430	90.82	269.5	57959	0
Total 6/30/20	81393	93263	34211	90.60	275.1	57534	8984
Total 6/29/20	81685	91153	30281	85.85	230.7	54343	13123
Total 6/28/20	81754	84709	7374	82.83	54.2	12834	55134
Total 6/27/20	81359	91965	30055	89.90	239.8	52131	15256
Total 6/26/20	80845	81695	33470	90.69	269.5	57398	0
Total 6/25/20	80901	88510	36071	90.77	290.6	62867	0
Total 6/24/20	83374	89327	35618	90.80	287.1	64385	112
Total 6/23/20	84907	93049	37471	90.81	302.1	66584	52
Total 6/22/20	85216	93863	34737	88.51	272.9	61435	6186
Total 6/21/20	84819	89519	3845	80.73	27.6	6201	66552
Total 6/20/20	84670	96199	36502	91.57	296.7	62234	6535
Total 6/19/20	82822	81588	33559	90.73	270.3	57690	0
Total 6/18/20	81617	92076	38109	90.80	307.1	64583	0
Total 6/17/20	80693	80514	32485	90.83	261.9	58254	0
Total 6/16/20	82739	92071	36955	90.82	297.9	66743	0
Total 6/15/20	85381	95371	37235	89.86	297.0	65649	2882
Total 6/14/20	86158	85065	5261	81.72	38.2	8700	60199
Total 6/13/20	85620	89780	36123	90.78	291.1	65481	0

Pri Dig	Raw To CNG	Pipline	%CH4Avg	Gallons (GGE)	Tail Gas	Gas To Flare
raw biogas from primary digester	total gas from digester to BioCNG	CNG to fleet fueling		CNG to fleet fueling	waste gas from skid	totally wasted gas, This to be eliminated

CITY OF Grand Junction COLORADO

Purchasing Division

ADDENDUM NO. 1

DATE: **July 27, 2020**
FROM: **City of Grand Junction Purchasing Division**
TO: **All Offerors**
RE: **Design/Build Grand Junction Bio Compressed Natural Gas (BioCNG) Storage and Fueling Station Optimization Project RFP-4813-20-DH**

Offerors responding to the above referenced solicitation are hereby instructed that the requirements have been clarified, modified, superseded and supplemented as to this date as hereinafter described.

Please make note of the following clarifications:

1. Due to technical difficulties with the MS Teams link, some firms are unable to login to the virtual pre-proposal meeting scheduled for 2:00pm local time today. Therefore, the City will be offering second virtual pre-proposal meeting opportunity next week. Information will be forthcoming in Addendum 2, to be issued shortly.

The original solicitation for the project noted above is amended as noted.

All other conditions of subject remain the same.

Respectfully,

Duane Hoff Jr., Senior Buyer
City of Grand Junction, Colorado

CITY OF Grand Junction COLORADO

Purchasing Division

ADDENDUM NO. 2

DATE: **July 28, 2020**
FROM: **City of Grand Junction Purchasing Division**
TO: **All Offerors**
RE: **Design/Build Grand Junction Bio Compressed Natural Gas (BioCNG) Storage and Fueling Station Optimization Project RFP-4813-20-DH**

Offerors responding to the above referenced solicitation are hereby instructed that the requirements have been clarified, modified, superseded and supplemented as to this date as hereinafter described.

Please make note of the following clarifications:

1. As stated in Addendum 1, due to technical difficulties with the virtual pre-proposal meeting held on July 27, 2020, the City is offering a second virtual pre-proposal meeting:

> **2nd Recommended Pre-Proposal Virtual Meeting/Briefing:** A pre-proposal virtual meeting/briefing recommended for all prospective offerors. The purpose of this virtual meeting/briefing will be to inspect and to clarify the contents of this Request for Proposal (RFP). The virtual meeting/briefing shall take place on August 4, 2020 at 8:30am MST. Nothing stated during the Virtual Meeting/Briefing will modify the solicitation. Only information provided in an addendum can modify the solicitation.

The virtual meeting will be hosted via **Microsoft Teams** and attendees shall participate remotely. The link for the virtual meeting is below

https://teams.microsoft.com/l/meetup-join/19%3ameeting_YmVjMWU2ZDUtNjRlNC00Nzc2LWJjMzAtOTVhZDJkMDBhNTZk%40thread.v2/0?context=%7b%22Tid%22%3a%228d207e5d-3faa-4a17-8389-db5747bc379c%22%2c%22Oid%22%3a%2227bd0506-8294-424d-891e-42a0f92aae16%22%7d

2. Section 4.4 RFP Tentative Time Schedule shall be modified as follows:

• Request for Proposal Available	July 17, 2020
• Recommended Pre-Proposal Virtual Meeting/Briefing	July 27, 2020
• 2nd Recommended Pre-Proposal Virtual Meeting/Briefing	August 4, 2020
• Inquiry deadline, no questions after this date	August 18, 2020
• Addendum Posted	August 24, 2020
• Submittal deadline for proposals	September 3, 2020

• Owner evaluation of proposals	September 4 - 17, 2020
• Interviews (if required)	September 29, 2020
• Final selection	October 2, 2020
• City Council Approval	October 21, 2020
• Contract execution	October 22, 2020
• Work begins	Upon Notice to Proceed
• Completion Date	TBD

3. **The Responses Due/Submittal Deadline date and time have been extended to September 3, 2020 prior to 3:30pm.**

The original solicitation for the project noted above is amended as noted.

All other conditions of subject remain the same.

Respectfully,

Duane Hoff Jr., Senior Buyer
City of Grand Junction, Colorado

CITY OF Grand Junction COLORADO

Purchasing Division

ADDENDUM NO. 3

DATE: **August 17, 2020**
FROM: **City of Grand Junction Purchasing Division**
TO: **All Offerors**
RE: **Design/Build Grand Junction Bio Compressed Natural Gas (BioCNG) Storage and Fueling Station Optimization Project RFP-4813-20-DH**

Offerors responding to the above referenced solicitation are hereby instructed that the requirements have been clarified, modified, superseded and supplemented as to this date as hereinafter described.

Please make note of the following clarifications:

1. Q. Can you provide some background of the drawings that were attached to the proposal request?

A. The drawings are from reference only and to assist the firm with preparing a response to the design-build RFP. The selected firm will need to verify any information after a contract is awarded. There have been several previous projects between 2010 and 2017 at the CNG fleet fueling station and the Persigo BioCNG facility. The drawings are from the previous projects which are all completed.

2. Q. What space is available either at the Persigo WWTP or the Fleet station?

A. Aerial images of both Persigo and the fleet fueling stations are available on the City's GIS maps http://www.gjcity.org/Maps/ . There is fair amount of open space at Persigo WWTP.

3. Q. What design criteria are we to adhere to other than the volumetric storage of gas noted as being between 60,000 to 75,000 scf of Low Pressure Gas Storage in a round mounted membrane gas holder.

A. Each firm should propose what storage volume they would select for this project based on the project budget, supplied operating data and any other pertinent information. The selected firm will be asked to validate the amount of gas storage required to meet the project objective of not flaring biogas.

4. Q. Can you verify that the scope of work includes:
   a. Ground mounted low pressure Gas Storage of digester gas or as an option Ground Mounted low pressure gas storage of processed CNG
   b. Additional gas flow metering (existing fueling station)

c. Additional flow control valves

A. a. Either storage option is okay. Firm should include if they are proposing to store raw digester gas or processed CNG.

b. Likely, firm to determine what additional instrumentation and control would enhance the ability to reduce biogas flaring.

c. Likely, firm to determine what additional instrumentation and control would enhance the ability to reduce biogas flaring.

5. Q. The scope states an 'elimination' of flaring of CNG. The data provided of the gas flared shows an amount that is close to 75,000 scf. It appears that it would be inappropriate to state that the gas flaring would be eliminated at the proposed design basis storage volumes.

A. We believe a combination approach of demand side management (better instrumentation and control at the fleet fueling station) and adding supply side storage (gas storage at Persigo) could eliminate flaring. Currently the fleet CNG vehicles use about twice the amount of biogas that Persigo produces. A smart fueling system and an additional wide spot in the process for CNG storage is the objective of this project.

6. Q. How will the City address changes to the design at the 60% and 90% review periods should there be deviation from the design submission at bid time?

A. Should the City make any changes/modifications/additions to the project, beyond the scope of this solicitation process, a change order will be issued for said changes/modifications/additions.

7. Q. What grant was obtained for this project and what requirements are there of the Design Builder through the City's use of the grant funding?

A. The project is partially funded by the Colorado Department of Local Affairs Renewable/Clean Energy Implementation Grant. Grant funding requires will be reviewed with the selected firm.

8. See attached City of Grand Junction Sample Contract.

9. Q. Sheet P-1.0, General Note 1. Confirming that equipment inside dashed line will be provided by Clean Energy and is not part of our current scope of work/procurement.

A. Correct, these drawings are from a project completed in 2017. This scope of work is focused on adding improved instrumentation and automation to the fleet fueling stations.

10. Q. If equipment is to be furnished by Clean Energy, has equipment already arrived at the site, and if so, where is it currently located?

A. N/A, its already installed at 333 West Avenue.

11. Q. Sheet C-1.0: New fence, bollards, wheel stops and bollards are labeled as "by others." Are these items to be included in our scope of work or excluded?

A. No, these are already installed

12. Q. Will a site visit be allowed?

A. There will be no site visits during the solicitation process. The awarde firm will be able to conduct site visits after contract award. Should proposers desire additional site information, the may visit the City's GIS website at http://www.gjcity.org/Maps/

13. Q. Does this project need to comply with Davis-Bacon/prevailing wage requirements?

A. No.

14. Q. RFP Section 2.13 lists liquidated damages of $1,000 per day, but Section 4.4 states that completion date is To Be Determined. Can the City provide a month and year of its anticipated completion date?

A. Desired completion date no later than October 2021. Note, as per Section 5.0 Preparation and Submittal of Proposals, Item C - Include a **time schedule** for completion of your firm's implementation plan and an estimate of time commitments from Owner staff.

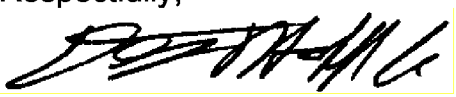
15. Q. Will red-line comments currently on the drawings be reconciled in a conformance/for construction set of drawings?

A. No, these drawings are from a previously completed project. These are for reference only and to assist firms in preparing their response to this Design-Build RFP. All information will need to be verified by selected firm after a contract is awarded.

The original solicitation for the project noted above is amended as noted.

All other conditions of subject remain the same.

Respectfully,



Duane Hoff Jr., Senior Buyer
City of Grand Junction, Colorado

CITY OF GRAND JUNCTION, COLORADO

****

CONTRACT

This CONTRACT made and entered into this ___ day of _____, 2015 by and between the **???, Colorado,** a government entity in the County of Mesa, State of Colorado, hereinafter in the Contract Documents referred to as the "Owner" and _____hereinafter in the Contract Documents referred to as the "Contractor."

WITNESSETH:

WHEREAS, the Owner advertised that sealed Responses would be received for furnishing all labor, tools, supplies, equipment, materials, and everything necessary and required for the Project described by the Contract Documents and known as **Title & Number**.

WHEREAS, the Contract has been awarded to the above named Contractor by the Owner, and said Contractor is now ready, willing and able to perform the Work specified in the Notice of Award, in accordance with the Contract Documents;

NOW, THEREFORE, in consideration of the compensation to be paid the Contractor, the mutual covenants hereinafter set forth and subject to the terms hereinafter stated, it is mutually covenanted and agreed as follows:

ARTICLE 1

Contract Documents: It is agreed by the parties hereto that the following list of instruments, drawings, and documents which are attached hereto, bound herewith, or incorporated herein by reference constitute and shall be referred to either as the "Contract Documents" or the "Contract", and all of said instruments, drawings, and documents taken together as a whole constitute the Contract between the parties hereto, and they are fully a part of this agreement as if they were set out verbatim and in full herein:

The order of contract document governance shall be as follows:

a. The body of this contract agreement
b. Negotiated Terms and Conditions/Scope of Work etc.
c. Solicitation Documents for the Project; **Solicitation Name;**
d. Intent to Award
e. Contractors Response to the Solicitation
f. Work Change Requests (directing that changed work be performed);
g. Field Orders
h. Change Orders.

ARTICLE 2

Definitions: The clauses provided in the Solicitation apply to the terms used in the Contract and all the Contract Documents.

ARTICLE 3

Contract Work: The Contractor agrees to furnish all labor, tools, supplies, equipment, materials, and all that is necessary and required to complete the tasks associated with the Work described, set forth, shown, and included in the Contract Documents as indicated in the Solicitation Document.

ARTICLE 4

Contract Time and Liquidated Damages: Time is of the essence with respect to this Contract. The Contractor hereby agrees to commence Work under the Contract on or before the date specified in the Solicitation from the Owner, and to achieve Substantial Completion and Final Completion of the Work within the time or times specified in the Solicitation. In the event the Work is not completed in the times set forth and as agreed upon, the Contractor further agrees to pay Liquidated Damages to the Owner as set forth in the Solicitation. The Contractor acknowledges and recognizes the delays, expenses and difficulties involved in proving in a legal proceeding the actual losses suffered by the Owner if the work is not completed on time. Accordingly, instead of requiring any such proof, the Owner and the Contractor agree that as Liquidated Damages for delay, but not as a penalty, the Contractor shall pay to the Owner the amounts specified in the Solicitation.

ARTICLE 5

Contract Price and Payment Procedures: The Contractor shall accept as full and complete compensation for the performance and completion of all of the Work specified in the Contract Documents, the sum of **Amount Written ($Amount Numerical).** If this Contract contains unit price pay items, the Contract Price shall be adjusted in accordance with the actual quantities of items completed and accepted by the Owner at the unit prices quoted in the Solicitation Response. The amount of the Contract Price is and has heretofore been appropriated by the Grand Junction City Council for the use and benefit of this Project. The Contract Price shall not be modified except by Change Order or other written directive of the Owner. The Owner shall not issue a Change Order or other written directive which requires additional work to be performed, which work causes the aggregate amount payable under this Contract to exceed the amount appropriated for this Project, unless and until the Owner provides Contractor written assurance that lawful appropriations to cover the costs of the additional work have been made.

Unless otherwise provided in the Solicitation, monthly partial payments shall be made as the Work progresses. Applications for partial and Final Payment shall be prepared by the Contractor and approved by the Owner in accordance with the Solicitation.

Upon Final Completion of the Work under the Contract and before the Contractor shall receive final payment, the Owner shall publish at least twice in a newspaper of general circulation published in the County a notice that: 1. the Owner has accepted such Work as completed according to the Contract Documents; 2. the Contractor is entitled to final payment therefore; 3. thirty days after the first publication, specifying the exact date, the Owner shall pay the full balance due under the Contract; and 4. persons having claims for labor, materials, team hire, sustenance, provisions, provender, or other supplies used or consumed by the Contractor or a subcontractor shall file a verified statement of the amount due and unpaid on account of such claim prior to the date specified for such payment. Nothing

herein shall be construed as relieving the Contractor and the Sureties on the Contractor's Bonds from any claim or claims for work or labor done or materials or supplies furnished in the execution of the Contract.

ARTICLE 6

Bonds: The Contractor shall furnish currently herewith the Bonds required by the Contract Documents, such Bonds being attached hereto. The Performance Bond shall be in an amount not less than one hundred percent (100%) of the Contract Price set forth in Article 5. The Payment Bond shall be in an amount not less than one hundred (100%) of the Contract Price set forth in Article 5.

ARTICLE 7

Contract Binding: The Owner and the Contractor each binds itself, its partners, successors, assigns and legal representatives to the other party hereto in respect to all covenants, agreements and obligations contained in the Contract Documents. The Contract Documents constitute the entire agreement between the Owner and Contractor and may only be altered, amended or repealed by a duly executed written instrument. Neither the Owner nor the Contractor shall, without the prior written consent of the other, assign or sublet in whole or in part its interest under any of the Contract Documents and specifically, the Contractor shall not assign any moneys due or to become due without the prior written consent of the Owner.

ARTICLE 8

Severability: If any part, portion or provision of the Contract shall be found or declared null, void or unenforceable for any reason whatsoever by any court of competent jurisdiction or any governmental agency having the authority thereover, only such part, portion or provision shall be effected thereby and all other parts, portions and provisions of the Contract shall remain in full force and effect.

IN WITNESS WHEREOF, City of Grand Junction, Colorado, has caused this Contract to be subscribed and sealed and attested in its behalf; and the Contractor has signed this Contract the day and the year first mentioned herein.

The Contract is executed in four counterparts.

CITY OF GRAND JUNCTION, COLORADO

By: _____ _____
Title: Date

ATTEST:

By: _____
Title:

(Contractor's Name)

By: _____ _____
Title: Date

ATTEST:

By: _____
Title:

CITY OF Grand Junction COLORADO

Purchasing Division

ADDENDUM NO. 4

DATE: **August 24, 2020**
FROM: **City of Grand Junction Purchasing Division**
TO: **All Offerors**
RE: **Design/Build Grand Junction Bio Compressed Natural Gas (BioCNG) Storage and Fueling Station Optimization Project RFP-4813-20-DH**

Offerors responding to the above referenced solicitation are hereby instructed that the requirements have been clarified, modified, superseded and supplemented as to this date as hereinafter described.

Please make note of the following clarifications:

1. Q. What is the flow rate of conditioned gas downstream of the biogas skid?

   A. This is variable depending the demand at the fleet fueling stations. The daily flow rate of gas going into the pipeline is in column 3 on attachment 7 of the RFP. Depending on the demand at the fleet fueling stations the pipeline pressure will vary between 20 and 95 psi. Typically the demand for conditioned biogas at the fueling station is timed at the end of each days shift when the trucks all return and the vehicles connect to the slow fill stations overnight.

2. Q. What is the operating pressure of the inlet biogas riser at the CNG compound?

   A. 20 - 95 psi

3. Q. Can you please provide the KVA size of the transformer that is providing power to the CNG compound?

   A. This will need to be confirmed by selected firm.

4. Q. What is the existing communications network between the Persigo and the fueling center?

   A. Currently, there is no communication between the Persigo WWTP and the fleet fueling stations. The BioCNG skid and CNG pipeline is operated independently of the CNG fueling operations. The CNG skid at Persigo puts CNG into the pipeline until the pipeline reaches 95 psi. When the pipeline reaches 95 psi, all additional raw biogas coming from the anaerobic digester is flared. When the CNG pipeline drops below 95 psi, flaring stops and the raw biogas is treated in the BioCNG skid and put into the BioCNG pipeline.

5. Q. What is the preferred communications means, manufacturer of equipment?

   A. None at this time.

6. Q. Is there preferred valve and or PLC manufacturer?

   A. Not at this time.

7. Q. Is there an existing Controls Network Architecture that could be shared?

   A. Not at this time.

8. Q. Is there an existing Controls Narrative and Cause and Effect that could be shared?

   A. Not at this time.

9. Q. The overall usage of CNG by the CNG fleet vehicles is about twice of the amount of the BioCNG that is produced at Persigo WWTP. Currently, the entire CNG fleet refuels at about the same time everyday. This rapidly draws down the pressure in the BioCNG pipeline coming from Persigo. When the pressure in the BioCNG pipeline hits 20 psi, the fleet fueling system switches to a Xcel Energy Natural gas source and tops off all the fleet vehicles connected to the system. Once the fleet is topped off, the pressure in the BioCNG pipeline gradually increases as BioCNG is being produced and cleaned. Once the BioCNG pipeline reached 95 psi, all additional raw digester gas is flared. We think that having the ability to fuel smaller portions of the fleet at a time and in a sequence will allow better management of the BioCNG gas and reduce peak demands that rapidly reduces the pipeline pressure and causes the system to switch to Xcel natural gas. One potential goal of additional metering and control valves may be to be able to fuel a smaller portion of the entire CNG fleet at any one time and ensure that the maximum amount of BioCNG gets into the vehicles before the system switches to Xcel gas. This approach would be most likely on the weekends, when there is a couple days that the fleet vehicles wouldn't be in service and have extended time windows when they could be refueled in sequence. The weekends are also when most of the available BioCNG is flared.

The original solicitation for the project noted above is amended as noted.

All other conditions of subject remain the same.

Respectfully,



Duane Hoff Jr., Senior Buyer
City of Grand Junction, Colorado

CITY OF Grand Junction COLORADO



BioCNG Storage and Fueling Station Optimization

Proposal No. 920289 Rev. 0

ZAP

EXCELLENCE IN EXECUTION

September 3, 2020
333 S. Allison Parkway - Suite 100
Lakewood, CO 80226
Phone: 720.529.4430
www.zapecs.com

September 3, 2020

Kurt Carson
Project Manager
Department of Public Works - Utilities
City of Grand Junction

RE: 920289 - BioCNG Storage and Fueling Station Optimization Rev. 0

Dear Mr. Carson:

Enclosed, please find ZAP Engineering & Construction Services, INC.'s (ZAP) proposal for the opportunity to perform engineering services for City of Grand Junction's BioCNG Storage and Fueling Station Optimization project. This proposal is based on our understanding of the scope of work provided in Request for Proposal RFP-4813-20-DH and Addendums 1, 2, 3 and 4. This proposal is valid for 30 days.

The team at ZAP is honored to have the opportunity to submit a proposal to help the City of Grand Junction minimize the flaring of valuable biogas, thereby reducing emissions and reducing the amount of additional fuel that must be purchased for your existing CNG vehicle fleet. We want to play a significant role, as a partner, with the City of Grand Junction. We believe these types of projects not only benefit the city but benefit those who call the City of Grand Junction home.

In the accompanying proposal, we have outlined the most economical and technically feasible approach for biogas storage from the existing Persigo Wastewater Treatment Plant. In evaluating the current challenge the city faces, ZAP identified an alternate solution by leveraging our extensive background in storage, processing, compression and transportation of natural gas. In our proposal, we describe the methodology, technical support, and total installed cost estimate for our alternative. We firmly believe we are offering the right solution for your current challenges.

ZAP has designed, constructed, and commissioned projects in a variety of industries and utilizes this expertise to develop feasible and practical designs tailored to meet your specific project objectives. ZAP fosters a client-centered culture and teamwork-based methods to ensure a safe, environmentally-responsible, and reliable operation. ZAP will provide a customized, cost-effective yet flexible approach to meet all of your needs. We consider ourselves on the forefront of new technologies in the gas and oil sector. Our foundation and reputation is centered on our highly technical, process oriented approach to engineering projects.

ZAP has reviewed City of Grand Junction's requirements for this project and believe this proposal will provide great value in cost, quality, and expertise. As a firm that prides itself in providing customers with tailored solutions, ZAP has highlighted characteristics which set us apart from our competitors.

ZAP's Key Differentiators:

- ✓ Core values present in all aspects of business: Accountability, Mutual Respect, Quality, and Execution
- ✓ Extensive experience in gas processing, storage and compression
- ✓ Denver-based allowing for face to face interaction throughout the project, with easy travel to Grand Junction
- ✓ Full service engineering, procurement, and construction firm

ZAP expects the following individuals to be involved with any presentations on behalf of ZAP:

Josh Ruyle, Project Manager and Primary Point of Contact
Frank Lousberg, President and Managing Principal
Shane Wilson, Vice President of Business Development
Drew Mathies, EPC Program Manager

Thank you for this opportunity to provide our proposal. If you have any questions or require any clarifications, feel free to contact us. We look forward to discussing our proposal in greater detail.

Sincerely,

Josh Ruyle

Josh Ruyle, PMP | Project Manager and Primary Point of Contact
ZAP Engineering & Construction Services, Inc.
333 S. Allison Parkway, Suite 100
Lakewood, CO 80226
303.565.5540
ruylej@zapecs.com

cc: Duane Hoff Jr.

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Exhibit L – CNG Storage Vessel Drawing

SECTION B: QUALIFICATIONS/EXPERIENCE/CREDENTIALS

CAPABILITIES

ZAP Engineering & Construction Services, Inc. (ZAP) was established in 2001 and has grown to over 150 employees. The diverse backgrounds of our project team members allow ZAP to bring focused knowledge to unique challenges and projects. Our in-house engineering services include: Process, Mechanical, Electrical, Instrumentation & Controls, and Civil/Structural.

ZAP specializes in:

- ✓ Conceptual Engineering,
- ✓ Detailed Engineering and Design,
- ✓ Project and Construction Management,
- ✓ Controls and Automation,
- ✓ Procurement Services,
- ✓ Safety Management,
- ✓ Project Controls,
- ✓ Feasibility Studies,
- ✓ Due Diligence Analysis, and
- ✓ Permitting Support.

Our projects support the oil & gas, specialty chemical, and material handling industries and range from quick turnaround maintenance and optimization projects, to turn-key engineering, procurement, and construction (EPC) installations. ZAP completes projects including, but not limited to:

- ✓ Processing and Treating Plants,
- ✓ Compressor Stations,
- ✓ Pipelines,
- ✓ Production Facilities,
- ✓ Manufacturing Facilities,
- ✓ Stabilization and Fractionation Facilities, and
- ✓ Pipeline, Truck, Rail, and Marine Terminals.

Our company size allows us to execute a wide range of projects and prioritize work to meet City of Grand Junction's needs. ZAP has the manpower to tackle large capital projects while efficiently executing smaller projects. We are able to meet deadlines, identify alternate solutions, and change direction quickly when necessary.

Efficiency and quality are emphasized on every project, and the ZAP team is continually looking for ways to improve in these categories. ZAP takes pride in producing high quality designs at a lower cost. The ZAP culture embraces a collaborative design process with cooperative design reviews. These design reviews involve all

project stakeholders to ensure a successful project. By providing our clients with our expertise in design and construction, the ZAP team is able to execute all projects with efficiency and quality resulting in a project that stays on schedule and on budget.

SCOPE UNDERSTANDING AND OBJECTIVES

The City of Grand Junction (the City) is currently experiencing excessive flaring of biogas from an existing wastewater treatment plant. The root cause of the excessive flaring is the difference between the continuously produced BioCNG from the digester at Persigo and the intermittent, demand based usage at the fleet fueling operation. Without adequate storage for these extended periods, which occur primarily on weekends and holidays, the City has no other option but to flare the valuable biogas. The RFP suggests a solution which is to install low pressure storage capacity in a ground membrane at the existing Persigo site.

ZAP reviewed the RFP and with our expertise in the natural gas industry we believe that it is more economical to add high pressure storage at the fueling facility and additional controls rather than installing low pressure storage at the waste water treatment facility digester. This solution is technically feasible, more cost effective, and results in less community and environmental impact than a ground storage membrane at Persigo.

From a technical standpoint, adding high pressure storage in the form of two (2) banks of three (3) 20" diameter by 23 ft CNG storage packs will provide 71,192 SCF of additional storage volume. As shown in the graphical depiction in Figure 1 below, the inventory control required on the high pressure side will be managed by monitoring the pressure and flow rate of the produced gas into the vessel pack storage in addition to the existing sphere storage so that each bank will operate between 2,000 PSIG and 4,500 PSIG. The controls will be integrated with enhanced compressor controls to ensure stable suction pressure control and to give the operation the ability to eliminate flaring of the BioCNG and optimize the use of utility gas. See the PFD redlines in **Exhibit A** for the proposed equipment and control additions to manage the high pressure BioCNG inventory. This solution eliminates flaring, reducing the environmental impact and adding value by reducing utility gas consumed during the week at peak filling times. The added benefit of this approach is that a third bank of CNG tube storage could be added in the future to allow for even more operational flexibility over extended weekends/holidays, and other periods of reduced demand.

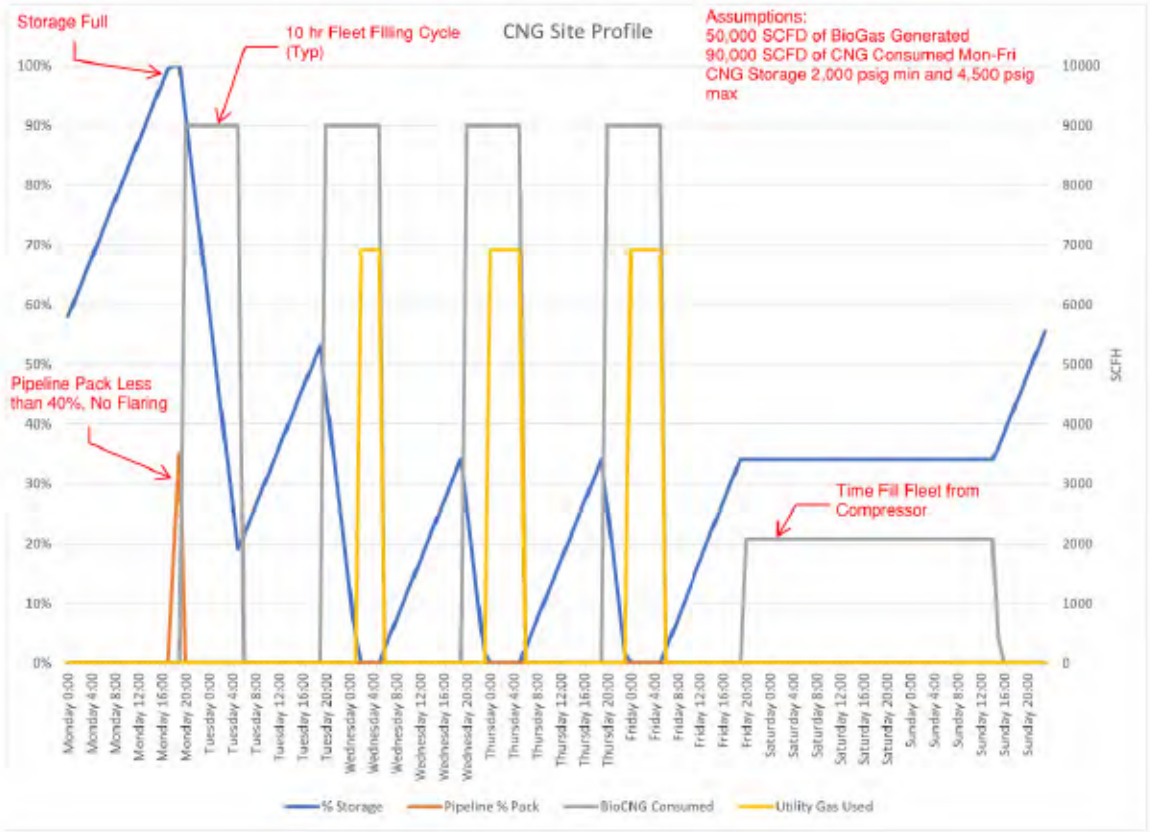


Figure 1

With the unknowns at Persigo and with respect to the available compression capacity, treating equipment, and intended operational modes, ZAP believes strongly that leaving the existing digester operation as-is and focusing on the fueling system will result in a more economical and easier to operate system for the City. There is adequate compression capacity at the fueling facility, but we were not given the capacity of the treating and compression at the Persigo facility. ZAP has extensive experience in high pressure gas compression, storage, and truck/rail loading, however we have no experience working within the wastewater facility at Persigo. We believe this has led to a superior solution.

One of the main advantages of our approach is minimized community and environmental impact for the relatively small footprint of the high pressure storage (about 6 ft. by 25 ft. total) compared with the large membrane storage. ZAP's solution will require only construction permits and minimal involvement of the community. Installing a large low pressure storage system will likely require additional permitting than a simple vessel pack. The low pressure system will have a visible impact on the local landscape and will be visible from a distance. This could be met with community resistance. This is less desirable than the low impact and simple solution that ZAP proposes. Operationally, leaving the digester and treating system in production and not complicating the tie in and construction will be simpler for the City as well. The tie in of the high pressure storage option will be straight forward and will require no disruption to the digester operation. ZAP is proposing to include additional controls at the fueling station to allow for more consistent compressor operation. None of these controls necessitate modifications to the existing digester and treating operations at Persigo, a key advantage. Another reduced impact is that the site work will be greatly reduced since only two small foundations are required for our approach compared with the large area disturbed by the construction and installation of

the low-pressure storage. Finally, the longevity and mechanical integrity of ASME code constructed pressure vessels should greatly exceed the membrane, resulting in reduced environmental and safety monitoring risk.

This approach allows the existing operation at the Persigo wastewater treatment plant located at 2145 River Road to continue functioning as normal and without interruption. The additional BioCNG storage at the existing fueling operation will be integrated with new compressor controls and valves to ensure adequate staging of compression to control inventory as the digester continues to produce. Piping, instrumentation and automation will be minimal, as there will be only tie points to the existing piping system and automated valves for control of the new storage system. ZAP will perform system integration into the City's existing PLC infrastructure.

KEY PERSONNEL

PERSONNEL	ROLE/TITLE
Frank Lousberg, PE	President | Managing Principal
Josh Ruyle, PMP	Project Manager
Drew Mathies, PMP, PE	EPC Program Manager
Steve Wymore, PMP	Vice President of Construction Services
Eric Walker, PE	Mechanical Engineer
Mason Bieker, PE	Process Engineer
Tom Terrell, PE	Civil/Structural Engineer
Keivan Pirasteh	Instrumentation and Controls Engineer

Resumes of key personnel which show their Colorado licenses and registrations in addition to relevant project history are located in **Exhibit B**. ZAP's organization chart is provided in **Exhibit C**.

ZAP PROJECT EXPERIENCE AND CAPABILITIES

ZAP has performed engineering and construction management on several related projects. The following is a short list of those projects:

PROJECT NAME	PROJECT DESCRIPTION
PROPANE SPHERE	ZAP completed engineering and design of a 50,000 bbl storage sphere to increase C3 storage capacity at a facility. To connect the sphere into the facility, additional pipe rack and associated piping including cable tray which carries controls and electrical cabling was accounted for. The project was completed with the provisions for a future 20,000 bbl sphere. ZAP also assisted with the design of a bleve wall and the relocation of an existing retention pond.

	Goal and Challenges: The goal of the project was to provide additional storage volume for the product so that the product from the plant was not interrupted during periods of reduced shipping volume. The main challenge with this project was to implement the changes in an operating, federally regulated PSM hazardous material producing facility. The ZAP team met this challenge and the project was executed per the client requirements for schedule and budget.
TURBINE EXPANSION EPC	ZAP completed an EPC project for a 210 MMSCFD expansion of a high pressure gas booster compressor station in Colorado. ZAP procured and installed the specified equipment and services. This includes purchasing of all other process and utility equipment, electrical distribution equipment, plant DCS equipment, civil construction, structural construction, mechanical construction, electrical and I&C construction, programming, commissioning support, startup support, engineering, and construction management. Goals and Challenges: The goal for this project was to reduce the operating upstream gathering system pipeline pressure by adding booster compression to increase the downstream delivery pressure as new volume was added to the system. The primary challenge that was met by the ZAP construction execution team is the successful coordination and management of over 30 subcontracts with thousands of components and materials arriving to site over the approximately six-month duration of construction.
NATURAL GAS LIQUIDS (NGL) INJECTION PUMPS	ZAP was contracted to perform engineering and design for the installation of three vertical can pumps for injection of NGL into an interstate pipeline. The project consisted of three 240 gpm, 7300 TDH (2,000 PSI) product pipeline pumps. The pumps were driven by 500 hp medium voltage motor with soft start drives. ZAP completed the sizing of the pumps, specification and purchase of the pumps, vendor approval, process, mechanical, electrical, instrumentation and controls, structural, and design to create a detailed construction package. ZAP supported construction and provided as-built drawings for the facility. P&IDs, electrical one line diagrams, motor schematics, controls programming package, loop drawings, and electrical studies were included in the construction package. Goals and Challenges: This project was to incorporate the new pumps into the design to allow safely transporting the natural gas liquids via a high pressure pipeline as opposed to trucking the liquids from the plant. This reduced the overall environmental footprint of the facility and reduced traffic on local roads.
ACID GAS INJECTION	ZAP was contracted to complete the full service engineering package for a 5 MMSCFD AGI injection system. Two compressors increased the pressure of the acid gas off the amine still at 8 psig so it could be pipelined to the well injection site. The site was approximately two miles from the plant. The injection site

	consisted of a compressor that increased the pressure to 2,750 psig for injection down hole. Proximity to population centers required additional shutdown and safeguards for leak detection. After successful execution of the first well, ZAP engineered the upgrade of the system to accommodate injection to a second well. Goals and Challenges: Safely compressing highly toxic acid gas containing H2S and other hazardous substances to inject into the wells was the primary goal and challenge. ZAP has extensive experience with high pressure gas piping, compression, instrumentation, and safety systems. This project required utilizing a rigorous process safety management approach to all aspects of the design.
SALT WATER DISPOSAL FACILITY	ZAP designed a saltwater injection facility with the capability to receive produced water via truck, separate oil, settle out solids, store processed water, filter out solids and inject the processed water down one of two injection wells. The design daily throughput of the facility is 4,000 BPD with a maximum daily throughput of 8,000 BPD. This process utilized a series of atmospheric API 12F tanks to skim oil and settle out solids. Prior to the high pressure injection pumps, a bank of bag filters were installed to further remove solids carried over from the settling tanks. Goals and Challenges: The goal of the facility is to separate oil and solids from the water prior to returning to an injection well. The challenges with this project were to carefully consider the design flow rates and intended tank and separator inventory to ensure the proper performance of the system. ZAP met this challenge with properly designed controls.
CO2 FLOOD FEED STUDY	ZAP completed a FEED study for a brownfield project to recover natural gas liquids (NGL) from a CO2 rich stream from a nearby facility. The residue stream (mostly CO2) was sent back to the facility for compression to wellhead pressure (up to 4,500 PSIG) for re-injection and the NGL stream will be treated, fractionated, and sent to product storage/loadout. ZAP's scope included process modeling, detailed sizing/rating calculations performed on existing equipment, and specification and quoting of new equipment based on results. A cost estimate was generated to install the proposed facility with all necessary aboveground and underground piping, foundations and structural steel, instrumentation, programming, electrical connections, utility tie-ins, demolition, and all other required tasks to provide a complete and robust process installation. Goals and Challenges: Safely compressing the gas to re-inject to the well at high pressure was a key consideration of the design.

PROPANE AND BUTANE PIPELINE PUMPS	ZAP completed the engineering and design for the addition of three 12-stage horizontal 3,000 hp pumps to deliver propane and mixed butane to sales pipeline from existing storage spheres. ZAP performed engineering services for the following: process, mechanical, electrical, instrumentation and controls, structural, and design to create a detailed construction package. ZAP supported construction and provided as-built drawings for the facility. P&IDs, a 3D model, and PHA support were included in the construction package. ZAP utilized a 3D scan of the affected area of the existing facility to enable smooth addition of piping and cable tray. Goals and Challenges: The project goal was to transport the liquid products at high pressure through the pipelines. The brownfield nature of the project meant that interferences and tie points were critical to ensure a smooth construction result.
AMMONIA TRUCK LOADING	ZAP helped define the project scope, prepared a +/-50% budgetary total installed cost (TIC), and generated an IFC package for upgrading the ammonia truck loading at a distribution terminal. An additional compressor was added to provide additional compression capacity. This included installing an ammonia surge vessel west of the new truck load-out heater with associated instrumentation, two new control valves and new RIO panel, new pipe from the truck load out heater to the ammonia surge vessel and from the vessel to the flare line existing tie point, and six (6) relief devices will have sizing validated, with discharge lines tied into the existing flare system. Goals and Challenges: The hazardous nature of ammonia facilities and ensuring the safety of onsite personnel and the adjacent community made safety the primary objective. The successful integration of the new equipment was achieved including a seamless transition from construction to operation.
AMMONIA TERMINAL CONSTRUCTION MANAGEMENT	ZAP provided supervision of the field work and manage the civil, structural, mechanical, and electrical subcontractors for the installation of a new wet surface air cooling (WSAC) condensing units and an additional Vilter refrigeration compressor at an anhydrous ammonia terminal. ZAP also provided a construction manager to supervise the field work including trade inspection, material receiving, and on site document control. Goals and Challenges: The three person ZAP construction team successfully managed a difficult brownfield project where unexpected underground obstructions were encountered, adverse weather, and difficult contractor relationships happened throughout the approximately six months of construction. Managing the safety aspects of working inside an operational ammonia terminal was one of the main

	challenges. The project was ultimately delivered with a satisfied client and successful, safe project record.

SAFETY CULTURE

ZAP has logged more than a million safe man-hours on our EPC project sites demonstrating our understanding of the importance of safety on the job. Our dedication to safety is reflected in our outstanding OSHA ratings and current EMR rating **(Exhibit D)**. To continue to achieve an exceptional safety record, ZAP has a number of programs and trainings in place for our office and field employees. ZAP's company-wide safety manual is located in **Exhibit D.**

To comply with OSHA's process safety management (PSM) regulations, ZAP focuses on employee participation and training, project hazard analysis (PHA) knowledge, effective communication, and performing pre-startup safety reviews (PSSR). A PSSR is always completed as part of our dedication to safety. As part of this review, ZAP's safety director, safety manager, and other onsite personnel will meet with City of Grand Junction to confirm construction and equipment are in accordance with design specifications; Safety, operating, maintenance, and emergency procedures are in place and are adequate; A process hazard analysis has been performed for new facilities and recommendations have been resolved or implemented before startup, and modified facilities meet the updated requirements; and employee training of proper operating processes has been completed.

SUBCONTRACTORS

ZAP is proposing to complete this project with direct personnel as well as the following proposed subcontractors:

Construction Management/Inspection:	ZAP Engineering & Construction Services, Inc.
Mechanical Construction:	Willow Creek Companies
Electrical Construction:	Willow Creek Companies

In addition to the above contractors, ZAP will have minor subcontractors for services such as office trailer, dumpsters, portable restrooms, non-destructive testing, geotechnical testing, insulation, and placing final site rock.

START-UP, COMMISSIONING, AND PERFORMANCE VERIFICATION

The approach and process that will be used in start-up, commissioning and performance verification for this project will be as follows. The checkout and installation verification of the equipment, electrical, and controls will be completed by inspection of the site work during the final phase of construction. The checkout process will be documented on trade specific checkout forms indicating the readiness for operation of all components of the work. The subcontractor, ZAP, and Owner shall sign off on the completion documents prior to commencing commissioning operations. Commissioning will be managed by ZAP in cooperation with Owner's site representative. The ZAP project manager and construction manager will coordinate all commissioning activities. A Pre-Startup Safety Review (PSSR) will be completed to ensure all components are installed per the design, code, and Owner's requirements to ensure a safe startup and operation. The performance verification for this project will consist of verifying controls all work correctly and the design rates for storage are achieved.

The personnel that will perform startup are the project manager, construction manager, and process engineer. These personnel have extensive experience in startup and operation of gas compression and processing facilities, see resumes in **Exhibit B**.

ZAP has several complex plant projects that were successfully started, commissioned, and performance verified by ZAP field and engineering personnel. ZAP is expert in design, engineering, and construction of complicated gas processing facilities, including cryogenic gas plants, high pressure gas pipeline booster compressor stations, programming complete plant facilities, truck and rail loading system planning and design, control system planning and integration, brownfield plant construction, and startup and commissioning of these facilities.

ZAP provides complete job files including all equipment, controls, and electrical device operations and maintenance manuals. ZAP will provide the relevant storage system documents, control device data, and PLC programming documentation for this project upon completion. ZAP will provide all native files to the City of Grand Junction.

SECTION C: STRATEGY AND IMPLEMENTATION PLAN

PROPOSED STRATEGY

ZAP plans to coordinate with the City Project Manager throughout the contract execution period.

Per the RFP, ZAP has included the necessary resources for project management, permitting, and all design documents to support the project. The approach ZAP takes to a project is based on our core values of mutual respect, accountability, quality, and execution.

ZAP has a strong sense of responsibility to the communities we serve and evaluates project technical solutions to minimize environmental and community impact for our clients. ZAP feels strongly that our proposed technical solution will result in a better project for the community with simplified permitting and reduced environmental impact.

ZAP will progressively elaborate the project scope and iterate through the design process until an agreed upon design basis is established. This approach allows all stakeholders to participate in the review and acceptance of the design features and project requirements to ensure stakeholder needs are met. This respect for all stakeholders will be met with enthusiasm, encouraging input from the team as the project takes shape.

Accountability includes following through on our commitments, detailed communication, and transparency to our clients in project status, issues, and resolution of conflict. We strive to ensure accurate project data management including our earned value tracking to manage cost performance against the budget, schedule management of critical activities and recovery plans, and detailed action items management to ensure stakeholder engagement throughout the project.

Quality management is at the forefront of everything we do at ZAP. Managing communication, scope interfaces, vendor information, document control, and checking of design documents are core quality processes built into the way we work. Complex, multi-discipline projects are the majority of what we do at ZAP and what we design gets built in the real world. We understand what it takes to make a constructible, cost effective, high quality design work in practice. Our contractor partners, clients, and vendors all appreciate the superb diligence with which we manage our scope interfaces as a way to achieve high quality results.

For all project sizes, ZAP is a leader in efficient and flexible solutions to project execution. Different project needs require flexible project approaches to execution to meet schedule, budget, quality, scope, risk, and resource constraints. ZAP has expert planning, scheduling, and management personnel to deliver projects in a framework appropriate to meet our client's goals.

Communications Approach

For all official communication, the formal lines of communications shall be used. All other information that is exchanged by team members of different parties is considered for information only, unless it is confirmed afterwards via the official lines. Official correspondence will be through formal transmittals. Any open issues being worked by the team requiring interaction and communication via informal means will be tracked on the Action Items List and reviewed periodically to ensure progress and accountability.

ZAP will appoint a senior project sponsor for this project. This project sponsor will be the communication channel for the customer to escalate any project issues that cannot be handled by the project team, including: team issues, technical issues, product/system issues, organizational issues, etc.

It is the responsibility of the project sponsor to:

- Be available for City of Grand Junction to review the project status
- Take actions in the ZAP organization at a global level doing whatever is required to assist the project team
- Keep City of Grand Junction informed about the ongoing status of the issues and any corrective actions taken.

Meetings and Presentations

The frequency of the status meetings will be weekly. These meetings review the progress of work, look at upcoming engineering and construction deliverable dates, and updates project action items and/or issues. An agreed to standing agenda is agreed to at the beginning of the project. Weekly meetings are documented by meeting minutes that will be issued to the City within three working days after the meeting and include details of all agreements and actions. If the project duration warrants, ZAP will actively participate in monthly project meetings throughout the life of the project as requested by the City.

To control the internal processes and the communication between ZAP and the City, and between the individual ZAP departments, several project control meetings are defined:

- Project Order Hand-Over Meeting: This meeting is organized shortly after the moment ZAP has received the Purchase Order. The objective of this meeting is to review the contract and transfer responsibility from the Sales Department to the Project Execution Team.
- External Project Kick-Off Meeting: After Purchase Order placement, a meeting with the City representatives will be arranged. The aim is to review the contract requirements and ensure that all parties have an understanding of, and are in agreement with, these requirements. Activities may include the review of the Purchase Order, the project plan, and the project schedule.

- Internal Kick-off Meeting: Shortly after the project has been started and the team has been mobilized, an internal kick-off meeting will be scheduled to secure a well-organized project launch and brief all team members with the actual project status and history. The objectives of this meeting are to: define contacts and communication lines, and understand the scope of products and services the team has to deliver, communicate the project plan, and discuss the project schedule.

- Project Progress Meetings: Regular Progress meetings will be held on a weekly basis in order to: review the progress of work, identify any potential problem areas and provide timely solutions, and discuss and obtain approval of design matters outstanding. These meetings are documented by Minutes of Meeting that will be issued to the City within three (3) working days and include details of all agreements and actions.

Construction and Post-Construction Info

ZAP's engineering and design goals and construction management goals are:

- To develop a safe facility that delivers consistent, dependable business results. Safety will be the primary goal in design, engineering, construction, and operation.

- No accidents, injuries, or recordables.

- Follow the City of Grand Junction's construction specifications.

ZAP is committed to providing engineering services that meet the City's SOW and expected performance requirements. The ZAP engineering project manager has overall responsibility for the engineering and construction performance of the project. This responsibility includes managing the engineering, design team to include all major equipment suppliers and engineering subcontracts, establishing the project's design basis, documentation requirements, construction activities and construction subcontractors.

ZAP will initiate and complete a Design Basis document to consolidate all design information and City requirements and project criteria for the project in a single document. This is a "foundational" document, which will be referenced throughout the project cycle.

Formal Design Reviews are typically dictated by the City and or the complexity/duration of the project. ZAP conducts both internal and external design reviews to ensure that its design meets all operating, maintenance, safety, code, and City technical and constructability requirements. At a minimum, ZAP typically anticipates one formal design review meeting to finalize plot plan, City tie-points, P&IDs, and electrical one-lines. The safety and constructability aspects of the project are also reviewed.

When a significant change in the design basis or schedule delay occurs, the ZAP Project Manager will immediately notify the City for a path forward. Additionally, ZAP will maintain a Scope of Work Variance log throughout the duration of the project. Project scope of work variances are reported and reviewed in detail on a weekly basis.

ZAP's Construction Management team will be engaged early in the project to identify constructability issues during the design phase. This involvement will continue throughout design to ensure a seamless transition from engineering/design to construction. Once construction has mobilized, ZAP will complete Weekly Construction Reporting to track key progress metrics. ZAP completes extensive inspections and complete inspection forms for all aspects of the performed construction work. These inspections, along with all other construction documents will accompany the final job book once the work is complete. ZAP will manage construction with on-site

personnel, as well as office personnel to ensure the project is completed safely, to proper specifications, on time and within budget. Examples of our weekly reports and inspection forms are provided in **Exhibit E.**

All design drawings are submitted as detailed by the proposal. For review and approval documents are identified at the outset of the project kick-off meeting with the City. The ZAP project controls representative includes the documents in the project schedule and tracks and approval time period any subsequent comments by the City.

DELIVERABLES

Deliverables in the table below are based on our understanding of the scope of work based on the BioCNG Storage and Fueling Station Optimization RFP and the City of Grand Junction detailed design requirements. City of Grand Junction and ZAP will participate in design review and coordination in addition to the responsibilities, key activities and deliverables listed in **Table 1:**

TABLE 1. KEY ACTIVITIES | DELIVERABLES LIST

PROJECT MANAGEMENT| PROJECT CONTROLS	ZAP	Grand Junction
Design Basis	X	
Design Review (P&IDs, Plot Plan)	X	
Permitting Package	X	
Schedule	X	
Job Book	X	
PROCESS | MECHANICAL	**ZAP**	**Grand Junction**
Piping and Instrumentation Diagram	X	
PSV Calculations/Sizing	X	
Pipe / Valve Specs	Note 1	
CNG Storage Data Sheets/Specifications	X	
CNG Storage Vendor Drawing Review	X	
Equipment List	X	
Bill of Materials	X	
Hydrotest Procedures	X	
CIVIL | STRUCTURAL	**ZAP**	**Grand Junction**
Geotechnical Report		X
Plot Plan	X	
Work Point Layout Plan	X	
Fencing Plan	X	
Equipment Foundation Drawings	X	
Miscellaneous Supports Foundations	X	
Miscellaneous Supports Steel	X	
ELECTRICAL	**ZAP**	**Grand Junction**
Grounding Details	X	
INSTRUMENT & CONTROLS	**ZAP**	**Grand Junction**
Controls Narrative	X	
Cause and Effect	X	
Instrument Cable/Conduit and Circuit Schedule	X	
Instrument Index	X	

Instrument Data Sheets	X	
Control System Architect Diagram	X	
Programming	X	
MECHANICAL DESIGN	**ZAP**	**Grand Junction**
General Arrangement Drawings	X	
CONSTRUCTION MANAGEMENT	**ZAP**	**Grand Junction**
Material Receiving	X	
Inventory Control	X	
Document Control	X	
Construction and Contractor Management	X	
Access for City of Grand Junction Inspection	X	
QA/QC Supervision and Documentation	X	

Note 1: ZAP will match the existing piping specification.

PROJECT SCHEDULE

TASK/ACTIVITY	DUE DATE
Project Award	10/22/2020
Construction Complete	06/14/2021

ZAP's proposed project schedule is located in **Exhibit F.**

SECTION D: REFERENCES

ZAP has provided a list of our customer references in **Exhibit G.**

SECTION E: BID BOND AND CERTIFICATE OF INSURANCE

ZAP has provided our bid bond and certificate of insurance in **Exhibit H.**

SECTION F: FEE PROPOSAL

ZAP has provided our fee proposal on the provided Solicitation Response Form in **Exhibit I.**

SECTION G: ADDITIONAL DATA

PROJECT COST

ITEMS	COST
Base Scope	$604,540.00
Performance Bond	$10,870.00
Fixed Fee	$100,000.00
Guaranteed Maximum Price	**$715,380.00**

The price for engineering deliverables will be provided on a cost plus, fixed fee basis.

PAYMENT SCHEDULE

The project will be billed monthly.

CLARIFICATIONS AND EXCEPTIONS

- All piping will be designed to ASME B31.3.
- ZAP will be responsible for obtaining all building permits and will be responsible for permit related fees. These fees are included in our proposal.

COST SAVINGS OPPORTUNITIES

ZAP has identified and offered a proposal with the most cost effective solution and requests the City of Grand Junction to consider this as a viable alternative.

EXTRA WORK

Extra work requested, outside the scope of the proposal, will be billed on a time and material basis or a lump sum change order as agreed upon by both companies.

TAX EXEMPTION

ZAP assumes this project is tax exempt and has priced the proposal accordingly.

WARRANTY

Professional services will be performed in accordance with generally accepted good engineering practices. This warranty is in lieu of all other warranties either expressed or implied. Equipment purchased by ZAP will carry the manufacturer's warranty through to City of Grand Junction.

DOCUMENTATION

Documentation will be provided electronically in Adobe Acrobat format for review and approval. Upon completion of the work, a download package will be provided and two sets of discs will be compiled and transmitted to City of Grand Junction. If hard copy job books are desired, copies can be provided for $3,500 each.

FINANCIAL STATEMENTS

ZAP has provided our financial statement in **Exhibit J.**

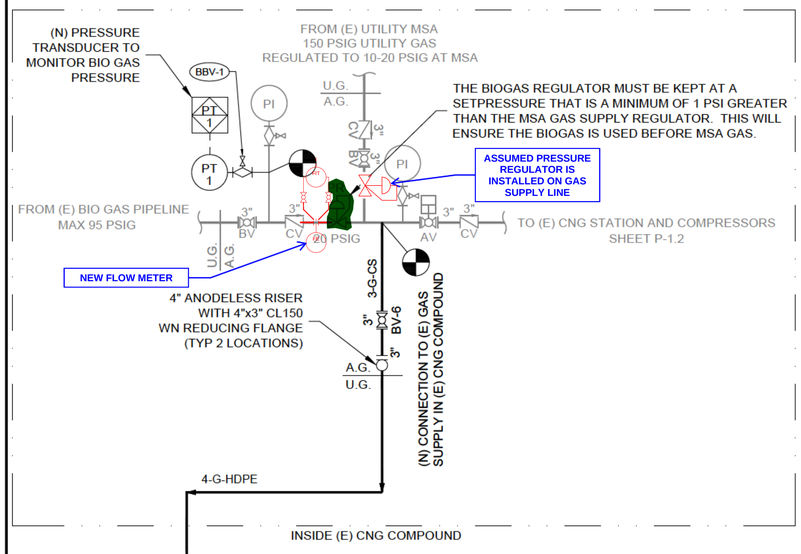
EXHIBIT A – PFD

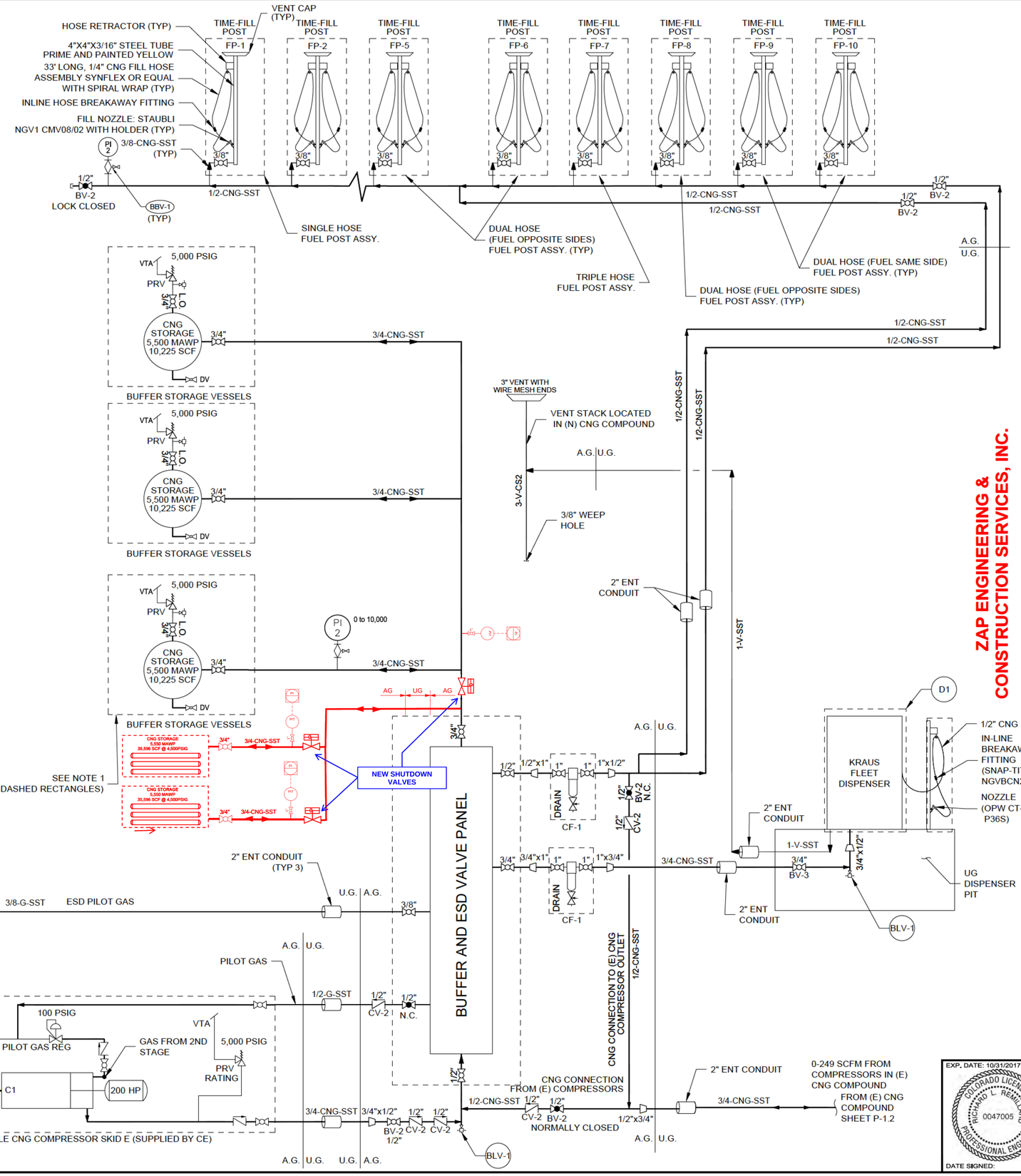
GENERAL NOTES:

1. EQUIPMENT INSIDE THE DASHED LINE IS PART OF THE MANUFACTURER'S FACTORY ASSEMBLY PROVIDED BY CLEAN ENERGY.
2. CLEAR SPACE OF AT LEAST 3 FEET SHALL BE PROVIDED FOR ACCESS TO ALL VALVES AND FITTINGS OF MULTIPLE GROUPS OF CONTAINERS.
3. EMERGENCY SHUT-OFF DISCONNECT WILL DISCONNECT ELECTRICAL POWER AND STOP DISPENSING OPERATIONS.
4. SELF CLOSING VALVES ON THE INLET OF THE COMPRESSORS SHALL SHUT OFF THE GAS SUPPLY TO THE COMPRESSOR WHEN ONE OF THE FOLLOWING OCCURS:
   - 4.1. AN EMERGENCY SHUTDOWN DEVICE IS ACTIVATED.
   - 4.2. A POWER FAILURE OCCURS.
   - 4.3. THE POWER TO THE COMPRESSOR IS SWITCHED TO THE OFF POSITION .
5. VALVE PANEL IS EQUIPT WITH AN OVER-PRESSURE PROTECTION DEVICE IN THE FUELING TRANSFER SYSTEM TO PREVENT OVERPRESSURE IN THE VEHICLE PER 2013 NFPA 52.
6. CONTROL CIRCUIT SHALL BE ARRANGED SO THAT, WHEN AN EMERGENCY SHUTDOWN DEVICE IS ACTIVATED OR ELECTRICAL POWER IS CUT OFF, SYSTEMS THAT SHUT DOWN SHALL REMAIN DOWN UNTIL MANUALLY ACTIVATED OR RESET AFTER A SAFE CONDITION IS RESTORED PER 2013 NFPA 52.
7. IF MSA OUTLET PRESSURE EXCEEDS 100PSIG PLASTIC PIPE CANNOT BE USED. PLEASE CONTACT CE ENGINEERING TO DETERMINE AN APPROVED SUBSTITUTE.

PROPERTY SYSTEM PERFORMANCE	
MSA OUTLET PRESSURE [PSIG]	FLOW RATE [SCF/MIN]
20	580

NEW COMPRESSOR SYSTEM PERFORMANCE	
INLET FLANGE PRESSURE [PSIG]	FLOW RATE [SCF/MIN]
17	331





ZAP ENGINEERING & CONSTRUCTION SERVICES, INC.

REDLINED FOR PROPOSAL

REV	DATE	REVISIONS	BY
-	9/3/2020	REDLINE, ISSUED FOR PROPOSAL	HVT
0	05/15/2017	ISSUED FOR PERMIT SUBMITTAL	

DIGALERT — Know what's below. CALL 811 before you dig.

REDUCED PLAN
CAUTION: THIS DRAWING MAY BE REDUCED
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Clean Energy®

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CNG FUELING FACILITY
GRAND VALLEY TRANSIT
333 WEST AVENUE
GRAND JUNCTION, CO 81501
PIPING AND INSTRUMENTATION DIAGRAM

ASSET NO: 160-11-17307.02.00

EXP. DATE: 10/31/2017
COLORADO LICENSED — RICHARD L. REMLEY — 0047005 — PROFESSIONAL ENGINEER
DATE SIGNED:

DATE	DESIGNED BY ARY
05/01/2017	CHECKED BY MES
	APPROVED BY RLR
SCALE	AS NOTED
SHEET	P–1.0

W:\Engineering Projects - Current\Grand Junction, CO - Grand Valley Transit (20820.00)\2.0 Drawings and Engineering\00\PID\1-P&ID SCHEDULE.dwg - PLOTTED: May 12, 2017 - 1:20pm

EXHIBIT B – RESUMES

Frank Lousberg, PE

President

Summary

Frank is responsible for managing all engineering disciplines and the deliverables that are produced at ZAP Engineering & Construction Services, Inc. Frank is an experienced project manager and process engineer with expertise in process analysis, process optimization, heat and mass transfer balances and process design. He was the production department manager of a $100 million (600,000 tpy) cement manufacturing facility. While there, he was responsible for safety and environmental compliance, budgeting and management of plant variable costs, hiring, training and development of personnel.

Career Experience

Project Manager – Regional Oil Treating Facilities

Infrastructure buildout on the Delaware Basin that comprised of developing a central oil stabilization facility from the conceptual phase through detailed engineering, construction support, and commission. The design was employed at two sites that were started up with a three month lag between the two.

Project Manager – Booster EPC Projects

This included two 48 MMSCFD field compressor booster stations from detailed design through construction and commissioning.

Project Manager – Amine Plant and Condensate Stabilizer Projects

This included an addition of a 750 gpm amine plant and a 4000 BPD condensate stabilizer.

Project Manager – Amine Project

This included a 300 gpm amine plant with Regenerative Thermal Oxidizer and NGL pipeline pumps.

Project Engineer – Biodiesel Facility

Responsible for integrating electrical, instrument and controls, mechanical and process engineering design for 30 MMgal/year biodiesel facility. Project included use of existing and used equipment in the design.

Project Manager – Weld County NGL

Incorporated operations from four facilities to determine new operating relationship for newly interconnected facilities. Scope of project included permitting, civil/structural design, process and mechanical design and optimization, electrical design, instrumentation and controls, and construction support. Responsible for management, engineering and overseeing design of project from FEL to commissioning.

ZAP Engineering & Construction Services, Inc.

333 S. Allison Parkway
Suite 100
Lakewood, CO 80226
720.529.4430
www.zapecs.com

Education

Bachelor of Science in Chemical Engineering,

Colorado School of Mines
Golden, CO

Certifications

Licensed Professional Engineer: Arizona, California, Colorado, Florida, Iowa, Kansas, Louisiana, New Jersey, New Mexico, North Dakota, North Carolina, Ohio, Oklahoma, Pennsylvania, West Virginia, and Texas

ZAP
ENGINEERING & CONSTRUCTION SERVICES, INC.

Josh Ruyle, PMP

Project Manager

Summary

Josh has a background in construction with a wide range of experience ranging from managing engineering projects, managing construction projects, and project controls. His experience includes project management, construction management, auditing and implementing project controls, cost estimating, scheduling and budgeting projects.

Career Experience

Project Manager – Compressor Station Conversion (EPC)

Project manager on a brownfield project to convert an existing gas processing plant to a compressor station designed to process 80MMSCFD of inlet gas with liquid separation, amine treating, dehydration, water separation and water disposal.

Project Manager – PSM Engineering Support

Project manager on a PSM engineering project to update documents on an existing 64 MMSCFD processing plant. Deliverables included as-built P&IDs, critical equipment list, consequences of deviation, electrical area class, cause & effect, and PSV study for the entire facility.

Project Manager – Plant Expansion FEED Study

Project manager on front-end engineering and design of a plant expansion to increase the throughput from 40 MMSCFD to 100 MMSCFD. The plant processes field gas to produce NGL, B/G Mix and residue product.

Project Manager – Compressor Station Additions (EPC)

Project manager on two brownfield EPC projects to increase the throughput from 48 MMSCFD to 60MMSCFD at two separate compressor stations, including additional compression and condensate handling.

Assistant Project Manager – Gas Processing Plant

Assistant project manager on a 200 MMSCFD cryogenic processing plant located in Texas. Engineering included residue compression, amine plant, flare, thermal oxidizer, modular pipe rack design and new power distribution.

Project Controls / On-Site Controls – Gas Processing Plant

Project controls and on-site controls for a 20MMSCFD refrigeration plant located in North Dakota. The project scope included engineering and on-site construction controls and supervision.

Project Controls – Gas Processing Plant

Project controls on a 64 MMSCFD brownfield gas processing facility upgrade project to integrate existing equipment with new refrigeration compression, residue compression, stabilizer addition and hot oil refurbishment.

Project Manager – Commercial Construction

Project manager on the 250 Columbine Development Project in the Cherry Creek North District of Denver, Colorado. The project scope included demolition and removal of existing structures.

ZAP Engineering & Construction Services, Inc.

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Education

Bachelor of Science in Construction Management with a Minor in Business Administration, Colorado State University

Certifications

Project Management Professional (PMP)

OSHA 10

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Drew Mathies, PE, PMP

EPC Program Manager

Summary

Drew has thirteen years of experience in the design of pipelines, pipeline facilities, produced water and crude oil storage facilities, greenfield compressor stations, and process unit expansions in operating facilities (amine/TEG and condensate stabilizer). He has acted as a civil/project engineer as well as a project manager. His pipeline experience includes feasibility studies through construction. Drew has designed storage facilities which include appurtenances such as storage tanks, concrete and earthen containment, platform access structures and pipe racks. His experience with expansion of existing facilities has included field-erected buildings, skid mounted buildings, acquisition of geotechnical information, geodetic data acquisition and coordination, process equipment layout and foundation design.

Career Experience

Program Manager – Cryogenic Processing Plant
One greenfield cryogenic processing plant in Colorado.

Program Manager – Turbine Compressor Stations
Three greenfield turbine compressor stations in Colorado.

Project Manager – Turbine Compressor Stations
Three greenfield turbine compressor stations in Colorado.

Project Manager – MRU Plant Expansion
MRU plant expansion to an existing plant in Colorado.

Project Manager – Turbine Compressor Station
Greenfield Turbine Compressor Stations in Utah.

Project Manager – Oil Gathering
Crude Oil Gathering System Central Facility with produced water disposal, crude truck load out and pipeline LACT in Kansas.

Project Manager – Pipelines
Several DOT jurisdictional gathering pipelines.

Project Manager – Produced Water
Modifying an existing produced water handling facility to add 320,000 barrels of storage capacity in Colorado.

Civil | Project Engineer – Amine | TEG
Amine and TEG expansion to an operating gas plant in Oklahoma.

Civil | Project Engineer – Amine Plant
Civil design and support for an amine plant expansion in Colorado.

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Education

Bachelor of Science in Engineering Physics, University of Colorado

Certifications

Licensed Professional Engineer: Colorado, Wyoming, North Dakota, Texas

Project Management Professional

ZAP
ENGINEERING & CONSTRUCTION SERVICES, INC.

Steven Wymore, PMP

Vice President of Construction Services

Summary

Steven is the Vice President of Construction Services for ZAP bringing 15 years of project manager/construction manager experience on industrial projects. His responsibilities include program management, project management, construction management, construction quality assurance/quality control, trade management, and turnaround scheduling. As Vice President of Construction Services, he currently manages multiple EPC projects and associated project teams concurrently.

Career Experience

Division Management

2020 – Power Plant Fly Ash Handling, Emery County, Utah

2020 – 400 MMSCFD Gas Plant upgrades, Weld County, Colorado

2020 – 250 MMSCFD Gas Plant, Williams County, North Dakota

2020 – 60 MMSCFD Recip Compressor Station, Lea County, New Mexico

2019 – 60 MMSCFD Recip Compressor upgrades, Lea County, New Mexico

2019 – Ammonia Terminal up-grades, La Salle County, Illinois

2019 – 140 MMSCFD Turbine Station, Weld County, Colorado

2019 – 140 MMSCFD Turbine Station, Weld County, Colorado

2019 – 60 MMSCFD Cryo Plant, Weld County, Colorado

2019 – Ethane Plant to Compressor Station Conversion, Hansford County, Texas

2018 – Recip Compressor Addition, Weld County, Colorado

2018 – Recip Compressor Addition, Weld County, Colorado

Construction Manager – Turbine Compressor Station

Construction management for a 100 MMSCFD turbine compressor station and ancillary equipment including two Solar Taurus 70 gas-fired turbine compressors, a TEG unit, and storage tanks. Completed the integration between two facilities and oversaw all equipment and material inspections.

Construction Manager – Turbine Compressor Station, Uintah County, Utah

Construction management for a 55 MMSCFD turbine compressor station and ancillary equipment including a Solar Mars 90 Gas Fired Turbine Compressor, a TEG unit, and storage tanks. Completed the integration between two facilities and oversaw all equipment and material inspections.

Construction Manager – Brownfield Gas Plant, Converse County, Wyoming

Construction management for several optimization, addition and refurbishment projects at a 64 MMSCFD brownfield gas processing facility. The scope included the refurbishment and relocation of a 50 MMBTU hot oil heater; Addition of a de-ethanizer overhead compressor; Addition of a stabilizer overhead compressor and repurposed stabilizer system equipment; Replacement of existing dual service residue and refrigerant compressors with separate residue and refrigerant systems; Integration of the refrigeration systems of two existing plants; Addition of a 24 MMSCFD refrigeration plant using refurbished equipment.

ZAP Engineering & Construction Services, Inc.

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720.529.4430
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Education

Bachelor of Science
Oregon State University
Corvallis, OR

Certifications

Project Management Professional

AWS CWI

ZAP
ENGINEERING & CONSTRUCTION SERVICES, INC.

Eric Walker, PE

Mechanical Engineering Supervisor

Summary

Eric is a licensed professional engineer and is experienced as a mechanical engineer on projects including pipeline, natural gas processing and well pad facilities. His gas processing experience includes completing feasibility studies for compressor stations and processing plants through the detailed engineering and construction phases.

Career Experience

Mechanical Engineer – Process Plant

Engineering and Design of a 90 MMSCFD expansion to an existing propane refrigeration plant. The expansion included deethanizer overhead compression, refrigerant compression, EG injection and regeneration, hot oil and pipeline pump additions.

Mechanical Engineer – Booster Station

Engineering and design of a 60 MMSCFD compressor station. Station included: slug catcher, reciprocating compressors, TEG dehydration, condensate storage, and truck loadout. Station was engineered and designed to have additional compression added in the future. Analyzed well production forecasts, gathering system hydraulics, and gathering system pipeline routing.

Mechanical Engineer – Compressor Station

Generated an issued for bid package for a 260 MMSCFD turbine field compressor station. Station included: slug catcher, filter separator, turbine driven centrifugal compressors, air coolers, TEG dehydration, 3-phase separator, and a liquid pump around skid.

Mechanical Engineer – Booster Station

Engineering and design of a 3.5 MMSCFD booster compressor station. Station included: slug catcher, screw compressor, air cooler, blow case, and gas metering. The station was engineered and designed to have additional compression added in the future.

Mechanical Engineer – Booster Station

Engineering and design of a screw booster compressor station. Station included: slug catcher, screw compressor, air cooler, blow case, and gas metering. Station was engineered and designed to have additional compression added in the future.

Mechanical Engineer – Processing Plant

Engineering and design of relocating a propane refrigeration plant to an existing compression and NGL recovery facility.

Mechanical Engineer – Gathering

Collected as-built piping data in order to model piping in Caesar so that pipe stress could be analyzed due to the ground settling.

ZAP Engineering & Construction Services, Inc.

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Education

Bachelor of Science in Energy Systems Engineering, University of Wyoming

Bachelor of Science in Business Marketing, University of Wyoming

Bachelor of Science in Business Administration, University of Wyoming

Certifications

Licensed Professional Engineer: Colorado

ZAP
ENGINEERING & CONSTRUCTION SERVICES, INC.

Mason Bieker, PE

Process Engineering Supervisor

Summary

Mason is a process engineering supervisor with over seven years of experience in petrochemical and midstream industries. Responsibilities have included project management, project engineering, supervision of process engineering team, quality control and quality assurance reviews, front-end engineering design for gas processing facilities balance of plant systems, debottleneck evaluations, relief device sizing and flare studies, and start-up and commissioning activities.

Career Experience

Process Engineer – Gas Plant (EPC)

Provided balance of plant engineering, design, specification, and construction support for a 250 MMSCFD gas plant in Williams County, North Dakota. Gas plant consisted of a slug catcher and inlet liquids handling; single tower stabilizer with overhead compression (arctic package); RSV NGL processing unit with refrigeration; and residue compression.

Project and Process Engineer – Gas Plant (EP)

Provided balance of plant engineering, design, and specification for a 40 MMSCFD gas plant in Converse County, Wyoming. Gas plant consisted of a slug catcher and inlet liquids handling; two-tower stabilizer unit with overhead compression; RJT NGL processing unit with refrigeration; deethanizer and depropanizer fractionation train; residue compression; and storage and truck loadout facilities. Assigned as lead project engineer to assist project manager with coordination of deliverables and milestone for each discipline. Facilitated communication with the client and vendors to ensure required information was promptly distributed and expectations set.

Process Engineer – Petrochemical Company

Assisted with de-bottlenecking a Poly Alpha Olefins Unit in Baytown, Texas. The project consisted of designing a new and larger CSTR reactor intended to operate in series or in parallel with the existing reactors (depending on the desired reaction products). In addition to the new reactor, a more reliable cooling system was installed for all the reactors in order to provide more consistent reactor temperatures. The overall result of the de-bottleneck project was improved reactor yield and higher plant throughput.

Process Engineer – Petrochemical Company

Assigned as the project lead tasked with debottlenecking an underperforming unit, which involved managing several engineers with $4 million in capital expenditure to implement proposed solutions. Supported start-up and commissioning activities of the world's largest on-purpose 1-hexene unit and achieved design capacity by identifying and addressing equipment reliability issues, unit bottlenecks, and operational discipline gaps which impeded production rates for over two years. Designed and executed a bearing conversion project that increased the rotor speed of a thin film evaporator, resulting in a 20% reduction in wax by-product formation and $180k decrease in annual disposal cost. Participated in a unit-wide process hazard analysis and layers of protection analysis revalidation study as the subject matter expert to ensure compliance with revised industry regulations and corporate policies.

ZAP Engineering & Construction Services, Inc.

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Education

Bachelor of Science in Chemical Engineering,
Iowa State University
Ames, Iowa

Certifications

Licensed Professional Engineer:
Alabama, Colorado, Texas, Wyoming

ZAP
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Tom Terrell, PE, MSCE

Civil / Structural Engineer

Summary

Tom is a civil engineer with nine years of experience in structural design, analysis, proposals, and cost estimates in heavy industrial engineering sectors. He has extensive project experience on large EPC projects, including discipline lead and field engineer roles. Tom possesses experience in multiple industries, including oil and gas, power generation, AQCS, mining, municipal, wastewater treatment and cement. His design experience ranges from platform retrofits to full scale independent design of 50-ton processing structures.

Career Experience

Lead Structural & Field Engineer – Sand Processing Facility

Team lead, design engineer, and field engineer of structural steel processing structures and foundations for 5 Mton/yr regional sand processing and distribution plant in Odessa, TX. The design included quarry, wet sand and water processing, drying process, screenhouse, and truck load out structures and foundations. Two CMU MCC buildings, a pre-engineered warehouse, and chemical building were also included in this EPC project.

Structural Engineer – Midstream Gas Facility Expansion

Engineered foundations and structural steel for equipment skids and vertical vessel for an expansion to existing gas facility in Campbell County, WY.

Structural Engineer – Combined-cycle Power Generation Facilities

Provided structural engineering design of foundations and steel supports for the balance-of-plant on two 1,000 MW power generation facilities in Texas. Design concrete secondary containments and equipment supports, PEMB foundations, access platforms, and evaluated foundations under crane loads on critical lifts. EPC project and best gas-fired project of year award winner.

Structural Engineer – Coal Power AQCS Retrofit

Brownfield structural support for design of three 2,000 ton WFGD scrubber units on $800 million coal-fired power plant upgrade of existing facility in Louisville, KY. Structures supported four foot diameter header piping, 15-ton monorails, process equipment and elevated MCC room.

Structural Engineer – Waste Water Treatment Plant Expansion

Modifications to existing and new designs for environmental process structures on this facility located in Winter Springs, FL. Design included FRP, stainless steel and aluminum access platforms.

Structural Engineer – Municipal Flood Channel and Bridges

Concrete structural designs for the widening of existing hydraulic channel in metro San Antonio, TX. Engineer for replacement of two existing four-lane two-span pre-stressed concrete slab beam bridges in accordance with AASHTO and TxDOT standards.

ZAP Engineering & Construction Services, Inc.

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Education

Bachelor of Science Civil Engineering / Business Minor
University of Central Florida
Orlando, Florida
2009

Master of Science Structural and Geotechnical Engineering
University of Central Florida
Orlando, Florida
2011

Certifications

Licensed Professional Engineer: Colorado, Texas, Florida, North Dakota

OSHA 10-hr

MSHA 24-hr

ZAP
ENGINEERING & CONSTRUCTION SERVICES, INC.

Keivan Pirasteh

Instrumentation and Controls (I&C) Supervisor

Summary

Keivan has over 15 years of experience in the controls and automation sector serving various midstream Oil and Gas clients as a project engineer and project manager. Experience in controls system design, installation, start-up and commissioning for gas processing plants, cryo plants, custody transfer metering stations, compressor stations, pump stations, and truck loading and unloading terminals. Additional experience in Water and Waste Water treatment, Manufacturing, Mining and Minerals processing, Substations and Utilities and Food and Beverage industries.

Career Experience

Sr. Systems Analyst/Programmer – Engineering Firm

Provide scope of services that extend from system studies, process functional specification, FEED studies, equipment selection, network architecture, control one-lines, PLC and HMI programming, bench testing, QA audits, HAZOP review, commissioning, operations support and customer training. These services are for oil & gas, water & waste water treatment, substations and food and beverage industries. Lead project engineer for oil refinery's Waste Water Treatment Plant new additional process, and upgrading controls of the existing treatment system. Utilizing AB Control Logix PlantPAx, FactoryTalk View SE to monitor & control various PowerFlex 755 & 70 drives via datalinks over ethernet. Deployment of Rockwell AssetCenter to configure process instrumentation.

EI&C Discipline Manager – Consulting Firm

Provide project scoping, cost estimate, cost control, scheduling, resource planning and forecasting, managing Electrical Instrumentation & Controls internal engineers and designers, managing contractors and client coordination. General functional specification, FEED studies, programming, bench testing, QA audits, HAZOP review, commissioning, operations support and customer training. These services are for oil & gas, food & beverage and pharmaceutical industries. Project engineer for complete station control, PLC, HMI, SCADA communication, Safety and commissioning of cooling water tower controls.

Technical Lead Engineer/Project Manager – Engineering Firm

Provide scope of services that extends from system studies, initial project conceptual design and budget, through to specification development, equipment selection, detail design and installation. It includes training, commissioning, start up and post start up support. These services are mainly for oil & gas industries. Lead project engineer for a complete station control, PLC, HMI, SCADA communication, safety / fire and gas monitoring and commissioning of a new and existing gas compressor stations.

Technical Lead Engineer / Project Engineer – Rockwell Automation

Provide scope of services that extends from system studies, initial project conceptual design & budget, through to specification development, equipment selection, detail design and installation. It includes training, commissioning, start up and post start up support.

ZAP Engineering & Construction Services, Inc.

333 S. Allison Parkway
Suite 100
Lakewood, CO 80226
720.529.4430
www.zapecs.com

Education

Bachelor of Science in Mechanical Engineering,
University of Maryland
College Park, MD

Bachelor of Science in Industrial Technology Management,
Colorado State University
Fort Collins, CO

ZAP
ENGINEERING & CONSTRUCTION SERVICES, INC.

EXHIBIT C – ORGANIZATION CHART

ZAP
ENGINEERING & CONSTRUCTION SERVICES, INC.

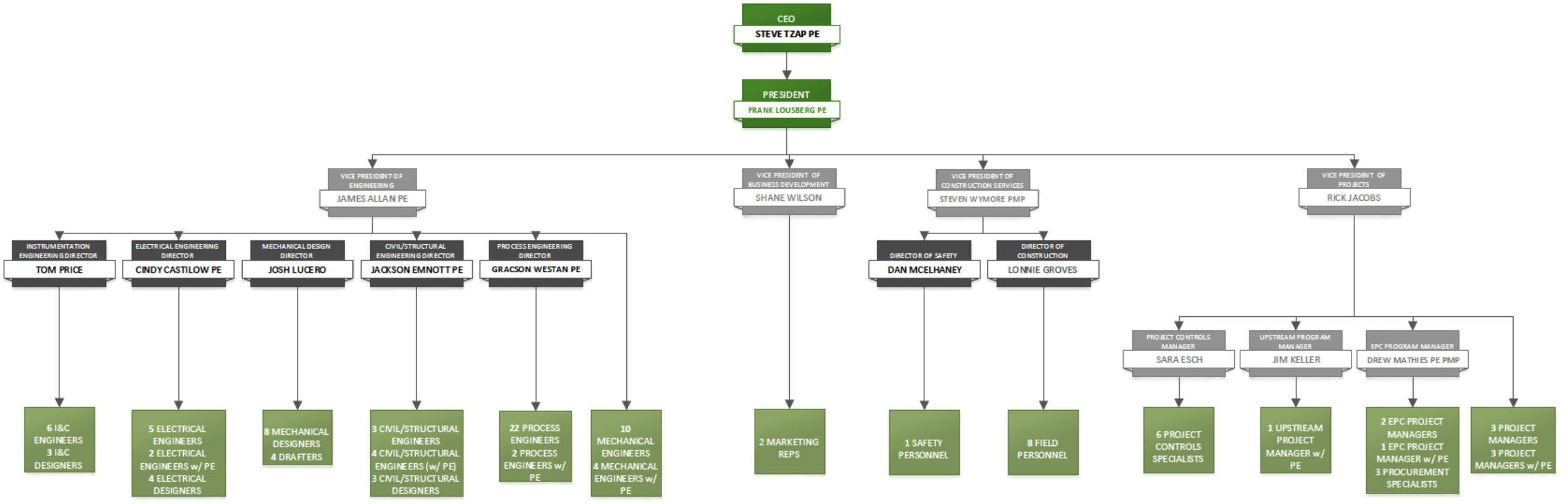


EXHIBIT D – EMR AND OSHA RATINGS & SAFETY MANUAL

PROTECTING ASSETS.
MAKING A DIFFERENCE.

August 16, 2019

ZAP Engineering & Construction Services Inc.
333 South Allison Parkway, Ste 100
Denver, CO 80226

RE: Workers Compensation NCCI Experience Modification History

Jeannette,

This letter is in response to your request for the history of your NCCI workers' compensation experience modification rating. Please see below:

08/15/19-20	0.89
08/15/18-19	0.77
08/15/17-18	0.74
08/15/16-17	0.74

Please let me know should you have any questions or concerns.

Sincerely,

Lynne Cox, CIC, AAI, CISR
Account Manager
IMA, Inc.
913 982-3658

OSHA's Form 300 (Rev. 01/2004)

Log of Work-Related Injuries and Illnesses

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year 20 1 9

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

You must record information about every work-related death and about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR Part 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an Injury and Illness Incident Report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Establishment name ZAP Engineering & Construction Services, Inc

City Lakewood State CO

Identify the person			Describe the case			Classify the case (CHECK ONLY ONE box for each case based on the most serious outcome for that case:)				Enter the number of days the injured or ill worker was:		Check the "Injury" column or choose one type of illness:						
								Remained at Work				(M)						
(A) Case no.	(B) Employee's name	(C) Job title (*e.g., Welder*)	(D) Date of injury or onset of illness	(E) Where the event occurred (*e.g., Loading dock north end*)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (*e.g., Second degree burns on right forearm from acetylene torch*)	Death (G)	Days away from work (H)	Job transfer or restriction (I)	Other record-able cases (J)	Away from work (K)	On job transfer or restriction (L)	Injury (1)	Skin disorder (2)	Respiratory condition (3)	Poisoning (4)	Hearing loss (5)	All other illnesses (6)
			/ month/day			☐	☐	☐	☐	____ days	____ days	☐	☐	☐	☐	☐	☐

ZAP Engineering & Construction Services, Inc.
333 S Allison Parkway, Suite 100
Lakewood, CO 80226

OSHA's Form 300A (Rev. 04/2004)

Summary of Work-Related Injuries and Illnesses

Note: You can type input into this form and save it.
Because the forms in this recordkeeping package are "fillable/writable" PDF documents, you can type into the input form fields and then save your inputs using the free Adobe PDF Reader.

Year 20 19

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no work-related injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete and accurate before completing this summary.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the Log. If you had no cases, write "0."

Employees, former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR Part 1904.35, in OSHA's recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	0	0	0
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
0	0
(K)	(L)

Injury and Illness Types

	Total number of (M)		
(1) Injuries	0	(4) Poisonings	0
(2) Skin disorders	0	(5) Hearing loss	0
(3) Respiratory conditions	0	(6) All other illnesses	0

Post this Summary page from February 1 to April 30 of the year following the year covered by the form.

Public reporting burden for this collection of information is estimated to average 58 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name: ZAP Engineering & Construction Services, Inc.

Street: 333 S. Alison Parkway, Suite 100

City: Lakewood State: CO Zip: 80226

Industry description (e.g., *Manufacture of motor truck trailers*)
Engineering Consultants

North American Industrial Classification (NAICS), if known (e.g., 336212)
8 7 1 1

Employment information

(If you don't have these figures, see the Worksheet on the next page to estimate.)

Annual average number of employees: 177

Total hours worked by all employees last year: 368160

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

Company executive: [signature] Title: VP-OPS

Phone: 303-565-5538 Date: 12/31/19

OSHA's Form 300 (Rev. 01/2004)

Log of Work-Related Injuries and Illnesses

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year 2018

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1220-0176

You must record information about every work-related death and about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR Part 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an Injury and Illness Incident Report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Establishment name ZAP Engineering & Construction Services, Inc

City Lakewood State CO

Identify the person			Describe the case			Classify the case (CHECK ONLY ONE box for each case based on the most serious outcome for that case)				Enter the number of days the injured or ill worker was:		Check the "Injury" column or choose one type of illness:					
								Remained at Work				(M)					
(A) Case no.	(B) Employee's name	(C) Job title (e.g., Welder)	(D) Date of injury or onset of illness	(E) Where the event occurred (e.g., Loading dock north end)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g., Second degree burns on right forearm from acetylene torch)	Death (G)	Days away from work (H)	Job transfer or restriction (I)	Other recordable cases (J)	Away from work (K)	On job transfer or restriction (L)	Injury (1)	Skin disorder (2)	Respiratory condition (3)	Poisoning (4)	Hearing loss (5)	All other illnesses (6)
			/ month day			☐	☐	☐	☐	___ days	___ days	☐	☐	☐	☐	☐	☐

OSHA's Form 300A (Rev. 01/2004)

Summary of Work-Related Injuries and Illnesses

Year 2018

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no work-related injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete and accurate before completing this summary.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the Log. If you had no cases, write "0."

Employees, former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR Part 1904.35, in OSHA's recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	0	0	0
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
0	0
(K)	(L)

Injury and Illness Types

Total number of . . .	(M)		
(1) Injuries	0	(4) Poisonings	0
(2) Skin disorders	0	(5) Hearing loss	0
(3) Respiratory conditions	0	(6) All other illnesses	0

Post this Summary page from February 1 to April 30 of the year following the year covered by the form.

Public reporting burden for this collection of information is estimated to average 58 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name: ZAP Engineering & Construction Services, Inc.

Street: 333 S. Allison Parkway, Suite 100

City: Lakewood State: CO ZIP: 80226

Industry description (e.g. *Manufacture of motor truck trailers*)
Engineering Consultants

Standard Industrial Classification (SIC), if known (e.g. *3715*)
8711

OR

North American Industrial Classification (NAICS), if known (e.g. 336212)
541330

Employment information

(If you don't have these figures, see the Worksheet on the back of this page to estimate.)

Annual average number of employees: 141

Total hours worked by all employees last year: 292,760

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

Company executive: [signature] Title: VP-OPERATIONS

Phone: (303) 565 - 5538 Date: 1/10/2019

OSHA's Form 300 (Rev. 01/2004)

Log of Work-Related Injuries and Illnesses

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year 2017_

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

You must record information about every work-related death and about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR Part 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an Injury and Illness Incident Report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Establishment name ZAP Engineering & Construction Services, Inc

City Lakewood State CO

Identify the person			Describe the case			Classify the case (CHECK ONLY ONE box for each case based on the most serious outcome for that case)				Enter the number of days the injured or ill worker was:		Check the "Injury" column or choose one type of illness:					
								Remained at Work				(M)					
(A) Case no.	(B) Employee's name	(C) Job title (e.g., Welder)	(D) Date of injury or onset of illness	(E) Where the event occurred (e.g., Loading dock north end)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g., Second degree burns on right forearm from acetylene torch)	Death (G)	Days away from work (H)	Job transfer or restriction (I)	Other recordable cases (J)	Away from work (K)	On job transfer or restriction (L)	Injury (1)	Skin disorder (2)	Respiratory condition (3)	Poisoning (4)	Hearing loss (5)	All other illnesses (6)
			/ month day			☐	☐	☐	☐	___ days	___ days	☐	☐	☐	☐	☐	☐

OSHA's Form 300A (Rev. 01/2004)

Summary of Work-Related Injuries and Illnesses

Year 20 17

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

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Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	0	0	0
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
0	0
(K)	(L)

Injury and Illness Types

Total number of . . .	(M)		
(1) Injuries	0	(4) Poisonings	0
		(5) Hearing loss	0
(2) Skin disorders	0	(6) All other illnesses	0
(3) Respiratory conditions	0		

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Establishment information

Your establishment name: ZAP Engineering & Corstruction Services, Inc.

Street: 333 S. Allison Parkway, Suite 100

City: Lakewood State: CO ZIP: 80226

Industry description (e.g., Manufacture of motor truck trailers): Engineering Consultants

Standard Industrial Classification (SIC), if known (e.g., 3715): 8 7 1 1

OR

North American Industrial Classification (NAICS), if known (e.g., 336212): 5 4 1 3 3 0

Employment information (If you don't have these figures, see the Worksheet on the back of this page to estimate.)

Annual average number of employees: 92

Total hours worked by all employees last year: 191,880

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

Company executive: [signature] Title: VP-OPERATION

Phone: (303) 565 - 5538 Date: 1 16 18

ENGINEERING & CONSTRUCTION SERVICES, INC.

REQUIRED PRACTICE

SAFETY MANUAL

REVISION	DATE	ENGINEER	MANAGER	CHANGE LOG
0	11/07/19	DM	CES	
1	12/03/19	DM	CES	

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POLICY STATEMENT

The safety of our employees, contractors and client is a constant concern ZAP Engineering & Construction Services, Inc. (ZAP Engineering). ZAP is committed to the present and future wellbeing of people and the environment. ZAP Engineering is dedicated to the principle that all workplace injuries and illnesses are preventable. While the ultimate responsibility for safety lies with management, all employees and contractors bear responsibility for their own safety and their co-workers. Employee commitment and involvement at all levels of the company are vital to the success of this policy.

In support of this policy, ZAP Engineering will:

1. Comply with all relevant laws, regulations and company procedures related to safety, as a minimum standard for acceptable practice.

2. Strive for an injury free workplace.

3. Provide workplace policies, standards, procedures and training to ensure that employees can perform their jobs in a safe, responsible manner.

4. Maintain current and effective safety policies and procedures and communicate them to the employees and contractors.

Expect each employee and contractor to safely conduct work practices in accordance with established policies and procedures.

The cooperation of every employee is necessary to make this company a safe place in which to work. It is each employees and contractors to report unsafe conditions and hazards immediately to your supervisor. Also, any injury at work, no matter how small, must be reported immediately to your supervisor.

Every ZAP Engineering employee has a role to play. We are responsible and accountable for adhering to letter and the spirit of the policy. We will incorporate safety considerations into our daily business and construction activities. We take safety seriously and any willful or habitual violation of safety will be considered cause for dismissal. ZAP Engineering is sincerely concerned for the health and wellbeing of each member of the team.

To ensure your safety, and that of your co-workers, contractors and clients, please review ZAP Engineering's Safety Manual.

Steve Tzap

CEO

1. LINE MANAGEMENT

1.1. For this safety program to be both effective and efficient within the most positive atmosphere possible, the responsibility for safety must be shared equally by all members of the work force. Apprentice craft workers spending their first day on the job will be just as responsible for jobsites safety as will members of top management.

1.2. We depend on all employees for input and feedback regarding the overall safety program's performance. Workers in the field know how easy or difficult these rules are to follow. This policy is not the final word by any means and will be subject to review and change as deemed necessary.

1.3. Any and all practical and constructive ideas regarding improvements in working conditions, employee comfort and safety will be welcomed. All input and criticism will be reviewed by the Safety Director and will be regarded as confidential information at the employee's request.

1.4. All new hires will receive orientation training, to include "Code of Safe Practices" as well as on-the-job training in accordance with federal and local laws, as well as ZAP policy concerning safety.

1.5. OSHA standards require that "the employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury".

1.6. Any questions or concerns regarding safe work practices or the laws governing them should be brought to the attention of the company safety representative, or other management representative. If an employee ever feels that he/she is being asked to expose themselves to a dangerous situation, they have a right to refuse to do so without fear of reprisal. Further, it is a condition of employment to refuse to do so.

2. ABRASIVE BLASTING

2.1. **Purpose**

2.1.1. The purpose of this program is to provide safe guidelines for the operation and maintenance of abrasive blasting equipment and their related components for ZAP Engineering.

2.2. **Scope**

2.2.1. This program covers all employees involved in abrasive blasting jobs. Whenever hazardous substances such as dusts, fumes, mists, vapors, or gases exist or are produced in the course of construction work, their concentrations shall not exceed the limits specified in the "Threshold Limit Values of Airborne Contaminants – 1970" of the American Conference of Governmental Industrial Hygienists. When ventilation is used as an engineering control method, the system shall be installed and operated according to the requirements of 1926.57 (Ventilation).

2.3. Key Responsibilities

2.3.1. Supervisors

- Be aware of potentially hazardous conditions that may arise during the blasting process prior to starting any blasting job and must take measures to protect employees.
- Ensure that all employees are trained on related safety topics.
- Understand the importance of regularly scheduled maintenance for continued safe operation of blast equipment. Ensure that all employees comply with this policy and all other related policies.

2.3.2. Blast Employees

- Be familiar with the safe operating functions of blasting equipment to be used on a job.
- Comply with all ZAP engineering policies.
- Have knowledge of hazards associated with respirable silica.
- Understand they are prohibited from using compressed air for cleaning unless the pressure is reduced to less than 30 pounds per square inch and be equipped with effective chip guarding and proper PPE.

2.4. Procedure

2.4.1. General

Abrasives and the surface coatings on the materials blasted are shattered and pulverized during blasting operations and the dust formed will contain particles of respirable size. The composition and toxicity of the dust from these sources shall be considered in making an evaluation of the potential hazards.

Dust shall not be permitted to accumulate on the floor or on ledges outside of an abrasive blasting enclosure. Dust spills shall be cleaned up promptly. Aisles and walkways shall be kept clear of steel shot or similar abrasives which may create a slipping hazard.

2.4.2. Equipment Handling

Follow these guidelines when moving blasting equipment to prevent back strains and crushing injuries:

- Use a forklift, crane or other type of lifting device for transporting a blast machine; always use a lifting device when the machine contains abrasive.
- Never manually move a blast machine where abrasive has been spilled on hard surfaces or on a wet or slippery surface.
- Never attempt to manually move a blast machine containing abrasive.
- Always disconnect hoses from machines to avoid interference during moving.

2.4.3. Air Compressors

- Air compressors must be in a well-ventilated area. It must be able to contain large volumes of clean, toxicant-free air. This means the compressor must be placed up wind from the blasting operation and out of the range of dust and flying abrasives.
- Due to the high pressure that air compressors create, precautions must be taken to prevent unleashing of strong forces that can cause serious bodily injury.
- Air for abrasive blasting respirators must be free of harmful quantities of dust, mists, or noxious gases and must be inspected daily, prior to use and comply with CFR 1910.134(I) (Respiratory Protection).
- Never adjust the pressure setting on a compressor above the blast equipment maximum working pressure rating. The maximum working pressure rating is indicated on the manufacturer's metal identification plate.

2.4.4. Blast Pot

- Position blast pots and/or compressors on level ground. Machines operate best when they sit on level surfaces.
- For communication purposes place blast pot between the compressor and the surface to be blasted. This will enable the pot tender and operator to make visual contact.
- All couplings and pipefitting on the blast pot, compressor and hoses must be airtight.
- Blast pots must be inspected daily prior to use.

2.4.5. Hoses and Connectors

- Couplings must have safety wires in place and be secure as required by federal safety regulations. The operator shall be responsible to ensure that each coupling has safety wires in place.
- Whip checks must be installed at bull hose connections.
- Operator should hold onto the blast hose until the air pressure from the nozzle drops off to zero.
- Do not use hoses with soft spots.
- Never use tape to repair a blown-out hose.
- Immediately replace a hose if a blowout or leak occurs.
- Hose ends must come into contact with coupling gaskets to prevent leaks and to maintain static electricity conductivity.

2.4.6. Nozzles and Remote Controls

- Blast nozzles shall be bonded and grounded to prevent the buildup of static charges. Where flammable or explosive dust mixtures may be present, the abrasive blasting enclosure, the ducts, and the dust collector shall be constructed with loose panels or explosion venting areas, located on sides away from any occupied area, to provide pressure relief in case of explosion following the principles set forth in the National Fire Protection Association Explosion Venting Guide. NFPA 68-1954.
- Organic abrasives which are combustible shall be used only in automatic systems.
- Blast cleaning nozzles shall be equipped with an operating valve which must be held open manually. A support shall be provided on which the nozzle may be mounted when it is not in use.

- All blast machines must be equipped with remote control systems to start and stop the blasting process.
- Never tape, strap, or tie down an air actuated remote-control lever or choke electric remote control switch.
- If there is the slightest delay in reaction time of the handle lever or lever lock to open, check for dust and dirt build-up around pivot pins before resuming blasting. Also, test the tension on the lever springs, and replace them immediately if they do not respond rapidly.
- Substituting component pieces with other manufacturer's parts is not allowed.
- Inspect blast nozzles for wear and cracks on the inner liner. When a nozzle orifice is worn 1/16" larger than its original size, it should be replaced.
- Check nozzles and nozzle holders for deterioration of thread form. Threads on nozzles and their companion holders must not be cross-threaded, worn or distorted.
- Hoses that are being tied and lifted to blasting operations being conducted above grade, i.e., scaffolds, shall be depressurized to prevent accidental start-up.

2.4.7. Operator Signals

- On the job site, voice communication is often impossible. Even shouts cannot be heard over the noise of compressors and blasting. In addition, the operator's head will be enclosed in the helmet, which blocks out sound and limits vision. For these reasons, an industry wide standard set of hand and sound signals has been developed.
- Signals may be visual hand movements, flashing light, pulls on a rope or sounds made by banging a hammer or using a horn or electric buzzer.
- Every operator must become familiar with the signals to be used on the jobsite.

2.4.8. Respirator Use

- A specific work-site procedure shall be developed where respirators or CE blasting hoods/helmets are required to protect the health of the operator. A respiratory protection program shall be established wherever it is necessary to use respiratory protective equipment including worksite specific procedures and elements for required respirator use. Abrasive blasting respirators shall be worn by all abrasive blasting operators under certain conditions.
- Equipment for the protection of eyes, face and body shall be supplied to the operator when the respirator design does not provide such protection and to any other personnel working in the vicinity of abrasive blasting operations. This equipment shall conform to the requirements of 1926.102 (Eye and Face Protection).
- Equipment for protection of the eyes and face shall be supplied to any other personnel working in the vicinity of abrasive blasting operations.

2.4.9. Environmental Controls

- Organic abrasives which are combustible shall be used only in automatic systems. Where flammable or explosive dust mixtures may be present, the construction of the equipment, including the exhaust system and all electrical wiring, shall conform to the requirements of American National Standard Installation of Blower and Exhaust

Systems for Dust, Stock, and Vapor Removal or Conveying, Z33.1-1961 (NFPA 91-1961), and Subpart S of 1926.57 (Ventilation).

- The work area must be inspected for exterior electrical power lines that may endanger operators.
- Operators should use care to avoid directly blasting power lines and insulators.
- Do not blast in atmospheres that contain flammable fumes.
- Take precautions at the work site to eliminate hazardous surface obstacles that may cause tripping hazards or interfere with worker mobility.
- Adequate ventilation must be provided for employees working within enclosures.
- Never operate compressor if hoses are frozen. When winter temperatures drop below freezing, check for ice prior to pressurizing hoses.
- Provide adequate drinking water for operators, especially during summer.

2.4.10. Personal Protective Equipment

- Secure hoses by tying them to scaffolding or personnel platforms, when working from elevations, to prevent injury from hoses falling on other personnel working below or near blasting area.
- Before using any blasting abrasive, check the SDS to find out the chemical composition of the abrasive material.
- Equipment for the protection of eyes, face and body shall be supplied to the operator when the respirator design does not provide such protection and to any other personnel working in the vicinity of abrasive blasting operations. This equipment shall conform to the requirements of 1926.102 (Eye and Face Protection).
- Ventilation systems and dust collectors may be necessary in enclosed conditions.
- Noise from abrasive blast nozzles can be loud enough to damage the hearing of blasters and others on the work site. Workers must not be exposed to noise levels exceeding 80 decibels as an eight-hour time weighted average (80 dBA TWA), therefore all blasters shall wear earplugs.
- Blaster must wear heavy-duty gloves and steel toe boots.
- Helmet lenses should be changed as soon as pitting or frosting takes place.

ABRASIVE BLASTING CHECKLIST

Location: _____Lead Person at Jobsite:_____

Yes No N/A

Worksite Environment

☐ ☐ ☐ Has a hazardous blasting zone been established at the job site that includes the blast area and areas where dust concentrations may exceed OSHA's permissible exposure limits?

☐ ☐ ☐ Has the composition of the materials to be blasted been investigated for lead, asbestos and other heavy metals and toxics?

☐ ☐ ☐ Have electrical lines and hoses in the blast area been identified and protected from blasting operations?

☐ ☐ ☐ Has the atmosphere in the work area been tested to ensure that it will be safe to breath?

☐ ☐ ☐ Have all the work surfaces been inspected, holes covered, water and other liquids removed, and ice, snow and other slippery surfaces controlled?

☐ ☐ ☐ Are air movers and vacuum/dust collectors being used to provide clear visibility for the blasters?

☐ ☐ ☐ Is hearing protection available for personnel exposed to greater than 80 dBA and double hearing protection available to those exposed to greater than 100 dBA?

Air Supply

☐ ☐ ☐ If an oil lubricated compressor is used for breathing air, is it equipped with a high temperature and carbon monoxide alarm?

☐ ☐ ☐ If an oil lubricated compressor is used for breathing air, has the air quality been tested within the last quarter to determine that it meets the CGA standard for "Grade D "breathing air?

☐ ☐ ☐ If an air compressor or pump is used for breathing air, is it positioned so that the air intake is positioned to prevent the ingestion of engine exhaust or other toxic gases, vapors or fumes?

☐ ☐ ☐ Is the compressor or air pump and air lines shutoff and depressurized prior to performing maintenance?

Yes No N/A

Airlines

☐ ☐ ☐ Have the airlines and connections been inspected for wear and damage and been repaired, prior to use?

☐ ☐ ☐ Have the gaskets for each connection been inspected and replaced if worn, distorted or too soft?

☐ ☐ ☐ Are airlines laid out so that they will not obstruct workers?

☐ ☐ ☐ Are safety pins and whip checks installed on all connections?

Abrasives

☐ ☐ ☐ Are appropriate NIOSH approved respirators being used during blasting and cleanup?

☐ ☐ ☐ Are mechanical lifting devices used to assist in loading and handling abrasives?

☐ ☐ ☐ Does the abrasive contain less than 1% crystalline silica?

☐ ☐ ☐ Has the Material Safety Data Sheet (SDS) been reviewed for the blasting agent and hazardous compounds?

Blasting Machine

☐ ☐ ☐ Have all fittings and valves been checked for tightness and found to be in good operating condition?

☐ ☐ ☐ Have damaged gaskets and parts been replaced?

☐ ☐ ☐ Has the machine been inspected for dents and other damage?

Abrasive Metering Valve

☐ ☐ ☐ Does the valve handle move freely for accurate adjustment of abrasive flow?

Remote Controls

☐ ☐ ☐ Is the blast machine equipped with a remote-control system? OSHA 29 CFR 1910.244

☐ ☐ ☐ Is the remote-control handle allowed to be strapped, taped, wired, or otherwise secured in a position that will interfere with the movement of the lever?

Yes No N/A

☐ ☐ ☐ Is the abrasive trap cleaned at least twice each shift to avoid restriction in the air exhaust?

Pressure Regulators

☐ ☐ ☐ Are pressure regulators specifically designed for nozzle air volumes and pressures per the manufacturer's recommendations?

Screens & Covers

☐ ☐ ☐ Is a screen used to keep debris out of the blast machine?

☐ ☐ ☐ Is a cover used to protect the entry of moisture when not in use?

Blast Hose & Couplings

☐ ☐ ☐ Are the couplings inspected daily for damage prior to use?

☐ ☐ ☐ Are hoses inspected daily for wear and soft spots?

☐ ☐ ☐ Are couplings wired together and whip checks installed to prevent disengagement and whipping?

☐ ☐ ☐ Is static dissipating hose used to prevent the buildup of static electricity?

☐ ☐ ☐ Is the size of the blast hose 3 to 4 times the size of the nozzle orifice to prevent premature hose wear?

☐ ☐ ☐ Are hoses laid out in long curves to reduce premature wear and blowouts?

Nozzles

☐ ☐ ☐ Is the nozzle washer inspected before each use and replaced if worn?

☐ ☐ ☐ Is the nozzle replaced if the orifice size increases to 1/16" larger than its original size?

Blaster' Safety Equipment

☐ ☐ ☐ Is the blaster wearing a NIOSH Type CE respirator?

☐ ☐ ☐ Are others personnel working in the same area wearing appropriate respiratory protection?

Yes No N/A

☐ ☐ ☐ Are appropriate head, eye, face, and hearing protection being used by all personnel?

☐ ☐ ☐ Is the air supply at least CGA "Grade D?"

☐ ☐ ☐ Is the breathing air filtered to remove moisture, oil mists, and particulates?

☐ ☐ ☐ Is the helmet inspected for wear and damage before each use?

☐ ☐ ☐ Are lenses replaced frequently?

☐ ☐ ☐ After blasting is the dust removed from the helmet and clothing before they are removed?

☐ ☐ ☐ Is the helmet stored in a clean, dust free location away from the blasting operation?

☐ ☐ ☐ Has the carbon monoxide monitor and alarm system been calibrated?

Blaster

☐ ☐ ☐ Has the blaster been trained qualified to the equipment, functions, blasting techniques, abrasives, maintenance requirements and safety features?

☐ ☐ ☐ Has the operator participated in the pre-job safety meeting?

Scaffolding

☐ ☐ ☐ Has the scaffold been inspected and signed off for use?

☐ ☐ ☐ Is the scaffolding equipment equipped with the appropriate guard rails and work platforms?

☐ ☐ ☐ Is the staging surfaces level, smooth, and free of obstructions?

Inspection Completed by: _____ _____ _____

Print Name Signature Date

_____

Location

3. ACCESS TO EMPLOYEE MEDICAL RECORDS

3.1. Purpose

3.1.1. The purpose of this procedure is to insure right of access to relevant exposure and medical records to employees and/or their designated representatives.

3.2. Key Responsibilities

3.2.1. ZAP Safety Manager

- Develops local medical records practices for all worksites in accordance with this procedure and ensures employees are aware of the requirements of this procedure.
- Responsible for the review, implementation and maintenance of the local worksite medical records procedure.

3.2.2. Project Manager

- Responsible for the implementation and maintenance of the medical records procedure for their facility and ensuring all assets are made available for compliance with the procedure.

3.2.3. Employees

- All shall be familiar with this procedure and have access to their records.

3.3. Overview

3.3.1. This section applies to all employee exposure and medical record, and analysis thereof, made or maintained in any manner, including on an in-house or contractual (e.g., fee-for-service) basis.

- Trade secret information disclosure must follow requirements as stated in 29 CFR 1910.1020 (f) (8).
- Recognized collective bargaining agents who have statutory authority to represent the interests of the employees within the bargaining unit are automatically considered designated representatives. While these representatives do not have the right to secure individual medical records without written consent of the employee, they have the right of access to employee exposure records and analysis without employee consent.

3.4. Definitions

3.4.1. Access means the right and opportunity to examine and copy.

3.4.2. Analysis of exposure or medical records means any compilation of data, and research, or other studies based, at least in part, on information collected from individual employee exposure or medical records or other sources including information from health insurance claim forms provided that either the analysis must have been

reported to the employer or no further work is being done by the person responsible for preparing the analysis.

3.4.3. Designated representative will mean any individual or organization to which an employee gives written authorization to exercise a right of access. For the purposes of access to employee exposure records and analyses using exposure or medical records, a recognized or certified collective bargaining agent shall be treated automatically as a designated representative without regard to written employee authorization.

3.4.4. Employee exposure records could include any of the types of information listed below:

- Environmental (workplace) monitoring or measuring of a toxic substance or harmful physical agent, including personal, area, grab, wipe, or other form of sampling, as well as related collection and analytical methodologies, calculations, and other background data relevant to interpretation of the results obtained;
- Biological monitoring results which directly assess the absorption of a toxic substance or harmful physical agent by body systems (e.g., the level of a chemical in the blood, urine, breath, hair, fingernails, etc.) but not including results which assess the biological effect of a substance or agent or which assess an employee's use of alcohol or drugs;
- Material safety data sheets indicating that the material may pose a hazard to human health; or In the absence of the above, a chemical inventory or any other record which reveals where and when used and the identity (e.g., chemical, common, or trade name) of a toxic substance or harmful physical agent.

3.4.5. Employee medical records are records that concern the health status of an employee and are made or maintained by a physician, nurse, or other health care personnel or technician. "Employee medical record" means a record concerning the health status of an employee which is made or maintained by a physician, nurse or other health care personnel, or technician.

3.4.6. The following will not be considered a medical record:

- Physical specimens, such as blood or urine samples, which are routinely discarded.
- Health insurance claims, accident investigation reports and other non-medical correspondence if maintained separately from the medical file.
- The record of any voluntary employee assistance program (alcohol, drug, etc.) if maintained separately.
- Records created solely in preparation for litigation which are privileged from discovery under applicable rules of procedure or evidence.

3.4.7. Specific Written Consent means a written authorization containing the following:

- The name and signature of the employee authorizing the release of medical information.
- The date of the written authorization.
- The name of the individual or organization that is authorized to release the medical information.

- The name of the designated representative (individual or organization) that is authorized to receive the released information.
- A general description of the medical information that is authorized to be released.
- A general description of the purpose for release of the medical information.
- A date or condition upon which the written authorization will expire (if less than one year).

3.4.8. A toxic substance or harmful physical agent is defined as any chemical substance, biological agent (bacteria, fungus, virus, etc.) or physical stress (noise, heat, cold, ionizing radiation or non-ionizing radiation, hypo or hyperbaric pressure, etc.) which:

- Is regulated under federal law or rule due to a hazard to health.
- Is listed in the National Institute of Occupational Safety and Health (NIOSH) Registry of Toxic Effects of Chemical Substances (RTECS).
- Shows positive evidence of acute or chronic health hazard in human, animal or other biological test by or known to the employer.
- Has a Safety Data Sheet indicating that the substance may pose hazard to human health?

3.5. Procedure

3.5.1. The Safety Manager will maintain applicable medical and exposure records for all employees. All requests to access medical and exposure records and analysis based on those records must be submitted to using the forms provided for that purpose.

3.5.2. Access to records is provided in a reasonable time, place and manner. Access to records must be provided in a reasonable time, place and manner. If access to records cannot reasonably be provided within fifteen (15) working days, ZAP Engineering shall within the fifteen (15) working days apprise the employee or designated representative requesting the record of the reason for the delay and the earliest date when the record can be made available.

3.5.3. Personal identifiers (name, address, social security number, payroll number, etc.) are removed from records before access is granted. Whenever access is requested to an analysis which reports the contents of employee medical records by either direct identifier (name, address, social security number, payroll number, etc.) or by information which could reasonably be used under the circumstances indirectly to identify specific employees (exact age, height, weight, race, sex, date of initial employment, job title, etc.), personal identifiers must be removed before access is provided.

3.5.4. ZAP Engineering, upon request, will assure the prompt access of representatives of the Assistant Secretary of Labor for Occupational Safety and Health to employee exposure and medical records and to analyses using exposure or medical records.

3.5.5. Except for a recognized collective bargaining agent, any designated representative must have the employee's written permission for access to exposure records and analyses. It is necessary however, for the union representative to specify the occupational need for access to records absent the employees' consent. Union

representatives must have the employee's written permission to access medical records.

3.5.6. Copies of medical records are provided at no cost to employees. Whenever an employee or designated representative requests a copy of a record, that record must be provided at no cost.

3.5.7. Any review of medical or exposure records by an employee or union representative shall be done on his or her own time, outside of normal working hours, at a time mutually agreeable to the parties. The review will be conducted in person with the individual requesting access to the records.

3.5.8. The employee is entitled access to his or her medical records except when a physician determines that this knowledge would be detrimental to the employee's health as in such cases of terminal illness or psychological conditions. However, if the employee provides a designated representative with specific written consent, access to medical records must be provided even if the physician has denied the employee access to the records.

3.5.9. The authorized physician, nurse or other responsible health care personnel maintaining employee's medical records may delete the identity of anyone who has provided confidential information concerning the employee's health status but cannot withhold the information itself.

3.5.10. When an analysis of medical records identifies the employee, a physician may remove direct or indirect personal identification. If this cannot be done, the personally identifiable portions need not be provided to the person seeking such information.

3.5.11. Employees and their designated representatives will be permitted upon request access to past and present exposure data to toxic substances or harmful physical agents.

3.5.12. Copies of exposure records of other employees with past or present job duties or working conditions like or similar to those of the employee will also be provided upon request.

3.5.13. Any employee or designated representative is also permitted access to any record of exposure information which pertains to a new workplace or condition(s) to which the employee is being assigned or transferred.

3.6. **Records Retention**

3.6.1. Medical records must be preserved and retained for the duration of employment plus 30 years.

3.6.2. Employee exposure records must be retained for 30 years.

3.7. Transfer of Records

3.7.1. Whenever ZAP ceases to do business it shall transfer all records subject to this section to the successor employer. Whenever ZAP either is ceasing to do business and there is no successor employer to receive and maintain the records, or intends to dispose of any records required to be preserved for at least thirty (30) years, ZAP Engineering shall transfer the records to the Director of the National Institute for Occupational Safety and Health (NIOSH) if so required by a specific occupational safety and health standard.

3.8. Employee Information

3.8.1. Employees are informed of the provision of recordkeeping upon initial assignment and annually thereafter. Upon an employee's first entering into employment, and at least annually thereafter, information must be given to current employees of the existence, location, availability and the person responsible for maintaining and providing access to records and each employee's rights of access to these records.

3.8.2. The Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020) will be readily available for review by employees upon request.

3.8.3. A copy of the employee notice that will be used to comply with the employee information requirements is included with policy. This notice will be posted on those bulletin boards where other notices normally appear.

AUTHORIZATION LETTER FOR THE RELEASE OF EMPLOYEE MEDICAL RECORDS

I, _____ hereby authorize the _____
(Full name of employee) (Name of Organization)

to release to ZAP ENGINEERING the following medical record(s):

_____
Give specific description of the information to be released)

I give my permission for the medical information to be used for the following purpose(s):

_____

_____

_____ I do not give permission for any other use or reason.

_____ I understand that this authorization expires twelve (12) months from today's date unless I specify a particular date less than twelve months which is _____

_____ _____
Signature of employee or his/her legal representative

Date of Signature

Reviewed on: _____ with: _____
(Date) (Signature of Organization's Representative)

Copies given: Yes _____ No _____

ACCESS TO MEDICAL/EXPOSURE RECORDS NOTICE

Federal Regulation 29 CFR 1910.1020 requires us to inform you that ZAP ENGINEERING does keep records designated as Employee Exposure and Employee Medical Records.

The above regulation gives you the right to review those records with certain exceptions.

The records are maintained in the Safety Department and the Safety Manager is responsible for the records.

A copy of CFR 1910.1020 is available for viewing upon request to the Safety Manager.

_____ _____

Signature Date

Note: This notice must be posted annually

4. AERIAL LIFT

4.1. Purpose

4.1.1. The purpose of this program is to define the requirements for safely operating an aerial lift device.

4.2. Scope

4.2.1. This policy shall cover all aerial lift devices used on ZAP Engineering property.

4.3. Key Responsibilities

4.3.1. Supervisors

- Shall ensure that all aerial devices are properly operated by trained personnel.
- Shall ensure that aerial lift devices are designed and constructed in conformance with applicable requirements of the American National Standards for "Vehicle Mounted Elevating and Rotating Work Platforms" ANSI A92.2-1969, including appendix.

4.3.2. Employees

- Shall follow all aspects of this program.

4.4. Procedure

- Aerial lifts may be "field modified" for uses other than those intended by the manufacturer provided the modification has been certified in writing by the manufacturer or by an equivalent entity.
- Lift controls shall be tested each day prior to use to determine that such controls are in safe working conditions. Tests shall be made at the beginning of each shift during which the equipment is to be used to determine that the brakes and operating systems are in proper working condition.
- Only authorized persons shall operate an aerial lift and boom and basket load limits specified by the manufacturer shall not be exceeded.
- Aerial lifts shall have a working back-up alarm audible above the surrounding noise level or the vehicle is backed up only when an observer (spotter) signals that it is safe to do so.
- The minimum clearance between electrical lines and any part of the equipment (i.e. crane or load) shall be 10 feet for lines rated 50 kV or below.
- Employees shall always stand firmly on the floor of the basket and shall not sit or climb on the edge of the basket or use planks, ladders, or other devices for a work position.
- An approved fall restraint system shall be worn when working from an aerial lift. The fall restraint system must be attached to the boom or basket. An approved fall restraint system shall be attached to the boom or basket when working from an aerial lift and it is not permitted to be attached to adjacent poles or structures.
- All employees who operate an aerial lift device shall be trained in the safe operation of the specific device they will operate. Training must conform to all OSHA requirements.

5. ASSURED GROUNDING

5.1. Purpose

5.1.1. The purpose of this program is to provide procedures and guidelines to eliminate all injuries resulting from possible malfunctions, improper grounding and/or defective electrical tools. This program applies to all sites, employees and contractors and shall be used on owned premises.

5.2. Definitions

5.2.1. Competent Person - one who can identify existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

5.2.2. Ground Fault Circuit Interrupter - a device for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a current to ground exceeds some predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit.

5.3. Responsibilities

5.3.1. Supervisors are designated as competent persons for the Assured Equipment Grounding Conductor Program and are responsible for program execution. One or more competent persons must be designated (as defined in 1926.32(f) to implement and execute the program.

5.3.2. Employees are responsible for following the requirements of this program, to perform visual inspections and to take defective equipment out of service.

5.4. Procedures and Guidelines to Eliminate Injuries

5.4.1. The following procedures and guidelines are designed to eliminate all injuries resulting from possible malfunctions, improper ground and/or defective tools.

5.4.2. Assured Grounding Site Program Requirement

An assured grounding conductor program must be implemented on all ZAP Engineering sites covering all cord sets, receptacles which are not part of the building or structure & equipment connected by cord and plug which are available for use or used by employees.

5.4.3. Ground Fault Circuit Interrupters

All 120-volt, single-phase 15 and 20 ampere receptacle outlets on construction or maintenance sites, which are not part of the permanent wiring of the building or structure and which are in use by employees, shall have approved ground fault circuit interrupters for personnel protection.

- All hand portable electric tools and extension cords shall use a GFCI.
- Additionally, approved GFCI's shall be used for 240-Volt circuits in the same service as described above.

- GFCI's must be used on all 120 volt, single-phase 15 amp and 20-amp receptacles within 6 feet of a sink, damp areas or on installed outdoor equipment.
- The GFCI must be the first device plugged into a permanent receptacle.
- The GFCI must be tested before each use.

5.4.4. Assured Equipment Grounding Conductor Program

The Assured Equipment Grounding Conductor Program (AEGCP) shall cover all cord sets, receptacles not a part of the permanent wiring of a structure and equipment connected by cord and plug on all construction and maintenance sites.

This written description of the program shall be kept at the jobsite for inspection and copying by OSHA and any affected employee.

5.4.5. Removing Equipment

Restrictions for the use of equipment that does not meet requirements or if is found to be defective shall be applied and enforced. Any equipment which has not met the requirements of this program shall not be available or permitted to be used by ZAP Engineering. Damaged items shall not be used until repaired.

5.4.6. How Often Inspection of Cords and Equipment are to be made

Daily Visual inspections – The following shall be visually inspected before each day's use for external defects (such as deformed or missing pins or insulation damage) and for indication of possible internal damage:

- Cord sets;
- Attachment caps;
- Plug and receptacle of cord sets;
- Any equipment connected by cord and plug (with the exception of cord sets and receptacles which are fixed and not exposed to damage) such as deformed or missing plug, and
- Insulation damage
- Damaged items shall not be used until repaired or shall be discarded.

5.4.7. How and When Tests are Performed and What Records are maintained

All equipment grounding conductors shall be tested for continuity and shall be electrically continuous.

Each receptacle and attachment cap or plug shall be tested for correct attachment of the equipment grounding conductors. The equipment grounding conductor shall be connected to its proper terminal.

When tests are performed:

- Before each use.
- Before equipment is returned to service following any repairs.
- Before equipment is used such as when a cord has been run over.
- At intervals not to exceed 3 months, except that cord sets and receptacles which are fixed and not exposed to damage shall be tested at intervals not exceeding 6 months.

Tests performed as required by this program shall be recorded as to the identity of each receptacle, cord set and cord and plug connected equipment that passed the test and shall indicate the last date tested or interval for which is was tested. This record shall be kept by means of logs, color coding or other effective means and shall be maintained until replaced by a more current record. These records shall be made available at the job site for inspection by the Assistant Secretary and any affected employees.

All tested cord sets and cord and plug-connected equipment shall be marked, one or both ends, with colored tape to denote the month that the tests were performed. The below color code chart that must be followed for marking.

Month #	Month	Color of Tape to Apply to Cords
1	Jan	Red
2	Feb	Yellow
3	Mar	Green
4	Apr	Blue
5	May	Brown
6	Jun	White
7	Jul	Start over with Red and repeat

6. AMMONIA AWARENESS

6.1. Purpose

6.1.1. The purpose of this procedure is to advise employees in areas where ammonia is being used and to supply on an awareness level basis about the properties and hazards of ammonia, general guidelines and training requirements.

6.2. Scope

6.2.1. This procedure applies to ZAP Engineering operations where employees whose work activities may involve working with or around ammonia. When work is performed on a non-owned or operated site, the operator's program shall take precedence, however, this document covers ZAP Engineering employees and contractors and shall be used on owned premises, or when an operator's program doesn't exist or is less stringent.

6.3. Responsibilities

6.3.1. Managers and Supervisors

- In coordination with the Safety Manager, develop and implement ammonia awareness training.
- Ensure personnel are aware of work that has the potential of exposure to ammonia.
- Identify possible locations where ammonia in the workplace may be used.
- Inform the Safety Manager of upcoming work involving ammonia, allowing the Safety Manager to provide any necessary monitoring or other required actions.
- Ensure employees comply with the ammonia awareness requirements.

6.3.2. Safety Manager:

- Coordinate annual ammonia awareness training activities.

6.3.3. Employees:

- Comply with the ammonia awareness requirements and direct any questions or concerns to the Safety Manager.
- Attend required annual training.

6.4. Procedure

6.4.1. Characteristics of Ammonia

Appearance

Ammonia is a colorless gas under normal conditions. It can be a liquid under pressure. It has a pungent, suffocating odor.

Description

Ammonia refers to solutions that are 50% ammonia or greater, ammonia anhydrous, and ammonia anhydrous liquefied, unless otherwise specified. Ammonia is a toxic gas or liquid that, when concentrated, is corrosive to tissues upon contact. Exposure to ammonia in sufficient quantities can be fatal. One of the highest production-volume chemicals in the U.S., concentrated ammonia is used in manufacturing, refrigeration, and agriculture (as a fertilizer). Household ammonia is much less concentrated; it rarely causes burns, but it does cause irritation. The lowest level at which humans can detect the odor of ammonia (odor threshold) generally provides enough warning of exposure; however, persons with prolonged exposure to ammonia will lose their ability to detect the odor (olfactory fatigue). Ammonia commonly exists as part of a solution.

Health Effects

Some of the potential health effects of ammonia such as burning of the eyes, temporary blindness, coughing, chest pain, etc. Exposure of the eyes to ammonia may cause burning, tearing, temporary blindness and severe eye damage. Exposure of the skin to ammonia may cause severe burns and blistering. Exposure of the respiratory tract (mouth, nose and throat) to ammonia may cause runny nose, coughing, chest pain, severe breathing difficulties, severe burns and death.

Possible ways employees may be exposed to ammonia during their job functions. Some examples may include, but not limited to:

- Working on/near industrial refrigeration machinery rooms, equipment and/or piping
- Working in petroleum refineries
- Working with/near agricultural fertilizer.

Methods of Dissemination:

- Indoor Air: Ammonia can be released into indoor air as a liquid spray (aerosol) or as a vapor.
- Water: Ammonia can be used to contaminate water.

- Food: Ammonia is unlikely to contaminate food due to unpalatable qualities rendered to food.
- Outdoor Air: Ammonia can be released into outdoor air as a liquid spray (aerosol) or as a vapor.
- Agricultural: If ammonia is released into the air as a liquid spray (aerosol), it has the potential to contaminate agricultural products. If ammonia is released as a vapor, it is highly unlikely to contaminate agricultural products.

Routes of Exposure

Ammonia can cause harm if inhaled and/or if it comes into contact with the eyes or skin. High concentrations of ammonia gas, liquid ammonia and solutions of ammonia can cause harm if inhaled or if they come into contact with eyes or skin.

6.4.2. Pre-Job Planning for Ammonia Related Work

Pre-job planning or a site assessment will be conducted prior to starting work and that the assessment will documented. Documented planning will be conducted for those operations involving potential ammonia exposure and this includes anytime an active purge is being applied to a system in or around equipment associated with work. Some planning or assessment elements include:

- All proposed work requires a jobsite visit by the requestor and a unit operator to identify special precautions, equipment status and personal safety equipment requirements.
- The permit must clearly identify all hazards and special personal protective equipment requirements.
- Appropriate signage will be utilized and adhered to. Appropriate signage will include adequate warning as seen below.



6.4.3. Personal Protective Equipment

ZAP Engineering employees will use impervious clothing, gloves and/or face shields if there is a possibility of skin contact with liquid ammonia or vessels containing liquid ammonia. Employees will be provided with and required to use impervious clothing, gloves, face shields and other appropriate protective clothing necessary to prevent any possibility of skin contact with liquid anhydrous ammonia or aqueous solutions of ammonia containing more than 10% by weight of ammonia. Similar precautions should be taken to prevent the skin from becoming frozen from contact with vessels containing liquid anhydrous ammonia.

6.5. Training

Employees will be aware of provisions of site-specific contingency/emergency plans. Employees will be aware of owners' contingency plans and provisions. Employees must be informed where ammonia is used in the host facility and aware of additional plant safety rules.

ZAP Engineering shall provide training for all affected employees including any ZAP Engineering employee working with or near ammonia and the training shall emphasize:

- The characteristics of ammonia
- The hazards of ammonia
- Proper PPE
- Owner client requirements

Documentation of training - Ammonia awareness training shall be documented including dates of training, location of training, employee name and trainer name.

7. BEHAVIOR BASED SAFETY

7.1. Purpose

The ZAP Engineering Behavior Based Safety (BBS) initiative is an education and observation process used to improve safety and reduce risk in the workplace. This process uses a proactive approach and is intended to communicate to employees the elements and the procedures of Behavior Based Safety that will assist in reducing at risk behaviors which in turn reduces injuries in our workplaces.

7.2. Scope

The ZAP Engineering BBS applies to all staff. Employees are permitted to participate in BBS initiatives already in place at customer locations if required by the customer. Employees are requested to participate in Behavior Based Safety process and follow the process guidelines.

7.3. Requirements

Safety awareness principles are the foundation of the ZAP Engineering Behavior Based Safety process. The key concepts teach employees to recognize when they may be in one of the following states:

- Rushing
- Frustration
- Fatigue
- Complacency (which can cause or contribute to these critical errors)
- Eyes not on task
- Mind not on task
- Line of fire
- Loss of balance/traction/grip (which in turn increase the risk of injury.)

Pre-task Analysis is a process to evaluate the work environment by performing a Job Safety Analysis (JSA) of each job. The purpose of which is to eliminate or control all hazards that may be encountered to complete the job. This process is included in the Behavior Based Safety process to establish the correct habits and work procedures in order to reduce at-risk behaviors.

The observation process is designed to raise safety awareness and provide a feedback mechanism for management to make changes in design, process or procedure in order to reduce at-risk behaviors. The key to this process is raising awareness of behavior through observation and feedback. The process has three key elements:

7.3.1. Conducting Observations of Employees Work Behavior

Observations provide direct, measurable information on employee work practices identifying both safe and unsafe behaviors. The process starts with the observation of workers - fellow employees, other contractor employees and customer employees as they perform their tasks. Observers collect information about worker performance and provide feedback via the observation card. The emphasis is not on who was observed but rather what behavior was observed.

During the observation the observer records their findings on the BBS Observation Form. Items to be observed include but are not limited to:

- Personal Protective Equipment
- Procedures / Methods
- People
- Work Environment
- Equipment

Upon completion of an observation the observer is expected to have a discussion with the observed to get feedback. The observer will:

- Review the observation with observed employee.
- Start with a positive comment.
- Reinforce safe behaviors observed first.
- Describe and discuss unsafe behaviors observed.
- Solicit from observed employee explanation of his/her unsafe behavior with open-ended questions.
- Re-emphasize no consequence to observed employee.

Documenting feedback allows workers to assess what should be repeated and what should change to reduce risks in the workplace.

7.3.2. Collection of Data and Performing Trend Analysis

Individual departments, as well as ZAP Engineering as a whole, will compare these measurements and track these results by an acceptable method so that numerical and statistical comparisons can be made over time.

BBS Observation Forms are forwarded to the corporate safety manager for input into the BBS database. Reports are generated and forwarded to management. ZAP Engineering will collect data and performing trend analysis based on the information.

7.3.3. Elements of an Action Plan after the Trend Analysis is Completed

Once trend analysis is complete, appropriate action plans shall be developed to address unsafe behaviors. Action planning will include:

- Evaluate unsafe behaviors from trend analysis and prioritize
- Develop action plan for unsafe behaviors based on comments and feedback from data sheets
- Designate responsible parties and timeframes within the action plan
- Define who is responsible for action planning
- Ensure management support

7.3.4. Action Plan Follow Up

All action plans shall be arranged by a set time period. To ensure effectiveness of the BBS follow-up is necessary to ensure the closure of all actions listed. The follow-up process will include:

- Monthly frequency for review of action by the safety manager, senior management and employees.
- Assign accountability for closeout of action plans within ZAP Engineering.
- Document archiving of action plans with completed action items.

7.4. Responsibilities

7.4.1. Oversight

The manager/supervisor has these oversight responsibilities:

- Coach observers and develop action plans to ensure continuous improvement.
- Ensure that all employees are trained on the Behavior Based Safety elements.
- Maintain communication with workforce by channeling information in a timely manner (feedback).
- Collect and review process modification change requests from employees.
- After reviewing and giving feedback the BBS/JSA cards should be forwarded to the corporate safety director for data entry.

Each employee plays a specific role in the Behavioral Based Safety process. These roles include observee, observer, supervisor, manager and safety manager.

7.4.2. Person being observed

- Be willing to be observed.
- Be open and cooperative.
- Avoid being defensive.
- Participate in problem-solving meetings.
- Be familiar with the Behavior Based Safety process.

7.4.3. Person performing the observation

- Learn the Behavior Based Safety process and the benefits of reducing at-risk behaviors.
- Promote the Behavior Based Safety process.
- Make observing proactive.

- Be open to coaching.
- Be courteous and helpful.
- Assist workers by offering suggestions to safely perform a task or help them with a task if necessary.
- Communicate with the workers being observed.
- Give constructive feedback after observations.
- Stress the safe behaviors before the at-risk behaviors.
- Offer and work towards solutions of problems found.
- Record a comment for every recorded "at-risk" to include what and why. Make quality observations, concentrating on quality comments.

7.4.4. Manager

- Actively promote and participate in the behavior safety process by supporting the goals and objectives of the Behavior Based Safety process.
- Ensure that all employees are aware of what is expected of them regarding the BBS process.
- Encourage employees to participate in observations so that incidents/injuries are reduced in the workplace.
- Provide necessary resources to keep process productive.
- Attend safety meetings and offer feedback on areas of improvement.

7.4.5. Supervisor

- Actively promoting and participating in the Behavior Based Safety process by reviewing BBS Observation Forms turned in at least weekly and giving feedback, completing corrective actions needed, etc.
- Refraining from using data from the Behavior Based Safety process in a punitive manner.
- Assisting in problem solving and completing corrective actions in a timely manner.
- Understanding the behavior safety process and the benefits of reducing at-risk behaviors.

7.4.6. Safety Manager

- Support the goals and objectives of the Behavior Based Safety process.
- Encourage, promote, provide technical support and assist in acquiring the resources needed for the Behavior Based Safety process.
- Address the concerns and suggestions of field personnel.
- Collect all observation data cards.
- Enter data into BBS database.

7.5. Training

Training on the observation process will include how to conduct the observation, how to complete the observation form, what do the behaviors mean, feedback training and role play (mentoring and coaching) and employees should be aware they may be observed at any time.

Training will include:

- Program objectives and incident metrics reviewed.
- How to conduct the observation.
- How to complete the observation form.
- What do the behaviors mean?
- Feedback training and role play (mentoring and coaching).
- Employees should be aware they may be observed at any time.

BBS Safety Observation Form

Your concerns for safety and suggestions as how to improve our safety program are important to ZAP Engineering. Use this form to submit either safety improvement input and/or a BBS safety observation. Your name is optional and the name of the person being observed is not to be used. This information will be used to continually improve our safety system and conditions.

Improvement Input

☐ BBS Observation	☐ Unsafe Act	☐ Unsafe Condition	☐ Recognition	☐ Environmental

Employee/Observer Input:

Employee's Action Taken or Recommendation:

Supervisor or Management Action Taken:

Safety Observation S=Safe C=Concern Critical Factors

PPE / Procedures / Methods			Body Position / Mechanics			Slips / Trips			Equipment / Work Environment		
S	C	Eye & Head	S	C	Proper Position	S	C	Proper Footwear	S	C	SDS If Needed
S	C	Hand & Body	S	C	Ask for Help	S	C	Aware of Hazards	S	C	Lock Out
S	C	Footwear	S	C	Use Dolly	S	C	Prompt Clean Up	S	C	Tools are Safe
S	C	Trained on Task	S	C	Smaller Loads	S	C	Tripping Hazards	S	C	Adjacent Work
S	C	Work Permit / JSA	S	C	Don't Twist Body	S	C	Not Rushing	S	C	Signage if Needed
S	C	All trained in BBS	S	C	Get Close to Item	S	C	Step Conditions	S	C	Spill Control

Observer's feedback given to another employee:

Location: Observer Name: Date:

Promptly after observation give this form to your supervisor who will review it and who must then forward it to the ZAP Engineering Safety Manager for action.

8. BLOODBORNE PATHOGENS

8.1. Purpose

This Bloodborne Pathogen Exposure Control Plan has been established to ensure a safe and healthful working environment and act as a performance standard for all employees. This program applies to all occupational exposure to blood or other potentially infectious materials. The content of this plan complies with OSHA Standard 29 CFR 1910.1030 (Occupational Exposure to Bloodborne Pathogens).

8.2. Scope

This program addresses all occupational exposure to blood or other potentially infectious materials (examples of potentially infectious materials include bodily fluids containing hepatitis B, HIV). OSHA requires that all employers that can "reasonably anticipate exposure" of employees to infectious material to prepare and implement a written exposure control plan.

8.3. Key Responsibilities

8.3.1. Exposure Control Officer (ZAP ENGINEERING Safety Manager)

Has overall responsibility for developing and implementing the Exposure Control Procedure for all facilities.

8.3.2. Site Project Manager and Supervisors

Site project manager and supervisors are responsible for exposure control in their respective areas.

8.3.3. Employees

- Know what tasks they perform that have occupational exposure.
- Plan and conduct all operations in accordance with our work practice controls.
- Develop good personal hygiene habits.

8.4. Procedure

8.4.1. Training

ZAP Engineering shall ensure that all employees with occupational exposure participate in a training program. Training is conducted for all employees with occupational exposure before initial assignment and within one year of previous training. Training shall be provided at the time of initial assignment and within one year of an employee's previous training. Training shall include:

- What bloodborne pathogens are; how to protect themselves from exposure
- Methods of warnings (signs, labels, etc.)
- The OSHA requirements of bloodborne pathogens
- The Hepatitis B vaccine shall be made available to all employees that have occupational exposure at no cost to the employee(s).



Biohazard Label

8.4.2. Availability of Procedure to Employees

All employees will have access to a copy of the exposure control plan. Access to a copy of the exposure control plan shall be provided in a reasonable time, place, and manner.

8.4.3. Reviews and Update of the Procedure

The procedure is reviewed annually and updated whenever we establish new functional positions within our facility that may involve exposure to biohazards.

8.4.4. Exposure Determination

- There are no job classifications in which some or all employees have occupational exposure to bloodborne pathogens that may result from the performance of their routine duties.
- Designated employees are trained to render first aid and basic life support. Rendering first aid or basic life support will expose employees to bloodborne pathogens and will require them to adhere to this program.
- In addition, no medical sharps or similar equipment is provided to, or used by, employees rendering first aid or basic life support.
- This exposure determination has been made without regards to the Personal Protective Equipment that may be used by employees.
- A listing of all first aid and basic life support trained employees in this work group shall be maintained at each work site and at each first aid kit.

8.5. **Methods of Compliance**

8.5.1. Universal Precautions

Under circumstances in which differential between bodily fluids is difficult or impossible, all body fluids will be considered potentially infectious.

8.5.2. Engineering Controls

Engineering and work practice controls shall be used to eliminate or minimize employee exposure. Engineering controls should be examined and maintained or replaced on a regular schedule to ensure their effectiveness. Hand washing facilities shall be readily available at all work locations. If provision of hand washing facilities is not feasible, then an appropriate antiseptic hand cleanser in conjunction with cloth/paper towels or antiseptic towelettes shall be provided by ZAP Engineering.

Containers for contaminated reusable sharps that our clients provide have the following characteristics: Puncture-resistant; Color-coded or labeled with a biohazard warning label; Leak-proof on the sides and bottom.

Secondary containers which are: Leak-proof; Color-coded or labeled with a biohazard warning label; Puncture-resistant, if necessary.

8.5.3. Work Practice Controls

- Employees shall wash their hands immediately, or as soon as feasible, after removal of potentially contaminated gloves or other personal protective equipment.
- Following any contact of body areas with blood or any other infectious materials, employees wash their hands and any other exposed skin with soap and water as soon as possible.
- Hand washing facilities shall be available. If hand washing facilities are not feasible ZAP Engineering will provide either an appropriate antiseptic hand cleanser in conjunction with cloth/paper towels or antiseptic towelettes.
- Contaminated needles and other contaminated sharps should not be handled if you are not AUTHORIZED or TRAINED to do so. Contaminated needles and other contaminated sharps are not bent or recapped.
- Eating, drinking, smoking, applying cosmetics or lip balm and handling contact lenses is prohibited in work areas where there is potential for exposure to biohazardous materials.
- Food and drink is not kept in refrigerators, freezers, on countertops or in other storage areas where potentially infectious materials are present.
- All equipment or environmental surfaces shall be cleaned and decontaminated after contact with blood or other infectious materials.
- Specimens of blood or other potentially infectious materials must be put in leak proof bags for handling, storage and transport.
- If outside contamination of a primary specimen container occurs, that container is placed within a second leak proof container, appropriately labeled, for handling and storage.
- Bloodborne pathogens kits are located on top of first aid kits and are to be used in emergency situations by the caregiver. Once the seal is broken on kit and any portion has been used it is not to be reused. Pathogen Kits shall be ordered and replaced promptly. Biohazard bags are identified by stickers and located in the first aid area. Contaminated supplies are to be disposed at once.

8.5.4. Personal Protective Equipment

When the possibility of occupational exposure is present, PPE is to be provided at no cost to the employee such as gloves, gowns, etc. PPE shall be used unless employees temporarily declined to use under rare circumstances. PPE shall be repaired and replaced as needed to maintain its effectiveness. All PPE shall be of the proper size and readily accessible.

Our employees adhere to the following practices when using their personal protective equipment:

- Any garments penetrated by blood or other infectious materials are removed immediately.
- All potentially contaminated personal protective equipment is removed prior to leaving a work area.
- Gloves are worn whenever employees anticipate hand contact with potentially infectious materials or when handling or touching contaminated items or surfaces.
- Disposable gloves are replaced as soon as practical after contamination or if they are torn, punctured or otherwise lose their ability to function as an "exposure barrier".

- Masks and eye protection (such as goggles, face shields, etc.) are used whenever splashes or sprays may generate droplets of infectious materials.
- Any PPE exposed to bloodborne pathogens shall be disposed of properly.
- PPE shall be used unless employees temporarily declined to use PPE under rare circumstances.
- PPE should be cleaned, laundered & properly disposed of if contaminated.
- ZAP Engineering will repair and replace PPE as needed to maintain its effectiveness.

8.5.5. Housekeeping

Our staff employs the following practices:

- All equipment and surfaces are cleaned and decontaminated after contact with blood or other potentially infectious materials.
- Protective coverings (such as plastic trash bags or wrap, aluminum foil or absorbent paper) are removed and replaced.
- All trash containers, pails, bins, and other receptacles intended for use routinely are inspected, cleaned and decontaminated as soon as possible if visibly contaminated.
- Potentially contaminated broken glassware is picked up using mechanical means (such as dustpan and brush, tongs, forceps, etc.).

8.5.6. Post-Exposure and Follow Up

Post-Exposure Evaluation & Follow-Up

If there is an incident where exposure to bloodborne pathogens occurred, we immediately focus our efforts on investigating the circumstances surrounding the exposure incident and making sure that our employees receive medical consultation and immediate treatment.

The ZAP Engineering Safety Manager/ Supervisor investigates every reported exposure incident and a written summary of the incident and its causes is prepared, and recommendations are made for avoiding similar incidents in the future. We provide an exposed employee with the following confidential information:

- Documentation regarding the routes of exposure and circumstances under which the exposure incident occurred.
- Identification of the source individual (unless not feasible or prohibited by law).

Once these procedures have been completed, an appointment is arranged for the exposed employee with a qualified healthcare professional to discuss the employee's medical status. This includes an evaluation of any reported illnesses, as well as any recommended treatment.

Information Provided to the Healthcare Professional. We forward the following:

- A copy of the Biohazards Standard.
- A description of the exposure incident.
- Other pertinent information.

Healthcare Professional's Written Opinion

After the consultation, the healthcare professional provides our facility with a written opinion evaluating the exposed employee's situation. We, in turn, furnish a copy of this opinion to the exposed employee. The written opinion will contain only the following information:

- Whether Hepatitis B Vaccination is indicated for the employee.
- Whether the employee has received the Hepatitis B Vaccination.
- Confirmation that the employee has been informed of the results of the evaluation.
- Confirmation that the employee has been told about any medical conditions resulting from the exposure incident which require further evaluation or treatment.
- All other findings or diagnoses will remain confidential and will not be included in the written report.

8.5.7. Record Keeping

All records shall be made available upon request of employees, OSHA's Assistant Secretary and the Director of OSHA for examination and copying. Medical records must have written consent of employee before released. ZAP Engineering shall meet the requirements involving transfer of records set forth in 29 CFR 1910.1020(h).

The respective Human Resources representative shall maintain Bloodborne Pathogen exposure records.

Employee medical records shall be kept confidential and are not to be disclosed without the employee's written consent, except as required by 29 CFR 1910.1030 or other law.

Accurate medical records for each employee with occupational exposure must be maintained for at least the duration of employment plus 30 years and shall include at least the following:

- Employee's name, Social Security number and ZAP Engineering employee number.
- Employee's Hepatitis B vaccination status, including vaccination dates.
- All results from examinations, medical testing and follow-up procedures, including all health care professional's written opinions.
- Information provided to the health care professional.
- Any Hepatitis B Vaccine Declinations.

Training records shall be maintained for 3 years from the date on which the training occurred and shall include at least the following:

- Outline of training program contents.
- Name of person conducting the training.
- Names and job titles of all persons attending the training.
- Date of training.

8.5.8. Labels and Signs

Biohazard warning labeling shall be used on containers of regulated waste; Sharps disposal containers; contaminated laundry bags and containers; contaminated equipment.

8.5.9. Information

Information provided to our employees includes:

- The Biohazards Standard itself.
- The epidemiology and symptoms of bloodborne diseases.
- The modes of transmission of bloodborne pathogens.
- Our facility's Exposure Control Procedure (and where employees can obtain a copy).
- Appropriate methods for recognizing tasks and other activities that may involve exposure.
- A review of the use and limitations of methods that will prevent or reduce exposure.
- Selection and use of personal protective equipment.
- Visual warnings of biohazards within our facility including labels, signs and "color-coded" containers.
- Information on the Hepatitis B Vaccine.
- Actions to take and persons to contact in an emergency involving potentially infectious material.
- The procedure to follow if an exposure incident occurs, including incident reporting.
- Information on the post-exposure evaluation and follow-up, including medical consultation.

9. COLD WEATHER EXPOSURE

9.1. Purpose

9.1.1. The purpose of this program is to address control measures to protect ZAP Engineering employees from stress or injuries when working in cold temperatures.

9.2. Scope

9.2.1. Each ZAP Engineering worksite shall implement a site-specific cold weather/cold stress hazard assessment and have the control plan approved by the ZAP Engineering Safety Manager.

9.3. Responsibilities

9.3.1. Safety Manager

- Identify and conduct an assessment of tasks and occupations where there is the potential for cold stress.
- Implement and/or provide controls (engineering, administrative or personal protective equipment) to minimize cold stress.
- Provide training and education regarding cold stress, including early signs and symptoms of cold-related exposure.

9.3.2. Worker Responsibilities

- Adhere to all control measures or work procedures that have been designed and implemented to reduce exposure to conditions that could cause cold stress.
- Leave cold environments if signs or symptoms of cold-related stress appear.

- Wear all required cold temperature clothing and PPE.
- Immediately report any signs or symptoms of cold-related stress.

9.4. Cold Temperature Procedures

9.4.1. Health Effects of Cold Stress

Warning signs of hypothermia can include complaints of nausea, fatigue, dizziness, irritability or euphoria. Workers can also experience pain in their extremities (hands, feet, ears, etc.), and severe shivering. Workers should be moved to a heated shelter and seek medical advice when appropriate.

9.4.2. Hazard Assessment

An assessment will be conducted by the Safety Manager to identify the types of jobs or employees who are at risk for cold exposure. Jobs that are at risk for cold exposure include, but are not limited to: airport ground personnel, auto repair and refueling, cold storage, construction and demolition, ice making, logging, mining, oil and gas drilling, pulp and paper, railroad and trucking, snow and trash removal, utility repair and warehousing. The assessment must also consider employees who work inside but have to go outside for any portion of the shift to either perform work or to travel to transportation departure or arrival points.

9.4.3. Facilities

- Regularly used walkways and travel ways shall be sanded, salted or cleared of snow and ice as soon as practicable.
- Employees will be informed of the dangers associated with working around unstable snow and ice build-ups. All employees will be informed of the dangers and destructive potential caused by unstable snow build-up, sharp icicles, ice dams and know how to prevent incidents caused by them.
- When dangerous overhead build-ups of snow or ice are present barricades will be used to prevent staff from walking or driving into potential fall zones.

9.4.4. Clothing, PPE and Supplies

Proper cold weather protection must be worn by employees when working in cold, wet and windy conditions. Protective clothing is the most important way to avoid cold stress. The type of fabric also makes a difference.

Cotton loses its insulation value when it becomes wet. Wool, silk and most synthetics, on the other hand, retain their insulation even when wet. The following are recommendations for working in cold environments:

- Wear at least three layers of clothing. An inner layer of wool, silk or synthetic to wick moisture away from the body – a middle layer of wool or synthetic to provide Insulation even when hot - an outer wind and rain protection layer that allows some ventilation to prevent overheating.
- Wear a hat or hood. Up to 40% of body heat can be lost when the head is left exposed.
- Keep a change of dry clothing available in case work clothes become wet.

- With the exception of the wicking layer do not wear tight clothing. Loose clothing allows bettor ventilation of heat away from the body.
- Do not underestimate the wetting effects of perspiration. Oftentimes wicking and venting of the body's sweat and heat are more important than protecting from rain or snow.
- Wear insulated boots or other footwear. Felt-lined, rubber bottomed, leather-topped boots with removable felt insoles are best suited for heavy work in cold since leather is porous, allowing the boots to "breathe" and let perspiration evaporate.
- Liner socks made from polypropylene will help keep feet dry and warmer by wicking sweat away from the skin. Always wear the right thickness of socks for your boots.
- In extremely cold conditions, where face protection is used, eye protection must be separated from the nose and mouth to prevent exhaled moisture from fogging and frosting eye shields or glasses.
- Clothing must be dry. Moisture should be kept off clothes by removing snow prior to entering heated shelters.

Cold weather supplies will be regularly inspected and restocked when necessary by ZAP Engineering. Regular inspections on cold weather supplies such as hand warmers, jackets, shovels, etc. will be carried out to ensure that supplies are always in stock.

9.4.5. Preventative Controls That Are Implemented to Avoid Cold Induced Injuries

- Workers will be under constant protective observation by a co-worker or supervisor. ZAP Engineering will implement a "Buddy System" to ensure that no employee is working alone in cold work environments.
- Some preventive measures include drinking plenty of liquids, avoiding caffeine and alcohol.
- It is easy to become dehydrated in cold weather. If possible, heavy work should be scheduled during the warmer parts of the day.
- Take breaks out of the cold.
- Try to work in pairs to keep an eye on each other and watch for signs of cold stress.
- Avoid fatigue since energy is needed to keep muscles warm.
- Take frequent breaks and consume warm, high calorie food such as pasta to maintain energy reserves.
- If a worker exposed to cold shows signs or reports symptoms of cold stress or injury the worker must be removed from further exposure and treated by an appropriate first aid attendant, if available, or a physician.
- For continuous work in temperatures below the freezing point, heated warming shelters such as tents, cabins or rest rooms should be available. The work should be paced to avoid excessive sweating. If such work is necessary, proper rest periods in a warm area should be allowed and employees should change into dry clothes.
- New employees should be given enough time to get acclimatized to cold and protective clothing before assuming a full workload.
- For work below the freezing point, metal handles and bars should be covered by thermal insulating material. Also, machines and tools should be designed so that they can be operated without having to remove mittens or gloves.

9.5. Training

ZAP Engineering employees who are required to work in cold weather conditions will receive initial and annual training regarding the health effects of cold exposure and proper rewarming procedures, recognition of and first aid for frostbite and hypothermia, required protective clothing, proper use of warming shelters, the buddy system, maintaining communications, vehicle breakdown procedures and proper eating and drinking habits for working in the cold.

9.5.1. Health Effects

Where employees are exposed to work conditions that may present a hazard because of excessive cold ZAP Engineering shall ensure that a competent person provides training to ensure the employees are familiar with the signs and symptoms of cold weather induced health problems such as hypothermia, frostbite and trench foot. Training will include:

- Hypothermia occurs when body heat is lost faster than it can be replaced. When the core body temperature drops below the normal 98.6oF to around 95oF the onset of symptoms normally begins. The person may begin to shiver and stomp their feet in order to generate heat. Workers may lose coordination, have slurred speech and fumble with items in the hand. The skin will likely be pale and cold.
- Frostbite occurs when tile skin actually freezes and loses water. In severe cases, amputation of the frostbitten area may be required. While frostbite usually occurs when the temperatures are 30°F or lower, wind chill factors can allow frostbite to occur in above freezing temperatures. Frostbite typically affects the extremities, particularly the feet and hands. The affected body part will be cold, tingling, stinging or aching followed by numbness. Skin color tums red, then purple, then white and is cold to tile touch. There may be blisters in severe cases.
- Trench Foot or immersion foot is caused by having feet immersed in cold water at temperatures above freezing for long periods of trine. It is similar to frostbite but considered less severe. Symptoms usually consist of tingling, itching or a burning sensation. Blisters may be present.

Workers and supervisors involved with work in cold environments should be informed about symptoms of adverse effect exposure to cold, proper clothing habits, safe work practices, physical fitness requirements for work in cold, and emergency procedures in case of cold injury. While working in cold, a buddy system should be used. Look out for one another and be alert for the symptoms of hypothermia.

9.5.2. First Aid Training

Employees will be trained to administer proper first aid treatment on cold induced injuries or illnesses. All ZAP Engineering employees who are required to perform work in cold conditions will be knowledgeable on how to administer first aid treatment on cold induced injuries or illnesses.

All training shall be documented.

10. GAS CYLINDERS UNDER PRESSURE

10.1. Purpose

The purpose of this program is to prevent injury from failing or failure of compressed gas cylinders and to establish requirements for handling, lifting and storing compressed gas cylinders safely.

10.2. Scope

This program covers all employees and contractors who handle, transport and/or use compressed gas cylinders.

10.3. Key Responsibilities

10.3.1. Managers/Supervisors

- Shall ensure that all employees are aware of the proper handling, storage and use requirements for compressed gas cylinders.
- Shall ensure that initial training is conducted for all new employees and that retraining is conducted when employee behaviors suggest that retraining is warranted.

10.3.2. Employees

- Shall follow all requirements regarding the safe handling, storage and use of compressed gas cylinders.

10.4. Procedure

10.4.1. General

Cylinders shall not be accepted, stored or used if evidence of denting, bulging, pitting, cuts, neck or valve damage is observed. If damage is observed:

- The cylinder must be taken out of service.
- The cylinder's owner shall be notified to remove the cylinder from the premises.
- If owned, the cylinder shall be de-pressured and inspected as required by this program.

10.4.2. Cylinder Identification

Gas identification shall be stenciled or stamped on the cylinder or a label used. No compressed gas cylinder shall be accepted for use that does not legibly identify its content by name.

10.4.3. Handling

Valve caps must be secured onto each cylinder before moving or storage.

Secure the cylinder in a blanket when being lifted by mechanical means. Slings, ropes or electromagnets are prohibited to be used for lifting compressed gas cylinders.

The preferred means to move compressed gas cylinders is with a cart, carrier or with a helper.

Compressed gas cylinders must not be allowed to strike each other.

When a cylinder cap cannot be removed by hand the cylinder shall be tagged "Do Not Use" and returned to the designated storage area for return to vendor.

10.4.4. Storing

All cylinders must be secured upright in a safe, dry, well-ventilated area that limits corrosion and deterioration.

- Cylinders must be secured by means that will prevent the cylinder from falling.
- When securing the cylinder, the restraints shall not be attached to electrical conduit or process piping.

Empty and non-empty cylinders shall be stored separately. All stored cylinders shall be capped.

Oxygen cylinders must be stored a minimum of 20 feet from combustible gas cylinders or areas where there may be open flame or arcing. Cylinders may also be stored where the oxygen is separated from combustible gas cylinders by a 5 foot or higher wall with a fire resistance rating of 30 minutes.

Storage areas for full and empty cylinders must be designated and labeled. Cylinders should be stored in definitely assigned places away from elevators, stairs or gangways.

10.4.5. Use

Cylinders must be equipped with the correct regulators. Regulators and cylinder valves should be inspected for grease, oil, dirt and solvents. Only tools provided by the supplier should be used to open and close cylinder valves.

- Never force or modify connections.
- Only regulators and gauges shall be used within their designated ratings.
- The use of a pressure-reducing regulator is required at the cylinder, unless the total system is designed for the maximum cylinder pressure.
- Valves must be closed when cylinders are not in use.
- Cylinders shall not be used as rollers or supports.
- Cylinders shall not be placed where they can come in contact with electrical circuits.
- Cylinders must be protected from sparks, slag or flame from welding, burning or cutting operations.
- Empty cylinders must be returned to designated storage areas as soon as possible after use.

10.4.6. Inspection of Compressed Gas Cylinders

ZAP Engineering shall determine that compressed gas cylinders under its control are in a safe condition to the extent that this can be determined by visual inspection. Visual and other inspections shall be conducted as prescribed in the Hazardous Materials Regulations of the Department of Transportation (49 CFR parts 171-179 and 14 CFR part 103). Where those regulations are not applicable, visual and other inspections shall be conducted in accordance with Compressed Gas Association Pamphlets C-6-1968 and C-8-1962. Some elements include, but are not limited to:

- Hoses and connections should be inspected regularly for damage. Hoses should be stored in cool areas and protected from damage.
- These owned cylinders shall be visually inspected prior to charging, before each use and at least annually.
- All inspections and testing must be documented.

High Pressure Cylinders are those cylinders marked for service pressures of 900 psi and greater.

- High pressure cylinders shall be taken out of service and submitted for re-qualification testing when any of the following conditions are identified by visual inspection.
- Cuts, dings, gouges, dents bulges, pitting, neck damage or evidence of exposure to fire.
- The cylinders shall be inspected and retested according to the requirements stated in 49 CFR 180.205 and .209.
- Re-qualification of non-damaged cylinders shall be conducted per the schedule in 49 CFR 180.209.

Low Pressure Cylinders are those cylinders marked for service pressures of less than 900 psi.

- Low pressure cylinders fall into two categories, those requiring requalification and those that do not require re-qualification.
- Low pressure cylinders that do not require re-qualification shall be taken out of service and condemned when any of the following conditions are identified during inspection:
- The tare weight of the cylinder is less than 90% of the stamped-on weight of the cylinder.
- Observed pitting, dents, cuts, bulging, gouges or evidence of exposure to fire.
- Low pressure cylinders subject to re-qualification shall be taken out of service, inspected and retested when visual inspection identifies any of the following conditions; dents, bulges, pitting or neck damage.
- Re-qualification of non-damaged cylinders shall be conducted per the schedule in 49 CFR 180.209.

10.4.7. Leaking Cylinders

Leaking cylinders should be moved promptly to an isolated, well-ventilated area, away from ignition sources. Soapy water should be used to detect leaks. If the leak is at the junction of the cylinder valve and cylinder, do not try to repair it. Contact the supplier and ask for response instructions.

10.4.8. Transportation

Cylinders must be transported in a vertical secured position using a cylinder basket or cart and must not be rolled. Regulators should be removed, and cylinders capped before movement. Cylinders should not be dropped or permitted to strike violently, and protective caps are not used to lift cylinders.

10.4.9. Empty Cylinder Marking

Cylinders should be marked as "MT" and dated when empty. Never mix gases in a cylinder and only professionals should refill cylinders. Empty cylinders must be handled as carefully as when filled.

10.4.10. Engineering Controls

Engineering controls such as emergency shutoff switches, gas cabinets and flow restrictors should be used wherever possible to control hazards. Emergency eyewash facilities should be present where corrosive gases or materials are used.

11. HAZARD COMMUNICATION

11.1. Purpose

The purpose of this program is to ensure that the hazards of all chemicals and substances are evaluated and the information concerning their hazards is communicated to employees, including emergency response organizations, state and federal agencies, other employers and contractors, as necessary. This hazard information will be communicated and displayed in accordance with this Hazard Communication Program.

ZAP Engineering is firmly committed to providing each of its employees a safe and healthy work environment. It is recognized that workers may use chemicals or substances that have potentially hazardous properties. When using these substances, workers must be aware of the identity, toxicity or hazardous properties of a chemical or substance, since an informed employee is more likely to be a safe employee. To this end, ZAP Engineering has established a written Hazard Communication Program.

11.2. Scope

This program is applicable to all ZAP Engineering employees who may be exposed to hazardous chemicals. When work is performed on a non-owned or operated site, the operator's program shall take precedence, however, this document covers ZAP Engineering employees and contractors and shall be used on owned premises, or when an operator's program doesn't exist or is less stringent.

11.3. Definitions

Chemical - any element, chemical compound, or mixture of elements and/or compounds.

Chemical Inventory List - a list of chemicals used at this facility, or by personnel that report to this facility.

Electronic Access – using electronic media (telephone, fax, internet, etc.) to obtain Safety Data Sheets or health information.

Facility - an establishment at one geographical location containing one or more work areas.

Hazardous chemical - any chemical that is a physical hazard, a health hazard, or has a Permissible Exposure Limit established for it.

Hazardous substance - see hazardous chemical.

Hazard Communication Program Coordinator - the person who has overall responsibility at a facility for that facility's Hazard Communication Program.

Health hazard - a substance for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic adverse health effects may occur in exposed employees.

IDLH - immediately dangerous to life and health.

Immediate Use - the chemical will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

Jobsite - an area remote from a ZAP Engineering facility where hazardous chemicals are stored or used and employees are present for the purpose of ZAP Engineering business.

(SDS) Safety Data Sheet - a written or printed document containing chemical hazard and safe handling information, prepared in accordance with the OSHA Occupational Safety & Health Standards, Section 1910.1200, paragraph (g).

(NFPA) National Fire Protection Association Labeling - a common industry labeling method developed by the National Fire Protection Association to identify the hazards associated with a particular chemical.

(PEL) Permissible Exposure Limit - the maximum eight-hour time weighted average of any airborne contaminant to which an employee may be exposed.

Readily available - when an employee has access during the course of his/her normal work shift.

Substance - see Chemical.

(TLV) Threshold Limit Value - the airborne concentration of a substance that represents conditions under which it is believed that nearly all normal workers may be repeatedly exposed day after day without adverse effect.

Work area - a room or defined space in a facility where hazardous chemicals are stored or used and where one or more employees are present.

Workplace - see Facility.

Workplace Chemical List - see Facility Chemical List.

11.4. Responsibilities

A written hazard communication program shall be developed, implemented and maintained at each ZAP Engineering workplace that describes how labels and other forms of warning, Safety Data Sheets and employee information will be met.

The Safety Manager is responsible for developing and implementing the Hazard Communications Program. Managers are responsible for maintaining Safety Data Sheets and the Chemical Inventory List for their locations. The Safety Manager reviews the SDS files and Chemical Inventory List at each location at least annually to ensure that they are complete and up to date.

Employees are responsible for following the requirements in the Hazard Communication Program, to use proper personal protective equipment, to report containers without labels immediately and to not deface any label.

Any employee who transfers any material from one container to another is responsible for labeling the new container with all required information.

All employees are responsible for learning the requirements of this section and for applying them to their daily work routine.

11.5. Requirements

11.5.1. Introduction

This Hazard Communication Program was prepared for use by ZAP Engineering to explain how ZAP Engineering meets the requirements of the federal Occupational Safety and Health Administration's Hazard Communication Standard (29 CFR 1910.1200). It spells out how ZAP Engineering will inventory chemicals stored and used, obtain and use Safety Data Sheets, maintain labels on chemical substances, and train employees about the hazards of chemicals they are likely to encounter on the job.

Preparation of this program indicates our continuing commitment to safety among our employees in all of our locations.

- Each facility is expected to follow this program and maintain its work areas in accordance with these requirements.
- Employees, their designated representatives, and government officials must be provided copies of this program upon request.
- In addition to the program, other information required as part of our hazard communication effort is available to workers upon request.
- Asking to see this information is an employee's right.
- Using this information is part of our shared commitment to a safe, healthy workplace.

11.5.2. List of Hazardous Chemicals

ZAP Engineering maintains a listing of all known hazardous chemicals known to be present or used at each job site by using the identity that is referenced on the appropriate material safety data sheet (SDS). This identity is often a common name, such as the product or trade name (i.e., Lime-A-Way).

The Chemical Inventory List is updated as necessary and at least annually by the Hazard Communication Program Coordinator or their designee.

The facility Chemical Inventory List must be available for review upon request.

11.5.3. Safety Data Sheets

Chemical manufacturers are responsible for developing SDSs. ZAP Engineering shall have a SDS for each chemical used with the exception of consumer products. SDSs must be obtained for each required chemical from the chemical manufacturer, supplier or vendor. The purchasing of any potentially

hazardous chemical products from any supplier that does not provide an appropriate Material Safety Data Sheet in a timely fashion is prohibited.

SDSs shall be maintained and readily accessible in each work area. SDSs can be maintained at the primary work site. However, they should be available in case of an emergency. SDSs must be made available, upon request, to employees, their designated representatives, the Assistant Secretary of Labor and the Director of OSHA.

Safety Data Sheets are filed alphabetically, by material classification, in the SDS Book. A Chemical Inventory List is provided in the front of the SDS Book, listing all SDS' contained therein. This inventory serves as the index of the SDS Book. The SDS Book shall be displayed in a prominent location in the work area where it is accessible to all employees.

A copy of a SDS request form is located in the first section of the SDS Book. An employee may use a copy of this form to request an SDS or he may ask the Manager for one. In either case the requested SDS must be given to the employee within 24 hours.

The Safety Data Sheet must be kept in the SDS library for as long as the chemical is used by the facility.

Electronic access (telephone, fax, internet, etc.) may be used to acquire and maintain SDS libraries and archives.

The Manager is responsible for seeing that the Chemical Inventory List inventory is maintained, is current and is complete. He will review the inventory and the SDS Book at least annually. When a hazardous material has been permanently removed from the workplace, its SDS is to be removed from the SDS Book and the Chemical Inventory List. A file copy is to be maintained in a "dead file".

SDS' for hazardous materials to which ZAP Engineering employees have been exposed must be maintained after the employee leaves the employment of ZAP Engineering.

Before any non-routine task is performed, employees will be advised of methods and special precautions, PPE and the hazards associated with chemicals and the hazards associated with chemicals contained in unlabeled pipes in their work areas. In the unlikely event that such tasks are required, the Manager will provide SDS for involved chemical.

Employees have the right to request SDS on any chemical and it must be provided without any issues.

11.5.4. Labels, Labeling and Warnings:

The Manager will ensure that all hazardous chemicals used or stored in the facility are properly labeled.

- Damaged labels or labels with incomplete information shall be reported immediately.
- Damaged labels on incoming containers of chemicals shall not be removed.
- New labels shall be provided as needed so that all containers are properly labeled.
- Only containers into which an employee transfers a chemical for their own immediate use will not require labeling.
- Employees who are unsure of the contents of any container, vessel or piping must contact their supervisor for information regarding the substance including:
  - The name of the substance

- The hazards related to the substance
- The safety precautions required for working with the substance.

Labels, tags or markings on containers shall list as a minimum:

- Identity of hazardous chemical.
- Name and address of the chemical manufacturer, importer or other responsible party.
- Words, pictures, symbols or combinations thereof may be used.
- The trade name of the product as listed on the Safety Data Sheet.
- Appropriate hazard warnings to help employees protect themselves from the hazards of the substance.
- Labels shall be legible, in English. However, for non-English speaking employees, information shall be presented in their language as well.
- ZAP Engineering or employees shall not remove or deface labels on incoming containers of hazardous chemicals.

All containers must be labeled. When an employee transfers the contents of one container to another, he must label the new container with all required information. This information can be obtained from the labeling of the original container or from the material's SDS. Any container of a potentially hazardous material that will not be emptied during one shift must be labeled, without exception.

Personnel in the Shipping and Receiving Departments are responsible for proper labeling of all containers shipped by ZAP Engineering and for the inspection of all incoming materials to ensure correct labeling. Chemicals received from vendors that are not properly labeled must be rejected.

NFPA Standard 704 labels shall be the preferred hazard identification method used in ZAP Engineering facilities and on materials containers used on client sites. All employees, clients, subcontractors and visitors who may come in contact with a ZAP Engineering hazardous substance must be briefed to ensure understanding of the NFPA 704 labeling system.

11.5.5. Training

Employees shall be provided with effective information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new physical or health hazard the employees have not previously been trained about is introduced into their work area. Information and training may be designed to cover categories of hazards (e.g., flammability, carcinogenicity) or specific chemicals. Chemical-specific information must always be available through labels and Safety Data Sheets.

Additional training will be provided whenever a new chemical hazard is introduced into the work area. To reinforce the importance of handling chemicals properly when performing new or non-routine tasks supervisors will conduct supplementary training as needed.

Formal training will be conducted by facility employees or individuals who are knowledgeable in the Hazard Communication program.

The Manager shall ensure records of employee training are maintained.

When an outside contractor, such as a pest control worker or a carpenter enters a ZAP Engineering site to perform a service for the ZAP Engineering, they must first present SDS for any and all hazardous chemicals

he will use. These SDS will be treated as above with the same training requirements. The Manager will be responsible for contacting each contractor before work is started to gather and disseminate any information concerning chemical hazards the contractor is bringing into the workplace.

The Hazard Communication Program documented training shall, as a minimum, include:

- Requirements, details and rights of the employee as contained in the Hazard Communication regulation
- Operations and work areas where hazardous chemicals are present.
- Location of the written Hazard Communication Program, SDS and the Chemical Inventory List.
- How to access SDS or SDS information.
- How to read and an explanation of labels and Safety Data Sheets for pertinent hazard information and how employees can obtain and use the appropriate hazard information.
- Methods and observations that may be used to detect the presence or release of hazardous chemicals by use of monitoring devices, visual appearance or odor.
- The physical & health hazards of chemicals in the work area.
- Protection measures to be utilized to prevent exposure.
- Appropriate work practices.
- Emergency procedures.
- Proper PPE to be used.

11.5.6. Multi-Employer Job Sites/Multi-Work Site

Multi-Work Sites

Where employees must travel between workplaces during a work shift, the written HAZCOM Program shall be kept at a primary job site. If there is no primary job site, then the program shall be sent with employees.

The program shall be made available, upon request, to employees, their designated representatives, the Assistant Secretary and the Director in accordance with requirements of 29 CFR 1910.1020(e).

Multi-Employer Job Sites

A pre-job briefing shall be conducted with the contractor prior to the initiation of work on the site.

- During this pre-job briefing, contractors shall notify ZAP Engineering and present current copies of Safety Data Sheets and label information for every hazardous substance brought on-site.
- ZAP Engineering shall notify and provide required SDS and label information for all hazardous materials the contractor may encounter on the job.
- The facilities labeling system and any precautionary measures to be taken by contractor during normal conditions and emergencies shall be addressed.
- By providing such information to other employers, ZAP Engineering does not assume any obligations that other employers have for the safety of their employees.
- In this regard, other employers working on ZAP Engineering property or for ZAP Engineering on client's property remain fully responsible for developing and implementing their own compliant hazard communication programs.

11.5.7. Hazard Warnings / NFPA 704

The NFPA 704 Diamond is a means of disseminating hazard warning and information for a material. The diamond is divided into four sections. Each of the first three colored sections has a number in it associated with a particular hazard. The higher the number is, the more hazardous a material is for that characteristic. The fourth section includes special hazard information. The four sections and an explanation of the numbers in them are provided below:

NFPA Rating Explanation Guide

RATING NUMBER	HEALTH HAZARD	FLAMMABILITY HAZARD	INSTABILITY HAZARD
4	Can be lethal	Will vaporize and readily burn at normal temperatures	May explode at normal temperatures and pressures
3	Can cause serious or permanent injury	Can be ignited under almost all ambient temperatures	May explode at high temperature or shock
2	Can cause temporary incapacitation or residual injury	Must be heated or high ambient temperature to burn	Violent chemical change at high temperatures or pressures
1	Can cause significant irritation	Must be preheated before ignition can occur	Normally stable. High temperatures make unstable
0	No hazard	Will not burn	Stable

RATING SYMBOL	SPECIAL HAZARD
ALK	Alkaline
ACID	Acidic
COR	Corrosive
OX	Oxidizing
	Radioactive
W	Reacts violently or explosively with water
W OX	Reacts violently or explosively with water and oxidizing

12. CONFINED SPACE

12.1. Purpose

The purpose of this program is to ensure the safety of all employees and contractors working for ZAP Engineering and to comply with all regulations and host clients that pertain to confined spaces.

12.2. Scope

This program covers all employees and other workers that may be involved in confined space entry. When work is performed on a non-owned or operated site, the operator's program shall take precedence. This document covers ZAP Engineering employees and contractors and shall be used on owned premises, or when an operator's program doesn't exist or is less stringent.

12.3. Definitions

Acceptable entry conditions - the conditions that must exist in a confined space to allow entry and to ensure that employees involved with a confined space entry can safely enter into and work within the space.

Attendant - an individual stationed outside one or more Confined spaces who monitors the authorized Entrants and who performs all Attendant's duties assigned in the ZAP Engineering Confined Spaces Program. Attendants must have sufficiently completed and fully understands the Confined Space training and is approved by the HSE Manager to work in a confined space as an Attendant.

Authorized Entrant - an individual who is authorized by ZAP Engineering to enter a confined space. Entrants must have sufficiently completed and fully understands the Confined Space training and is approved by the HSE Manager to work in a confined space as an Authorized Entrant.

Blanking or Blinding - the absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

Confined Space

- A space that is large enough and so configured that an employee can bodily enter and perform assigned work;
- Has limited or restricted means for entry or exit (for example, tanks, vessels, coolers, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry); and
- Is not designed for continuous occupancy.

Double block and bleed - the closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

Emergency - any occurrence (including any failure of hazard control or monitoring equipment) or an event internal or external to the confined space that could endanger Entrants.

Engulfment - the surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

Entry - the action by which a person passes through an opening into a confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the Entrant's body breaks the plane of an opening into the space.

Entry permit – means the written or printed document that is provided by ZAP Engineering to allow and control entry into a confined space that contains the information specified in this program.

Entry Supervisor - the person responsible for determining if acceptable entry conditions are present at a confined space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this section.

- Entry Supervisors must have sufficiently completed and fully understands the Confined Space training and is approved by the HSE Manager to work in a confined space.
- An Entry Supervisor also may serve as an Attendant or as an authorized Entrant, as long as that person is trained and equipped as required by this section for each role he or she fills. Also, the duties of Entry Supervisor may be passed from one individual to another during the course of an entry operation.
- The Entry Supervisor is responsible to test and monitor the atmosphere conditions.

Hazardous atmosphere - an atmosphere that may expose employees to the risk of death, incapacitation, and impairment of ability to self-rescue (that is, escape unaided from a confined space), injury, or acute illness from one or more of the following causes:

- Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL), (0% is normal).

- Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent, (20.9 % is normal).
- Any other atmospheric condition that is immediately dangerous to life or health. (Ex.- H2S 10%, 0% is normal).
- Note: For air contaminants for which OSHA has not determined a dose or permissible exposure limit, other sources of information, such as Material Safety Data Sheets that comply with the Hazard Communication Standard, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.

Hot work permit - the written authorization to perform operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

Immediately dangerous to life or health (IDLH) - any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a confined space.

- Note: Some materials -- hydrogen fluoride gas and cadmium vapor, for example -- may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possibly fatal collapse 12-72 hours after exposure. The victim "feels normal" from recovery from transient effects until collapse. Such materials in hazardous quantities are considered to be “immediately dangerous to life or health”.

Inerting - the displacement of the atmosphere in a permit space by a non-combustible gas (such as nitrogen) to such an extent that the resulting atmosphere is non-combustible. This procedure produces an IDLH oxygen deficient atmosphere.

Isolation - the process by which a confined space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

Line Breaking - the intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

Non-Permit Confined Space - A confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

Oxygen deficient atmosphere - an atmosphere containing less than 19.5 percent oxygen by volume.

Oxygen enriched atmosphere - an atmosphere containing more than 23.5 percent oxygen by volume.

Permit-Required Confined Space - a confined space that has one or more of the following characteristics:

- Contains or has a potential to contain a hazardous atmosphere.
- Contains a material that has the potential for engulfing an Entrant.
- Has an internal configuration such that an Entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section.

- Contains any other recognized serious safety or health hazard.

Permit system - the employer's written procedure for preparing and issuing permits for entry and for returning the confined space to service following termination of entry.

Prohibited condition - any condition in a confined space that is not allowed by the permit during the period when entry is authorized.

Rescue service - the personnel designated to rescue employees from Permit-Required Confined Spaces.

Retrieval system - the equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from confined spaces.

Testing - the process by which the hazards that may confront Entrants of a confined space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

12.4. Responsibilities

12.4.1. Managers/Supervisor

- Shall ensure that all employees have been trained and fully understand the requirements of this program.
- Shall provide the necessary equipment to comply with these requirements and ensure that all employees are trained on its use.
- Shall ensure that all confined space assessments have been conducted and documented.
- Shall ensure that provisions and procedures are in place for the protection of employees from external hazards including but not limited to pedestrians, vehicles and other barriers and by use of the pre-entry checklist verifying that conditions in the permit space are acceptable for entry during its duration.
- Shall ensure that all Permit-Required Confined Spaces permits are posted.
- Shall ensure an annual review of the program including all entry permits issued that during that annual period.
- Shall ensure that confined spaces are identified properly as either a Non-Permit Confined Space or a Permit-Required Confined Space.
- Shall ensure that all confined spaces that have been identified as “no entry” have signs that state, “DANGER- DO NOT ENTER”.
- Shall ensure signs have been posted at all Permit-Required Confined Space areas that state, “DANGER – PERMIT ENTRY CONFINED SPACE” along with the proper warning word such as “ASPHYXIANT, FLAMMABILITY or TOXIC HAZARD”
- Shall file all permits at the area offices for review. Permits shall be kept on file for one year.

12.4.2. Affected Employee

- Shall attend Confined Space Entry training commensurate with their duties and when duties change as required.
- Shall comply with all aspects of this program.

- Authorized Entrants, Attendants and Entry Supervisors may be any ZAP Engineering employee that is authorized by management to work in a confined space setting and that has been trained and is proficient in the understanding of program requirements.

12.4.3. Authorized Entry Supervisor Duties

- Shall have a tailgate safety meeting, with all workers to be involved in the confined space entry and review the job to be performed and what safety concerns may be present.
- Shall confirm that all isolation, Lock/out and Tag/outs have been completed prior to entry into a confined space.
- Shall ensure that the requirements of this program are followed and maintained.
- Shall test all atmosphere conditions prior to entry and shall always complete and maintain the confined space permit form and have it accessible for review on the job site.
- Shall notify ZAP Engineering supervisor of entry into a confined space and notify the supervisor of any changes that may occur, during an entry.
- If the confined space poses a hazard that cannot be eliminated, the Entry Supervisor must arrange for a rescue service.
- If the confined space poses no hazards to the Entrants, the Entry Supervisor can reclassify the confined space to a Non-Permit Confined Space.
- A stand-by rescue team is not required to be on site for Non-Permit Confined Space entries.

12.4.4. Authorized Attendant Duties

- Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure.
- Is aware of possible behavioral effects of hazard exposure in authorized Entrants.
- Continuously maintains communication and an accurate count of authorized Entrants in the confined space and ensures that the means used to identify authorized Entrants, and accurately identifies who is in the confined space.
- Remains outside the confined space during entry operations until relieved by another Attendant.
- ZAP Engineering has procedures to be used by a single attendant monitoring several confined spaces during an emergency. If more than one confined space is to be monitored by a single attendant, the program must include the means and procedures that will be used in order to enable the attendant to respond to emergencies in one or more permit spaces that he/she is monitoring without distraction from all responsibilities. This will include radio communications with emergency responders or other methods of summoning aid, directing entrants to leave the confined spaces, etc. The procedures shall be on the confined space permit.
- Monitors activities inside and outside the confined space to determine if it is safe for Entrants to remain in the space and orders the authorized Entrants to evacuate the confined space immediately under any of the following conditions:
  - If the Attendant detects a prohibited condition;
  - If the Attendant detects the behavioral effects of hazard exposure in an authorized Entrant;

- If the Attendant detects a situation outside the space that could endanger the authorized Entrants;
- If the Attendant cannot effectively and safely perform all the duties required.

- Summon rescue and other emergency services as soon as the Attendant determines that authorized Entrants may need assistance to escape from confined space hazards.
- Takes the following actions when unauthorized persons approach or enter a confined space while entry is underway:
  - Warn the unauthorized persons that they must stay away from the confined space;
  - Advise the unauthorized persons to exit the confined space immediately, if they have entered the space;
  - Inform the authorized Entrants and the Entry Supervisor if unauthorized persons have entered the confined space.
- Performs no duties that might interfere with the Attendant's primary duty to monitor and protect the authorized Entrants.
- Authorized Attendants shall not monitor more than one confined space at a time.

12.4.5. Authorized Entrant Duties

- Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;
- Uses appropriate personal protective equipment properly, e.g., face and eye protection, and other forms of barrier protection such as gloves aprons, coveralls, and breathing equipment;
- Is aware of possible behavioral effects of hazard exposure in authorized Entrants;
- Shall witness and verify calibrated air monitoring data and if approved, sign off, before entry is made.
- Is entitled to request additional monitoring at any time.
- Maintain communication with the Attendants to enable the Attendant to monitor the Entrants status as well as to alert the Entrant to evacuate if needed; and
- Exit from confined spaces as soon as possible when ordered by an Attendant or Entry Supervisor, when the Entrant recognizes the warning signs or symptoms of an exposure exists, or when a prohibited condition exists, or when an alarm is activated.

12.5. **Procedure**

12.5.1. Non-Permit Confined Space Entry

If testing of the confined space atmosphere is within acceptable limits without the use of forced air ventilation and the space is properly isolated, the space can be entered by following the requirements for Level I confined space entry.

- Entrants and/or their representative shall be given the opportunity to observe and participate in the air monitoring process.
- Entrants shall review and sign the confined space permit.

Employees may enter and work in the confined space as long as LEL, O2, and toxicity hazards remain at safe levels.

- Complete the ZAP Engineering Confined Space Entry Permit to document that there are no confined space hazards. Make this certification available to all personnel entering the space.
- A trained Attendant must always be outside the confined space. The Attendant must monitor the authorized Entrants for the duration of the entry operation.

Exception: The Attendant requirements for Level I confined space entry may be exempted, if the job assessment is performed and has determined that there are no inherent dangers to allow single person entry.

- This provision is intended to permit field operations to enter crankcases, shallow valve boxes, cellars, excavations, etc. without an Attendant being present and all other aspects of the entry permit complied with.
- When there are changes in the use and configuration of a confined space that might increase the hazards to the Entrants (e.g., using epoxy coating on a tank floor, welding, painting, etc.), re-evaluate the space. If necessary, reclassify the space as a Permit-Required Confined Space.
- Continuously monitor the confined space atmosphere to ensure that it is still safe.
- The space must not contain a hazardous atmosphere while personnel are inside.
- If a hazardous atmosphere is detected during an entry, personnel must immediately evacuate the space.
- Re-evaluate the space to determine how the hazardous atmosphere developed.
- The Entry Supervisor shall cancel the entry permit.
- Take action to protect personnel before any subsequent activity to re-enter the space takes place.
- Reissue the ZAP Engineering Confined Space Entry Permit before allowing Entrants to re-enter the space.
- If necessary, reclassify the space as a Permit-Required Confined Space.
- Ensure that vehicle or other equipment exhaust does not enter the space.

12.5.2. Permit-Required Confined Space Entry

If the space is properly isolated and results of air monitoring are above acceptable parameters without local exhaust ventilation in operation, classify the entry as a Permit-Required Confined Space.

- Complete the ZAP Engineering Confined Space Entry Permit before proceeding with work in a Permit-Required Confined Space.
- Entrants and/or their representative shall be given the opportunity to observe and participate in the air monitoring process.
- Entrants shall review and sign the confined space permit.
- At least one trained Attendant must always be outside the Permit-Required Confined Space.
- The Attendant must monitor the authorized Entrants for the duration of the entry operation.
- Only authorized Entrants may enter a Permit-Required Confined Space.
- All Entrants must sign in and out on the entry permit when entering and leaving a Permit-Required Confined Space.

- The back of the permit or a sign-in sheet must be used for this purpose.
- Post signs and barricades outside all Permit-Required Confined Spaces to notify personnel that a confined space entry is in progress and unauthorized entry is prohibited.
- Conditions must be continuously monitored where Entrants are working to determine that acceptable conditions are maintained during entry.
- If a hazardous atmosphere is detected during an entry, personnel must immediately evacuate the space.
  - The Entry Supervisor shall cancel the entry permit.
  - Re-evaluate the space to determine how the hazardous atmosphere developed.
  - Take action to protect personnel before any subsequent activity to re-enter the space takes place.
  - Re-issue the ZAP Engineering Confined Space Entry Permit before allowing Entrants to re-enter the space.
  - Employees or their representatives are entitled to request additional monitoring at any time.
- The permit must be terminated when the entry operations are complete or when permit conditions change (i.e., hazardous air monitoring results are noted, unsafe behaviors are observed, etc.).
- The minimum rescue equipment required for Permit-Required Confined Space entry is covered in the Rescue & Emergency section of this program.
- Permit-Required Confined Space entry operations will be reviewed when ZAP Engineering believes that the requirements of this confined space program may not adequately protect personnel.
- If deficiencies are found in the program, the program will be revised, and personnel will be trained in the new revisions before subsequent entries are authorized.

12.5.3. Pre-Job Planning and Space Preparation

- The Entry Supervisor must determine that the confined space is properly isolated by blinding, disconnecting, and/or by following local Lockout/Tagout procedures.
- The Entry Supervisor must discuss with all Entrants the hazards of the space, communication methods and emergency procedures during the confined space entry.
- Eliminate any condition making it unsafe to open the equipment to atmosphere.
- Promptly guard the opening to prevent an accidental fall through the opening and to protect each employee working in the space from foreign objects entering the space.
- If applicable, wash, steam, ventilate or degas the confined space to properly free it of possible contaminants. Vent vapors to a safe location.
- Do not allow unauthorized personnel to enter a confined space. Barricade and/or guard all confined spaces to prevent entry of unauthorized Entrants.
- If performing hot work in the confined space, precautions must be taken consistent with the ZAP Engineering Hot Work Permit procedure.
- Ensure that vehicle or other equipment exhaust does not enter the space.

12.5.4. Pre-Entry Safety Meeting

The Entry Supervisor must declare when the confined space is ready for entry.

The Entry Supervisor shall hold a pre-entry safety meeting to discuss all requirements and procedures with all authorized Entrant(s) and Attendant(s) involved with the entry. He/she will discuss other concerns such as previous contents, vessel coating, PPE required etc., during this meeting.

The Entry Supervisor must coordinate entry operations when employees of more than one ZAP Engineering are working simultaneously in the confined space. This coordination is necessary so that one ZAP Engineering's work does not endanger the employees of another ZAP Engineering.

12.5.5. Equipment

Check all work equipment to ensure that it has the proper safety features and is approved for the locations where it will be used. The Entry Supervisor shall ensure that all equipment is properly maintained in a safe condition and that Entrants use the equipment properly.

The following equipment must be considered and may be required when entering a confined space:

- Atmospheric Testing and Monitoring Equipment.
- Barriers, Shields, and Signs – Post signs and barricades outside all Permit-Required Confined Spaces to notify personnel that a confined space entry is in progress and unauthorized entry is prohibited. Any signs used must state "Danger – Permit Entry Confined Space" along with the proper warning word such as "Asphyxiant, Flammability or Toxic Hazard". All barricades must be capable of preventing a person from inadvertently walking into or kicking an object into the space.
- Communications Equipment – Only use intrinsically safe equipment in areas where a hazardous atmosphere may exist. Use a communication system that will keep the Attendant in constant, direct communication with the Entrant(s) working in the confined space. Also, use a communication system that allows the Attendant to summon help from rescue or emergency service.
- Entry and Exit Equipment – (For example: ladders may be needed for safe entry and exit).
- Lighting Equipment – Needed for safe entry, work within the space and exit. Lighting equipment used in the confined space must be certified safe for the location.
- Portable electric lighting used in wet and/or other conductive locations (drums, tanks, vessels) must be operated at 12 volts or less. 120 volt lights may be used if protected by a ground-fault circuit interrupter.
- Personal Protective Equipment – Ensure that personnel wear the required personal protective equipment. For respiratory protection requirements, refer to the Respiratory Protection Program.
- Rescue and Emergency Equipment – Except if provided by outside rescue services.
- The Attendants must also have an approved first aid kit.
- Vacuum Trucks – When used, trucks must be properly grounded or bonded to prevent static sparks.
- Ventilating Equipment – Local exhaust air movers used to obtain acceptable atmospheric entry conditions (e.g., Coups air movers).
- Other – Any other equipment necessary for safe entry into and rescue from permit required confined spaces.

12.5.6. Air Monitoring

- Before an employee enters the space, the internal atmosphere shall be tested, with a calibrated direct-reading instrument, for oxygen content, for flammable gases and vapors, and for potential toxic air contaminants, in that order. Monitoring of the space must inform the entrants of the potential hazards and results and they must participate in the permit review and signing.
- Air shall be periodically test while continuous ventilation is applied.
- Any employee, who enters the space, or that employee's authorized representative, shall be provided an opportunity to observe the pre-entry testing required by this paragraph.
- Employees or their representatives are entitled to request additional air monitoring at any time.

12.5.7. Ventilation

Continuous forced air ventilation must be used and tested as follows:

- An employee may not enter the space until the forced air ventilation has eliminated any hazardous atmosphere;
- The forced air ventilation shall be so directed as to ventilate the immediate areas where an employee is or will be present within the space and shall continue until all employees have left the space;
- The air supply for the forced air ventilation shall be from a clean source and may not increase the hazards in the space.
- The atmosphere within the space shall be periodically tested as necessary to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere. Any employee, who enters the space, or that employee's authorized representative, shall be provided with an opportunity to observe the periodic testing and may request additional monitoring at any time.
- If a hazardous atmosphere is detected during entry each employee shall leave the space immediately and the space shall be evaluated to determine how the hazardous atmosphere developed; and measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.

12.5.8. Multiple Employer Procedure

In order not to endanger the employees of any other employer, the Entry Supervisor shall:

- Verify that all contractor employees have been trained in confined space and that all contractor employees fully understand the ZAP Engineering procedures pertaining to Confined Space.
- Inform the contractor that the workplace contains permit spaces and that permit space entry is allowed only through compliance with a permit space program meeting the requirements of this section.
- Apprise the contractor of the elements, including the hazards identified and the employees experience with the space, that make the space in question a permit space.
- Inform the contractor of any precautions or procedures that ZAP Engineering has implemented for the protection of employees in or near permit spaces where contractor personnel will be working.

- Coordinate entry operations with the contractor, when both ZAP Engineering personnel and contractor personnel will be working in or near confined spaces.
- Debrief the contractor at the conclusion of the entry operations regarding the permit space program followed and regarding any hazards confronted or created in confined spaces during entry operations.
- In addition to complying with the confined space requirements that apply to all employees; each contractor, who is retained to perform permit space entry operations, shall:
  - Obtain any available information regarding confined space hazards and entry operations from the ZAP Engineering Entry Supervisor.
  - Coordinate entry operations with the ZAP Engineering Entry Supervisor, when both ZAP Engineering personnel and contractor personnel will be working in or near permit spaces.
  - Inform ZAP Engineering of the confined space program that the contractor will follow and of any hazards confronted or created in the confined space, either through a debriefing or during the entry operation.

12.5.9. Rescue and Emergency Services

General

Rescue service must be on-site for immediately dangerous to life and health (IDLH) conditions while work is being performed. Rescue services must be either:

- Provided by the host facility,
- Provided by an outside service which is given an opportunity to examine the entry site, practice rescue and decline as appropriate, or
- Provided by ZAP Engineering by selecting a rescue team that is equipped and trained to perform the needed rescue services.
- The Attendant shall order the other Entrants not to move the injured nor allow untrained or unauthorized workers into the space that are not trained to handle a confined space rescue.
- Material Safety Data Sheet's for substances that an injured Entrant was exposed to must be provided to the medical facility treating the injured worker.

Permit-Required Confined Space Rescue:

- When the Attendant becomes aware of the need for rescue, the Attendant shall immediately summon the onsite rescue team by the agreed upon communication method, verbally, radio or cell phone, without leaving the vicinity of the confined space.
- The Attendant shall prevent unauthorized personnel from attempting a rescue.
- After the rescue team has been notified, the Attendant shall alert the Entry Supervisor of the emergency via the same communication methods.
- The preferred means of providing rescue service is through the use of a qualified outside rescue service vendor (client host). The outside rescue service vendor must be:
  - Informed of the hazards that they may confront during a rescue;
  - Provided access to the Permit-Required Confined Space to examine the entry site, practice rescue, and decline as appropriate.
  - Access to the space allows the rescue service and local supervision to jointly develop appropriate rescue plans.

- If the host operator is designated to provide rescue services for ZAP Engineering, the agreement of services must be included in contract for the job.

- If ZAP Engineering employees are to perform Permit-Required Confined Space rescues, they must be:
  - Provided and trained in the use of the proper personal protective equipment necessary to make the rescue;
  - Provided PPE at no cost
  - Trained to perform the assigned duties;
  - Required to practice making rescues at least once every 12 months;
  - Trained in basic first aid and CPR.
  - A minimum of one member of the rescue team must hold a current certification in first aid and CPR.

Non-entry Rescue

- To facilitate non-entry rescue, an Entrant must be attached to a retrieval system whenever he/she enters a Permit-Required Confined Space with a vertical depth of more than 5 feet.
- The retrieval equipment is not required if it will increase the overall risk of the entry, e.g., creating an entanglement hazard, or will not contribute to the rescue of the Entrant.
- Each Entrant shall use a full body harness equipped with a "D" ring located between the shoulders or above the head.
- Wristlets may be used instead of the full body harness, if the use of the full body harness is not feasible or creates a greater hazard and that using wristlets is the safest and most effective alternative.
- The retrieval line must be attached to the "D" ring and the other end of the retrieval line attached to a retrieval device or fixed point located outside the space so that rescue can begin as soon as the rescuer becomes aware that rescue is necessary.

12.5.10. Issuance/Reviewing of Permit

Only when all pre-entry requirements are satisfied, the Entry Supervisor shall issue a completed and signed confined space permit. The confined space permit is valid for one shift.

In the event of any unauthorized entry, employee complaints, a hazard not covered by the permit, the occurrence of an injury or near miss the entry permit shall be cancelled and a review shall be conducted to provide employee protection and for revising the program prior to authorizing subsequent entries.

An annual review of this program, using the cancelled permits retained within 1 year after each entry shall be conducted by the HSE Manager to revise the program as necessary, to ensure that employees are protected. If no confined space entries were performed during a 12-month period, no review is necessary.

12.5.11. Termination and Closing or Cancelling of Permits

The Entry Supervisor shall terminate the confined space permit, at the end of the job operation, at the end of the shift or when the Entry Supervisor or Attendant determine that conditions in or near the confined space have changed and is hazardous to the Entrants.

The Entry Supervisor shall, at the conclusion of entry operation, close out the permit and provide the safety department the original copy of the Confined Space Permit.

12.6. Training

Training shall be provided so that all employees whose work is regulated by this program acquire the understanding, knowledge, and skills necessary for the safe performance of the duties assigned to them.

Training shall be provided to each affected employee, before the employee is first assigned duties under this program, if a new hazard has been created or special deviations have occurred and before there is a change in assigned duties.

The employee shall be retrained:

- Whenever there is a change in confined space operations that presents a hazard about which an employee has not previously been trained.
- Whenever the supervisor has reason to believe either that there are deviations from the permit space entry procedures required by this section or that there are inadequacies in the employee's knowledge or use of these procedures.

The training shall establish employee proficiency in the duties required by this program and shall introduce new or revised procedures, as necessary.

The supervisor shall certify that the training required by this program has been accomplished.

- The certification shall contain each employee's name, the signatures or initials of the trainers, and the dates of training.
- The certification shall be available for inspection by employees, their authorized representatives, management, clients and the safety department.

Confined Space Entry Permit

Date: _____ Permit Space Number/Location: _____
Reason for Entry: _____
Hot Work Permit Needed? _____ Authorized Duration of Entry: _____

Permit Space Hazards

No	Yes	Hazard
		Pre-Opening Hazards
		Oxygen Def./Enrichment
		Flammables/Fire
		Hazardous Energy
		Engulfment/Entrapment
		Falls/Falling Objects
		Lighting/Noise/Heat/Cold
		Hot/Corrosive Materials
		Toxins:
		Other:

Preparation Procedure

Required?	Done Initials	Procedures
		Pre-Entry Checklist
		Pre-opening Hazards
		Electrical lockout/tagout
		Pneumatic Isolation
		Hydraulic Isolation
		Mechanical Isolation
		Traffic Control/Barricading
		Noise, Heat, Cold
		Fall Protection
		Ventilation Purge Time _____
		Emergency Egress
		Special Work

Procedures, if not attached, can be found in:

Required Equipment

- ☐ **Ventilator(s)** Minimum Cap: _____CFM
- ☐ **Respirators** Type(s):
- ☐ **Atmospheric Monitors** Type:
- ☐ **Communications** Type:
- ☐ **Fall Protection**
  - ☐ Harnesses
  - ☐ Tripods
  - ☐ Other:
- ☐ **Personal Protection**
  - ☐ Eye
  - ☐ Hearing
  - ☐ Foot/Hand
  - ☐ Protective Clothing
  - ☐ _____
  - ☐ Other:
- ☐ **Sparkproof Tools/Lighting**
  - ☐ Lights
  - ☐ Tools
  - ☐ Other:
- ☐ **Rescue/Emergency**
  - ☐ SCBA
  - ☐ Fire Extinguisher
  - ☐ Radio/Telephone
  - ☐ Charged Fire Hose
  - ☐ Communication Devices
  - ☐ First Aid Kit
  - ☐ Other:

Attendant (s)	Entrant(s)
_____	_____
_____	_____
_____	_____

Entry Supervisor: I certify that all pre-entry conditions listed on this permit have been met and the space is safe to enter:

_____ _____/_____
Entry Supervisor Date/Time

Permit Cancelled:

_____ _____/_____

Signature Date/Time

Did all information of this permit accurately reflect conditions encountered? ___ Yes or ___ No If no, describe conditions:

Safety Comments:

Acceptable Entry Conditions

Required?	Done? Initials	Action/Condition
X		Surrounding area free from vapors, all other hazards
X		Review of permit info with attendant, entrants
X		All safety equipment available
X		Employees properly trained
X		Pre-opening hazards eliminated
X		Completion of all preparation and isolation procedures
X		Communication between entrants, attendant and rescue
		Traffic control/barricading
X		Atmospheric tests satisfactory

Hazmat Emergency Management

Toxin	_____	_____
Symptoms and First Aid		
Spill/Release Control Procedures		
Incompatibilities Reactive, Fire Hazard		
MSDS Attached?		

Atmospheric Tests – Test Gases in Order Shown

Gas	Limits	Time Results	Time Results	Time Results	Time Results	Time Results	Time Results	Time Results	Time Results	Time Results	Time Results
1. Oxygen	23.5% 19.5%										
2. Combustibles	10% LEL										
3. H2s	10ppm										
4. CO	20 ppm										
5.											

6.											
Name(s) of Testers _____											
Test Unit Serial/ID Number _____ Most Recent Calibration/Zeroing _____											

NOTE: All Special work procedures must be reviewed with a safety representative before commencing work

13. HAZARD ASSESSMENT

13.1. Purpose

- To provide guidelines for identifying, assessing and controlling workplace hazards;
- To ensure the potential hazards of new processes and materials are identified before they are introduced into the workplace;
- To identify the jobs/tasks which require risk assessment.

13.2. Key Responsibilities

ZAP Engineering must assess a work site and identify existing or potential hazards before work begins at the work site or prior to the construction of a new work site as specified within this program.

13.3. Hazard and Risk Identification

The hazard identification process is used for routine and non-routine activities as well as new processes, changes in operation, products or services as applicable.

The Safety Manager shall conduct a baseline worksite hazard assessment which is a formal process in place to identify the various tasks that are to be performed and the accompanying Zap Engineering identified potential hazards. The results are included in a report of the results of the hazard assessment and the methods used to control or eliminate the hazards identified. The hazard assessment report must be signed and have the date on it.

Inputs into the baseline hazard identification include, but are not limited to:

- Scope of work;
- Legal and other requirements;
- Previous incidents and non-conformances;
- Sources of energy, contaminants and other environmental conditions that can cause injury;
- Walk through of work environment.

Hazards identifications (as examples) are to include:

- Working Alone
- Thermal Exposure
- Isolation of Energy
- Hearing Protection
- Musculoskeletal Disorders

- Bloodborne Pathogens
- Confined Spaces
- Driving
- General Safety Precautions
- And any other established policy or procedure by ZAP Engineering
- Any other site-specific work scope

ZAP Engineering has a formal process for identifying potential hazards. Processes are in place to identify potential hazards using JSA's, JHA's, facility wide or area specific analysis/inspections.

All identified hazards are assessed for risk and risk controls are assigned within the worksite hazard assessment for that specific hazard.

Employees and/or sub-contractors are actively involved in the hazard identification process. The ZAP Engineering program provides processes to ensure employees and/or sub-contractors are actively involved in the hazard identification process and hazards are reviewed with all employees concerned.

Employees are trained in the hazard identification process. Employees will be trained in the hazard identification process including the use and care of proper PPE.

Unsafe hazards must be reported immediately and addressed by the supervisor. The supervisor discusses the worksite hazard assessment with employees at the respective work location during the employee's documented orientation.

13.3.1. Review of Hazard Assessment

Existing worksite hazard identifications are formally reviewed annually or repeated at reasonably practicable intervals to prevent the development of unsafe and unhealthy working conditions and specifically updated when new tasks are to be performed that have not been risk assessed, when a work process or operation changes, before the construction of a new site or when significant additions or alterations to a job site are made.

The respective supervisor or project manager advises the Safety Manager when additional hazards are introduced into the workplace in order to revise planning and assessment needs.

13.4. Risk Assessment

Hazards are classified and ranked based on severity. The program identifies hazards are classified/prioritized and addressed based on the risk associated with the task. (See the risk analysis matrix outlining severity and probability).

ZAP ENGINEERING RISK ASSESSMENT MATRIX

CONSEQUENCE					PROBABILITY				
					A	B	C	D	E
Severity	People	Assets	Environment	Reputation	Not Done	Rarely	Once a week	Several Times in a Week	Multiple Times in a Day
0	No health effect	No damage	No effect	No impact					
1	Slight health effect	Slight damage	Slight effect	Slight impact					
2	Minor health effect	Minor damage	Minor effect	Limited impact					
3	Major health effect	Localized damage	Localized effect	Considerable impact					
4	Single fatality	Major damage	Major effect	National impact					
5	Multiple fatalities	Extensive damage	Massive effect	Global impact					

Key	Manage for continuous improvement (Low)	Incorporate risk reduction measures (Medium)	

13.5. Risk Controls/Methods

The following describes how identified hazards are addressed and mitigated:

- Risk assessed hazards are compiled with and addressed and mitigated through dedicated assignment, appropriate documentation of completion, and implemented controls methods including engineering or administrative controls and PPE required into the worksite hazard assessment of the site specific HSE plan. No work will begin before the worksite assessment is completed. Additionally, no risk assessed as High (Intolerable) shall be performed.
- If an existing or potential hazard to workers is identified during a hazard assessment ZAP Engineering must take measures to eliminate the hazard, or if elimination is not reasonably practicable, control the hazard. If reasonably practicable, ZAP Engineering must eliminate or control a hazard through the use of engineering controls. If a hazard cannot be adequately controlled using engineering controls, ZAP Engineering must use administrative controls that control the hazard to a level as low as reasonably achievable. If the hazard cannot be adequately controlled using engineering and/or administrative controls, ZAP Engineering must ensure that the appropriate personal protective equipment (PPE) is used by workers affected by the hazard. ZAP Engineering may use a combination of engineering controls, administrative controls, and personal protective equipment if there is a greater level of worker safety because a combination is used.

13.5.1. Emergency Control of Hazards

Only those employees competent in correcting emergency controls of hazards may be exposed to the hazard and only the minimum number of competent employees may be exposed during hazard emergency control. An example is a gas leak in a building. Only those personnel with training on fire safety, gas supply shut off and other related controls will attempt to resolve the emergency control of a hazard. ZAP

Engineering will make every possible effort to control the hazard while the condition is being corrected or under the supervision of client emergency response personnel in every emergency.

13.5.2. Certification of Hazard Assessment

The Safety Manager completes and signs the certification of hazard assessment for the worksite hazard assessment (also see PPE Program) and includes it within the site specific HSE plan. Hazard assessments are reviewed annually and updated when new tasks are to be performed that have not been risk assessed.

13.5.3. Job Safety Analysis (JSA)

For those jobs with the highest injury or illness rates, jobs that are new to our operation, jobs that have undergone major changes in processes and procedures or jobs complex enough to require written instructions will have a Job Safety Analysis performed. Completed JSAs are available from the Safety Manager.

13.5.4. Site Specific HSE Plan (SSSP)

Each work location has a site specific HSE plan. Each employee reporting to a location shall receive a documented orientation from a ZAP Engineering supervisor that includes the SSSP for that site. The SSSP contains the ZAP Engineering Health and Safety Policy, site specific safety requirements as well as a PPE matrix and a signed site-specific worksite hazard assessment for that location, which ZAP Engineering has a responsibility to provide.

13.6. **Review Process**

The hazard assessment program will be reviewed to ensure no new hazards derived from the corrective measures. The review shall include a management of change consideration as well.

The safety committee shall be involved in the review process as well.

WORKSITE HAZARD ASSESSMENT FORM

CERTIFICATE OF HAZARD ASSESSMENT STATEMENT FOR *_form shall be signed_* **SITE**

I certify a worksite hazard assessment was performed for this facility on *date* by the ZAP Engineering Safety Manager. *(Signature on File)*

Task: Indicate Task Group (Additional Tasks shall be listed in each site specific HSE plan)

TASKS	RISK LEVEL	HAZARDS	ENGINEERING OR ADMINISTRATIVE CONTROLS	PPE (Refer to PPE Matrix)
List individual task	***Use Risk Matrix***	***Identify hazards associated with task***	• ***List procedures that apply*** • ***List appropriate engineering controls*** • ***List procedures or other administrative controls***	***List appropriate PPE***
Example: Washing Parts	MED	Chemical Exposure (Skin, Eyes, Body)	• ZAP ENGINEERING PPE Procedure • No smoking;	Chemical gloves, splash proof goggles chemical apron
			•	
			•	
			•	
			•	
			•	
			•	

JOB SAFETY ANALYSIS FORM

Location / Dept:		Date:	New? ☐	Revision ☐	JSA NO:
Task			Supervisor:		
			Analysis By:		
Team Members			Reviewed By:		
			Approved By:		
Specific rules and procedures to be followed (Safe Work Practice Number ____):					

Sequence of Basic Job Steps	Potential Injury or Hazards	Recommendations to Eliminate or Reduce Potential Hazards.

CHECK ITEMS REQUIRED TO DO THIS JOB:

Safety Glasses	☐	Leather Gloves	☐	Face Shield	☐	Fire Extinguisher	☐	Atmospheric Testing	☐
Hard Hats	☐	Work Vest	☐	Goggles (type?)	☐	Lockout/Tagout	☐	Traffic Control	☐
Safety Shoes	☐	Fall Harness	☐	Flame Resistant Clothing	☐	Warning signs	☐	Other	☐

INSTRUCTIONS FOR COMPLETING THE JOB SAFETY ANALYSIS FORM

Select an employee to help you with the JSA: someone who is experienced in the job, willing to help and a good communicator. The employees play an important role in helping you identify job steps and hazards. In summary, to complete this form you should consider the purpose of the job, the activities it involves, and the hazards it presents. In addition, observing an employee performing the job, or "walking through" the operation step by step may give additional insight into potential hazards. Here's how to do each of the three parts of a Job Safety Analysis:

SEQUENCE OF BASIC JOB STEPS

Examining a specific job by breaking it down into a series of steps or tasks, will enable you to discover potential hazards employees may encounter.

Each job or operation will consist of a set of steps or tasks. For example, the job might be to move a box from a conveyor in the receiving area to a shelf in the storage area. To determine where a step begins or ends, look for a change of activity, change in direction or movement.

Picking up the box from the conveyor and placing it on a hand truck is one step. The next step might be to push the loaded hand truck to the storage area (a change in activity). Moving the boxes from the truck and placing them on the shelf is another step. The final step might be returning the hand truck to the receiving area.

Be sure to list all the steps needed to perform the job. Some steps may not be performed each time; an example could be checking the casters on the hand truck. However, if that step is generally part of the job it should be listed.

POTENTIAL HAZARDS

A hazard is a potential danger. The purpose of the Job Safety Analysis is to identify ALL hazards – both those produced by the environment or conditions and those connected with the job procedure. To identify hazards, ask yourself these questions about each step:

Is there a danger of the employee striking against, being struck by, or otherwise making injurious contact with an object?

Can the employee be caught in, by or between objects? Is there a potential for slipping, tripping, or falling?

Could the employee suffer strains from pushing, pulling, lifting, bending, or twisting?

Is the environment hazardous to safety and/or health (toxic gas, vapor, mist, fumes, dust, heat, or radiation)?

Close observation and knowledge of the job is important. Examine each step carefully to find and identify hazards – the actions, conditions, and possibilities that could lead to an accident. Compiling an accurate and complete list of potential hazards will allow you to develop the recommended safe job procedures needed to prevent accidents.

RECOMMENDED ACTION OR PROCEDURE

Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the hazards that could lead to an accident, injury or occupational illness.

Begin by trying to: (1) engineer the hazard out; (2) provide guards, safety devices, etc.; (3) provide personal protective equipment; (4) provide job instruction training; (5) maintain good housekeeping; (6) ensure good ergonomics (positioning the person in relation to the machine or other elements).

List the required or recommended personal protective equipment necessary to perform each step of the job.

Give a recommended action or procedure for each hazard.

Serious hazards should be corrected immediately. The JSA should then be changed to reflect the new conditions.

Finally, review your input on all three columns for accuracy and completeness with affected employees. Determine if the recommended actions or procedures have been put in place. Re-evaluate the job safety analysis as necessary.

14. DRIVING SAFETY

14.1. Purpose

This program is written to be in compliance with local regulatory requirements and provide directives to managers, supervisors, and employees about their responsibilities in the operations and management of ZAP Engineering vehicle safety.

14.2. Key Responsibilities

14.2.1. ZAP Engineering Safety Manager

- The designated Safety Manager is responsible for developing and maintaining the program and related procedures. These procedures are kept in the designated safety manager's office.

14.2.2. Site Manager

- Responsible for the implementation and maintenance of the program for their site and ensuring all assets are made available for compliance with the plan.

14.2.3. Employees

- All shall be familiar with this procedure and the local workplace vehicle safety program.
- Follow all requirements, report unsafe conditions, and follow all posted requirements.

14.3. Vehicles and Transportation

14.3.1. Driving Safety

- Operators of ZAP Engineering or client on or off road vehicles shall be qualified by possession of a valid, current driver's license for the type of vehicle being driven.
- Only authorized employees will drive a motor vehicle in the course and scope of work or operate a ZAP Engineering owned vehicle.
- Drivers shall have 3 years of driving experience on the vehicle he/she is licensed to drive & regularly drives.
- Drivers will be appropriately assessed, licensed and trained to operate the vehicle they have been authorized to operate.
- No passengers shall be on trucks used to deliver goods.
- Backing is prohibited whenever practicable. Where backing is required, drivers, when parking, should make every effort to park the vehicle in a manner that allows the first move when leaving the parking space to be forward.
- Drivers must have either a reversing alarm, use a spotter or walk around the truck/trailer prior to backing.
- Passenger compartments are to be free from loose objects that might endanger passengers in the event of an incident. Any vehicle with non-segregated storage shall be equipped with a cargo net or equivalent to separate the storage area.
- Vehicles (light vehicles, heavy vehicles and trailers) may not be modified without the endorsement of the manufacturer.

- Signs, stickers or labels are to be fitted in such a manner that they do not obstruct the driver's vision or impede the driver's use of any controls.

14.3.2. Employees driving vehicles are required to follow safe driving practices:

- Obey all federal and local driving laws or regulations as well as requirements of clients;
- Immediately report any citation, warning, traffic violation, collision, vehicle damage or near miss associated with ZAP Engineering or client vehicle operation or while driving on ZAP Engineering duties to the supervisor;
- Immediately report any restriction or change to their driving privileges to the supervisor.
- Seat belts shall always be worn by all occupants whenever the vehicle is in motion; only seats fitted with three-point inertia-reel type seatbelts shall be used. All vehicles capable of more than 10 mph/15 kph shall have seat belts installed.
- Defensive drivers continually assess conditions and hazards and remain prepared for any challenge that may approach them;
- When speaking with a passenger, always keep your eyes on the road;
- Both hands on the wheel;
- No use of cell phones, radios or other electronic devices while driving any vehicle - vehicle must be safely parked prior to using a mobile phone or 2-way radio.
- Slow down around construction, large vehicles, wildlife, fog, rain, snow, or anything else that adds a hazard to your driving;
- Drive for conditions, not just the speed limit;
- Alcohol or illegal drugs are not allowed to be in a ZAP Engineering, client or leased vehicle at any time;
- Drivers shall not operate a motor vehicle while under the influence of alcohol, illegal drugs, or prescription or over-the counter medications that might impair their driving skills.

14.3.3. Drivers are to be prepared before leaving:

- Perform 360 walk around – report new damage;
- Check windshield for cracks that could interfere with vision;
- Inspect for vehicle damage and immediately report any damage to the supervisor if not previously observed;
- Make sure dirt or snow is removed from lights on all sides of the vehicle;
- Brush or clean off snow or ice on all windows to ensure complete vision;
- Check fuel level to be certain the destination can be reached;
- Check to ensure the license plates and inspection tag on vehicle are current;
- Ensure that there is a first aid kit and inspected fire extinguisher in the ZAP Engineering vehicle;
- Ensure driver is rested and alert for driving;
- Employees are not to perform repairs or maintenance other than routine fluid additions.

14.3.4. Vehicle Requirements

- All vehicles shall be fit for the purpose and shall be maintained in safe working order.

- No vehicle less than 1000 kg is to be used on public roads.
- Tires, including spares if full size, are to be of same type, profile and tread pattern, except when the vehicle or tire Manufacturer recommends a different type for certain axles.
- Tire type and pattern is to be recommended by the vehicle or tire manufacturer for use on the vehicle in the area of operation.
- Vehicles are to be fitted with a spare wheel and changing equipment to safely change a wheel, or a suitable alternative.
- Vehicles longer than 6 meters/20 feet or with restricted rear view (i.e. pickup trucks that are fully loaded) are to be fitted with an audible reversing alarm.
- All seats are to be fitted with headrests
- All light duty vehicles (including buses) are to be equipped with an adjustable left, right and central rear-view mirrors
- Loads shall be secure and shall not exceed the manufacturer's specifications and legal limits for the vehicle.
- All vehicles are to be equipped with a multipurpose fire extinguisher with a capacity of at least 0.9 kg/2 lb. The fire extinguisher shall be securely mounted on a bracket and located so that it is easily accessible in an emergency without becoming a hazard in case of an incident.
- All light vehicles shall be equipped with a securely stowed first aid kit.
- All drivers of light vehicles shall carry a high visibility jacket for use in case of emergency stops.
- All light duty vehicles carry a minimum of one collapsible hazard warning triangle.
- Rollover protection will be installed in any vehicle to address high risk environments. The rollover protection engineered will conform to recognized regulatory standard and industry preferred practices.
- All light equipment vehicles shall be outfitted with two red high-intensity lights located as high, as far apart, and as far back as practical, wired to the headlight switch, but also with an override switch, if permitted by local regulations.

14.3.5. Transportation

- If workers are required to travel in a worker transportation vehicle ZAP Engineering must ensure that reasonable measures are taken to evaluate road, weather and traffic conditions to ensure the safe transit of the workers.
- The operator of a worker transportation vehicle must ensure that the worker transportation vehicle has been inspected by a qualified person before first use on a work shift.
- Seated workers must wear seat belts while being transported in a vehicle equipped with seat belts.
- A worker must not ride in a vehicle in a standing position, unless protected from being thrown off balance.
- A worker must not ride in a vehicle with any part of the body outside the vehicle unless essential to the work process and then only if the worker is adequately restrained.
- Materials, goods, tools or equipment carried in a portion or compartment of a vehicle in which workers are riding must be located and secured to prevent injury to the operator or workers.

- Any enclosed portion or compartment of a vehicle in which workers are transported must have:

    - Effective ventilation, independent of doors, providing clean air,
    - Adequate lighting and means for heating and cooling,
    - An effective means of communication between the operator and passengers, and
    - More than one means of exit.

14.3.6. Traffic Control

ZAP Engineering shall develop, in writing, and implement a traffic protection plan for its workers at a worksite if any of them may be exposed to a hazard from vehicular or pedestrian traffic that may endanger the safety of any worker. It shall include the following control measures:

- Effective means of traffic control shall be provided whenever the unregulated movement of vehicular traffic constitutes a hazard to workers.
- Traffic control shall include barricades and cones as the primary control and, where required, signs, flagmen or other techniques and devices made necessary by the prevailing circumstances.
- Operations or equipment, encroaching on the traveled way, shall be protected by barricades and cones as the primary control and, where required other effective devices.
- ZAP ENGINEERING must train workers in the traffic control safe work procedures.
- ZAP ENGINEERING will ensure that before a worker is designated as a flag person, the worker is trained in the safe work procedures for the safe control of traffic operations and wears the appropriate high visibility outer clothing and/or equipment.
- If a worker at a project on a highway may be endangered by vehicular traffic unrelated to the project, the project shall make use of as many measures as necessary to adequately protect the worker.
- A worker who is required to set up or remove traffic control measures on a roadway or a shoulder of a roadway shall be a competent worker, shall be equipped with the appropriate high visibility apparel, shall not perform any other work while setting up or removing the measures and shall be given adequate written and oral instructions in a language that he or she understands, with respect to setting up or removing the measures.

14.3.7. ATV Vehicles

If a ZAP Engineering work site utilizes ATV vehicles, then the following shall apply:

- If the manufacturer has not set limits for operation of the ATV on sloping ground, 5% is the maximum allowable slope unless ZAP Engineering has developed and implemented written safe work procedures appropriate for any steeper slope on which the equipment is to be used.
- ZAP Engineering must ensure that each ATV operator is properly licensed and trained in the safe operation of the vehicle. The training program for an ATV operator must cover:

    - The operator's pre-trip inspection,

- Use of personal protective apparel,
- Operating skills according to the ATV manufacturer's instructions,
- Basic mechanical requirements, and
- Loading and unloading the vehicle, if this is a job requirement.

- An ATV operator and any passenger on an ATV must wear approved eye and hearing protection as required by local regulatory requirements and the ZAP Engineering PPE Program. An ATV operator and any passenger on an ATV must wear clothing suitable for the environmental conditions and when necessary to protect against the hazards presented at the worksite, suitable gloves and clothing which covers the ankles and legs and the arms to the wrists and appropriate footwear.
- ZAP Engineering requires that approved helmets shall be worn by the operator and passenger.
- Loading and unloading of an ATV onto or off a carrier vehicle must be done in a safe manner. If ramps are used when loading or unloading an ATV they must be placed at a suitable angle, be sufficiently wide and have a surface finish which provides an adequate grip for the ATV's tires.

15. FATIGUE

15.1. Purpose

To ensure our employees recognize to effect of fatigue as related to safely being able to perform work and to establish guidelines for work hours and equipment to reduce fatigue in our business and at our client locations.

15.2. Scope

This program applies to all ZAP Engineering projects and operations.

15.3. Policy

The guiding principles of fatigue management shall be incorporated into the normal management functions of the business and include the following:

- Employees must be in a fit state to undertake work
- Employees must be fit to complete work
- Employees must take minimum periods of rest to safely perform their work

These principles will be managed through:

- The appropriate planning of work tasks, including driving, vehicle and equipment maintenance, loading and unloading and other job-related duties and processes
- Providing appropriate equipment to help reduce stress and fatigue
- Regular medical checkups and monitoring of health issues as required by legislation
- The provision of appropriate sleeping accommodations where required
- Ongoing training and awareness of employee health and fatigue issues

15.4. Roles and Responsibilities

The following addresses the roles and responsibilities of workers to report tiredness/fatigue to supervision and that supervision take appropriate action to assist the worker.

15.4.1. ZAP Engineering Management

Management accepts responsibility for the implementation of this fatigue management policy.

15.4.2. Site Manager

Responsible for the implementation and maintenance of this program for their site and ensuring all assets are made available for compliance with the program.

15.4.3. Roles and Responsibilities Employees in Safety Critical Positions

- Employees must present in a fit state free from alcohol and drugs;
- Employees must not chronically use over the counter, prescription drugs and any other product which may affect an employee's ability to perform their work safely, including fatigue that sets in after the effects of the drug wear off.
- Employees shall report tiredness/fatigue and lack of mental acuity to supervision and supervisory personnel shall make safety critical decisions and take appropriate actions to prevent loss including replacement of tired employees, changing schedules or forcing work stoppages.
- Employees need to be rested prior to starting work.
- Employees need to monitor their own performance and take regular periods of rest to avoid continuing work when tired.

15.5. Work Hour Limitations

ZAP Engineering has set the following procedures limiting work hours and controlling job rotation schedules, also known as staff/work balance, to help control worker fatigue. ZAP Engineering will set work hour limitations and will control job rotation schedules to control fatigue, allow for enough sleep and increase mental fitness in an effort to control employee turnover and absenteeism.

15.5.1. Every Employee shall have necessary work breaks in order to avoid fatigue. These scheduled breaks will apply to both driving and on-site hours. The following shall be a minimum:

- 15 Minutes each 2.5 hours
- 30 Minutes after 5 Hours
- 30 Minutes after 10 Hours

15.5.2. No Workers shall work more than:

- 16 hours per day
- 13 Days Continuous

15.5.3. Unfamiliar or irregular work should be avoided.

15.5.4. Chairs will be provided for workers to site periodically and ZAP Engineering will provide periodic rest breaks for personnel.

15.6. Use of Ergonomic Equipment

Ergonomic equipment will be used to improve workstation conditions such as anti-fatigue mats for standing, lift assist devices for repetitive lifting, proper lighting and controls of temperature and other ergonomic devices as deemed appropriate. Equipment to be used will be determined in the work task analysis.

15.7. Analysis of Work Tasks to Control Fatigue

Work tasks to control fatigue must be analyzed and evaluated periodically. ZAP Engineering will make any necessary changes to equipment, training or procedures based on the evaluation.

15.8. Incident Analysis

If there is an incident there shall be an initial identification/assessment of evidence. Initial identification of evidence immediately following the incident might include a listing of people, equipment, materials involved and a recording of environmental factors such as weather, illumination, temperature, noise, ventilation, etc. and physical factors such as fatigue, age and medical condition.

15.9. Initial and Annual Training

ZAP Engineering is committed to ensuring that all employees are competent to perform their tasks including:

- Fatigue management and health issues.
- ZAP Engineering must provide initial and annual training on how to recognize fatigue, how to control fatigue through appropriate work and personal habits and reporting of fatigue to supervision.

A record of individual fatigues training and competency will be maintained.

16. ASSURED GROUNDING

16.1. Purpose

The purpose of this program is to provide procedures and guidelines to eliminate all injuries resulting from possible malfunctions, improper grounding and/or defective electrical tools. This program applies to all sites, employees and contractors and shall be used on owned premises.

16.2. Definitions

Competent Person - one who can identify existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Ground Fault Circuit Interrupter - a device for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a current to ground exceeds some predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit.

16.3. Responsibilities

Supervisors are designated as competent persons for the Assured Equipment Grounding Conductor Program and are responsible for program execution. One or more competent persons must be designated (as defined in 1926.32(f) to implement and execute the program.

Employees are responsible for following the requirements of this program, to perform visual inspections and to take defective equipment out of service.

16.4. Procedure and Guidelines to Eliminate Injuries

The following procedures and guidelines are designed to eliminate all injuries resulting from possible malfunctions, improper ground and/or defective tools.

16.4.1. Assured Grounding Site Program Requirement

An assured grounding conductor program must be implemented on all ZAP Engineering sites covering all cord sets, receptacles which are not part of the building or structure & equipment connected by cord and plug which are available for use or used by employees.

16.4.2. Ground Fault Circuit Interrupters

All 120-volt, single-phase 15 and 20 ampere receptacle outlets on construction or maintenance sites, which are not part of the permanent wiring of the building or structure and which are in use by employees, shall have approved ground fault circuit interrupters for personnel protection.

- All hand portable electric tools and extension cords shall use a GFCI.
- Additionally, approved GFCI's shall be used for 240-Volt circuits in the same service as described above.
- GFCI's must be used on all 120 volt, single-phase 15 amp and 20-amp receptacles within 6 feet of a sink, damp areas or on installed outdoor equipment.
- The GFCI must be the first device plugged into a permanent receptacle.
- The GFCI must be tested before each use.

16.4.3. Assured Equipment Grounding Conductor Program

The Assured Equipment Grounding Conductor Program (AEGCP) shall cover all cord sets, receptacles not a part of the permanent wiring of a structure and equipment connected by cord and plug on all construction and maintenance sites.

This written description of the program shall be kept at the jobsite for inspection and copying by OSHA and any affected employee.

16.4.4. Removing Equipment

Restrictions for the use of equipment that does not meet requirements or if is found to be defective shall be applied and enforced. Any equipment which has not met the requirements of this program shall not be available or permitted to be used by ZAP Engineering. Damaged items shall not be used until repaired.

16.4.5. How Often Inspection of Cords and Equipment Occur

Daily Visual inspections – The following shall be visually inspected before each day's use for external defects (such as deformed or missing pins or insulation damage) and for indication of possible internal damage:

- Cord sets;
- Attachment caps;
- Plug and receptacle of cord sets;
- Any equipment connected by cord and plug (with the exception of cord sets and receptacles which are fixed and not exposed to damage) such as deformed or missing plug, and
- Insulation damage
- Damaged items shall not be used until repaired or shall be discarded.

16.4.6. How and When Tests are Performed and Which Records are Maintained

All equipment grounding conductors shall be tested for continuity and shall be electrically continuous.

Each receptacle and attachment cap or plug shall be tested for correct attachment of the equipment grounding conductors. The equipment grounding conductor shall be connected to its proper terminal.

When tests are performed:

- Before each use.
- Before equipment is returned to service following any repairs.
- Before equipment is used such as when a cord has been run over.
- At intervals not to exceed 3 months, except that cord sets and receptacles which are fixed and not exposed to damage shall be tested at intervals not exceeding 6 months.

Tests performed as required by this program shall be recorded as to the identity of each receptacle, cord set and cord and plug connected equipment that passed the test and shall indicate the last date tested or interval for which is was tested. This record shall be kept by means of logs, color coding or other effective means and shall be maintained until replaced by a more current record. These records shall be made available at the job site for inspection by the Assistant Secretary and any affected employees.

All tested cord sets and cord and plug-connected equipment shall be marked, one or both ends, with colored tape to denote the month that the tests were performed. The below color code chart that must be followed for marking.

Month #	Month	Color of Tape to Apply to Cords
1	Jan	Red
2	Feb	Yellow

3	Mar	Green
4	Apr	Blue
5	May	Brown
6	Jun	White
7	Jul	Start over with Red and repeat

17. DISCIPLINARY PROGRAM

17.1. Purpose

The purpose of this program is to establish a firm but fair disciplinary action policy to enforce the safety system.

17.2. Scope

This document is applicable to all employees.

17.3. Responsibilities

It is the responsibility of each, and every person employed by ZAP Engineering to work in a safe and efficient manner. The safety system provides guidelines and procedures to help ensure that safe work practices are observed. In the event that any employee violates provisions of the ZAP Engineering safety system or works in a manner that threatens his own health and safety or the health and safety of the employees around him, he will be subject to disciplinary action, up to and including termination of employment.

The safety manager, operations managers, supervisors and foremen hold positions responsible for enforcing the safety system and for issuing disciplinary action as required by this section of the safety manual.

ZAP Engineering is committed to safety and senior management holds all supervisory staff responsible and accountable for safety within their respective areas.

Physical inspections by ZAP Engineering officials or insurance representatives shall occur. ZAP Engineering officials must conduct periodic inspections of work areas to ensure compliance with safety rules and policies.

17.4. Requirements

Safety is a core value and a condition of employment at ZAP Engineering. The following actions constitute a safety violation:

- Not following verbal or written safety procedures, guideline or rules of ZAP Engineering or our clients
- Horse play, failure to wear required PPE, and or abuse of PPE
- Being under the influence of drugs or alcohol during work
- Bringing weapons on the job site
- Failure to report incidents or injuries

- Attempted or actual physical force to cause injury, threatening statements or other actions to cause an employee to feel they are at risk of injury.

17.5. Procedure

The following procedures will be following issuing a safety violation notice:

- The first offense will result in a verbal warning. The employee will be met with and informed that he or she is being issued a verbal warning and informed of the infraction, rule or procedure that was violated and the corrective action to be taken. Proper procedure will be discussed to clarify the situation and allow the employee to correct his behavior. The person making this verbal warning will inform the operations manager of his branch that this warning has been issued so the operations manager may make a written record of the warning.
- The second offense will result in a written reprimand and additional training. The reprimand will be written on the standard Safety Reprimand form (see below) and will describe the unsafe activity or behavior that needs correction. Refer to the section of the safety program that was violated (when applicable). The employee receiving the reprimand has the right to submit a written rebuttal to the reprimand. The employee must sign the reprimand. The reprimand and any rebuttal will become a part of the employee's employment records.
- The third offense may result in the termination of the offending employee.

The above actions are to be placed against a sliding twelve-month scale. If an employee receives a reprimand on January 1 and commits his third offense on or before December 31st of the same year, he is terminated. The employee does not have to commit the same violation each time to receive further reprimands. He could receive a verbal reprimand for smoking in a no smoking area on his first offense and get a written reprimand for his second offense which might be a forklift violation and yet another for failing to use proper personal protective equipment. He will be terminated upon his third offense in the last twelve months.

In the case of serious safety violations such as by-passing guarding or other unsafe activities that put the violator or other employees at serious risk of injury, the manager may move the violator directly to the second or third warning level. If the violator's actions put him or others at risk of death or dismemberment the manager has the option to terminate him with no further warning.

18. DRUG & ALCOHOL PROGRAM

18.1. Scope

This policy is applicable to all ZAP Engineering employees and subcontractors. If subcontractors are used, they are required to comply with this policy and testing requirements. ZAP Engineering will also validate that the employees of the subcontractor have been tested to meet our client's requirements. ZAP Engineering is in full compliance with DOT regs 49CFR40 and 49CFR199. As a contractor who works extensively with natural gas and hazardous liquid pipeline operators and operators of liquefied natural gas facilities, we are required to be in compliance with DOT regulations. As of January 1, 1995, ZAP Engineering implemented the Research and Special Programs Administration (RSPA) Alcohol regulations as set forth in 49 CFR Part 199, B and 49 CFR Part 40, Subpart C.

18.2. Testing Requirements

Drug testing is performed using a certified collector to collect the urine specimen then sent to a (Substance Abuse and Mental Heal Services Administration) certified laboratory for analysis. Quick screen and dip stick tests are not acceptable.

18.2.1. Frequency for Testing of Drugs and Alcohol

- Pre-Employment
- Post-Accident
- Random
- Reasonable Cause
- Return to Work
- Follow-Up as required

18.2.2. Drugs Being Tested For

The names of the drugs being tested for include:

- Marijuana
- Cocaine
- Opiates
- Amphetamines
- Phencyclidine

18.2.3. Records

ZAP Engineering must ensure that it will maintain appropriate records for as long as we have a contract with a client and then for 3 years after the termination of the contract. Examples include:

- Chain of custody forms
- Alcohol testing forms
- Signed acknowledgment/consent forms

18.3. Policy

Any employee or subcontractor on duty or on ZAP Engineering property who possesses, sells, receives, is impaired or is determined to have measurable levels of any alcohol or illegal drug in their blood or urine (no matter the amount), post drug/alcohol screen, will be subject to immediate disciplinary action or contract dismissal.

ZAP has a Zero Tolerance policy. ANY violation to the policy will result in the permanent removal of the employee from ZAP Engineering or our client's premises. ZAP Engineering does not have a return to duty process and will any employee or subcontractor violating this policy will be permanently banned from ZAP Engineering or client property.

ZAP Engineering prohibits firearms, weapons, explosives, etc. when working on ZAP Engineering or customer premises.

Drug and alcohol testing will be performed when there is reasonable suspicion or reasonable cause to suspect the employee of being under the influence of a prohibited substance. The employee(s) or subcontractor(s) removed for reasonable cause testing will not be allowed to return to work until receipt of a negative drug and alcohol test is received.

Alcohol testing must be performed by a breath, blood or saliva (with breath confirmation) test.

Drug and alcohol testing will be performed after an accident or incident. The employee(s) or subcontractor employee(s) will not be allowed to return to work on our clients' premises until documentation has been received showing the negative drug and alcohol test.

If an employee or subcontractor returns to work following an absence of more than 90 days a return to work screening shall occur. Follow up drug screening shall be applied when appropriate as determined by management.

ZAP Engineering must ensure that all employees who will be working on our client's jobsite must have received a negative result on a drug within the past 12 months.

ZAP Engineering prohibits the misuse of prescription or over the counter medications. Some types of medications could have undesirable effects, and these can create a safety risk and endanger the employee and others. Employees must notify his/her supervisor if taking a medication that might impair their ability.

Periodically, unannounced inspections will be made of persons entering or leaving ZAP Engineering work sites by authorized ZAP Engineering representatives. Entry onto ZAP Engineering or client property is deemed to have provided consent to an inspection of a person, locker, vehicle, or any other personal effects. Our clients have the right to conduct unannounced searches of your personnel and property and any employee who refuses to cooperate with the searches shall be removed from our clients' property.

Any refusals to submit to a drug/alcohol screen will be treated as a positive test, resulting in immediate contract dismissal or disciplinary action, up to and employment termination. The subcontractor or employee refusing to submit to the test will be asked to sign a refusal document. If they refuse to sign the document, it will be noted and kept on file.

Drug and alcohol screening will be performed by an approved and qualified medical clinic with a medical review officer authorized to perform the tests. All results are treated with confidentiality. The switching or adulterating any urine, blood, or any other samples is a violation of this policy.

If another subcontractor or employee comes to management with concern regarding another subcontractor or employee in reference to alcohol or substance abuse, we will treat that with discretion and confidentiality. We will pursue investigation and decide accordingly whether a drug and or alcohol screen is the appropriate step to take.

All subcontractors and employees are subject to the policies explained above. This policy is to be posted in all facilities by the site supervisor.

DRUG AND ALCOHOL POLICY ACKNOWLEDGEMENT FORM

I acknowledge that I have been provided a copy of the ZAP ENGINEERING Drug and Alcohol Policy requirements. I understand that disciplinary action, up to and including termination, will result if I violate this policy.

_____ _____

Employee Signature Date

_____ _____

Employee Printed Name Social Security Number (last 4 digits)

CONSENT AND AUTHORIZATION FOR DISCLOSURE TO CLIENTS OF ZAP ENGINEERING OF ALCOHOL AND DRUG TEST RESULTS AND RELATED INFORMATION

I hereby consent to disclosure by ZAP Engineering and its agents, including, but not limited to, any collecting and testing agencies, of the test results identified above and any related information to clients of ZAP Engineering and its authorized agents, assigns, or representatives.

_____ _____

Employee Signature Date

_____ _____

Employee Printed Name Social Security Number (last 4 digits)

19. ELECTRICAL SAFETY AWARENESS

19.1. Purpose

The purpose of the Electrical Safety program is to set forth procedures for the safe use of electrical equipment, tools, and appliances at ZAP Engineering.

19.2. Scope

This program applies to all ZAP Engineering employees, temporary employees, and contractors. When work is performed on a non-owned or operated site, the operator's program shall take precedence, however, this document covers ZAP Engineering employees and contractors and shall be used on owned premises, or when an operator's program doesn't exist or is less stringent.

19.3. Definitions

Affected Personnel - Personnel who normally use and work with electrical equipment, tools, and appliances, but who do not make repairs or perform lock out/tag out procedures.

Appliances - Electrical devices not normally associated with commercial or industrial equipment such as air conditioners, computers, printers, copiers, coffee pots, microwave ovens, toasters, etc.

Circuit Breaker - A device designed to open and close a circuit by non-automatic means and to open the circuit automatically on a predetermined over current without injury to itself when properly applied within its rating.

Disconnecting Means - A device, or group of devices, or other means by which the conductors of a circuit can be disconnected from their source of supply.

Disconnecting Switch - A mechanical switching device used for isolating a circuit or equipment from a source of power.

Double Insulated Tool - Tools designed of non-conductive materials that do not require a grounded, three wire plugs.

Ground - Connected to earth or some conducting body that serves in place of the earth.

Grounded Conductor - A conductor used to connect equipment or the grounded circuit of a wiring system to a grounding electrode or electrodes.

Ground Fault Circuit Interrupter (GFCI) - A device whose function is to interrupt the electric circuit to the load when a fault current to ground exceeds some predetermined value that is less than that required to operate the over current protective device of the supply circuit. *ZAP ENGINEERING shall use GFCIs in lieu of an assured grounding program*.

Insulated - A conductor encased within material of composition and thickness that is recognized as electrical insulation.

Premises Wiring - That interior and exterior wiring, including power, lighting, control, and signal circuit wiring together with all of its associated hardware, fittings, and wiring devices, both permanently and temporarily installed, which extends from the load end of the service drop, or load end of the service lateral conductors to the outlet (s). Such wiring does not include wiring internal to appliances, fixtures, motors, controllers, motor control centers, and similar equipment.

Qualified Person - One that has been trained in the repair, construction and operation of electrical equipment and the hazards involved.

Strain Relief - A mechanical device that prevents force from being transmitted to the connections or terminals of a cable or extension cord.

Class I Locations - Are those in which flammable gases or vapors are or may be present in the air in quantities enough to produce explosive or ignitable mixtures.

Class 1 Division 1 - Is a location (a) in which hazardous concentrations of flammable gases or vapors may exist under normal operating conditions; or (b) in which hazardous concentrations of such gases or vapors may exist frequently because of repairs or maintenance operations or because of leakage; or (c) in which a breakdown or faulty operation or equipment or processes might release hazardous concentrations of flammable gases or vapors, and might also cause simultaneous failure of electrical equipment.

Class 1 Division 2 - Is a location (a) in which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the hazardous liquid, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in of abnormal operation of equipment or (b) in which hazardous concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operations of the ventilating equipment; or (c) that is adjacent to a Class 1, Division 1 location, and to which hazardous concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

Class II locations - Class II locations are those that are hazardous because of the presence of combustible dust. Class II locations include the following:

Class II, Division 1 - A Class II, Division 1 location is a location (a) in which combustible dust is or may be in suspension in the air under normal operating conditions, in quantities sufficient to produce explosive or ignitable mixtures; or (b) where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitable mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electric equipment, operation of protection devices, or from other causes, or (c) in which combustible dusts of an electrically conductive nature may be present.

NOTE: This classification may include areas of, areas where metal dusts and powders are produced or processed, and other similar locations that contain dust producing machinery and equipment (except where the equipment is dust-tight or vented to the outside).

- These areas would have combustible dust in the air, under normal operating conditions, in quantities enough to produce explosive or ignitable mixtures.
- Combustible dusts that are electrically nonconductive include dusts produced in the handling and processing produce combustible dusts when processed or handled.
- Dusts containing magnesium or aluminum are particularly hazardous and the use of extreme caution is necessary to avoid ignition and explosion.

Class II, Division 2 - A Class II, Division 2 location is a location in which: (a) combustible dust will not normally be in suspension in the air in quantities sufficient to produce explosive or ignitable mixtures, and dust accumulations are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus; or (b) dust may be in suspension in the air as a result of infrequent malfunctioning of handling or processing equipment, and dust accumulations resulting there from may be ignitable by abnormal operation or failure of electrical equipment or other apparatus.

NOTE: This classification includes locations where dangerous concentrations of suspended dust would not be likely but where dust accumulations might form on or in the vicinity of electric equipment. These areas may contain equipment from which appreciable quantities of dust would escape under abnormal operating conditions or be adjacent to a Class II Division 1 location, as described above, into which an explosive or ignitable concentration of dust may be put into suspension under abnormal operating conditions.

19.4. Responsibilities

19.4.1. Managers/Supervisor

The HSE Manager will develop electrical safety programs and procedures in accordance with OSHA requirements and/or as indicated by events and circumstances.

Operations Managers and Supervisors are responsible for ensuring that only qualified employees and or qualified contractors perform electrical repairs or installations.

Operations Managers are also responsible for ensuring all applicable electrical safety programs are implemented and maintained at their locations.

Employees are responsible to use electrical equipment, tools, and appliances according to this program, for attending required training sessions when directed to do so and to report unsafe conditions to their supervisor immediately.

Only qualified employees may work on electric circuit parts or equipment that has not been de-energized. Such employees shall be made familiar with the use of special precautionary techniques, PPE, insulating and shielding materials and insulated tools.

19.5. Safe Work Practices

19.5.1. Inspections

- Electrical equipment, tools, and appliances must be inspected prior to each use.

- The use of a hard fixed GFCI or a portable GFCI adapter shall be used with all portable hand tools, electric extension cords, drop lights and all 110-volt equipment.
- Faulty equipment, tools, or appliances shall be removed from service immediately and tagged "Out of Service", dated and signed by the employee applying the tag.

19.5.2. Repairs

- Only Qualified Personnel, who have been authorized by the department supervisor or manager, may make repairs to supply cords on electrical tools and to extension cords.
- The names of employees authorized to make repairs will be posted in the workplace.
- Only certified electricians shall be allowed to make repairs to electrical equipment and wiring systems.
- The supervisor obtaining the services of a certified electrician is responsible to verify the electrician's credentials.
- Employees shall not enter spaces containing exposed energized parts unless qualified and proper illumination exists to enable employees to work safely.
- Employees shall not wear conductive apparel such as rings, watches, jewelry, etc. (unless they are rendered non-conductive by covering, wrapping, or other insulating means) while working on or near open energized equipment this includes batteries on trucks, forklifts, phone backup systems or other such equipment.
- If employees are subject to handle long dimensional conductor objects (ducts or pipes), steps for safe work practices shall be employed to ensure the safety of workers.

19.5.3. Extension Cords

- Use only three-wire, grounded, extension cords and cables that conform to a hard service rating of 14 amperes or higher, and grounding of the tools or equipment being supplied.
- Only commercial or industrial rated-grounded extension cords may be used in shops and outdoors.
- Cords for use other than indoor appliances must have a rating of at least 14 amps.
- Cords must have suitable strain relief provisions at both the plug the receptacle ends.
- Work lamps (drop light) used to power electrical tools must have a 3 wire, grounded outlet, unless powering insulated tools.
- Adapters that allow three wire, grounded prongs, connected to two wire non-grounded outlets are strictly prohibited.
- Cords must have a service rating for hard or extra-hard service and have S, AJ, ST, SO, SJO, SJT, STO, or SJTO printed on the cord.
- Cords may not be run through doorways, under mats or carpets, across walkways or aisles, concealed behind walls, ceilings or floors, or run through holes in walls, or anywhere where they can become a tripping hazard.
- High current equipment or appliances should be plugged directly into a wall outlet whenever possible.

    - All extension cords shall be plugged into one of the following:
    - A GFCI outlet;
    - A GFCI built into the cord;
    - A GFCI adapter used between the wall outlet and cord plug.

- All extension cords and or electrical cords shall be inspected daily or before each use, for breaks, plug condition and ground lugs, possible internal breaks, and any other damage. If damage is found, the extension cord or electrical cord shall be removed from service and repaired or replaced.
- Extension cords shall not be used on compressor skid to operated heat tapes or any other type of equipment on a temporary basis. Heat tapes or other equipment shall be hard wired per applicable electrical codes.

19.5.4. Outlets

- Outlets connected to circuits with different voltages must use a design such that the attachment plugs on the circuits are not interchangeable.

19.5.5. Multiple Outlet Boxes

- Multiple outlet boxes must be plugged into a wall receptacle.
- Multiple outlet boxes must not be used to provide power to microwave ovens, toasters, space heaters, hot plates, coffeepots, or other high-current loads.

19.5.6. Double Insulated Tools

- Double insulated tools must have the factory label intact indicating the tool has been approved to be used without a three-wire grounded supply cord connection.
- Double insulated tools must not be altered in any way, which would negate the factory rating.

19.5.7. Switches, Circuit Breakers, and Disconnects

- All electrical equipment and tools must have an on and off switch and may not be turned on or off by plugging or unplugging the supply cord at the power outlet.
- Circuit breaker panel boxes and disconnects must be labeled with the voltage rating.
- Each breaker within a breaker panel must be labeled for the service it provides.
- Disconnect switches providing power for individual equipment must be labeled accordingly.

19.5.8. Ladders

- Only approved, non-conductive ladders, may be used when working near or with electrical equipment, which includes changing light bulbs.
- Ladders must be either constructed of wood, fiberglass, or have non-conductive side rails.
- Wood ladders should not be painted, which can hide defects, except with clear lacquer.
- When using ladders, they shall be free from any moisture, oils, and greases.

19.5.9. Energized and Overhead High Voltage Power Lines & Equipment

- A minimum clearance of 10 feet from high voltage lines must be maintained when operating vehicular and mechanical equipment such as forklifts, cranes, winch trucks, and other similar equipment.
- When possible, power lines shall be de-energized and grounded or other protective measures shall be provided before work is started.
- Minimum approach distance to energized high power voltages lines for unqualified employees is 10 feet.
- Minimum approach distance for qualified employees shall be followed per 29 CFR 1910.333(c)(3)(i) Qualified – Table S5 Selection and Use of Work Practices - Approach Distances for Qualified Employees – Alternating Current). Approach distances are 10' for 50kV plus 4" for every additional 10kV.

19.5.10. Confined or Enclosed Workspaces

- When an employee works in a confined or enclosed space that contains exposed energized parts, the employee shall isolate the energy source and turn off the source and lock and tag out the energy source (Only qualified electricians can work on an exposed energy source).
- Protective shields, protective barriers or insulating materials as necessary shall be provided.

19.5.11. Enclosures, Breaker Panels, and Distribution Rooms

- A clear working space must be maintained in the front, back and on each side of all electrical enclosures and around electrical equipment for a safe operation and to permit access for maintenance and alteration.
- A minimum two-foot working floor space in front of panels and enclosures shall be painted yellow.
- Employees may not enter spaces containing exposed energized parts unless illumination is provided that enables the employees to work safely.
- Housekeeping in distribution rooms must receive high priority to provide a safe working and walking area in front of panels and to keep combustible materials to the minimum required to perform maintenance operations.
- All enclosures and distribution rooms must have "Danger: High Voltage – Authorized Personnel Only" posted on the front panel and on entrance doors.
- Flammable materials are strictly prohibited inside distribution rooms (Boxes, rags, cleaning fluids, etc.)

19.5.12. Lock Out/Tag Out

- No work shall be performed on (or near enough to them for employees to be exposed due to the dangers of tools or other equipment coming into contact with the live parts) live parts and the hazards they present.
- If any employee is exposed to contact with parts of fixed electric equipment or circuits which have been deenergized, the circuits energizing the parts shall be locked out or tagged or both.
- Conductors and parts of electrical equipment that have been de-energized but not been locked or tagged out shall be treated as live parts.

- Per ZAP Engineering policy all electrical will be outsourced and performed only by qualified and licensed electrical contractors who are familiar with the use of special precautionary techniques, PPE, insulating and shielding materials and insulated tools. Any equipment being made ready for maintenance will be locked out using ZAP Engineering's Control of Hazardous Energy – Lock Out/Tag Out Program. Lockouts are performed by the HSE Manager, Shop Foreman or Branch Manager. Designated employees in some branches may be trained by local management to lock out equipment. If live sources are to be worked, it will only be performed with the knowledge of local management. Only certified electricians may work on electric circuit parts or equipment.
- Only authorized personnel may perform lock out/tag out work on electrical equipment and will follow ZAP Engineering's Control of Hazardous Energy – Lock out/Tag Out Program.
- Authorized personnel will be trained in lock out/tag out procedures.
- Affected personnel will be notified when lock out/tag out activities are being performed in their work area.

19.5.13. Contractors

- Only approved, certified, electrical contractors may perform construction and service work on ZAP Engineering or client property.
- It is the Manager/Supervisors responsibility to verify the contractor's certification.

19.5.14. Fire Extinguishers

- Approved fire extinguishers must be provided near electrical breaker panels and distribution centers.
- Water type extinguishers shall not be located closer than 50 feet from electrical equipment.

19.5.15. Electric Shock-CPR

- If someone is discovered that has received an electric shock and is unconscious, first check to see if their body is in contact with an electrical circuit. Do not touch a person until you are sure there is no contact with an electrical circuit.
- When it is safe to contact the victim, begin CPR if the person's heart has stopped or they are not breathing.
- Call for help immediately.

19.5.16. Electric Welders

- A disconnecting means shall be provided in the supply circuit for each motor-generator arc welder, and for each AC transformer and DC rectifier arc welder which is not equipped with a disconnect mounted as an integral part of the welder.
- A switch or circuit breaker shall be provided by which each resistance welder and its control equipment can be isolated from the supply circuit. The ampere rating of this disconnecting means may not be less than the supply conductor ampacity.

19.5.17. Equipment Grounding

- All gas compressors, air compressors, separators, vessels, etc. shall be grounded by means of using a lug and ground strap, nominal in size to a ½" bolt or larger, attached to a ground rod six feet or longer.
- Equipment bonding jumpers shall be of copper or other corrosion-resistance material.
- The transfer of hazardous or flammable material from a metal or plastic container with a flash point of 100 degrees F or less shall have a ground strap from the container and attached to the skid or a ground rod placed in the ground.

19.5.18. Assured Grounding

- OSHA requires that employers shall use either ground fault circuit interrupters (GFCI) or an assured equipment grounding conductor program to protect personnel from electrical shock while working.
- ZAP Engineering shall use GFCI's in lieu of an assured grounding program.

19.5.19. Ground Fault Circuit Interrupters

All 120-volt, single-phase 15 and 20 ampere receptacle outlets on construction or maintenance sites, which are not part of the permanent wiring of the building or structure and which are in use by employees, shall have approved ground fault circuit interrupters for personnel protection.

- All hand portable electric tools and extension cords shall use a GFCI.
- Additionally, approved GFCI's shall be used for 240-Volt circuits in the same service as described above.
- GFCI's must be used on all 120 volt, single-phase 15 amp and 20-amp receptacles within 6 feet of a sink, damp areas or on installed outdoor equipment.
- The GFCI must be the first device plugged into a permanent receptacle.
- The GFCI must be tested before each use.

19.6. Training

All regular full time and temporary employees will be trained in electrical safety utilizing the ZAP Engineering Electrical Safety Training course or an approved equivalent.

Employees who face a risk of electric shock, but who are not qualified persons, shall be trained and familiar with electrically related safety practices.

Employee shall be trained in safety related work practices that pertain to their respective job assignments.

Employees shall be trained on clearance distances.

Safe work practices shall be employed to prevent electric shock or other injuries resulting for either direct or indirect electrical contacts when work is performed near or on equipment or circuits which are or may be energized.

Qualified employees must adhere to the approach distances in Table S5 of CFR 1910.333 (below). ZAP Engineering only has unqualified employees.

Voltage Range (phase to phase) Minimum Approach Distance

Over 300V, not over 750V.....1 ft. 0 in. (30.5 cm).
Over 750V, not over 2kV.....1 ft. 6 in. (46 cm).
Over 2kV, not over 15kV.....2 ft. 0 in. (61 cm).
Over 15kV, not over 37kV.....3 ft. 0 in. (91 cm).
Over 37kV, not over 87.5kV.....3 ft. 6 in. (107 cm).
Over 87.5kV, not over 121kV.....4 ft. 0 in. (122 cm).
Over 121kV, not over 140kV.....4 ft. 6 in. (137 cm).

19.7. Personal Protective Equipment & Safeguards for Personnel Protection

- Employees working in areas where there are potential electrical hazards shall be provided with, and shall use, electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed.
- Equipment shall be maintained in a safe, reliable condition. Such protective equipment shall be periodically inspected and/or tested.
- If the insulating capability of protective equipment may be subject to damage during use, the insulating material shall be protected. (An example might be an outer covering of leather used for the protection of rubber insulating material.)
- Employees shall wear nonconductive head protection wherever there is a danger of head injury from electric shock or burns due to contact with exposed energized parts.
- Employees shall wear protective equipment for the eyes or face wherever there is danger of injury to the eyes or face from electric arcs or flashes or from flying objects resulting from electrical explosion.
- Each employee shall use insulated tools or handling equipment if they might contact conductors or parts. Program shall state that if the insulating capability of insulated tools or handling equipment is subject to damage, the insulating material shall be protected.
- Ropes and handlines used near exposed energized parts shall be nonconductive.
- Protective shields, protective barriers, or insulating materials shall be used to protect each employee from shock, burns, or other electrically related injuries while that employee is working near exposed energized parts. When normally enclosed live parts are exposed for maintenance or repair, they shall be guarded to protect unqualified persons from contact with the live parts.
- Alerting techniques used to warn and protect employees from hazards which could cause injury due to electric shock, burns or failure of electric equipment parts can take the form of safety signs and tags, barricades & attendants).

20. EMERGENCY ACTION PLAN

20.1. Purpose

Each ZAP Engineering location shall have a written Emergency Action Plan, appropriate to the hazards of the workplace, in order to respond to an emergency that may require rescue or evacuation.

Each Emergency Action Plan shall be prepared to reflect all known probable emergency conditions which may arise from within the workplace and from adjacent workplaces, the minimum of which will include fire or other emergencies.

The emergency action plan must be available to all employees to review. An emergency action plan must be in writing, kept in the workplace and available to employees for review. However, if a site has 10 or fewer employees the plan may be orally to employees.

20.2. Emergency Response Planning, Issuing, and Annual Review Guidelines

Emergency Procedures shall be issued and discussed with all new/transferred personnel upon arrival for assignment.

Emergency Action Plans shall be established, implemented, reviewed, maintained and updated annually in conjunction with:

- Client emergency services department requirements.
- ZAP Engineering safety staff and management.
- The requirement to ensure the plan is up to date to reflect current circumstances at the workplace.

The plan is to be reviewed before the job and when conditions warrant and should be used for routine and non-routine emergencies as well as changes in operation, and products or services which warrant new emergencies situations.

20.2.1. Reviewing the Emergency Action Plan with Employees

A review of the emergency action plan should occur with employees:

- When the plan is developed, or the employee is assigned initially to a job.
- When the employee's responsibilities under the plan change.
- When the plan is changed.

20.3. Procedures for Emergency Evacuation Planning

The emergency action plan must include procedures for emergency evacuation. An emergency action plan must include at a minimum procedure for emergency evacuation, including type of evacuation and exit route assignments.

The individual site evacuation procedure shall be appropriate to the risk must be developed and implemented to:

- Notify staff, including the first aid attendant, of the nature and location of the emergency,
- Evacuate employees safely and procedures to account for all employees after evacuation,
- Check and confirm the safe evacuation of all employees,
- Notify the fire department or other emergency responders, and
- Notify adjacent workplaces or residences which may be affected if the risk of exposure to a substance extends beyond the workplace. Notification of the public must be in conformity with the requirements of other jurisdictions, including provincial and municipal agencies.

20.4. List of Potential Emergencies

The emergency action plan must include procedures for reporting a fire or other emergency. An emergency action plan must include at a minimum procedure for reporting a fire or other emergency.

Each location shall conduct a risk assessment for hazards posed by potential hazardous substances from accidental release, fie or other such emergencies that could cause an evacuation or rescue and list the potential emergencies for ZAP Engineering operations. Procedures for each of these potential emergencies shall be contained within the Emergency Action Plan. Examples include:

- Fire
- Gas Leaks/Chemical Spills
- Bomb Threats
- Medical Emergencies
- Explosion
- Workplace Violence

20.4.1. Guidance Procedures for Potential Emergencies

20.4.1.1. Fire

- Warn others in the immediate area. Notify the appropriate emergency response personnel by phone or radio and pull the nearest fire alarm if present.
- If nearby staff have been trained, and it is safe to do so, fight the fire using a portable fire extinguisher. Remember, if in doubt get out.
- Evacuate the premises via the nearest exit and proceed to the nearest Emergency Assembly Area.
- Re-enter only after the Emergency Coordinator has given an ALL CLEAR.

20.4.1.2. Gas Leaks/Chemical Spills - Upon smelling or noticing a gas leak or unusual vapors, or a chemical spill:

- Pull fire alarm (if present) or sound warning and evacuate the premises via the nearest exit
- Proceed to the Emergency Assembly Area
- Contact local emergency response personnel by phone or radio
- Re-enter only after the Emergency Coordinator has given an ALL CLEAR.

If employees are required to control a release of a hazardous substance, to perform cleanup of a spill, or to carry out testing before re-entry, ZAP Engineering shall provide:

- Adequate written safe work procedures and documented training.
- Appropriate personal protective equipment which is readily available to employees and is adequately maintained, and
- Material or equipment necessary for the control and disposal of the hazardous substance.

20.4.1.3. Bomb Threats

- If a threat is received by phone, mail or other means, get as much information as possible.

- If the threat is received by phone, try to keep the person on the line for as long as possible. Do not hang up the phone, even after the call has been terminated.
- Contact local emergency response personnel by phone or radio.
- If a suspicious device is identified, evacuate the immediate area and notify local emergency response personnel.

20.4.1.4. Medical Emergencies

- Call for assistance by phone or radio. Give the exact location and details of the medical emergency.
- If qualified, provide basic first aid, and keep the person comfortable. Do not move the person. Do not leave him/her unattended.
- Arrange for emergency medical transportation based on the medical planning portion of the site's Emergency Action Plan.

20.4.1.5. Explosions

- Get down on the floor, take shelter under tables or desks, and protect your face and head against flying glass and debris.
- Once it is safe to do so, evacuate the premises via the nearest exit and proceed to the nearest Emergency Assembly Area.
- Re-enter only after the Emergency Coordinator has given an ALL CLEAR.

20.4.1.6. Workplace Violence

- Notify security immediately by phone or radio and report the occurrence.
- Do NOT attempt to physically intervene. Protect yourself first at all costs.

20.5. Emergency Response Equipment

20.5.1. Listing of Types of Emergency Equipment

Each site Emergency Action Plan shall identify, list the locations of and provide operational procedures for types of emergency equipment. For off-site locations, available emergency equipment should be identified and reviewed with workers prior to commencing work activities. Examples include:

- Living areas with an audible alarm and a fire hose cabinet.
- Emergency lighting, exit doors, dampers and fire stop flaps.
- First aid kits located throughout the facility and in vehicles.
- Portable fire extinguishers being located throughout the facility and clearly marked.
- Only authorized and trained personnel will operate emergency equipment.

20.5.2. Inspection & Maintenance Records

Maintenance records must be kept, including but not limited to the name of manufacturer, the type of equipment, the date put into service, when and for what purpose the equipment has been used, the date of the last inspection and name of the inspecting person, any damage suffered, and the date and nature of any of maintenance on emergency response equipment.

Ropes and associated equipment must be inspected visually and physically by qualified employees after each use for rescue, evacuation or training purposes.

The ZAP Engineering designated representative will perform and maintain the ZAP Engineering Emergency Inspection Checklist Form on a monthly basis. The checklist shall be maintained for retention in active files for two years and in onsite archives for seven years.

20.6. Media Response Plan

ZAP Engineering employees must not be interviewed by anyone unless the Legal Department has given prior approval. In most cases the Legal Department will have an attorney present for such interviews.

Note: If after ZAP Engineering personnel have received approval for an interview from the Legal Department and another party's attorney appears unannounced, you should politely adjourn the interview until the ZAP Engineering Legal Department can be contacted. Personnel must not give any work-related interviews, affidavits, written or recorded statements, or depositions without the express approval from the ZAP Engineering Legal Department.

In the case of interviews of ZAP Engineering employees by non-attorneys, (law enforcement, government officials, media, etc.) you must inform the Legal Department before the interview. If the interview is taped or videotaped, you must request a copy of the tape. If the interview is reduced to writing, you must ask for a copy of any notes or statements taken. This procedure is to avoid information being misrepresented.

All media requests should be referred to the ZAP Engineering President Carl Soderman. Unless requested to do so by the Legal Department, other ZAP Engineering personnel are not to give interviews or make statements to the media. Management prefers that families of personnel involved in an incident receive initial notification from a ZAP Engineering representative and not the media.

20.7. Training

ZAP Engineering shall ensure training for Emergency Action Plan is delivered, documented and prepares the staff and facility for emergency conditions. ZAP Engineering will designate and train employees to assist in a safe and orderly evacuation of other employees. Requirements include:

- All employees must be given adequate instruction in the fire prevention and emergency evacuation procedures applicable to their workplace.
- The designated site representative shall provide the Emergency Action Plan orientation to all new/transferred personnel before they begin work.
- All personnel shall receive a review/update orientation at least annually, or whenever any new/revised information is to be provided.
- The Emergency Action Plan Orientation Check List shall be completed after orientation and the record maintained in the individual's training records.
- ZAP Engineering management shall ensure that contractors/consultants working in areas under the supervision of ZAP Engineering also receive the Emergency Action Plan orientation upon arrival to the area.
- Employees expected to perform duties under the Emergency Action Plan will be trained prior to assuming their roles. This will include simulated rescue or evacuation exercises

and regular retraining, appropriate to the type of rescue or evacuation being provided, and training records must be kept.

- A list of trained staff responders shall be posted and maintained indicating their name, response function, their work location and what type of equipment they have been trained for.

20.8. Location and Use of Emergency Facilities

ZAP Engineering shall ensure each Emergency Action Plan lists the location and how to use emergency facilities for each work site. For off-site locations, outside services that can provide assistance in the event of an emergency should be identified and reviewed with workers prior to commencing work activities. A list shall be posted in a conspicuous area showing local emergency facilities and how to contact. Examples include:

- Client Emergency Response Department (Initial Responder for All Emergencies If Applicable)
- Local Police, Local Hospital, Poison Center (Poison Response) 1-800-332-1414, etc.

20.9. Fire Protection and Response

ZAP Engineering shall ensure each Emergency Action Plan provides fire protection and response planning within each site Emergency Action Plan and is utilized during all phases of work. As a minimum, all shall include the following:

20.9.1. Protection

- Smoking is not permitted except in designated 'SMOKING" areas.
- Facilities shall be designed and maintained in accordance with local fire code and regulations.
- Portable fire extinguishers shall be stationed, inspected and maintained in accordance with local fire code and regulations. ZAP Engineering personnel shall be trained in their use.
- Flammable and combustible liquids shall be properly stored.
- Employees shall report all fire safety issues to their immediate supervisor.
- Facilities shall be inspected by use of the ZAP Engineering Emergency Inspection Checklist

20.9.2. Response

In the event of a fire, personnel working in facility will adhere to the following procedure for their work area:

- Warn others in the immediate area. Notify the appropriate emergency response personnel by phone or radio and pull the nearest fire alarm if present.
- If nearby staff have been trained, and it is safe to do so, fight the fire using a portable fire extinguisher. Remember, if in doubt get out.
- Evacuate the premises via the nearest exit and proceed to the nearest Emergency Assembly Area.
- Re-enter only after the Emergency Coordinator has given an ALL CLEAR.

Roads are designated as fire lanes. Vehicles can stop there for unloading, but no parking will be allowed.

20.10. Alarm and Emergency Communication

Each Emergency Action Plan for ZAP Engineering shall contain methods to address alarms and communications in case of an emergency. For off-site locations, the method of emergency notification should be identified and reviewed with workers prior to commencing work activities.

20.10.1. Alarm System

A system must be in place to alert employees. The alarm system shall be distinctive and recognizable as a signal to evacuate the work area or perform actions designated under the emergency action plan. For sites with 10 or fewer employees in a workplace, direct voice communication is an acceptable procedure for sounding the alarm provided all employees can hear the alarm. Each Emergency Response plan will describe how to activate an alarm and what to do after either activating or hearing an alarm.

Personnel responding to any alarm shall avoid complacency. Every alarm should be treated as an actual incident until proven otherwise. Treating and responding to alarms as a routine happening can result in injuries, fatalities and destruction of property.

20.10.2. Communications

ZAP Engineering responders and security use telephones, cell phones and radios in conjunction with emergency response.

20.11. Rescue and Evacuation Procedures

20.11.1. Procedures for Rescue and Medical Services

Each site Emergency Action Plan shall address who performs recue services when required. It is the position of ZAP Engineering that all rescue and medical duties are performed by client emergency responders or local governmental responders when on their location. For off-site locations, evacuation procedures and methods of rescue shall be identified and reviewed with workers prior to commencing work activities.

At least one member of a rescue team must be a first aid attendant trained to immobilize an injured employee.

Effective communications must be maintained between the employees engaged in rescue or evacuation and support persons.

20.11.2. Procedure for Evacuation

20.11.2.1. Preparation for Evacuation

Each site Emergency Action Plan shall contain a procedure for evacuation if required.

The ZAP Engineering designated Emergency Coordinator will maintain an active list of all Zap Engineering and contract emergency responders.

20.11.2.2. Critical Plant Operations Personnel

Staff designated to remain in the facility to shut down or supervise critical operations or equipment will be specifically trained and authorized by management to perform their duties before any evacuation may occur.

20.11.2.3. Evacuation Drills

Evacuation drills shall be conducted at least annually. Before conducting an evacuation drill a pre-drill assessment of the evacuation routes and assembly points shall be conducted. The pre-drill assessment is intended to verify that all egress components (stairs, doors, etc.) are in proper order and that occupants can use them safely.

20.11.2.4. Coordination Within a Facility

Emergency training and drills should also be coordinated within a ZAP Engineering facility so that key staff are involved in the planning process and are aware of their responsibilities in an emergency as well as during the drill.

Facility management also needs to be informed of the potential for the interruption in productivity and business operations. Alternatives for the continuity of critical operations need to be considered.

20.11.2.5. Procedures to Account for All Employees After Evacuation

The emergency action plan must include procedures to account for all employees after the evacuation. An emergency action plan must include at a minimum procedure to account for all employees after evacuation. Each muster or assembly point will have a blank roster for evacuees to enter their name. All completed rosters will be gathered and checked against a master list of employees assigned or checked in at the facility to verify all employees are accounted for.

20.11.2.6. Emergency Evacuation Notification and Routes

In the event of an emergency occurring within or affecting the work site, the Emergency Coordinator makes the following decisions and ensures the appropriate key steps are taken:

- Advise all personnel of the emergency.
- Activate the emergency notification sequence to alert the appropriate responders and initiate emergency notification within the building.
- Evacuate all persons to the identified assembly area and account for everyone including visitors and clients.

All personnel will proceed to the primary safe area immediately located at the identified emergency assembly area for their location.

A copy of escape routes shall be posted in all offices, at all alarm stations and at all exits.

20.11.2.7. Sweep Check by ZAP Engineering Designated Responders

- ZAP Engineering trained responders will establish a pattern that will permit covering the area in the shortest time, with a minimum of backtracking.
- When the evacuation alarm rings, stop work immediately, and conduct a sweep of the area. Ask everyone to leave the premises immediately and proceed to the identified emergency assembly area for their location.
- If you encounter smoke or flame, leave that section immediately, finish your sweep and evacuate the building by activating fire alarm pull stations. Remember, if in doubt get out.
- If anyone refuses to leave, note their name and location, and advise the client emergency services personnel.
- Meet the client emergency services personnel and advise them of your sweep or an area of smoke or flame that you were unable to check. Assist with head count and evacuation if required.
- Ensure that everyone stays at the emergency assembly area until the Emergency Coordinator has given an all clear to re-enter the building.
- In the event of inclement weather, the client will make arrangements to have buses either as temporary shelter or to transport personnel to another location.

20.11.2.8. Evacuation or Drill Evaluation

Following an evacuation or drill a response review shall be conducted and documented by the ZAP Engineering Emergency Coordinator and lessons learned share with the appropriate responders and staff using the ZAP Engineering Evacuation Report.

20.12. Emergency Response Program Management

Contact information will be provided to employees who need additional information pertaining to the plan or to their respective duties. The ZAP Engineering site manager may be contacted by employees who need more information about the plan or an explanation of their duties under the plan.

For the purpose of this Emergency Action Plan guidance the Emergency Coordinator will be designated by the ZAP Engineering site manager. His/her alternate will be the ZAP Engineering Site Safety Supervisor or otherwise designated by the site manager.

Employees performing rescue or evacuation must wear personal protective clothing and equipment appropriate to the hazards likely to be encountered.

20.12.1. Duties

20.12.1.1. ZAP Engineering Emergency Coordinator

The ZAP Engineering Emergency Coordinator ensures that:

- Evacuation drills are conducted on an annual basis.
- Inspections of facilities are performed monthly.
- All necessary repairs of components for evacuation paths are completed.
- Plans for the modification of any part of an evacuation path are reviewed.
- An up to date list of Fire Wardens is maintained.
- Radios and reflective vests and other response equipment are available.

During an evacuation or evacuation exercise, the ZAP Engineering Emergency Coordinator:

- Coordinates activities in accordance with either local authorities or the client Security and ERT as required.
- Coordinates Fire Wardens and informs them the nature of the emergency via handheld radios.

Following an evacuation or evacuation exercise, the ZAP Engineering Emergency Coordinator:

- Notifies Fire Wardens that it is safe to re-enter the building.
- Prepares a report following an evacuation (actual or drill).
- Reports to management for follow up or corrective actions.

20.12.1.2. ZAP Engineering Site Safety Supervisor

- Assist the ZAP Engineering Emergency Coordinator when requested.

20.12.1.3. Fire Wardens

- Be equipped with radios and reflective vests. The equipment is to be handed into the ZAP Engineering Emergency Coordinator and reissued to the next oncoming Fire Warden for the designated area.
- Be familiar with exits and muster stations for their responsible area.
- Direct residents safely out of the building to the designated muster station or to an alternate location.
- Sweep their effected area, ensuring that the alarms are properly functioning and that residents evacuate safely.
- In order to account for all employees after evacuation the fire wardens or designated personnel shall complete a head count and reconcile the evacuees with the attendance or daily housing report at the assigned muster station or alternate location.
- Radio unaccounted for personnel to Security.
- Notify personnel that they may re-enter the building when permission has been given by the appropriate authorities.

20.12.1.4. Residents, Contractors & Visitors

- All employees, users, contractors and visitors will follow the instructions of the Fire Wardens, Security, ERT, Safety Personnel, managers and supervisors when asked to evacuate the building.
- Know the two safest and most direct evacuation routes from their work area(s).
- Know the designated evacuation assembly point for the building.

ZAP ENGINEERING EMERGENCY INSPECTION CHECKLIST

Department:	Location:	Date of Inspection:
Inspected by:	Title:	Ext:

This form is to be used monthly.

	N/A	Yes	No
EGRESS			
Is every means of egress arranged and clearly marked, so that the way to safety is always unmistakable?			
Are exits signs lit?			
Are there sufficient exits for the prompt escape of all employees in case of fire or other emergencies?			
Are doors that aren't exits that could be mistaken as one, clearly marked "Not an Exit"?			
Do exit doors swing out?			
Are means of egress at least 28 inches at any point and adequate width for the number of people?			
Are always egresses kept clear of obstructions and materials?			
Is there proper lighting for emergency exiting? (i.e. during a power failure)			
Are at least two exits by separate ways of travel available for each occupant?			
Is the minimum width of any exit way no less than 28 inches?			
Are furnishings and decorations so placed that they will not obstruct the exits, the access thereto, or the egress there from, or the visibility thereof?			
Are explosive and highly flammable furnishings or decorations prohibited?			
EMERGENCIES/EVACUATION			
Are evacuation maps posted in readily accessible places?			
Do employees know where their muster point is located?			
Do employees know area hazards, the nearest exit and alternate routes of escape?			
Do employees know the preferred means of reporting emergencies?			
Do employees know the site emergency number(s)?			
Is the site emergency number posted on or by the phone?			
Do employees know what signal indicates evacuation?			
Can all personnel perceive the employee alarm?			
Do employees with special assistance needs been addressed?			
Employees questioned know where the emergency shut off is for the natural gas			
FIRE PROTECTION			
Are fire hydrants accessible?			
Are fire hydrants inspected yearly and records maintained to show the date?			

This form is to be used monthly.

	N/A	Yes	No
Are control and operating valves locked open or electronically supervised?			
Are fire hoses maintained and periodically tested?			
Are combustible materials kept away from ignition sources?			
Are standpipe and hose system components visually inspected quarterly?			
Is the accumulation of flammable and combustible materials controlled so they do not contribute to fire emergency?			
All product, supplies, merchandise etc. not piled within 18" of Sprinkler heads			
No Combustibles within three feet of Hot Water Tank, Space Heaters and/or Electrical panels			
All Compressed Gas Cylinders tied or chained to eliminate tipping			
DETECTION AND ALARM SYSTEMS			
Are detection systems installed and maintained?			
Are all trouble alarms and fire signals investigated?			
Do detection/alarm systems shut down or reverse HVAC systems for smoke control?			
Do detection/alarm systems close smoke or fire doors?			
Do detection/alarm systems activate local alarms?			
Are alarm and PA systems periodically tested?			
PORTABLE FIRE EXTINGUISHERS			
Does everyone know where the nearest fire extinguisher is stored?			
Has the area fire extinguisher been maintenance tested within the last year and tagged to show the date?			
Are fire extinguishers accessible and the proper type for the fire hazard?			
Are employees trained in how to use fire extinguishers?			
Is there a fire extinguisher mounted within 75 ft. of any point in an area?			
Are the extinguishers clean and well cared for?			
Is the seal and lock pin in place?			
Clear access to extinguishers? Not blocked			
Is the extinguisher location plainly marked, so as to be visible at a distance?			
Is the extinguisher class marked on the extinguisher?			
FIRST AID / MEDICAL SUPPLIES			
Are first aid supplies stocked, clean, accessible and sanitary?			
Are there eye/body wash facilities near injurious corrosive materials?			
Is a person or persons adequately trained to render first aid available in the near proximity to the workplace?			
Are AEDs present and operators trained?			

This form is to be used monthly.

	N/A	Yes	No
Condition of First Aid Kits Acceptable			
Are employees/subcontractors familiar with the incident/accident reporting process?			
Do employees/subcontractors know where accident/incident forms are located?			

Date of last inspection of sprinkler system (required yearly) _____

Comment/Actions:

ZAP Engineering Evacuation Report

This form is to be used to record all emergency evacuations (including drills).

Building Details

Building Name _____ Number of Floors (including ground) _____

Designated Muster Station _____ Person Completing Form _____

Evacuation Details

Evacuation Date/Time: _____/_____ Evacuation Drill Yes ☐ No ☐

Trigger for Evacuation: Fire Alarm Activated ___ Drill ___ ERT ___ Security ___

Emergency Situation:

_____

_____

_____

Condition: Staff Only ____ All Occupants ____ After Hours ____ Unoccupied ___ Weather _____

Number of Evacuees _____ Elapsed Time to Evacuate _____ minutes

Evacuation was orderly with no panic		Yes ☐	No ☐
Mobility-impaired persons present (sight, hearing, physical, etc.)?		Yes ☐	No ☐
The majority of evacuees went to the mustering points?		Yes ☐	No ☐
Were the building occupants notified of this drill?	Not a drill ☐	Yes ☐	No ☐

Emergency Control Organization

Emergency Coordinator _____ Deputy Emergency Coordinator _____

Emergency Coordinators were stationed at the proper emergency control point?	Yes ☐	No ☐
All Fire Wardens reported to the Emergency Coordinator?	Yes ☐	No ☐
If not, who did not report in? _____		
All Fire Wardens were identifiable (vests, hard hats, flashlights)?	Yes ☐	No ☐
Control of external building exits achieved.	Yes ☐	No ☐
Did the Fire Wardens perform their duties correctly?	Yes ☐	No ☐
Evacuation maps and emergency procedures posters are up to date?	Yes ☐	No ☐

Building Fire & Emergency Equipment

Was the evacuation signal audible throughout the building?	Yes ☐	No ☐
Automatic closing fire doors closed when the fire alarm activated?	Yes ☐	No ☐
Card access doors automatically released when the fire alarm activated?	Yes ☐	No ☐
Fire doors and emergency exits unobstructed?	Yes ☐	No ☐

Emergency Response Members

Client: Maintenance ☐ Security ☐ ZAP Engineering Emergency Coordinator ☐ HSE ☐

Emergency Response Team Fire Brigade ☐ Ambulance ☐ Police ☐ Other: _____

ZAP Engineering Action Sheet

Issue(s)	Action(s) Required	By Who	By When	Sign Off/Date

Records

- Keep the original in your Emergency Response folder and monitor to ensure all action items completed as soon as possible. Report delays to senior management.
- Copies shall be distributed in accordance with the ZAP Engineering Site Emergency Action Plan.

Emergency Action Plan Orientation Check List

Employee Name _____ Department _____

Hire/Transfer Date _____ Orientation Date _____

[ ] Emergency Procedures

[ ] Evacuation route(s) from assigned work area

[ ] Evacuation from an unfamiliar area

[ ] Location of Emergency Assembly Areas

[ ] Receiving and following instructions during an emergency

[ ] ALL CLEAR and re-entry procedure

[ ] Reporting hazards and/or substandard conditions

[ ] Advising anyone who may require assistance during an emergency evacuation

[ ] Location of Emergency Equipment (i.e. Fire Extinguishers, etc.)

Employee Signature: _____

Orientation Conducted by: _____

Job Position/Title: _____

Sample Emergency Action Plan Core Requirements

POTENTIAL EMERGENCIES **(BASED ON HAZARD ASSESSMENT)**	The following are identified potential emergencies: • Fire • List others	
EMERGENCY PROCEDURES	In the event of a fire occurring within or affecting the work site, the Emergency Coordinator (or deputy) makes the following decisions and ensures the appropriate key steps are taken: • advise all personnel • pull the fire alarm to alert the nearest fire station and initiate all fire alarms within the building • evacuate all persons to a safe point in the assembly area and account for everyone including visitors and clients	
LOCATION OF EMERGENCY EQUIPMENT	Emergency equipment is located at: • Fire Alarm – List • Fire Extinguisher – List • Fire Hose - List	
WORKERS TRAINED IN THE USE OF EMERGENCY EQUIPMENT	(1) _____ (2) _____ (3) _____ (4) _____	
EMERGENCY RESPONSE TRAINING REQUIREMENTS	Type of Training • Use of fire extinguishers • Practice fire drills	Frequency • Orientation and annually • At the call of site management
LOCATION AND USE OF EMERGENCY FACILITIES	The nearest emergency services are located at: • List facilities	
FIRE PROTECTION REQUIREMENTS	• List all site fire protection requirements.	
ALARM AND EMERGENCY COMMUNICATION REQUIREMENTS	• Pulling the fire alarm automatically alerts the fire department and initiates an alarm within the building • The fire alarm signal is (describe sound and pattern)	
FIRST AID	First aid supplies are located at: • List First Aiders are:	

	• List all names Transportation for ill or injured workers is by (describe). The contact number or radio channel is (describe).
PROCEDURES FOR RESCUE AND EVACUATION	In case of fire: • Advise all personnel • Pull the fire alarm • Evacuate all persons to a safe point in the staff parking lot and account for everyone including visitors and clients • Assist ill or injured workers to evacuate the building • Provide first aid to injured workers if required • Call emergency response personnel to arrange for transportation of ill or injured workers to the nearest health care facility if required.
DESIGNATED RESCUE AND EVACUATION WORKERS	The following workers are trained in rescue and evacuation (or describe client rescue organization): (1)_____ (2)_____ (3)_____ (4) _____
Completed on: _____ Signed: _____	

21. FALL PROTECTION

21.1. Purpose

The purpose of this program is to provide fall protection procedures to prevent injury to employees while performing work assignments at elevated levels.

21.1.1. Qualifications of the Person or Position That Prepares Plans

Any changes to this Fall Protection Program must be approved by the Safety Manager, who is designated the Qualified Person to prepare plans for specified work sites. This is based on training received in fall protection planning and has demonstrated skills and knowledge in the preparation of fall programs, plans and the hazards involved.

21.2. Scope

Applies to all ZAP Engineering employees who have work assignments at work levels that exceed 6 feet in height where guardrails or nets are not utilized. This includes work near and around excavations. Guardrails, safety nets, or personal fall arrest systems shall be used where feasible. When work is performed on a non-owned or operated site, the operator's program shall take precedence, however, this document covers ZAP Engineering employees and shall be used on owned premises, or when an operator's program doesn't exist or is less stringent.

21.3. Definitions

"Anchorage" means a secure point of attachment for lifelines, lanyards or deceleration devices.

"Body belt (safety belt)" means a strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device.

"Body harness" means straps which may be secured about the employee in a manner that will distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a personal fall arrest system.

"Buckle" means any device for holding the body belt or body harness closed around the employee's body.

"Carabineer" - see Snap hook

"Connector" means a device which is used to couple (connect) parts of the personal fall arrest system and positioning device systems together. It may be an independent component of the system, such as a carabineer, or it may be an integral component of part of the system (such as a buckle or D-ring sewn into a body belt or body harness, or a snap-hook spliced or sewn to a lanyard or self-retracting lanyard).

"Deceleration device" means any mechanism, such as a rope grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards, etc., which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limit the energy imposed on an employee during fall arrest.

"Deceleration distance" means the additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of an employee's body belt or body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the employee comes to a full stop.

"Equivalent" means alternative designs, materials, or methods to protect against a hazard which the employer can demonstrate will provide an equal or greater degree of safety for employees than the methods, materials or designs specified in the standard.

"Failure" means load refusal, breakage, or separation of component parts. Load refusal is the point where the ultimate strength is exceeded.

"Free fall" means the act of falling before a personal fall arrest system begins to apply force to arrest the fall.

"Free fall distance" means the vertical displacement of the fall arrest attachment point on the employee's body belt or body harness between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes deceleration distance, and lifeline/lanyard elongation, but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur.

"Guardrail system" means a barrier erected to prevent employees from falling to lower levels.

"Infeasible" means that it is impossible to perform the inspection work using a conventional fall protection system (i.e., guardrail system, safety net system, or personal fall arrest system) or that it is technologically impossible to use any one of these systems to provide fall protection.

"Lanyard" means a flexible line of rope, wire rope, or strap which generally has a connector at each end for connecting the body belt or body harness to a deceleration device, lifeline, or anchorage.

"Leading edge" means the edge of a floor, roof, or formwork for a floor or other walking/working surface (such as the deck) which changes location as additional floor, roof, decking, or formwork sections are placed, formed, or constructed. A leading edge is an "unprotected side and edge" during periods when it is not actively and continuously under construction.

"Lifeline" means a component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

"Lower levels" means those areas or surfaces to which an employee can fall. Such areas or surfaces include, but are not limited to, ground levels, floors, platforms, ramps, runways, excavations, pits, tanks, material, water, equipment, structures, or portions thereof.

"Personal fall arrest system" means a system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body belt or body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.

"Positioning device system" means a body belt or body harness system rigged to allow an employee to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning.

"Rope grab" means a deceleration device which travels on a lifeline and automatically, by friction, engages the lifeline and locks so as to arrest the fall of an employee. A rope grab usually employs the principle of inertial locking, cam/level locking, or both.

"Safety Nets...Safety nets shall be provided when workplaces are higher than 25 feet above ground or water surfaces or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors, safety lines or safety belts are impractical.

Nets shall extend 8 feet beyond the edge of the work surface where employees are exposed and shall be installed as close under the work surface as practical but in no case more than 25 feet below the work surface. Nets shall be positioned in a manner to prevent the user from coming into contact with below surfaces or structures. Proper clearance positioning of nets shall be determined by impact load testing. Work procedures shall not begin until nets are in place and have been properly tested.

New nets shall meet accepted performance standards of 17,500-foot pounds minimum impact resistance as determined and certified by the manufacturers and shall bear a label of proof test. Edge ropes shall provide a minimum breaking strength of 5000 pounds.

"Self-retracting lifeline/lanyard" means a deceleration device containing a drum-wound line which can be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.

"Snap hook" means a connector comprised of a hook-shaped member with a normally closed keeper, or similar arrangement, which may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object. Snap hooks are generally one of two types: (1) The locking type with a self-closing, self-locking keeper which remains closed and locked until unlocked and pressed open for connection or disconnection; or (2) The non-locking type with a self-closing keeper which remains closed until pressed open for connection or disconnection. As of January 1, 1998, the use of a non-locking snap hook as part of personal fall arrest systems and positioning device systems is prohibited.

"Unprotected sides and edges" means any side or edge (except at entrances to points of access) of a walking/working surface, e.g., floor, roof, ramp, or runway where there is no wall or guardrail system at least 39 inches (1.0 m) high.

"Walking/working surface" means any surface, whether horizontal or vertical on which an employee walks or works, including, but not limited to, floors, roofs, ramps, bridges, runways, formwork and concrete reinforcing steel but not including ladders, vehicles, or trailers, on which employees must be located in order to perform their job duties.

Drawing of Components



Figure A

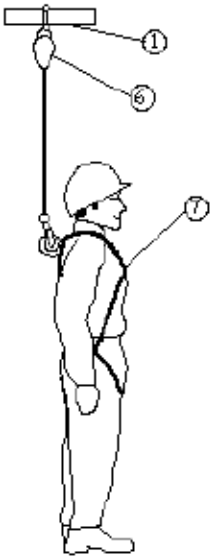


Figure B

1. Tie-off Point
2. Lifeline
3. Rope Grab
4. Shock Absorbing Lanyard
5. Cross-Arm Strap
6. Retractable Lifeline
7. Full-Body Harness
8. Restraining Belt
9.

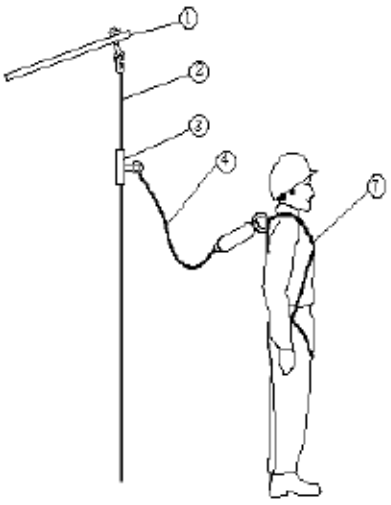


Figure C

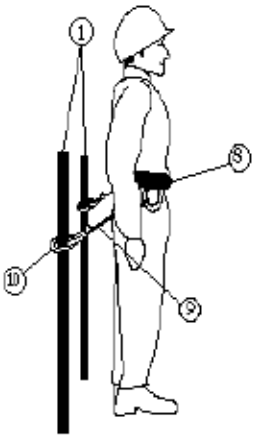


Figure D

21.4. Responsibilities

21.4.1. Safety Manager

It is the responsibility of the local Safety manager (designated competent person) to implement this Fall Protection Program. Continual observational safety checks of work operations and the enforcement of the safety policy and procedures shall be regularly enforced. All jobs shall be pre-planned prior to the start of work.

21.4.2. Supervisor

The Supervisor shall ensure that all persons assigned to work at elevated levels, exceeding 6 feet in height or more above lower level and where guardrails or nets are not utilized, be protected by personal fall protection equipment.

- Supervisors shall make exposure determinations and shall discuss with their employees the extent to which scaffolds, ladders or vehicle mounted work platforms can be used.
- Ensure that fall protection equipment is available and in safe working condition.
- Provide for emergency rescue in the event of a fall. Pre-plan the job to ensure that employees have been properly trained in the use, limitations, inspections and rescue procedures and that training records are on file.

21.4.3. Employees

Employees shall ensure they have and use the fall protection equipment as required by this program and:

- Understand the potential hazards of working at elevated levels as well as gaining access to and from the work location.
- Understand the use and limitations of such equipment.
- Pre-plan the job with his/her supervisor to agree that the job can be done safely.

Inspect such equipment before each use and to report defective equipment immediately to their supervisor.

21.5. Procedure

Fall protection is required whenever employees are potentially exposed to falls from heights of six feet or greater to lower levels. This includes work near and around excavations. Use of guard rails, safety net, or personal fall arrest systems should be used when the standard methods of protection are not feasible, or a greater hazard would be created.

Fall protection equipment will meet the requirements of applicable ANSI, ASTM or OSHA requirements. When purchasing equipment and raw materials for use in fall protection systems all applicable ANSI and ASTM requirements should be met.

21.5.1. Minimum Standards

Fall protection must be provided to employees working at heights that exceed applicable regulatory thresholds.

Fall protection is required whenever employees are potentially exposed to falls from heights that exceed applicable regulatory thresholds. Guard rails, safety nets or personal or fall arrest systems should be used. Some applicable regulatory thresholds may include:

- General Industry 1910.23(b) - Protection for wall openings and holes. Every wall opening from which there is a drop of more than 4 feet shall be guarded.
- Construction Industry 1926.501(b)(1) - Unprotected sides and edges. Each employee on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge which is 6 feet (1.8 m) or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest systems.
- Steel Erection 1926.760(a)(1) - Each employee engaged in a steel erection activity who is on a walking/working surface with an unprotected side or edge more than 15 feet (4.6 m) above a lower level shall be protected from fall hazards by guardrail systems, safety net systems, personal fall arrest systems, positioning device systems or fall restraint systems.

The following are minimum standards for ZAP Engineering employee personal fall protection systems:

- All D-rings must be a minimum of 2¼ inches (inside diameter).
- All snap hooks shall not allow pressure to be applied to the gate in the opening direction.
- No pelican hooks on lanyards should be used as a primary connection.
- Connectors shall be drop forged, pressed or formed steel, or made of equivalent materials.
- Connectors shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of the system.
- D-rings and snap hooks shall have a minimum tensile strength of 5,000 pounds.
- D-rings and snap hooks shall be proof-tested to a minimum tensile load of 3,600 pounds without cracking, breaking, or taking permanent deformation.
- Snap hooks shall be sized to be compatible with the member to which they are connected to prevent unintentional disengagement of the snap hook. Only a locking type snap hook designed and used to prevent disengagement of the snap hook by the contact of the snap hook keeper by the connected member shall be used.
- Horizontal lifelines shall be designed, installed, and used, under the supervision of a qualified person, as part of a complete personal fall arrest system, which maintains a safety factor of at least two.
- Lanyards and vertical lifelines shall have a minimum breaking strength of 5,000 pounds. Where vertical lifelines are used, each employee shall be attached to a separate lifeline.
- Lifelines shall be protected against being cut or abraded.
- Self-retracting lifelines and lanyards which automatically limit free fall distance to 2 feet or less shall be capable of sustaining a minimum tensile load of 3,000 pounds applied to the device with the lifeline or lanyard in the fully extended position.
- Self-retracting lifelines and lanyards which do not limit free fall distance to 2 feet or less, rip stitch lanyards, and tearing and deforming lanyards shall be capable of sustaining a minimum tensile load of 5,000 pounds applied to the device with the lifeline or lanyard in the fully extended position.
- Anchorages used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms and capable of

supporting at least 5,000 pounds per employee attached, or shall be designed, installed, and used as part of a complete personal fall arrest system which maintains a safety factor of at least two and under the supervision of a qualified person.

- Systems used by an employee having a combined person and tool weight in excess of 310 pounds shall be modified to provide proper protection for such heavier loads.
- The attachment point of the body harness shall be in the center of the wearer's back near shoulder level, or above the wearer's head, except when climbing.
- Body harnesses and components shall be used only for employee protection and not to hoist materials.
- Personal fall arrest systems and components subjected to impact loading shall be immediately removed from service and shall not be used again for employee protection until inspected and determined by a competent person to be undamaged and suitable for reuse.
- Provide for prompt rescue of employees in the event of a fall or assure that employees are able to rescue themselves.
- Personal fall arrest systems shall be inspected prior to each use for wear, damage and other deterioration, and defective components shall be removed from service.
- Personal fall arrest systems shall not be attached to guardrail systems, nor shall they be attached to hoists unless prior approval is obtained from a competent person.
- If a personal fall arrest system is used at hoist areas, it shall be rigged to allow the movement of the employee only as far as the edge of the walking/working surface.

21.5.2. Stopping a Fall

The arresting force on an employee stopped by a fall shall be limited to a maximum arresting force of 1,800 pounds when wearing a body harness.

The fall arrest system shall be rigged such that an employee can neither free fall more than 6 feet, nor contact any lower level.

The fall arrest system shall bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet.

The fall arrest system shall have enough strength to withstand twice the potential impact energy of an employee free falling 6 feet, or the free fall distance permitted by the system, whichever is less.

21.5.3. Protection from Falling Objects

When employees are required to work in the near vicinity of others working with materials, tools, or equipment at elevated levels, Barricades around the immediate area of the overhead work shall be erected to prohibit employees from entering the barricaded area.

Employees performing work at elevated levels shall keep tools, materials, and equipment away from the edge to keep potential objects from falling over the side. Where practical, tools, etc. shall be secured with rope, wire, etc. to keep them from falling.

21.5.4. Portable Ladders

Three-point climbing is required while ascending/descending ladders. While on ladders, both hands and one foot, or both feet and one hand shall always be in contact with the ladder.

Tools required to perform a task shall be transported by a mechanical carrier such as a tag line, suspended bucket or tool belt.

- Tools shall not be carried by hand while climbing.
- Hands must be free to grip the ladder.
- Tools shall not be carried in clothing pockets.
- Tools shall be pulled up to the job site only after reaching the area of work.

When work is to be performed from straight/extension ladders, fall protection shall be utilized when heights exceed 6 feet.

Straight ladders shall be tied off at the top to prevent them from moving. A second person shall steady the ladder at the base while it is being tied off at the top by another employee. Do not tie off fall protection equipment to the ladder.

21.5.5. Storage

A dedicated storage area shall be provided for the storage of fall protection equipment and all components. The storage area shall keep the equipment clean, dry, and free from oils, chemicals, paints, and excessive heat.

21.5.6. Inspections

Fall protection equipment shall be inspected before each use for wear, damage, other deterioration, or other defects.

21.5.7. Elevated Personnel Platforms

Work performed, regardless of the nature of the work, from personnel platforms raised by forklifts, cranes, scissor lifts, etc., shall require the use of a full body harness and shall be connected to the platform.

21.5.8. Prompt Rescue of an Employee in the Event of a Fall

ZAP Engineering shall provide for prompt rescue of employees in the event of a fall or shall assure the employees are able to rescue themselves.

The pre-planning stage prior to the beginning of each elevated work assignment shall be evaluated by the supervisor to provide rescue of employees involved in a fall.

21.5.9. Fall Protection Plan

This option is available only to employees engaged in leading edge work who can demonstrate that it is infeasible, or it creates a greater hazard to use conventional fall protection equipment. The fall protection plan shall conform to the following provisions:

- The fall protection plan shall be prepared by a qualified supervisor and developed specifically for the site where the leading-edge work is being performed.
- The fall protection plan shall document the reasons why the use of conventional fall protection systems (guardrail systems, personal fall arrest systems, or safety net systems) are infeasible or why their use would create a greater hazard.
- The fall protection plan shall identify each location where conventional fall Protection methods cannot be used.
- These locations shall then be classified as controlled access zones.

21.5.10. Controlled Access Zones

When used to control access to areas where leading edge or other operations are taking place the controlled access zone shall be defined by a control line or by any other means that restricts access.

When control lines are used, they shall be erected not less than 6 feet (1.8 m) nor more than 25 feet (7.7 m) from the unprotected or leading edge.

The control line shall extend along the entire length of the unprotected or leading edge and shall be approximately parallel to the unprotected or leading edge.

The control line shall be connected on each side to a guardrail system or wall.

- Control lines shall consist of ropes, wires, tapes, or equivalent materials.
- Each line shall be flagged or otherwise clearly marked at not more than 6-foot (1.8 m) intervals with high-visibility material.
- Each line shall be rigged and supported in such a way that its lowest point (including sag) is not less than 39 inches (1 m) from the walking/working surface and its highest point is not more than 45 inches (1.3 m).
- Each line shall have a minimum breaking strength of 200 pounds.

Only employees engaged in the related work shall be permitted in the controlled access zone.

21.5.11. Safety Monitoring System

When the use of conventional fall protection equipment is deemed infeasible or the use of this equipment creates a greater hazard a Fall Protection Plan which includes a safety monitoring system shall be implemented by the supervisor.

Supervisors shall designate a competent person to monitor the safety of other employees. The competent person shall be assigned to:

- Recognize fall hazards;
- Warn employees if they are unaware of fall hazard or are acting in an unsafe manner;
- Be on the same working surface and in visual contact of working employees;
- Stay close enough for verbal communication; and
- Not have other assignments that would take his/her attention from the monitoring function.

21.5.12. Incident Investigations

ZAP Engineering shall conduct accident investigations in the event of a fall, near miss or another serious incident.

Accident investigations shall be conducted to evaluate the fall protection plan for potential updates to practices, procedures or training in order to prevent reoccurrence.

Changes to the fall protection program shall be implemented if deemed appropriate from incident corrective actions.

21.6. Training

Employees receive training pertaining to the recognition and elimination of fall hazards. A training program shall be provided for each employee who might be exposed to fall hazards. Training shall enable each employee to recognize the hazards of falling and shall train each employee in the procedures to follow to minimize these hazards.

The employee will be trained in the use and operation of fall arrest systems, inspections and maintenance procedures.

Retraining – Retraining shall be provided when the following are noted:

- Deficiencies in training,
- Workplace changes
- Fall protection systems or equipment changes that render previous training obsolete.

All training is documented. Written certification records must be maintained showing the following:

- Who was trained?
- When and dates of training
- Signature of person providing training
- Date ZAP Engineering determined training was deemed adequate.

Training records shall be retained in the corporate office.

22. FIRE EXTINGUISHERS

22.1. Purpose

The purpose of this program is to provide fire extinguisher procedures to ensure equipment is operable and employees have the knowledge to safely operate in case of a fire incident.

22.2. Scope

Applies to all ZAP Engineering employees and all ZAP Engineering locations.

22.3. Responsibilities

The Safety Manager is responsible for developing procedures for the use and care of fire extinguishers and for developing a training program for the proper use of these devices. The Manager is responsible for implementing fire extinguisher training at his location. The shop foremen are responsible for enforcing the provisions of this section of the safety manual. All employees are responsible for following these provisions.

22.4. Procedure

22.4.1. Selection and Distribution

Portable fire extinguishers shall be provided for employee use and selected and distributed based on the classes of anticipated workplace fires and on the size and degree of the hazard which would affect their use. Fire extinguishers used by this ZAP Engineering are for four classes of fires:

- Class A Fire Extinguishers. Use on ordinary combustibles or fibrous material, such as wood, paper, cloth, rubber and some plastics. Travel distance for employees to any extinguisher is 75 feet (22.9 m) or less.
- Class B Fire Extinguishers. Use on flammable or combustible liquids such as gasoline, kerosene, paint, paint thinners and propane. Travel distance from the Class B hazard area to any extinguisher is 50 feet (15.2 m) or less.
- Class C Fire Extinguishers. Use on energized electrical equipment, such as appliances, switches, panel boxes and power tools. Travel distance from the Class C hazard area to any extinguishing agent is 50 feet (15.2 m) or less.
- Class D Fire Extinguishers. Use on combustible metals, such as magnesium, titanium, potassium and sodium. Travel distance from the combustible metal working area to any extinguishing agent is 75 feet (22.9 m) or less.

22.4.2. Labeling of Fire Extinguishers

Fire extinguishers are to be mounted in easily accessible locations that are indicated by a sign that reads "Fire Extinguisher". Fire extinguishers are to be located so that no employee will ever be more than 75 feet from an extinguisher. No equipment, boxes or product may be placed (even temporarily) in the way of a fire extinguisher.

Each fire extinguisher will be assigned a unique number.

22.4.3. Maintenance

All fire extinguishers shall be mounted no higher and no lower than four (4) feet from the floor. All fire extinguishers shall be maintained as follows:

- Numbered to identify their proper location
- Fully charged and in operable condition
- Clean and free of defects
- Readily accessible always

22.4.4. Inspection, Maintenance and Testing

All fire extinguishers are to be visually inspected by ZAP Engineering employees monthly. All fire extinguishers are to receive an annual maintenance check by certified personnel from a fire extinguisher dealer. Fire extinguishers are to be inspected and re-charged by certified personnel after any use.

Any fire extinguisher that shows a loss of pressure during the monthly inspection will be inspected and re-charged by certified personnel. Completed fire extinguisher inspection logs will be maintained in the safety files and become a part of the safety records. They are to be maintained for 5 years.

22.4.5. Use

In the event of a fire, one employee will get the nearest fire extinguisher and use it to attempt to put the fire out. All other employees in the immediate area will prepare to evacuate if needed. All other employees in the building need to be advised that a fire is in progress.

The employee attempting to extinguish the fire will break the safety seal on the handle and pull the pin. He will then aim his extinguisher at the base of the fire and discharge it with a sweeping motion from side to side; continuing until the fire is out or the extinguisher is emptied.

Remember that a standard fire extinguisher will be emptied in about 10 to 15 seconds. If the fire is not out when the extinguisher has been completely discharged, the employees must evacuate the area.

22.4.6. Training and Education

The purpose of this section is to establish training procedures which are necessary for the proper use and understanding of a fire extinguisher and incipient stage firefighting. Training will occur prior to initial assignment and at least annually thereafter.

Initial Training Outline

- General principles of a fire
- Hazards employed with an incipient stage fire(s)
- When to "back off' (evacuate) of an incipient stage fire(s)
- General fire principles of a fire extinguisher
- Hazards employed with the use a fire extinguisher
- Use of a fire extinguisher

Retraining

Retraining shall reestablish employee proficiency and introduce new or revised control methods and procedures, as necessary. Retraining shall be provided for all authorized and affected employees whenever there is:

- An annual basis or
- A change in job assignment or
- ZAP Engineering has reason to believe that there are deviations from or inadequacies in the employee's knowledge or use of fire extinguishers or fire prevention procedures.

Training Documentation

- All training will be documented, and each employee's understanding will be subject to a "hands-on" test.

- Documentation will consist of; as a minimum, the employee's name, the trainer's name, the date of the training, and an outline of training provided.

23. FIRST AID

23.1. Purpose

The purpose of this program is to establish the minimum first aid supplies, equipment and actions to properly respond to injuries.

23.2. Scope

This program is applicable to all ZAP Engineering employees while engaged in work at ZAP Engineering facilities and/or facilities operated by others.

23.3. Responsibilities

- It is the responsibility of the site manager to ensure that first aid kits are provided and maintained.
- All employees are responsible for using first aid materials in a safe and responsible manner.
- The HSE Manager is responsible for corresponding with the Red Cross or an equivalent to keep employee training levels current.

23.4. Requirements

23.4.1. Planning

The site manager will:

- Ensure that a minimum of one employee, with a valid certificate, shall always be present to render first aid while work is being performed if medical assistance is not available within 30 minutes.
- Ensure that provisions shall have been made prior to commencement of a project for prompt medical attention, including transportation, in case of serious injury.
- Ensure adequate first aid supplies and equipment are easily accessible when required.
- Ensure that in areas where 911 is not available, the telephone numbers of the physicians, hospitals, or ambulances to be used shall be conspicuously posted.

23.4.2. Medical Response

In the absence of an infirmary, clinic, hospital, or physician, that is reasonably accessible in terms of time and distance to the worksite, which is available for the treatment of injured employees, a person who has a valid certificate in first-aid shall be available at the worksite to render first aid. A valid certificate in first-aid training must be obtained from the U.S. Bureau of Mines, the American Red Cross or equivalent training that can be verified by documentary evidence.

Employees authorized to render first aid will always observe universal precautions. (Universal Precautions means that the aid giver treats all bodily fluids as if they were contaminated).

If 911 is not available refer to the list of posted phone numbers for prearranged medical response providers. All ZAP Engineering authorized first responders shall have a cell phone as a means of communications; otherwise handheld radios or telephones shall be used as a means of communication.

23.4.3. Supplies and Equipment

First aid supplies shall be easily accessible when required. Always follow the manufacturer's instructions when using the materials in the first aid kit.

All ZAP Engineering first aid kits contain appropriate items determined to be adequate for the environment in which they are used and if on a construction site are stored in a weatherproof container with individual contents sealed from the manufacturer for each type of item.

ZAP Engineering is responsible to ensure the availability of adequate first aid supplies and to periodically reassess the availability for supplies and to adjust its inventories. First Aid kits are to be inspected:

- On the first working day of each week to verify that they are fully stocked and that no expiration dates have been exceeded, and
- Before being sent out to each job, and
- Replace any items that have exceeded their expiration dates or that have been depleted.

Where the eyes or body of any person may be exposed to injurious corrosive materials, a safety shower and/or eye wash (suitable facilities) or other suitable facilities shall be provided within the work area. Ensure expiration dates are checked and water used in storage devices is sanitized.

An assessment of the material or materials used shall be performed to determine the type flushing/drenching equipment required. At client job sites, portable or temporary stations must be established prior to the use of corrosive materials.

23.4.4. Transportation

Based on the first responder's assessment of the injuries involved, decide whether the injured requires to be taken directly to a hospital's emergency room, occupational medicine provider or administer first aid on location.

Examples of serious injuries that result in the injured being transported to a medical provider are those resulting in severe blood loss, possible permanent disfigurement, head trauma, spinal injuries, internal injuries and loss of consciousness. Keep in mind that the needs and wellbeing of the injured are the priority.

Proper equipment for prompt transportation of the injured person to a physician or hospital or a communication system for contacting necessary ambulance service shall be provided.

Choices to consider include: private automobile, ZAP Engineering vehicle, helicopter, crew boat, EMS vehicles including medic-vac helicopters, or any other transportation that can provide safe transportation to the hospital or doctor's office in order to provide medical attention to the injured in the quickest manner

without any additional complications or injuries to the injured employee. Transportation needs must be preplanned and coordinated with the transportation provider prior to an incident requiring such service.

23.4.5. Training

Volunteers or selected employees are trained by the American Red Cross or equivalent in CPR and first aid. Each of these trained and certified employees are equipped with protective gloves and other required paraphernalia.

24. FIT FOR DUTY

24.1. Scope

24.1.1. Personal Medical Reporting Requirements

Employees must report all medications to their supervisor they are taking that could impair their ability to work safely. Over-the-counter medications such as allergy or cold and flu medications could also impair one's ability to perform safely and must also be reported to their supervisor. The reporting must occur before the employee arrives for work or arranges for transportation to a remote site.

24.1.2. Client Drug and Alcohol Testing Requirements

Drug and alcohol testing for pre-employment, post-accident or random as prescribed by the host facility shall be implemented. Procedures must include and be implemented for drug and alcohol testing as prescribed by DOT or the host client facilities.

24.1.3. Employee Activity and Behavior

We will monitor employee activities and behaviors to determine if employees should be removed from the work site based on our drug and alcohol program requirements. Employee's activities and behaviors will be monitored to determine if employee should be removed from the work site if their ability to perform their duties safely is questioned.

24.2. Fit for Duty Examination

24.2.1. Confidentiality

Medical Records and other related records are protected by state and federal confidentiality laws and ZAP Engineering policy. The medical record of fitness for duty examination will be maintained in the Human Resources office. Employee medical records will not be released to unauthorized personnel without the employee's written consent or subpoena in accordance with state and federal laws.

24.2.2. Self-Referrals

Employees are responsible for notifying their supervisor if they are fatigued to the point of not being able to perform their duties safely. Employees must be responsible for ensuring they are physically and mentally fit to perform their job functions safely. Employees must take responsibility for their own safety as well as not reporting to work in a condition as to endanger the safety of their fellow workers.

Disciplinary action may occur for an employee not reporting to work in a condition which could endanger their safety or the safety of any other person(s). See below for Management Referral in case there is a question of the employee's ability to work safely.

24.2.3. Management Referral

Management Personnel Responsibility

Management personnel are responsible for monitoring the attendance, performance and behavior of their employees. When an employee's performance and/or behavior (including the odor of alcohol or possible use of any illegal substance) appears to be unsafe, ineffective and/or inappropriate, it is every manager's responsibility to challenge the employee's behavior and the ability to function, remove the employee from the job, refer the employee for a Fitness for Duty exam immediately and conduct appropriate follow up.

Due to the safety issues involved, supervisors have a special responsibility to implement this policy in a consistent and fair manner.

24.2.4. Procedure

- When any manager or their designee observes an employee who is not performing his/her job safely, appropriately, and effectively, or an odor of alcohol is present, or whose behavior is inappropriate, that manager is to remove the employee from her/his duty immediately and call Human Resources to continue the Fitness for Duty procedure. The employee will be referred to a medical provider for a fitness for duty exam.
- The Fitness for duty evaluation may include testing for chemical (e.g. alcohol and drug) levels, referral for psychiatric evaluation or any other evaluation or follow-up deemed necessary.
- The manager or designee must document the reasons for the fitness for duty request by recording the employee's behavior and noting the names of any witnesses who observed that behavior. Documentation must be submitted to Human Resources by the next business day.
- The employee is required to cooperate fully with the manager and medical personnel. The employee must sign consent forms for both the fitness examination and communication of its results in confidence to Human Resources. Refusal to cooperate will be considered insubordination and will be grounds for disciplinary action. The employee should be suspended pending investigation, which could result in termination.
- Medical personnel will advise Human Resources if the employee is fit or not fit for duty. The medical results of the fitness for duty exam will be communicated to Human Resources.
- If medical personnel determine that the employee is FIT FOR DUTY, the employee must contact Human Resources on the next general business day and the manager in consultation with Human Resources will determine discipline in situations where misconduct may have occurred.
- If medical personnel determine that the employee is NOT FIT FOR DUTY:
    - The manager makes every effort to arrange for safe transportation home for the employee.
    - The employee must contact Human Resources, on the next general business day.

- The manager, in consultation with Human Resources, will determine discipline in situations where misconduct has occurred.

24.2.5. Subsequent Fitness for Duty Exams

Dependent upon the reason for the fitness exam, employees who violate this policy a second time may be subject to progressive discipline, up to and including termination of employment.

25. FORKLIFT AND INDUSTRIAL TRUCKS

25.1. Purpose

The purpose of this program is to establish requirements for the safe operation and use of Powered Industrial Trucks.

25.2. Scope

This program applies to all ZAP Engineering employees who operate a Powered Industrial Truck in the scope of their job duties and assignments. When work is performed on a non-owned or operated site, the operator's program shall take precedence, however, this document covers ZAP Engineering employees and contractors and shall be used on owned premises, or when an operator's program doesn't exist or is less stringent. *NOTE*: All employees are required to be trained and certified prior to operating each specific type of forklift equipment. ZAP Engineering shall certify all authorized employees regarding competency on all types of equipment.

25.3. Definitions

Authorized Employee – A person, at least 18 years of age and who has completed the ZAP Engineering's or Sub Contractors required safety training for the safe operations of forklifts.

Forklift (Powered Industrial Truck) – Any mechanical device used for the movement of supplies, material or finished a product that is powered by an electric motor or an internal combustion engine.

25.4. Key Responsibilities

25.4.1. Manager/Supervisor

- Shall ensure that each powered forklift operator is competent to operate a forklift safely, as demonstrated by the successful completion of the training and evaluation program.
- Shall ensure that all forklifts are inspected before each shift and all repairs are made before the forklift is operated.

25.4.2. Employees

- Shall be current on applicable training.
- Operate forklift in accordance to the forklift standards and manufacture requirements.

- Inspect forklift at the start of shift and remove from service if defects are found until they are corrected.
- Operate forklift in a safe manner.

25.5. Procedure

25.5.1. General

All approved forklifts shall have a manufactures identification plate attached showing all specifications of the forklift and that the forklift is accepted by a nationally recognized testing laboratory.

Modifications and additions, that affect capacity and safe operation, shall not be performed without manufacturer's prior written approval. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed reflect the modification or addition.

If the forklift is equipped with front-end attachments other than factory installed attachments, the supervisor shall ensure that the forklift is marked to identify the attachments and show the approximate weight of the forklift and attachment combination at maximum elevation with load laterally centered.

The operator shall see that all nameplates and markings are in place and are maintained in a legible condition.

All forklifts shall be equipped with safety seat belts. All forklifts shall be equipped with a horn, backup alarm, beacon light, headlights and taillight.

25.5.2. Safety Guards

Forklifts shall be fitted with an overhead rollover cage, as per manufactures specifications.

If the type of load presents a hazard to the operator, the forklift shall be equipped with a vertical load backrest extension, as per manufactures specifications.

25.5.3. Training

Training shall consist of a combination of formal instruction (e.g., lecture, discussion, interactive computer learning, video tape, and written material), practical training (demonstrations performed by the trainer and practical exercises performed by the trainee) and evaluation of the operator's performance in the workplace.

All operator training and evaluation shall be conducted by authorized persons who have the knowledge, documented training, and experience to train powered industrial truck operators and evaluate their competence.

Each operator is required to be re-evaluated every three years.

Training shall include the following topics, except in topics for locations where they are not applicable to safe operation of the truck due to type of equipment or facility conditions.

- Operating instructions, warnings, and precautions for the types of truck the operator will be authorized to operate,
- Differences between the truck and the automobile,
- Truck controls and instrumentation: where they are located, what they do, and how they work,
- Engine or motor operation,
- Steering and maneuvering,
- Visibility (including restrictions due to loading),
- Fork and attachment adaptation, operation, and use limitations,
- Vehicle capacity,
- Vehicle stability,
- Any vehicle inspection and maintenance that the operator will be required to perform,
- Refueling and/or charging and recharging of batteries,
- Operating limitations,
- Any other operating instructions, warnings, or precautions listed in the operator's manual for the types of vehicle that the employee is being trained to operate,
- Surface conditions where the vehicle will be operated,
- Composition of loads to be carried and load stability,
- Load manipulation, stacking, and unstacking,
- Pedestrian traffic in areas where the vehicle will be operated,
- Narrow aisles and other restricted places where the vehicle will be operated,
- Hazardous (classified) locations where the vehicle will be operated,
- Ramps and other sloped surfaces that could affect the vehicle's stability,
- Closed environments and other areas where insufficient ventilation or poor vehicle maintenance could cause a buildup of carbon monoxide or diesel exhaust,
- Other unique or potentially hazardous environmental conditions in the workplace that could affect safe operation, and
- The requirements of CFR 1910.178 (Powered Industrial Trucks).

Mandatory refresher training shall be provided when unsafe operations are observed, after an incident, if operating a different vehicle type, changes in conditions or any time ZAP Engineering feels an operator requires refresher training.

Certification

Only trained and certified operators, including supervisors, can operate the device (this includes refresher training requirements).

The trainer shall certify in writing that each operator has been trained and evaluated as required.

The certification shall include the name of the operator, the date of the training, the date of the evaluation and the identity of the person(s) performing the training and/or evaluation.

25.5.4. Operations

General

- All operators shall wear a safety seat belt when operating a forklift.
- Forklifts shall not be driven up to anyone standing in front of a bench or other fixed object.

- No person shall be allowed to stand or pass under the elevated portion of any forklift, whether loaded or empty.
- Unauthorized personnel shall not be permitted to operate forklifts.
- No riders or passengers are permitted.
- It is prohibited for arms or legs to be placed between the uprights of the mast or outside the running lines of the forklift.
- When a forklift is left unattended, load engaging means shall be fully lowered, controls shall be neutralized, power shall be shut off, and brakes set.
- Wheels shall be blocked if the forklift is parked on an incline.
- A forklift is unattended when the operator is 25 ft. or more away from the vehicle, which remains in view, or whenever the operator leaves the forklift and it is not in view.
- When the operator of a forklift is dismounted and within 25 ft. of the forklift still in view, the load engaging means shall be fully lowered, controls neutralized, and the brakes set to prevent movement.
- A safe distance shall be maintained from the edge of ramps or platforms while on any elevated dock, or platform or freight car.
- Forklifts shall not be used for opening or closing freight doors.
- Brakes shall be set and wheel blocks shall be in place to prevent movement of trucks, trailers, or railroad cars while loading or unloading.
- Fixed jacks may be necessary to support a semi-trailer during loading or unloading when the trailer is not coupled to a tractor.
- The flooring of trucks, trailers, and railroad cars shall be checked for breaks and weakness before they are driven onto.
- There shall be enough headroom under overhead installations, lights, pipes, sprinkler system, etc.
- An overhead guard (cages) shall be used as protection against falling objects.
- An overhead guard is intended to offer protection from the impact of small packages, boxes, bagged material, etc., representative of the job application, but not to withstand the impact of a falling capacity load.
- Fire aisles, access to stairways, and fire equipment shall be kept clear.

Traveling

- The operator shall slow down and sound the horn at cross isles and other locations where vision is obstructed.
- If the load being carried obstructs forward view, the operator shall be required to travel with the load trailing.
- The operator shall be required to look in the direction of and keep a clear view of the path of travel.
- Grades shall be ascended or descended slowly.
- When ascending or descending grades in excess of 10 percent, loaded forklifts shall be driven with the load upgrade.
- On all grades the load and load engaging means shall be tilted back if applicable and raised only as far as necessary to clear the road surface.
- Under all travel conditions the forklift shall be operated at a speed that will permit it to be brought to a stop in a safe manner.
- Stunt driving and horseplay are prohibited.
- The operator shall slow down for wet and slippery floors.
- Dock board or bridge plates shall be properly secured before they are driven over.

- Dock board or bridge plates shall be driven over carefully and slowly, and their rated capacity never exceeded.
- While negotiating turns, speed shall be reduced to a safe level by means of turning the hand steering wheel in a smooth, sweeping motion.
- Except when maneuvering at a very low speed, the hand steering wheel shall be turned at a moderate, even rate.

Loading

- Only stable or safely arranged loads shall be handled.
- Caution shall be exercised when handling off-center loads, which cannot be centered.
- Only loads within the rated capacity of the forklift shall be handled.
- Forklifts equipped with attachments shall be operated as partially loaded forklifts when not handling a load.
- A load engaging means shall be placed under the load as far as possible; the mast shall be carefully tilted backward to stabilize the load.
- Extreme care shall be used when tilting the load forward or backward, particularly when high tiering.
- Tilting forward with load engaging means elevated shall be prohibited except to pick up a load.
- An elevated load shall not be tilted forward except when the load is in a deposit position over a rack or stack.
- When stacking or tiering, only enough backward tilt to stabilize the load shall be used.

Operation of the Truck

- If at any time a forklift is found to need repair, defective, or in any way unsafe, the forklift shall be taken out of service until it has been restored to safe operating condition.
- Fuel tanks shall not be filled while the engine is running.
- Spillage of oil or fuel shall be carefully washed away or completely evaporated and the fuel tank cap replaced before restarting engine.
- When fueling with Liquefied Petroleum Gas (LPG), precautions and handling requirements set forth in the "Safe Handling of LPG" program shall be followed.
- No forklift shall be operated with a leak in the fuel system.
- Open flames shall not be used for checking electrolyte level in storage batteries or gasoline level in fuel tanks.
- Operator must verify trailer chocks, supports, and dock plates are secured prior to loading/unloading.

Maintenance and Inspection of Forklifts

- Only authorized personnel shall perform maintenance and make repairs.
- Those repairs to the fuel and ignition systems of forklifts, which involve fire hazards, shall be conducted only in locations designated for such repairs.
- Forklifts in need of repairs to the electrical system shall have the battery disconnected prior to such repairs.
- Only parts equivalent with those used in the original design shall replace all parts of any forklift requiring replacement parts.
- Forklifts shall not be altered so that the relative positions of the various parts are different from what they were when originally received from the manufacturer, nor

shall they be altered either by the addition of extra parts not provided by the manufacturer or by the elimination of any parts.

- Additional counter weighting of fork trucks shall not be done unless approved by the truck manufacturer.
- Forklifts shall be inspected daily by the operator before being placed in service and shall not be placed in service if the inspection shows any condition adversely affecting the safety of the forklift.
- Inspection shall be made at least daily – prior to each shift. (visual – non documented) Inspection items shall be posted on each forklift. Operators must ensure the vehicle is safe prior to operating.
- Where forklifts are used on a round-the-clock basis, they shall be inspected before each shift.
- Defects when found shall be immediately reported to the supervisor and corrected before operating the forklift.
- When the temperature of any part of any forklift is found to be in excess of its normal operating temperature, thus creating a hazardous condition, the forklift shall be removed from service and not returned to service until the cause for such overheating has been eliminated.
- Forklifts shall be kept in a clean condition, free of lint, excess oil, and grease.
- Noncombustible agents, where at all possible, shall be used for cleaning trucks.
- Low flash point (below 100 degrees F.) solvents shall not be used.
- High flash point (at or above 100 degrees F.) solvents may be used if precautions regarding toxicity, ventilation, and fire hazard are mitigated with the agent or solvent used.

26. GENERAL WASTE MANAGEMENT

26.1. Purpose

The purpose of this waste management strategy was developed to provide guidance and requirements necessary for efficient, effective and compliant waste management during construction and operations.

26.2. Scope

This procedure applies to all ZAP Engineering employees. When work is performed on a non-owned or operated site, the operator's program shall take precedence, however, this document covers ZAP Engineering employees and contractors and shall be used on owned premises, or when an operator's program doesn't exist or is less stringent.

26.3. Procedure

The ZAP Engineering Safety Manager or other designated person in his or her absence is accountable for managing waste and disposition of wastes generated at the work site.

26.3.1. Waste Estimation

Each work site will estimate the waste, trash and/or scrap that will be generated and taken into consideration prior to work being performed so the need for containers and waste removal, if necessary, can be determined.

Each site will utilize the following for planning of dumpster scheduling and total non-hazardous dry waste material. These figures do not include neither recycling nor waste minimization efforts and reflect no use of an incinerator. Dumpster figures are based on a 40-yard container and can be modified if another size is used by changing the table below.

SAMPLE ONLY - SOLID WASTE					
Number of Employees	**10**	**25**	**35**	**50**	**100**
Total Estimated Square Feet of Waste (@ 0.675 cu ft per person daily)					
Daily	7	17	24	34	68
Weekly	47	118	165	236	473
Monthly (4.33 wks)	205	511	716	1,023	2,046
Annual	2,455	6,138	8,593	12,276	24,551
Total Estimated Weight of Waste (@ 4lb per person daily)	40	100	140	200	400
Weekly	280	700	980	1,400	2,800
Monthly (4.33 wks)	1,212	3,031	4,243	6,062	12,124
Annual	14,549	36,372	50,921	72,744	145,488
Number of Total Dumpster Fills 40 yard dumpster 7x8x22 = 1,232 square feet					
Daily	0.0	0.0	0.0	0.0	0.1
Weekly	0.0	0.1	0.1	0.2	0.4
Monthly (4.33 wks)	0.2	0.4	0.6	0.8	1.7
Annual	2.0	5.0	7.0	10.0	19.9

ZAP Engineering must coordinate with the project site or owner to ensure proper disposal of wastes or scrap materials.

ZAP Engineering must ensure the owner client is aware of whether wastes and scrap materials will be taken off site by ZAP Engineering or will be disposed of on the owner client's site.

26.3.2. Waste Segregation

- Do not mix waste streams
- Only place waste in the designated container, satellite accumulation area (SAA), recyclable accumulation area (RAA), universal waste accumulation area (UWAA) or designated dumpster.

26.3.3. Recycling

Wastes should be recycled whenever practicable. ZAP Engineering will encourage proper segregation of waste materials to ensure opportunities for reuse or recycling occurs at each work site. The collection of recycled material will reduce the total load on the environment. Bins of enough size must be lined with a plastic bag and clearly labeled for use. Posters from ZAP Engineering will be posted throughout the work site to encourage recycling. Collection bins will also be placed in administrative areas will follow the following color guiding:

- Blue - Paper
- Green - Aluminum cans
- Yellow - Plastic

Cardboard will be flattened, staples and excess shipping tape removed. No cardboard shall be placed in the dumpster used for the landfill.

26.3.4. Waste Handling Matrix

Each work site will develop a Waste Handling Matrix (sample shown) that will:

- Address safe practices related to the immediate storage and handling of waste, scrap or leftover material.
- The handling, organization and storage of waste and scrap materials to minimize potential impact to the environment. Waste materials shall be properly stored and handled to minimize the potential for a spill or impact to the environment. During outdoor activities receptacles must be covered to prevent dispersion of waste materials and to control the potential for runoff.

Waste Stream	Location	Activity Generating Waste	Hazardous/Non Hazardous	Safe Storage Practice	Disposal Method	PPE or Other Precautions
Aerosol Can Contents	Equipment Repair Shop	Puncturing of aerosol cans	Hazardous	SAA is self-contained in the equipment repair shop	Ship to assigned site for recycling or disposal	Read warnings before use of unit.
Aerosol Can Puncturing Unit Filter	Equipment Repair Shop	Filter Changes	Hazardous	Place in designated labeled container	Ship to assigned site for recycling or disposal	Change filter every 3 months
Aerosol Cans	Various Locations	Painting, lubricants, cleaning	Non-Hazardous if aerosol can is punctured and drained	Place punctured aerosol can in RAA storage drum	Crush RAA storage drum and place in the scrap metal dumpster from client.	See "Scrap Metal" for waste stream management
Ash	Smart Ash Unit	Incineration of acceptable waste	Non Hazardous	Dispose of Immediately	Place in the Burnable Waste Dumpster	Gloves Goggles
Automotive and Heavy Equipment Parts-Used	Equipment Repair Shop and Fab Shop	Replacement	Non-Hazardous	Place in RAA	Returned to vendors for recycling	Starters, Alternators, Pumps, Transmissions
Batteries (Alkaline)	Various Locations	Battery Failures	Universal Waste	Place in the UWAA	"D" cell and below are acceptable in the Non-Burnable Waste Dumpster	Ship to designated site for recycling or disposal
Batteries (Lead Acid)	Equipment Repair Shop and Fab Shop	Battery Failures	Universal Waste	No storage allowed. Containment boxes are labeled and available in the shops.	Lead acid batteries are returned to the Vendor upon removal	Ship to designated site for recycling
Batteries (NiCad)	Various Locations	Battery Failures	Universal Waste	UWAA in the equipment repair shop.	Ship to assigned site for recycling or disposal	Cell phones, radios
Butane Torch Bottle	Various Locations	Mechanic activities	Excluded Hazardous if recycled	Place drained Butane Torch Bottles in RAA storage drum	Crush RAA storage drum and place in the scrap metal dumpster	Prosolv Butane Bottle processor I

Waste Stream	Location	Activity Generating Waste	Hazardous/Non Hazardous	Safe Storage Practice	Disposal Method	PPE or Other Precautions
Cardboard/Office Paper	Parts Department & Offices	Shipping Boxes & Office Activities	Non-Hazardous	Place in RAA	Place on pallet in RAA and band for shipment to assigned site for recycling.	
Computers Discarded	Parts Department & Offices	Replacement	Non-Hazardous	Place in RAA	Ship to assigned site for recycling or disposal	
Diesel Filters-Used	Equipment Repair Shop and Fab Shop	Filter Changes	Non-Hazardous	RAA for drained and crushed used filters	Drain for 12 hrs., crush and incinerate in Smart Ash unit	Place metal in recycle metal dumpster
Diesel Rags	Various Locations	Mechanic activities	Non-Hazardous	Oily waste rag in clear bags w/yellow stripes.	Incinerated in Smart Ash unit	See "Ash" for management and disposal
Drained Diesel	Equipment Repair and Fab Shop	Draining diesel fuel and filters	Non-Hazardous when burned as off-Spec fuel	Place in "used oil" tank in the equipment repair shop and fab shop.	Burned for energy recovery in clean burn multi-oil heating system.	
Empty Paint Cans	Various Locations	Painting activities	Non-Hazardous	No storage allowed	Ship to assigned site for recycling or disposal	Paint cans must be RCRA empty.
Fluorescent Light Ballast	Various Locations	Failure	Non-Hazardous unless they contain PCB's or DEHP	None	Place in Non-Burnable Dumpster	Ballast will say on the label if it contains PCB's
Fluorescent Light Bulbs	Shops, Office Areas	Bulb replacement	Universal Waste	Place bulbs in their original container in the RAA in the shop area	Ship to assigned site for recycling or disposal	Label bulbs "Used Bulb" when put into RAA.
Glass	Various Locations	Replacement	Non-Hazardous	None	Place in Non-Burnable Dumpster	Ensure glass containers are empty.
Glycol Rags	Equipment Repair Shop and Fab Shop	Fluid Changes	Non-Hazardous	Oily waste rag WAA's lined w/clear bags w/yellow stripes.	Incinerated in Smart Ash unit	Minimize use of absorbent rags
Glycol-Used	Equipment Repair Shop and Fab Shop	Fluid Changes	Non-Hazardous	RAA - self-contained tank on recycling unit	Recycled in glycol recycling unit	Recycling unit stored in shop
Grinding Wheels	Equipment Repair Shop and Fab Shop	Grinding activities	Non-Hazardous	None	Place in Non-Burnable Dumpster	

Waste Stream	Location	Activity Generating Waste	Hazardous/Non Hazardous	Safe Storage Practice	Disposal Method	PPE or Other Precautions
Hoses & Belts	Equipment Repair Shop and Fab Shop	Replacement	Non-Hazardous	Place in Non-Burnable Dumpster	Place in Non-Burnable Dumpster	Drain all fluids from hoses
Metal Shavings/Cuttings	Equipment Repair Shop and Fab Shop	Fabricating activities	Excluded Hazardous if recycled	Placed in recycle metal dumpster or metal only RAA's	Place in recycle metal dumpster	Ensure there are no free flowing cutting fluids present before disposal.
Oil Filters-Used	Equipment Repair Shop and Fab Shop	Oil filter changes	Excluded Hazardous	RAA for drained and crushed used filters	Drain for 12 hrs., crush and incinerate in Smart Ash unit	Place metal in recycle metal dumpster
Oil-Used	Equipment Repair Shop, Fab Shop, Service Trucks	Draining oil and filters	Excluded Hazardous if burned for energy recovery	Receiving sumps are located in the Equipment Repair Shop and Fab Shop	Burned for energy recovery in clean burn multi-oil heating system.	Keep lids on receiving sumps at all times. DO NOT PUT SOLVENTS INTO USED OIL
Oily Waste (rags, absorbents)	Various Locations	Mechanic activities, equipment drips and leaks	Non-Hazardous	Oily waste rag WAA's lined w/clear bags w/yellow stripes.	Incinerated in Smart Ash unit	Collected daily. See "Ash" for management and disposal
Paint Waste (rags, rollers, brushes, etc.)	Various Locations	Painting activities	Determine on per occurrence basis. Use MSDS or testing	If hazardous, store in the assigned area. If non-hazardous, no storage is required.	If hazardous, ship to assigned site for disposal. If non-hazardous, place in burnable waste dumpster.	Need to review MSDS, do analytical test, or use generator knowledge to make waste determinations.
Parts Cleaner Rags	Equipment Repair Shop	Cleaning parts	Non-Hazardous	Oily waste rag WAA's lined w/clear bags w/yellow stripes.	Incinerated in Smart Ash unit	See "Ash" for management and disposal
Scrap Metal	Various Locations	Fabrication activities & house cleaning	Excluded Hazardous if recycled	Placed in recycle metal dumpster or metal only RAA's	Place in recycle metal dumpster	Eye Protection Gloves
Sodium Vapor/ Metal Halide Light Bulbs	Various Locations	Bulb replacement	Universal Waste	Place bulbs in their original container in the RAA.	Ship to assigned site for recycling or disposal	Label bulbs "Used Bulb" when put into RAA.
Tires	Various Locations	Replacement	Non-Hazardous	None	Place tires up to 20" rim diameter into dumpster.	

Waste Stream	Location	Activity Generating Waste	Hazardous/Non Hazardous	Safe Storage Practice	Disposal Method	PPE or Other Precautions
Toner Cartridges	Offices	Copiers, printers, fax machines	Non-Hazardous	Placed in original container in RAA	Ship to assigned site for recycling or disposal	Verify toner is expended before disposal.
Water Scrubber Filter & Absorbents	Equipment Repair Shop and Fab Shop	Filtering sump water in shops	Non-Hazardous	None	Incinerated in Smart Ash unit	See "Ash" for management and disposal
Welding Rods	Various Locations	Welding activities	Excluded Hazardous	Placed in recycle metal dumpster or metal only RAA's	Ship to assigned site for recycling or disposal	See "Scrap Metal" for waste stream management
Wood Waste	Various Locations	Various activities and shipping pallets	Non-Hazardous	Store on the far back corner of the pad or in the dump truck box if available.	Place in recycle wood dumpster	Pallets are refurbished and recycled when possible

26.4. Storage Requirements

ZAP Engineering must ensure project related wastes are stored and maintained in an organized fashion to encourage proper disposal and minimize risks to employees. Proper waste receptacles must be provided for trash and materials that may be reused or recycled during a project.

26.5. PPE

For each site waste management plan ZAP Engineering shall determine a PPE matrix that includes gloves, hand protection, eye and face protection and/or other necessary PPE.

26.6. Education and Training

Employees shall be instructed on managing waste generated at the work site and on the proper disposal method of wastes. Examples include:

- Instruction on the proper handling, storage and disposal of wastes and depending on the waste generated at the site to also include general instruction on disposal of non-hazardous wastes, trash or scrap materials. If wastes generated are classified as hazardous then employees shall be trained to ensure proper disposal and compliance with regulations.
- Minimization methods to reduce waste.
- Recycling methods and proper PPE to be utilized.

27. HAND OR POWER TOOLS

27.1. Purpose

The purpose of this program is to provide establish requirements for the safe operation of hand and power tools and other portable tools, including proper guarding. All hand and power tools shall be maintained in a safe condition.

This program applies to all ZAP Engineering employees who use hand and power tools.

27.2. Scope

This program is applicable to all ZAP Engineering employees while engaged in work at ZAP Engineering facilities and/or facilities operated by others.

27.3. Responsibilities

Any tool which is not in compliance with any applicable requirement of this plan is prohibited and shall either be identified as unsafe by tagging or locking the controls to render them inoperable or shall be physically removed from its place of operation.

27.3.1. Managers/Supervisors

- Ensure that all employees using portable tools have been trained and fully understand the operations and maintenance procedures of such tools, including their proper use.
- Provide and train employees with all additional PPE that may be needed for the safe operation of portable tools.

27.3.2. Employees

- Shall ensure they have and properly use the correct tool for each task.
- Shall follow manufactures safety and operating instructions before using

27.4. Requirements

27.4.1. General

All tools, regardless of ownership, shall be of an approved type and maintained in good condition.

- Tools are subject to inspection at any time.
- All employees have the authority and responsibility to condemn unsafe tools, regardless of ownership.
- Unsafe tools shall be tagged with a "DO NOT USE OR OPERATE" tag to prevent their use.
- Employees shall always use the proper tool for the job to be performed. Makeshift and substitute tools shall not be used.
- Hammers with metal handles, screwdrivers with metal continuing through the handle, and metallic measuring tapes shall not be used on or near energized electrical circuit or equipment.
- Tools shall not be thrown from place to place or from person to person; tools that must be raised or lowered from one elevation to another shall be placed in tool bags/buckets firmly attached to hand lines.
- Tools shall never be placed unsecured on elevated places.
- Impact tools such as chisels, punches, and drift pins that become mushroomed or cracked shall be dressed, repaired, or replaced before further use.

- Chisels, drills, punches, ground rods, and pipes shall be held with suitable holders or tongs (not with the hands) while being struck by another employee.
- Shims shall not be used to make a wrench fit.
- Wrenches with sprung or damaged jaws shall not be used.
- Tools shall be used only for the purposes for which they have been approved.
- Tools with sharp edges shall be stored and handled so that they will not cause injury or damage. They shall not be carried in pockets unless suitable protectors are in use to protect the edge. They shall not be carried in pockets unless suitable protectors are in use to protect the edge.
- Wooden handles that are loose, cracked, or splintered shall be replaced. The handle shall not be taped or lashed with wire. The handle shall not be taped or lashed with wire.
- Tools shall not be left lying around where they may cause a person to trip or stumble.
- When working on or above open grating, a canvas or other suitable covering shall be used to cover the grating to prevent tools or parts from dropping to a lower level where others are present, or the danger area shall be barricaded or guarded.
- The insulation on hand tools shall not be depended upon to protect users from high voltage shock (except approved live line tools).

27.4.2. Portable Electric Tools

The non-current carrying metal parts of portable electric tools such as drills, saws, and grinders shall be effectively grounded when connected to a power source unless:

- The tool is an approved double-insulated type, or
- The tool is connected to the power supply by means of an isolating transformer or other isolated power supply.

- All powered tools shall be examined prior to use to ensure general serviceability and the presence of all applicable safety devices.
- Powered tools shall be used only within their design and shall be operated in accordance with manufacturer's instructions. The use of electric cords for hoisting or lowering tools shall not be permitted.
- All tools shall be kept in good repair and shall be disconnected from the power source while repairs or adjustments are being made.
- Electrical tools shall not be used where there is hazard of flammable vapors, gases, or dusts without a valid Hot work Permit.
- Ground fault circuit interrupters or use of an Assured Grounding Program shall be used with portable electric tools. This does not apply to equipment run off of portable or truck mounted generators at 5kw or less that are isolated from ground or to equipment ran directly off of secondaries.

27.4.3. Pneumatic Tools

- Pneumatic tools shall never be pointed at another person.
- Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tool from becoming accidentally disconnected.
- Safety clips or retainers shall be securely installed and maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.

- Compressed air shall not be used for cleaning purposes, except where reduced to less than 30 psi and then only with effective chip guarding and personal protective equipment.
- Compressed air shall not be used to blow dust or dirt from clothing.
- The manufacturers stated safe operating pressure for hoses, pipes, valves, filters, and other fitting shall not be exceeded.
- The use of hoses for hoisting or lowering tools shall not be permitted.
- Before adjusting or changing air tools, unless equipped with quick-change connectors, the air shall be shut off at the air supply valve ahead of the hose. The hose shall be bled at the tool before breaking the connection.
- Compressed air tools, while under pressure, must not be left unattended.
- All connections to air tools shall be made secure before turning on air pressure.
- Air at the tool shall not be turned on until the tool is properly controlled.
- All couplings and clamps on pressurized air hose shall be bridged (pinned) with suitable fasteners.
- Hose and hose connections used for conducting compressed air to utilization equipment shall be designed for the pressure and service to which they are subjected.
- Use only approved end-fitting clamps (screw type heater hose clamps are not acceptable).
- While blowing down hose, do not point it toward people.
- Power tools are to be operated only by competent persons who have been trained in their proper use.
- Conductive hose should not be used near energized equipment.
- Foot protection shall be worn while operating paving breakers, tampers, rotary drills, clay spades, and similar impactor-type tools or at other times when instructed by supervision.
- All pneumatically driven nailers, staplers, and other similar equipment provided with automatic fastener feed, which operate at more than 100 psi. pressure at the tool shall have a safety device on the muzzle to prevent the tool from ejecting fasteners, unless the muzzle is in contact with the work surface.
- Airless spray guns of the type which atomize paints and fluids at high pressures (1,000 pounds or more per square inch) shall be equipped with automatic or visible manual safety devices which will prevent pulling of the trigger to prevent release of the paint or fluid until the safety device is manually released.
- In lieu of the above, a diffuser nut (which will prevent high pressure), high velocity release (while the nozzle tip is removed), plus a nozzle tip guard (which will prevent the tip from coming into contact with the operator), or other equivalent protection, shall be provided.

27.4.4. Powder Actuated Tools (Tools actuated by an explosive charge)

- Only those employees who have been certified in their use shall operate these tools.
- Explosive charges shall be carried and transported in approved containers.
- Operators and assistants using these tools shall be protected by means of eye, face, and hearing protection.
- Tools shall be maintained in good condition and serviced regularly by qualified persons. The material upon which these tools are to be used shall be examined before work is

started to determine its suitability and to eliminate the possibility of hazards to the operator and others.

- Prior to use, the operator shall ensure that the protective shield is properly attached to the tool.
- Before using a tool, the operator shall inspect it to determine to his satisfaction that it is clean, that all moving parts operate freely, all guards and safety devices are in place, and that the barrel is free from obstructions.
- Before using tools, the operator shall read and become familiar with the manufacturers operating guidelines and procedures.
- When a tool develops a defect during use, the operator shall immediately cease to use it, until it is properly repaired in accordance with the manufacture's specifications.
- Tools shall not be loaded until just prior to the intended firing time, nor shall an unattended tool be left loaded. Empty tools are to be pointed at any workmen.
- In case of a misfire, the operator shall hold the tool in the operating position for at least 30 seconds. He shall then try to operate the tool a second time. He shall wait another 30 seconds, holding the tool in the operating position; then he shall proceed to remove the explosive load in strict accordance with the manufacturer's instructions.
- A tool shall never be left unattended in a place where it would be available to unauthorized persons.
- Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tile, surface hardened steel, glass block, live rock, face brick, or hollow tile.
- Driving into materials easily penetrated shall be avoided unless such materials are backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying missile hazard on the other side.
- Tools shall not be used in an explosive or flammable atmosphere.

27.4.5. Hydraulic Power Tools

- The fluid used in hydraulic powered tools shall be fire-resistant fluids approved under Schedule 30 of the U.S. Bureau of Mines, Department of the Interior, and shall retain its operating characteristics at the most extreme temperatures to which it will be exposed.
- The manufacturer's safe operating pressures for hoses, valves, pipes, filters, and other fittings shall not be exceeded.
- All hydraulic tools, which are used on or around energized lines or equipment, shall use non-conducting hoses having adequate strength for the normal operating pressures.

27.4.6. Hydraulic Jacks

Loading and Marking

- The operator shall make sure that the jack used has a rating enough to lift and sustain the load.
- The rated load shall be legibly and permanently marked in a prominent location on the jack by casting, stamping, or other suitable means.

Operation and Maintenance

- In the absence of a firm foundation, the base of the jack shall be blocked. If there is a possibility of slippage of the cap, a block shall be placed in between the cap and the load.
- The operator shall watch the stop indicator, which shall be kept clean, in order to determine the limit of travel. The indicated limit shall not be overrun.
- After the load has been raised, it shall be cribbed, blocked, or otherwise secured at once.
- Hydraulic jacks exposed to freezing temperatures shall be supplied with adequate antifreeze liquid.
- All jacks shall be properly lubricated at regular intervals.

Each jack shall be thoroughly inspected before each use. Jacks, which are in unsafe condition, shall be tagged accordingly, and shall not be used until repairs are made.

27.4.7. Abrasive Blast Cleaning Nozzles

The blast cleaning nozzles shall be equipped with an operating valve, which must be held open manually. A support shall be provided on which the nozzle may be mounted when it is not in use.

27.4.8. Fuel Powered Tools

All fuel-powered tools shall be stopped while being refueled, serviced, or maintained, and fuel shall be transported, handled, and stored in accordance with the Flammable and Combustible Liquids Program.

When fuel powered tools are used in enclosed spaces, the applicable requirements for concentrations of toxic gases and use of personal protective equipment, shall be adhered too.

27.4.9. Guarding Portable Tools

Guards shall always be in place and operable while the tool is in use. The guard may not be manipulated in such a way that will compromise its integrity or compromise the protection in which intended. Guarding shall meet the requirements set forth in ANSI B15.1.

Portable Circular Saws

- All portable, power-driven circular saws having a blade diameter greater than 2 in. shall be equipped with guards above and below the base plate or shoe.
- The upper guard shall cover the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for bevel cuts.
- The lower guard shall cover the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work.
- When the tool is withdrawn from the work, the lower guard shall automatically and instantly return to covering position.
- All cracked saw blades shall be removed from service.

Switches and Controls

- All handheld powered tools, circular saws, drills, tappers, fastener drivers, horizontal or vertical angle grinders, etc., shall be with a constant pressure switch or control.

- All hand-held powered circular saws having a blade diameter greater than 2 inches, electric, hydraulic or pneumatic chain saws, and percussion tools without positive accessory holding means shall be equipped with a constant pressure switch or control that will shut off the power when the pressure is released. All hand-held gasoline powered chain saws shall be equipped with a constant pressure throttle control that will shut off the power to the saw chain when the pressure is released.
- Grounding of portable electric powered tools shall meet the electrical requirements that can be found in the Electrical Safety Program. All electric power tools shall be equipped with a three-prong plug.

27.4.10. Portable Abrasive Wheels

Safety Guards Exceptions

- Wheels used for internal work while within the work being ground.
- Mounted wheels used in portable operations 2 inches and smaller in diameter.
- Types 16, 17, 18, 18R, and 19 cones, plugs, and threaded hole pot balls where the work offers protection.
- Guards shall be made of steel or other material with adequate strength.
- A safety guard shall cover the spindle end, nut and flange projections. The safety guard shall be mounted to maintain proper alignment with the wheel, and the strength of the fastenings shall exceed the strength of the guard.
- Exception: safety guards on all operations where the work provides a suitable measure of protection to the operator may be so constructed that the spindle end, nut and outer flange are exposed. Where the nature of the work is such as to entirely cover the side of the wheel, the side covers of the guard may be omitted.
- Exception: the spindle end, nut, and outer flange may be exposed on portable machines designed for, and used with, type 6, 11, 27, and 28 abrasive wheels, cutting off wheels, and tuck-pointing wheels.

Mounting and Inspection of Abrasive Wheels

- Immediately before mounting, all wheels shall be closely inspected and a ring test performed, to make sure they have not been damaged in transit, storage, or otherwise.
- Ring test – “tap" wheels about 45 degrees each side of the vertical centerline and about 1 or 2 inches from the periphery; then rotate the wheel 45 degrees and repeat the test; a sound and undamaged wheel will give a clear metallic tone - If cracked, there will be a dead sound and not a clear "ring.”
- The spindle speed of the machine shall be checked before mounting of the wheel to be certain that it does not exceed the maximum operating speed marked on the wheel.
- Grinding wheels shall fit freely on the spindle and remain free under all grinding conditions.
- A controlled clearance between the wheel hole and the machine spindle (or wheel sleeves or adaptors) is essential to avoid excessive pressure from mounting and spindle expansion.
- The machine spindle shall be made to nominal (standard) size plus zero minus .002 inch, and the wheel hole shall be made suitably oversize to assure safety clearance under the conditions of operating heat and pressure.
- All contact surfaces of wheels, blotters, and flanges shall be flat and free of foreign matter.

- When a bushing is used in the wheel hole it shall not exceed the width of the wheel and shall not contact the flanges.

27.4.11. Portable Grinders

Special "revolving cup guards" which mount behind the wheel and turn with it shall be used. They shall be made of steel or other material with adequate strength and shall enclose the wheel sides upward from the back for one-third of the wheel thickness. It is necessary to maintain clearance between the wheel side and the guard. The clearance shall not exceed one-sixteenth inch.

Vertical portable grinders, also known as right angle grinders, shall have a maximum exposure angle of 180 degrees and the guard shall be located between the operator and the wheel during use. Adjustment of the guard shall ensure that pieces of an accidentally broken wheel will be deflected away from the operator.

Other Portable Grinders
The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on other portable grinding machines shall not exceed 180 degrees and the top half of the wheel shall always be enclosed.

27.4.12. Personal Protective Equipment

Employees using hand and power tools and exposed to the hazard of falling, flying, abrasive, and splashing objects, or exposed to harmful dust, fumes, mists, vapors or gases shall be provided with the particular PPE necessary to protect them from the hazard.

28. HEAT ILLNESS

28.1. Purpose

This program is designed to reduce the risk of work-related heat illnesses.

28.2. Scope

This procedure applies to all work being performed in hot environments.

28.3. Definitions

"Acclimatization" means temporary adaptation of the body to work in the heat that occurs gradually when a person is exposed to it. Acclimatization peaks in most people within four to fourteen days of regular work for at least two hours per day in the heat.

"Heat Illness" means a serious medical condition resulting from the body's inability to cope with a particular heat load, and includes heat cramps, heat exhaustion, heat syncope and heat stroke.

"Preventative recovery period" means a period to recover from the heat in order to prevent heat illness.

"Shade" means blockage of direct sunlight. Canopies, umbrellas and other temporary structures or devices may be used to provide shade. One indicator that blockage is enough is when objects do not cast a shadow

in the area of blocked sunlight. Shade is not adequate when heat in the area of shade defeats the purpose of shade, which is to allow the body to cool. For example, a car sitting in the sun does not provide acceptable shade to a person inside it, unless the car is running with air conditioning.

28.4. Requirements

All managers and supervisors are responsible for implementing and maintaining the Heat Illness Program in their work areas.

28.4.1. Provision of Water

Employees shall have access to potable drinking water. Employees shall have access to potable drinking water. Where it is not plumbed or otherwise continuously supplied, it shall be provided in enough quantity at the beginning of the work shift.

28.4.2. Access to Shade

Employees will be provided with access to shade. Employees suffering from heat illness or believing a preventative recovery period is needed shall be provided access to an area with shade that is either open to the air or provided with ventilation or cooling. Such access to shade shall always be permitted. See definition of "Shade".

28.4.3. Control Measures

Each work location involved in working in hot environments shall implement measures that must be in place to control the effects of environmental factors that can contribute to heat related illnesses. The most common environmental factors are air temperature, humidity, radiant heat sources and air circulation.

Physical factors that can contribute to heat related illness shall be taken into consideration before performing a task. The most common physical factors that can contribute to heat related illness are type of work, level of physical activity and duration, and clothing color, weight and breathability.

Supervisors must ensure personal factors that contribute to heat related illness are taken into consideration before assigning a task where there is the possibility of a heat-related illness occurring. The most common personal factors that can contribute to heat related illness are age, weight/fitness, drug/alcohol use, prior heat-related illness, etc.

Each work site shall develop site specific procedures but shall include the minimum:

- Bring at least 2 quarts per employee at the start of the shift and the supervisors/designated persons will monitor water containers every 30 minutes, and employees are encouraged to report to supervisor/designated person low levels or dirty water.
- Supervisors will provide frequent reminders to employees to drink frequently.
- Every morning there will be short tailgate meetings to remind workers about the importance of frequent consumption of water throughout the shift during hot weather.
- Place water containers as close as possible to the workers.

- When drinking water levels within a container drop below 50%, the water shall be replenished immediately, or water levels should not fall below the point that will allow for adequate water during the time necessary to effect replenishment.
- Disposable/single use drinking cups will be provided to employees or provisions will be made to issue employees their own cups each day.
- Supervisors will set-up an adequate number of umbrellas, canopies or other portable devices at the start of the shift and will relocate them to be closer to the crew, as needed.
- Non-agricultural employers can use other cooling measures if they demonstrate that these methods are as effective as shade.
- Working hours will be modified to work during the cooler hours of the day, when possible.
- When a modified or shorter work-shift is not possible, more water and rest breaks will be provided.
- Supervisors will continuously check all employees and stay alert to the presence of heat related symptoms.
- Supervisors will carry cell phones or other means of communication, to ensure that emergency services can be called and check that these are functional at the worksite prior to each shift.
- Every morning, workers will be reminded about address and directions to the worksite to inform medical responders and emergency procedures.
- All newly hired workers will be assigned a buddy or experienced coworker to ensure that they understood the training and follow the ZAP Engineering procedures.

28.4.4. Training

Training in the following topics shall be provided to all supervisory and non-supervisory employees:

- The environmental and personal risk factors for heat illness;
- The importance of frequent consumption of small quantities of water, up to 4 cups per hour, when the work environment is hot, and employees are likely to be sweating more than usual in the performance of their duties;
- The importance of acclimatization;
- The different types of heat illness and the common signs and symptoms of heat illness;
- The importance to employees of immediately reporting to the employer, directly or through the employee's supervisor, symptoms or signs of heat illness in themselves, or in co-workers;
- ZAP Engineering procedures for responding to symptoms of possible heat illness, including how emergency medical services will be provided should they become necessary;
- ZAP Engineering procedures for contacting emergency medical services, and if necessary, for transporting employees to a point where they can be reached by an emergency medical service provider;
- ZAP Engineering procedures for ensuring that, in the event of an emergency, clear and precise directions to the work site can and will be provided as needed to emergency responders.

Supervisors must receive training in the prevention of heat related illnesses prior to supervising employees working in heat. Supervisors will be trained in the ZAP Engineering heat illness emergency response

procedures to prevent heat illness and procedures to follow when an employee exhibits symptom consistent with possible heat illness, including emergency response procedures.

Communication for employees shall be in a form readily understandable by all affected employees.

ZAP Engineering shall ensure all contractors, subcontractors, staffing companies, etc. employees (including temporary) working outdoors have been trained in heat illness prevention.

29. HYDROGEN SULFIDE – H2S

29.1. Purpose

The purpose of this program is to establish minimum requirements for site specific H2S safety, which will enhance safety in the occupational setting where hydrogen sulfide is present or is recognized as being potentially present.

29.2. Scope

This program sets forth accepted practices for Hydrogen Sulfide (H2S). This program applies to all employees of ZAP Engineering, temporary employees, and any contractors working for ZAP Engineering. When work is performed on a non-owned or operated site, the operator's program shall take precedence, however, this document covers ZAP Engineering employees and contractors and shall be used on owned premises, or when an operator's program doesn't exist or is less stringent.

29.3. Definitions

Contingency Plan - a site-specific written document that provides an organized plan for alerting and protecting the public within an area of exposure following the accidental release of all potentially hazardous atmospheric concentrations of hydrogen sulfide.

Exposure Level - permissible exposure level of hydrogen sulfide is 10 PPM for an 8-hour, time weighted average.

Gas Detector Instrument - An instrument/detector to measure levels of H2S. Instruments may be electronically or manually operated.

Hydrogen Sulfide (H2S) - is an extremely deadly, toxic gas that in its pure state is colorless and is heavier than air. Additionally:

- It is the second most toxic gas known to man, ranking behind hydrogen cyanide and ahead of carbon monoxide.
- It has the odor of rotten eggs at low concentrations.
- In higher concentrations rapidly paralyze the olfactory nerves (sense of smell).
- Is soluble in water and is flammable and poses a definite threat of explosion.

Parts Per Million (PPM) - parts of vapor or gas per million parts of contaminated air by volume.

Personal H2S Monitor - An electronic instrument worn on the person that is set to alarm at 10 PPM of H2S.

Possible Locations of Where May Be Exposed to H2S During Their Job Functions – While clients are required to notify ZAP Engineering of known H2S locations the majority of time H2S can be located in drilling operations, recycled drilling mud, blowouts, water from sour crude wells, blowouts, tank gauging (tanks at producing, pipeline and refining operations), during routine field maintenance involving hydrocarbons, tank batteries and wells.

Venting - the process of discharging a material to the atmosphere through a series piping and/or venting devices, to facilitate the proper and safe dispersion of toxic materials and to minimize personnel exposure.

29.4. Key Responsibilities

29.4.1. Managers and Supervisors

- Shall ensure all employees who are to be assigned to work at locations where hydrogen sulfide is known to be present, or suspected to be present in any concentration, have been trained in hydrogen sulfide safety.
- To ensure employees have been medically approved to wear respirators and trained on the safe use of respirators, including a respirator fit test in accordance with ZAP Engineering's Respiratory Protection Program.
- To ensure employees have been trained and familiar with personal H2S monitors and gas detection instruments.
- To have been provided with the client's safety procedures.
- To ensure the necessary respiratory equipment to perform the work safely is available.
- That each employee has been provided with a copy of this program.

29.4.2. Employees

- Employees are responsible to comply with this program.

29.5. Procedure

29.5.1. Characteristics of Hydrogen Sulfide

The characteristics of hydrogen sulfide include being toxic, colorless, with the odor or rotten eggs at low concentrations, is soluble in water and is flammable:

- Toxicity – See table below. Hydrogen sulfide is a very dangerous and deadly gas - it is colorless and heavier than air. It can accumulate in low places and in small concentrations. Exposure to certain concentrations of H2S can cause serious injury or death.
- Color - H2S is colorless – you can't see it.
- Odor – it has a strong, pungent, somewhat distasteful odor like rotten eggs. In higher concentrations, it can deaden the sense of smell (olfactory nerve). Do Not Rely on Smell To Detect H2s – Rely Strictly On Instruments Designed To Measure Concentrations Of H2S.
- Solubility – H2S mixes with water.
- Flammability – H2S is an explosive gas.

- Toxic by Products – H2S presence can create sulfur dioxide which can ignite without warning

29.5.2. Toxic Effects of Hydrogen Sulfide

CONCENTRATION	PHYSICAL EFFECT
.01 PPM	Can smell odor.
10 PPM	Obvious and unpleasant odor. Beginning eye irritation. ANSI permissible exposure level for 8 hours (enforced by OSHA).
100 PPM	Immediately Dangerous to life or Health (IDLH) Kills smell in 3-15 minutes; may sting eyes and throat. May cause coughing and drowsiness. Possible delayed death within 48 hours.
200 PPM	Kills smell shortly, stings eyes and throat. Respiratory irritation. Death after 1-2 hours exposure.
500 PPM	Dizziness; breathing ceases in a few minutes. Need prompt rescue breathing (CPR). Self-rescue impossible because of loss of muscle control.
700 PPM	Unconscious quickly; death will result if not rescued promptly. 1000 PPM Unconscious at once, followed by death within minutes.

29.6. Health Effects of Exposure to Hydrogen Sulfide

Some basic health effects of H2s can include eye irritations, effects nerve centers of the brain which control breathing.

29.7. General Requirements

ZAP Engineering has a written confined space program per 29 CFR 1910.146 and employees must be aware of site-specific contingency/emergency plans and owners contingency plan provisions.

Each person entering a H2S designated location, regardless of the concentration, shall wear a personal H2S monitor that is set to alarm at 10 PPM and shall always carry a 5-minute escape pack with them . When the alarms sound the employees must either evacuate the area or don the SCBA's or airline respirators. Employees must evacuate the area, don SCBA's or airline respirators upon sounding of H2S alarm.

When work requires opening any equipment on location that has the potential of releasing concentrations of H2S at 100 PPM or higher, two or more H2S trained persons shall be present and follow these procedures prior to and during the opening of the equipment:

- Each person entering the H2S location shall don a personal H2S monitor prior to entry.
- A tailgate meeting will be held with everyone on location to discuss the work plan, the responsibilities of each person and the site-specific contingency plan.
- Each person shall have either a self-contained breathing apparatus (SCBA) or a supplied airline respirator equipped with a 5-minute escape pack and shall be worn when opening the equipment to the surrounding atmosphere.
- At least one person (per two workers), equipped with a SCBA will act as a stand-by person and may not participate in the work being performed until the atmosphere has

been tested and found to have no H2S present in quantities over 10 PPM. The stand-by person shall be stationed up wind, within 100 feet and in clear view of the workers.

- If an operator or other third party provides the stand-by person, it will be the responsibility of the ZAP Engineering manager/supervisor in charge to verify that the person has been H2S, CPR, and First Aid trained, and that they have been provided the proper respiratory equipment.
    - Only ZAP Engineering employees may wear ZAP Engineering respirator equipment.
    - If ZAP Engineering employees will use client or other third-party equipment, the equipment must be inspected to ensure it is safe to use and meets ZAP Engineering's requirements.
- After the equipment has been locked and tagged out (per ZAP Engineering Lockout/Tagout Program), opened and the H2S concentration has been cleared to less than 10 PPM, the stand-by person will no longer be required. Work may then be performed without respiratory equipment, except for the required 5-minute escape pack.

29.8. Safe Work Procedures

- Maintain compliance with permit requirements of ZAP Engineering and any requirements by the client.
- Verify that proper safety equipment is available, functioning properly and is utilized.
- Check and remain aware of wind conditions and direction.
- Perform a thorough check of the downwind area prior to the start of any potentially hazardous work activity.
- Check for other personnel and ignition sources.
- Ventilate work areas by venting and purging lines and vessels prior to beginning any work activities.
- Keep all non-essential personnel away from work areas.
- Immediately vacate the area when any H2S monitor sounds and do not re-enter without proper respiratory protection.

29.9. Required Equipment

The following equipment shall be provided and used as required by this program:

- Methods of detecting H2S using fixed or portable monitors and will alarm at the appropriate permissible exposure limits of 20 PPM for 1910 or 10 PPM for 1926? Personal or area monitors that alarm when PEL exceeds the preset level of 20 PPM for OSHA 1910 or 10 PPM for OSHA 1926 requirements.
- Portable H2S gas testing instrument, either electronic or manual pump operated, capable of testing the suspected concentrations of H2S in the system.
- Each testing instrument must be capable of testing the suspected concentrations of H2S by using the manufacturer's recommended calibrated tube or other means of measuring the concentration of gas.
- Testing instruments shall be calibrated periodically according to the manufacturer's recommendation, and at least annually.
- Calibration kits with regulator for calibrating the personal monitor.

- Calibration gas cylinder for testing the personal monitor.
- Approved self-contained breathing apparatus or airline respirator with escape SCBA should be used with H2S with a 5-minute escape pack and shall be worn when opening the equipment to the surrounding atmosphere.
- At least one person (per two workers), equipped with a SCBA will act as a stand-by person and may not participate in the work being performed until the atmosphere has been tested and found to have no H2S present in quantities over 10 PPM. The stand-by person shall be stationed up wind, within 100 feet and in clear view of the workers.
- If an operator or other third party provides the stand-by person, it will be the responsibility of the ZAP Engineering manager/supervisor in charge to verify that the person has been H2S, CPR, and First Aid trained, and that they have been provided the proper respiratory equipment.
    - Only ZAP Engineering employees may wear ZAP Engineering respirator equipment.
    - If ZAP Engineering employees will use client or other third-party equipment, the equipment must be inspected to ensure it is safe to use and meets ZAP Engineering's requirements.
- Respirator wearers requiring corrective eyewear will be fitted with spectacle kits according to the respirator manufacturer, at no expense to the employee.
- Respirators and their components, including all fittings of hoses, shall not be interchanged, which if done, would violate the approval rating of said respirator or related equipment.

29.10. Medical

Each employee shall have completed a medical evaluation by a physician or licensed health care professional to determine the employee's ability to wear a respirator as required by the ZAP Engineering Respiratory Protection Program.

Each employee will successfully complete the medical questionnaire and examination before being allowed to be fit tested with a respirator.

29.11. Training

Employees required to work on H2S locations will be trained. Training shall consist of:

- Physical and chemical properties of H2S
- Sources of H2S
- Human physiology
- Signs and symptoms of H2S exposure, acute and chronic toxicity
- Symptomatology of H2S exposure
- Medical evaluation
- Work procedures
- Personal protective equipment required working around H2S
- Use of contingency plans and emergency response
- Burning, flaring, and venting of H2S
- State and federal regulatory requirement
- H2S release dispersion models

- Rescue techniques, first aid, and post exposure evaluation
- Use, care, and calibration of personal monitors and gas detection instruments
- Respirator inspections and record keeping

Each respirator wearer will complete Respiratory Protection training and a Respirator Fit Test, after being given a medical clearance and before entering any H2S location.

Employees and other personnel visiting H2S locations who will not be involved in the work shall be briefed on the following prior to entering:

- Site-specific sources of H2S
- Health hazards of H2S
- Routes of egress
- Emergency assembly areas
- Applicable alarm signals and
- How to respond in the event of an emergency.

29.11.1. Rescue

Each employee, when working alone in a H2S designated area, shall plan and become familiar with self-escape procedures to include being aware of wind direction and obstacles to avoid when exiting the work area.

Employees working under the buddy system shall pre-plan an emergency rescue and/or evacuation procedure prior to commencing work and arrange for periodic communications with his/her supervisor and document the discussion on each employee's service report.

29.11.2. Respirator Inspections

Respirators will be inspected by the employee before each use and at least monthly.

The inspection will include the respirator face piece, hose, harness, 5minute escape pack cylinder and all other components of the air supply systems used.

Monthly inspections will be documented as per ZAP Engineering Respiratory Protection Program and will be kept on file at the local office for review during safety audits.

29.11.3. Monitors and Gas Detector Calibration

Each personal H2S monitor shall be calibrated at least monthly and the results recorded on the calibration log.

Those monitors that do not require calibrating shall be bump checked with calibration gas to test alarms, monthly or prior to use if not used routinely.

30. INCIDENT INVESTIGATING AND REPORTING

30.1. Purpose

The purpose of this program is to have effective procedures for reporting and evaluating/investigating incidents and non-conformances in order to prevent further occurrences.

30.2. Responsibilities

Responsibilities for incident investigation will be assigned prior to occurrence of an incident. Individual responsibilities for reporting and investigation must be pre-determined and assigned prior to incidents.

30.2.1. ZAP Engineering Director of Safety

- Ensures investigations are conducted and assists in identifying corrective actions.

30.2.2. Site Manager and Supervisors

- Investigates (or assists in) incident investigations
- Corrects non-conformances
- ZAP Engineering injured employees to the medical provider for initial treatment.

30.2.3. Employees

Immediately report any injury, job related illness, spill or damage to any property to their immediate supervisor. If their immediate supervisor is not available, the employee is then to immediately notify the project manager. Employees who could be first responders will be trained and qualified in first aid techniques to control the degree of loss during the immediate post-incident phase.

30.3. Procedure

After immediate rescue or response, actions to prevent further loss will occur if the scene is safe. For example, maintenance personnel should be summoned to assess integrity of buildings and equipment, engineering personnel to evaluate the need for bracing of structures, and special equipment/response requirements such as safe rendering of hazardous materials or explosives employed.

30.3.1. Investigations of Incidents & Non-conformances

Investigation is an important part of an effective safety program in that it determines the root cause and corrective actions necessary to prevent similar incidents or non-conformances.

The following must be reported to the employee's supervisor immediately. If that person is not available then the ZAP Engineering Safety Manager shall be immediately notified for:

- Near miss incidents with the potential to harm people, the environment or assets
- Work related injuries or illnesses; Property damage including vehicle incidents
- Hazardous chemical spillage, loss of containment and contamination
- Non-conformance to safety or environmental rules, policies or standards

The supervisor shall make the necessary notifications and begin the incident investigation process.

In the case of a major injury or incident the scene of the event should be closed off and kept "as is" at the time of the incident. This is vital for effective incident investigation.

Incident investigation occurs as soon as possible, while the facts are still fresh within the minds of those involved (i.e. witnesses). Take the opportunity to talk to all of those involved before they become unavailable or memory fades. An incident investigation must be thorough and concerned only with cause and prevention and must be separate from administrative disciplinary action.

30.3.2. Equipment

Proper equipment will be available to assist in conducting an investigation. Equipment may include some or all of the following items; writing equipment such as pens/paper, measurement equipment such as tape measures and rulers, cameras, small tools, audio recorder, PPE, flags, equipment manuals, etc. The Safety Manager shall have an incident investigation kit prepared in advance.

30.3.3. Incident Reporting Matrix

The Incident Reporting Matrix identifies, based on type of incident, who within corporate management shall be verbally notified and when. It also specifies which type of report from the field shall be completed based on the type of incident.

Reporting of the incident must occur in a specified manner based on site specific requirements and the reporting sequence shall be posted.

EXTERNAL INCIDENT NOTIFICATION MATRIX

TYPE OF INCIDENT	WHO TO NOTIFY VERBALLY	WHEN	INCIDENT REPORT FORM
Minor First Aid	ZAP Director of Safety	After treatment	Yes
Injury Above Minor First Aid	911 / Site Medical Response / Director of Safety	ASAP	Yes
As Required Injury Reporting	OSHA / Director of Safety	ASAP	Yes
Fire / Explosion	911 / Site Fire Response / Director of Safety	ASAP	Yes
Reportable Spill	Site Environmental / Director of Safety	ASAP	Yes
Property/Vehicle Damage	Owner Client	Within 4 hrs.	Yes

INTERNAL INCIDENT NOTIFICATION MATRIX

TYPE OF INCIDENT	WHO TO NOTIFY VERBALLY	WHEN	INCIDENT REPORT FORM
Minor First Aid	Director of Safety	ASAP	Yes
Injury Above Minor First Aid	Director of Safety	ASAP	Yes
As Required Injury Reporting	Director of Safety	ASAP	Yes
Fire / Explosion	Director of Safety	ASAP	Yes
Reportable Spill	Safety Manager	ASAP	Yes
Property/Vehicle Damage	Safety Manager	ASAP	Yes

30.3.4. Time Elements for OSHA and Client Notification

Required incidents must be verbally reported to OSHA within 8 hours of their discovery. Incidents must also be reported to the owner client as soon as possible or in a timely manner (within 8 hours of incident).

30.3.5. Incident Review Team and Incident Investigation Report

All incidents will be investigated to the appropriate level with regards to incident severity. While all incidents should be investigated, the extent of such investigation shall reflect the seriousness of the incident utilizing a root cause analysis process or other similar method determined by the ZAP Engineering Director of Safety. They will form an Incident Review Team that participates in the determination of the final root cause investigative incident report. The team consists of representatives of management or other designees as assigned by the ZAP Engineering onsite Safety Manager.

30.3.6. Initial Identification/Assessment of Evidence

Initial identification of evidence immediately following the incident could include a listing of people, equipment, and materials involved and a recording of environmental factors such as weather, illumination, temperature, noise, ventilation, etc.

30.3.7. Collection/Preservation and Security of Evidence

Evidence such as people, positions of equipment, parts, and papers must be preserved, secured and collected through notes, photographs, witness statements, flagging, and impoundment of documents and equipment. All shall be dated.

30.3.8. Witness Interviews and Statements

Witness interviews and statements must be collected. Locating witnesses, ensuring unbiased testimony, obtaining appropriate interview locations, and use of trained interviewers should be detailed. The need for follow-up interviews should also be addressed. All items shall be dated.

The final incident investigation report consists of findings with critical factors, evidence, corrective actions, responsible parties, and timelines for corrective action completion.

Results of incident investigations are communicated to employees via the Incident Notice form.

30.3.9. Preparation of the Written Incident Report

Written incident reports will be prepared and include the Field Incident Report Form and a detailed narrative statement concerning the events. The format of the narrative report may include an introduction, methodology, summary of the incident, Incident Review Team member names, narrative of the event, findings and recommendations. Photographs, witness statements, drawings, etc. should be included.

The supervisor completes the ZAP Engineering Field Incident Report and takes the below steps when beginning an incident investigation.

- Provide emergency assistance, as needed and qualified for
- Secure the area as quickly as possible to retain area in the same condition at the time of the incident
- Notify management by phone according to the Incident Notification Matrix
- Identify potential witnesses
- Use investigation tools, as needed (camera, drawings, video, etc.)
- Tag out for evidence any equipment that was involved
- Interview witnesses (including the effected employee) and obtain written, signed statements and fax to the ZAP Engineering Safety Manager

- Prepare ZAP Engineering Field Incident Report, sign the form, fax it to the ZAP Engineering Safety Manager
- Implement any immediate corrective actions needed

30.3.10. Incident Notice Form

ZAP Engineering shall provide documentation and communication of lessons learned and review of similar operations to prevent reoccurrence. Lessons learned are reviewed and communicated. Changes to processes must be placed into effect to prevent reoccurrence or similar events.

In order to communicate incident information and lessons learned from incidents the ZAP Engineering Director of Safety shall send the Incident Notice to all work sites. The form shall be posted on employee bulletin boards and shall be discussed in weekly safety meetings until all employees at the job site have been informed of the incident.

30.3.11. Corrective Actions Resulting from Incident Investigations

Incident investigations should result in corrective actions, individuals should be assigned responsibilities relative to the corrective actions, and these actions should be tracked to closure.

Site Managers are held accountable for closing corrective actions. Corrective actions for safety improvement input are posted at each site and tracked by the ZAP Engineering Director of Safety to ensure timely follow up and completion.

Corrective actions are also used as needed for revisions to site specific safety plans and the ZAP Engineering Safety and Health Management System.

30.3.12. Injury Classifications

Injuries shall be classified per the following:

First Aid – Dressing on a minor cut, removal of a splinter, typically treatment for household type injuries.

Lost Workday Case (LWDC) – An injury that results in an employee being unfit to perform any work on any day after the occurrence of an occupational injury.

Number of Lost or Restricted Workdays – The number of days, other than the day of occupational injury and the day of return, missed from scheduled work due to being unfit for work or medically restricted to the point that the essential functions of a position cannot be worked.

Occupational Injury – An injury which results from a work-related activity.

Occupational Illness – Any abnormal condition or disorder caused by exposure to environmental factors while performing work that resulted in medical treatment by a physician for a skin disorder, respiratory condition, poisoning, hearing loss or other disease (frostbite, heatstroke, sunstroke, welding flash, diseases caused by parasites, etc.). Do not include minor treatments (first aid) for illnesses.

Recordable Medical Case (RMC) – An occupational injury more severe than first aid that requires advanced treatment (such as fractures, more than one stitch, prescription medication, unconsciousness, removal of

foreign body embedded in eye (not flushing), admission to a hospital for more than observation purposes) and yet results in no lost work time beyond the day of injury.

Restricted Workday Case (RWDC) – An occupational injury which results in a person being unfit for essential functions of the regular job on any day after the injury but where there is no time lost beyond the day of injury. An example would include an injured associate is kept at work but not performing within the essential functions of their regular job.

Work- or Work-Related Activity – All incidents that occur in work related activities during work hours, field visits, etc. are reportable and are to be included if the occupational injury or illness is more serious than requiring simple first aid. Incidents occurring during off hours and incidents while in transit to or from locations that are not considered an employee's primary work are not reportable.

The following are examples of incidents that will not be considered as recordable:

- The injury or illness involves signs or symptoms that surface at work but result solely from a non-work-related event or exposure that occurs outside the work environment.
- The injury or illness results solely from voluntary participation in a wellness program or in flu shot, exercise class, racquetball, or baseball.
- The injury or illness is solely the result of an employee eating, drinking, or preparing food or drink for personal consumption (whether bought on the employer's premises or brought in). The injury or illness is solely the result of an employee doing personal tasks (unrelated to their employment) at the establishment outside of the employee's assigned working hours.
- The illness is the common cold or flu (Note: contagious diseases such as tuberculosis, brucellosis, hepatitis A, or plague are considered work-related if the employee is infected at work).

30.4. Training

ZAP Engineering shall train personnel in their responsibilities and incident investigation techniques. Personnel must be trained in their roles and responsibilities for incident response and incident investigation techniques. Training requirements relative to incident investigation and reporting are described below:

- Training frequency will be based on the specific are of responsibility but shall not exceed once every two years.
- Training requirements relative to incident investigation and reporting shall include:
  - Awareness
  - First Responder Responsibilities
  - The Initial Investigation at the Accident Scene
  - Managing the Accident Investigation
  - Collecting Data
  - Analyzing Data
  - Developing Conclusions and Judgments of Need
  - Reporting the Results

31. LADDER SAFETY

31.1. Purpose

The purpose of the program is to prescribe rules and establish minimum requirements for the construction, care, and use of the common types of ladders.

All ladders that are purchased and placed into service; or, any ladders that are engineered, manufactured and installed on any ZAP Engineering equipment shall follow the requirements set forth by this program.

31.2. Scope

This program is applicable to all employees who may utilize ladders. When work is performed on a non-owned or operated site, the operator's program shall take precedence, however, this document covers ZAP Engineering employees and contractors and shall be used on owned premises, or when an operator's program doesn't exist or is less stringent.

31.3. Definitions

Ladder - an appliance usually consisting of two side rails joined at regular intervals by cross- pieces called steps, rungs, or cleats, on which a person may step in ascending or descending.

Stepladder - a self-supporting portable ladder, nonadjustable in length, having flat steps and a hinged back. Its size is designated by the overall length of the ladder measured along the front edge of the side rails.

Single ladder - a non-self-supporting portable ladder, nonadjustable in length, consisting of but one section. The overall length of the side rail designates its size.

Extension ladder - a non-self-supporting portable ladder adjustable in length. It consists of two or more sections traveling in guides or brackets so arranged as to permit length adjustment. Its size is designated by the sum of the lengths of the sections measured along the side rails.

Fixed ladder - a ladder permanently attached to a structure, building, or equipment.

Individual-rung ladder - a fixed ladder each rung of which is individually attached to a structure, building, or equipment.

Cage - a guard that may be referred to as a cage or basket guard, which is an enclosure that is fastened to the side rails of the fixed ladder or to the structure to encircle the climbing space of the ladder for the safety of the person who must climb the ladder.

31.4. Key Responsibilities

31.4.1. Managers and Supervisors

- Managers and supervisors are responsible for ensuring that all employees, and/or contractors have been trained in the use and inspection of ladders in accordance to the manufactures guidelines.

- Managers and supervisors are responsible for ensuring that all employees and contractors are aware that if an inspection discovers a defect, the ladder shall not be used and taken out of service.

31.4.2. Employees

- Employees shall inspect ladders prior, during and at the completion of each use to ensure the condition of the ladder and the safety of its occupants.
- Employees are responsible for following this program and reporting any damage or repairs that may be needed to their supervisor.

31.5. **Procedure**

31.5.1. Inspection, Care and Safe Work Practices of Ladders

Inspection

Ladders shall be inspected by a competent person for visible defects on a periodic basis and after any occurrence that could affect their safe use.

- Ladder rungs must be uniformly spaced or meet OSHA/ANSI specifications. Ladder rungs, cleats, and steps shall be parallel, level, and uniformly spaced, when the ladder is in position for use.
- Portable and fixed ladders with structural defects, such as, but not limited to, broken or missing rungs, cleats, or steps, broken or split rails, corroded components, or other faulty or defective components, shall either be immediately marked in a manner that readily identifies them as defective, or be tagged with "Do Not Use" or similar language, and shall be withdrawn from service until repaired
- If a ladder is tipped over, it shall be inspected by a competent person for side rail dents or bends, or excessively dented rungs; check all rung to side rail connections; check hardware connections; check rivets for shears.
- Ladders with broken or missing steps, rungs, or cleats, broken side rails, or other faulty equipment shall not be used; improvised repairs shall not be made.
- All wood parts shall be free from sharp edges and splinters; sound and free from accepted visual inspection from shake, or other irregularities.

Care

- Ladders shall always be maintained in good condition, the joint between the steps and side rails shall be tight, all hardware and fittings securely attached, and the movable parts shall operate freely without binding or undue play.
- Metal bearings of locks, wheels, pulleys, etc., shall be frequently lubricated.
- Frayed or badly worn rope shall be replaced. Safety feet and other auxiliary equipment shall be kept in good condition to ensure proper performance.
- Rungs shall be kept free of grease and oil.
- Ladders shall be stored in a well-ventilated area in a manner to prevent sagging and warping.

Ladder Safe Work Practices

- Ladders shall be used only for the intended purpose for which they were designed.

- The ladder shall be secured at the top or held by another person at the base.
- The footing of the ladder shall be placed on a stable and level surface.
- Extension ladders shall be placed at a 4:1 ratio. Ladders shall be used at an angle such that the horizontal distance from the top support to the foot of the ladder is approximately one-quarter of the working length of the ladder (the distance along the ladder between the foot and the top support.
- When ladders are not able to be extended then the ladder shall be secured at its top to a rigid support that will not deflect
- Ladders shall not be placed on boxes, barrels, or other unstable bases to obtain additional height.
- Ladders shall not be used in a horizontal position as platforms, runways, or scaffolds.
- Ladders shall not be used by more than one man at a time.
- Ladders shall not be placed in front of doors opening toward the ladder unless the door is blocked open, locked, or guarded.
- If a ladder is used in a high traffic area, barricades shall be placed to avoid accidental displacement due to collisions.
- Do not stand on the top two rungs or top of step ladders.

- On two-section extension ladders the minimum overlap for the two sections in use shall be as follows:

Size of Ladder (feet)	Overlap (feet)
Up to and including 36’	3
Over 36 up to and including 48’	4
Over 48 up to and including 60’	5

- Ladders shall extend a minimum of 3 feet above top of upper landing surface. The ladder side rails shall extend at least 3 feet (.9m) above the upper landing surface.
- The employee shall always maintain a three (3)-point grip on the ladder and carry tools/equipment on a belt or hoist up. Do not carry anything in the hands that could cause injury in case of fall.
- The employee shall face the ladder while ascending or descending.
- The bracing on the back legs of stepladders is designed solely for increasing stability and not for climbing.
- The ladder shall not be moved while occupied.

31.5.2. Portable Ladders

Stepladders shall not be longer than 20 feet. Single ladders shall not be longer than 30 feet.

A two-section extension ladders shall not be longer than 60 feet. All ladders of this type shall consist of two sections, one to fit within the side rails of the other and arranged in such a manner that the upper section can be raised and lowered.

Keep all ladders at least ten (10) feet away from power lines.

Ladders shall have the correct load capacity for the task and not be loaded beyond the maximum intended load for which they were built nor in excess of the manufacturer's rated capacity. Weight includes the combined weight of the climber and his tools/equipment. Ladders are rated as the following:

- I (holds 250 lbs)
- I-A (holds 300 lbs)
- II (holds 225 lbs)
- III (holds 200 lbs)

31.5.3. Fixed Metal Ladders

Ladders shall be constructed to withstand a minimum of 200 pounds.

All metal rungs shall have a minimum diameter of ¾ inches and wooden rungs shall have a minimum diameter of 1 1/8 inches.

Rungs shall not be more than 12 inches apart and shall be uniform throughout the length of the ladder.

Rungs shall be a minimum length of 16 inches and provide protection so a foot cannot slip off the end.

Rungs shall have a minimum of 7 inches between itself and the structure behind it.

A fall restraint system must be provided for all fixed ladders greater than six feet in length.

- A cage is required when the fixed ladder is at least twenty feet tall.
- Cages on fixed ladders shall not begin at a point less than 7 feet nor greater than 8 feet from the walking surface below the cage.
- Cages shall provide a clear width of 15 inches in each direction of the rung's centerline.
- Cages shall not extend less than 27 inches, but not greater than 28 inched from the centerline of the rung.
- A climbing fall restraint system may be substituted for a ladder cage.

32. CRANES

32.1. Purpose

The purpose of this program is to outline the procedures for safe operations and the training requirements regarding crane and lifting devices, including all rigging is designed, constructed, installed, maintained and operated to perform safely.

32.2. Scope

This program is applicable to all employees who may utilize cranes and lifting equipment.

It applies to all ZAP Engineering employees who operate overhead cranes, hoists, and rigging equipment in the scope of their job duties and assignments. When work is performed on a non-owned or operated site, the operator's program shall take precedence, however, this document covers ZAP Engineering employees and shall be used on owned premises, or when an operator's program doesn't exist or is less stringent.

32.3. Key Responsibilities

32.3.1. Managers and Supervisors

- For ensuring only trained personnel operate the equipment.
- Establish and maintain a daily, monthly and annual inspection program.
- Establish a recordkeeping log for safety checks, maintenance and repairs.
- Are responsible to ensure that employees and contractors are trained and qualified on the proper operations and have been trained in rigging safety by a competent person. Modifications or additions which affect the safe operation of the equipment may only be made with the manufacturer's written approval.
- Are responsible to see that all provisions of this program are followed and that rigging inspections are performed, and the equipment is in safe operating condition.

32.3.2. Employees

- Personnel are responsible for visually checking the equipment they are using and reporting any observable wear, needed repairs or damage to their supervisor. They shall also report all equipment malfunctions immediately.
- Employees are responsible to follow the requirements of this program.

32.4. Procedure

Operating controls shall be plainly marked to indicate the direction of travel.

All manufacturer procedures applicable to the operational function of equipment must be complied with. All manufacturer procedures applicable to the operational functions of equipment, including its use with attachments, must be complied with.

Procedures applicable to the operation of the equipment be readily available in the cab at all times. The operator shall have access to procedures applicable to the operation of the equipment. Procedures include rated capacities (load charts), recommended operating speeds, special hazard warnings, instructions and operator's manual.

32.4.1. Operator Qualification

Operators must be determined to be qualified before they are permitted to operate any crane. Only those employees qualified by training or experience shall be allowed to operate equipment and machinery. Within 4 years of November 8th, 2010, employers must ensure operators be qualified/certified by one of the following methods:

- Certification by an accredited crane operator testing organization
- Qualification by an audited employer program
- Qualification by the U.S. military
- Licensing by a government entity

32.4.2. Load Chart

Each hoist shall have a legible load chart showing the rated capacity in all permitted working positions and configurations of use, manufactures name, model, serial number and year of manufacture or shipment date permanently marked or noted clearly, permanently posted on the equipment, weatherproofed and conspicuous on the equipment and shall be kept legible at all times. The load chart will be issued to the equipment operator, who must always have it available when operating the equipment.

32.4.3. Modifying Equipment

Modifications or additions that may affect the capacity or safe operation of the equipment must not be made without written approval from the manufacturer or approval from a registered professional engineer. The manufacturer must approve all modifications/additions in writing. A registered professional engineer must be qualified with respect to the equipment involved and must ensure the original safety factor of the equipment is not reduced.

32.4.4. Prior to Lifting

Cranes must not be used unless ground conditions are able to support the equipment and any supporting materials per the manufacturer's specifications. Equipment must not be assembled or used unless ground conditions are firm, drained, and graded to a sufficient extent so that, in conjunction (if necessary) with the use of supporting materials, the equipment manufacturer's specifications for adequate support and degree of level of the equipment are met.

All loads shall be hooked or slung under the direction of a competent employee.

Prior to operating any equipment, the operator must be familiar with all recent entries in its log book.

The operator must carry proof of training.

Before the start of each shift or use an operator uses a crane or hoist, the operator must inspect the crane or hoist was inspected for that work shift, and the control and safety devices were tested for that work shift to detect any defect, malfunction or hazardous condition. All safety devices must be in proper working order before operation begins. Safety devices are required to be on all equipment and must be in proper working order before operations begin. If any of the devices are not in proper working order the equipment must be taken out of service and operations must not resume until the device is working properly again. Examples of safety devices may include crane level indicator, boom stops, jib stops, foot pedal brake locks, horns, etc.

A fire extinguisher must be immediately available in the cab of each crane or other hoisting equipment.

The operator has the authority to stop and refuse to handle loads whenever there is a safety concern. Whenever there is a safety concern, the operator must have the authority to stop and refuse to handle loads until a qualified person has determined that safety has been assured.

When the operator of a crane or hoist does not have a clear and unobstructed view of the boom, jib, load line, load hook and load throughout the whole range of the hoisting operation, the operator must act only on the directions of a qualified, designated signaler who has a clear view of the things the operator cannot see. The operator of the crane or hoist must stop the operation of the equipment on receiving a stop signal from any person.

Operators of hoisting equipment shall disregard signals from anyone except designated signal persons but in an emergency other employee may give a stop signal.

Where the design of a crane is such that the boom may fall over backward, positive boom stops shall be installed in accordance with the manufacturer's instructions.

No employee shall ride or be permitted to ride on loads, hooks or similar equipment unless specifically authorized by his or her supervisor.

Marking Boundaries

ZAP Engineering must address safety measures to be used when the equipment has the potential to strike and injure an employee or pinch/crush an employee against any other object. ZAP ENGINEERING identifies hazard areas by marking the boundaries of the crane swing radius with warning lines, railings or similar barriers. Employees or other persons are not allowed within the barrier when operations are taking place. The crane will immediately be required to stop movement if someone enters the swing radius area.

Overhead Power Lines

A pre-operation hazard assessment will be performed to identify the work zone and determine if any part of the equipment could reach closer than 20 feet to a power line. The work zone shall be identified by demarcating boundaries such as flag and range limiting devices or defining the work zone as 360 degrees around the equipment up to the maximum working radius. The hazard assessment must determine if any part of the equipment could get closer than 20 feet to a power line.

ZAP Engineering will ensure measures must be taken if determined that any part of the equipment, load line or load could get closer than 20 feet to a power line. If it is determined that any part of the equipment, load line or load could get closer than 20 feet to a power line then at least one of the following measures must be taken:

- Ensure the power lines have been deenergized and visibly grounded.
- Ensure no part of the equipment, load line or load gets closer than 20 feet to the power line.
- Determine the line's voltage and minimum approach distance permitted in Table A below.

Voltage (nominal, kV, alternating current)	**Minimum Clearance Distance** (feet)
up to 50	10
over 50 to 200	15
over 200 to 350	20
over 350 to 500	25
over 500 to 750	35
over 750 to 1,000	45
over 1,000	(as established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution).

Note: The value that follows "to" is up to and includes that value. For example, over 50 to 200 means up to and including 200kV.

Assembling/Disassembling Equipment

The manufacturer instructions and prohibitions must be followed when assembling and/or disassembling equipment. The manufacturer's procedures and prohibitions must be complied with when assembling and disassembling equipment.

A competent and qualified person must direct the assembly/disassembly of equipment. ZAP Engineering will ensure the assembly/disassembly of equipment must be directed by a competent and qualified person.

32.4.5. Handling the Load

Size of Load

The rated capacity of a crane or hoist must not be exceeded, except for rated load test. The working load shall not be exceeded and shall be determined by the original manufacturer of the equipment, a registered professional engineer, or other persons whose qualifications are acceptable to local regulatory requirements.

Attaching the Load

- The load shall be attached to the hook by means of slings or other suitable and effective means which shall be properly rigged to ensure the safe handling of the load.
- Chain and rope slings shall be free of kinks or twists before use.
- Baskets, tubs, skips or similar containers used for hoisting bulk materials shall be loaded so as not to exceed their safe carrying capacity.
- The hoist rope shall not be wrapped around the load.
- The load shall not be moved without checking the balance and the brakes. Brakes are checked by raising the load a few inches and applying the brakes.

32.4.6. Load Lifting Manual

Safe lifting procedures can be found in the Lifting Handbook located in the operations office as designated for each work site by the Manager.

32.4.7. Safe Lifting

- If the operator of a lifting device has any doubts as to the safety of employees in the vicinity of the lift, the operator must not move any equipment or load until the operator is assured that the working conditions are safe. He or she shall report the circumstances to his or her supervisor who then shall be responsible for determining the action to be taken.
- Loads will be carried as close to the grade as possible and tag lines shall be rigged as necessary to control swinging of the load.
- Prior to moving a load ensure that the travel path of the load is free and clear of any undesirable obstructions.
- A suspended load shall not be left unattended by an employee.
- Ensure all employees who may be affected by the lift are aware of the hazards and are adequately protected.
- ZAP Engineering must ensure that work is arranged, if it is reasonably practicable, so that a load does not pass over employees. An operator of a lifting device must not pass the load on the device over employees unless no other practical alternative exists in the circumstances and the employees are effectively warned of the danger by an

audible alarm or other effective means. The operator of a lifting device that is travelling with a load must ensure that the load is positioned as close to the ground or grade as possible.

- A person working at a workplace must not stand or pass beneath a suspended load unless the employee has been effectively warned of the danger and the operator of the lifting device knows the employee is under the suspended load.
- Release the load only after the stability of the load has been verified and loads shall be safely landed and supported before unhooking.

If a hoist or crane is designed to be operated with outriggers or other stabilizing devices ZAP Engineering shall ensure:

- The outriggers or other stabilizing devices are used in accordance with manufactures instructions.
- Are set on a solid footing or pad.
- Have their controls if any readily accessible to the operator and in a suitable position for safe operation.
- The area around the outriggers or other stabilizing devices is kept free of obstruction.
- There is a proper minimum clearance between any moving part of the crane and any obstacle near the base of the hoist or crane.
- Where there is a danger of an employee being trapped or crushed by any moving part of the crane when the crane swings, the area around the base of the crane is barricaded to restrict the entry of employees.

32.4.8. Logbook Procedure

The logbook will always be readily available to the operator and to another employee concerned with the maintenance and safe operation of the equipment. The operator shall be responsible for recording defects, operating difficulties, the need for maintenance and all maintenance and alteration work performed. If the operator requests, they shall be given a copy of the logbook.

The logbook for the equipment at a project shall include the greater of the immediately preceding twelve months or the period the crane or similar hoisting device is on the project.

When not being operated the logbook will be located in the operations office as designated for each work site by the Manager.

All logbook entries shall, on a regular basis, be signed by the person who performs the inspection, maintenance or calibration and review.

The logbook will include the following information:

- The date and time any work was performed on the hoist.
- Length of time in lifting service including hours of service.
- All defects and deficiencies and when they were detected.
- Details on all inspections, examinations, calibrations, checks and tests.
- Repairs or modifications performed or maintenance history.
- The record of certification.
- Details on any incident that may affect the safe operation of the equipment.

32.4.9. Inspections

Each crane and hoist must be inspected and maintained at a frequency and to the extent required to ensure that every component is capable of carrying out its original design function with an adequate margin of safety and is maintained in good working order. Inspections shall also be conducted at regular intervals as recommended by the manufacturer and by law.

Records of inspection and maintenance must be kept by the equipment operator and other persons inspecting and maintaining the equipment, for the following types of lifting equipment:

- A crane or hoist with a rated capacity of 900kg (2200 lbs.) or more
- A crane or hoist used to support an employee
- A tower crane
- A mobile crane, boom truck or sign truck
- A side boom tractor or pipe layer
- A construction material hoist
- A chimney hoist

The following inspections shall occur at the indicated frequency:

New Equipment

Before being placed in service, new hoisting equipment, or hoisting equipment which has had modifications in the design or has undergone major repairs, shall be inspected and proof tested under the direction of a competent person who shall give the written warranty of the safe capacity of the equipment.

Daily

A visual inspection of the equipment will be conducted by a competent person prior to each shift. A competent person must conduct a visual inspection of equipment prior to each shift. The inspection must consist of observation for apparent deficiencies. Some inspection items shall include control mechanisms, pressurized lines, hooks and latches, wire rope, electrical apparatus, tires (when used), and ground conditions. The manufacturer's guidelines shall be followed.

The following will be tested at the beginning of each shift by the competent operator:

- Limit switches
- Brakes
- Circuit breakers
- Other safety devices

Any defects found during inspection or use of a crane or hoist must be recorded in the inspection and maintenance record system and be reported immediately to the supervisor, who must determine the course of action to be taken. If a defect affects the safe operation of the crane or hoist, the equipment must not be used until the defect has been remedied.

Monthly

ZAP Engineering will ensure monthly inspections of equipment by a competent person are documented. Equipment must be inspected monthly by a competent person. The manufacturer's guidelines shall be followed. The inspection must be documented. Documentation must include the following:

- Items checked,
- Results of inspection,
- Name and signature of the inspector.

Documentation must be retained for 3 months. (Documented monthly inspection is not required if the daily inspection is documented and records are retained for 3 months).

Any defects must be corrected before the crane is used. The report must be dated and signed by the person performing the inspection.

Yearly

Once each year a more detailed inspection must be made of all hoisting equipment at each facility. After completing the annual inspection, a report must be completed and signed by the person performing the inspection and the report will be returned promptly to the Safety Manager.

32.5. Rigging

All rigging work shall be assembled, used, maintained and dismantled under the direct supervision of a competent and qualified employees trained in safe rigging practices, in accordance with manufacturer's specifications and with the code of signals authorized by local regulatory guidelines for controlling hoisting operations.

32.5.1. Rigging Breaking Strength and Load Rating

The safe working-load on ropes, chains, slings and fittings shall not exceed the safe working-load recommended by the manufacturer.

Rigging fittings must be marked with the manufacturer's identification, product identifier and the working load limit (WLL) or enough information to readily determine the WLL. The WLL of existing fittings not identified must be determined by a qualified person, marked on the fitting and such fittings must be removed from service by January 1, 2001.

Rigging shall not be subjected to a load of more than 10 percent of the breaking strength of the weakest part of the rigging, if an employee is being raised or lowered 20 percent of the ultimate breaking strength of the weakest part of the rigging, and if the rigging is fatigue rated and an employee is not being raised or lowered the maximum load must not exceed 25 percent of the ultimate breaking strength.

ZAP Engineering may use a dedicated rigging assembly designed and certified for a particular lift or project by a professional engineer, but the dedicated rigging assembly must be re-rated before it is used for another lift or project.

The maximum load rating of the rigging, as determined by the rigging manufacturer or a professional engineer must be legibly and conspicuously marked on the rigging. If it is not practicable to mark the rigging the maximum load rating of the rigging must be available to the employees at the work site.

32.5.2. Rigging Inspection and Rejection Criteria

All ZAP Engineering rigging and rigging equipment to be used during a work shift is to be inspected thoroughly prior to each period of continuous use during the shift to ensure the rigging is functional and

safe by a competent person. All deteriorated or defective equipment will be immediately removed from service if it doesn't meet the below inspection requirements or rejection criteria.

Slings

- A wire rope sling with a swaged or poured socket or a pressed fitting must be permanently identified with its working load limit, the angle upon which the WLL is based and the name or mark of the sling manufacturer.
- An alloy steel chain sling must be permanently identified with the size, the manufacturer's grade and the WLL, the length and number of legs, and the name or mark of the sling manufacturer.
- Synthetic fiber web slings must be permanently identified with the manufacturer's name or mark, manufacturer's code or stock number, working load limits for the types of hitches permitted, and type of synthetic web material or be removed from service if any of these requirements are not met.
- A sling shall be permanently removed from service if it is damaged or worn.
- All slings are to be clearly labeled to indicate the slings maximum load or the slings maximum load is made readily available to employees.
- A sling must be stored to prevent damage when not in use.
- When a sling is applied to a sharp edge of a load, the edge or the sling must be protected to prevent damage to the sling

Hooks

- A worn or damaged hook must be permanently removed from service and ZAP Engineering shall not require or permit an employee to use a hook that is worn, damaged, deformed, cracked or otherwise defective or where the throat opening has been increased or the tip has been bent more than 10% out of plane from the hook body, or any dimension of the hook has been decreased by 10% or any damage exceeds any criteria specified by the manufacturer. Note: This is a higher standard than required is some locations.
- All hooks shall be clearly labeled with the maximum load of the hook in a location where an employee using the hook can easily see the rating or the hooks maximum load is made readily available to employees.
- A hook will have a safety latch, moussing or shackle if the hook could cause injury if it is dislodged while in use.

All devices shall be visually inspected prior to use and removed from service for any of the following conditions:

- Nylon slings with:
  - Abnormal wear.
  - Torn stitching.
  - Broken or cut fibers.
  - Discoloration or deterioration.

- Wire rope slings with:
  - Kinking, crushing, bird caging, or other distortions.
  - Evidence of heat damage.
  - Cracks, deformation, or worn end attachments.
  - Hooks opened more than 10% at the throat.

- Hooks twisted sideways more than 10 degrees from the plane of the unbent hook.

- Alloy steel chain slings with:
  - Cracked, bent, or elongated links or components.
  - Cracked hooks.
  - Shackles, eye bolts, turnbuckles, or other components that are damaged or deformed.

32.5.3. Operational Procedures

- Rigging shall not be subjected to loads more than outlined in legislative requirements. ZAP Engineering will ensure the maximum load rating of the rigging is available to the employees at the work site.
- Wire rope, alloy steel chain, synthetic fiber rope, metal mesh slings, and synthetic fiber slings shall meet the requirements of ASME Standard B30.9-2006, Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks and Slings (or current version). Below-the-hook lifting devices, other than slings shall meet the requirements of ASME Standard B30.20-2006, Below the Hook Lifting Devices (or current version).
- Loads to be unhooked by an employee must be safely landed and supported before the rigging is detached.
- The determination of the working load limit (WLL) of a sling assembly must ensure that the WLL of any individual component of the assembly is not exceeded.
- All slings used to hoist a load and the slings fittings and attachments must be in compliance with legislated standards and capable of supporting at least 10 times the load to which the slings fittings, and attachments may be subjected where they are used to support an employee, and at least five times the maximum load to which they may be subjected in any other case.
- No shackles shall be subjected to a load greater than the maximum load indicated on the shackle, and all shackle pins are installed to prevent accidental withdrawal, and a bolt is never used in the place of a properly fitted shackle pin.
- All hooks shall have a safety latch, moussing, or shackle if the hook could cause injury if it is dislodged while in use.
- Where an employee may be endangered by the rotation or motion of a load during hoisting one or more tag lines must be used to control the rotation or motion of the load and the tag lines will be of sufficient length to protect the employees from any overhead hazard and the tag lines are not removed from the load until the load is securely landed.

32.5.4. Rigging a Load

- Determine the weight of the load - do not guess.
- Determine the proper size for slings and components.
- Do not use manila rope for rigging.
- Ensure that shackle pins and shouldered eyebolts are installed in accordance with the manufacturer's recommendations.
- Ensure that ordinary (shoulder less) eyebolts are threaded in at least 1.5 times the bolt diameter.

- Use safety hoist rings (swivel eyes) as a preferred substitute for eye bolts wherever possible.
- Pad sharp edges to protect slings.
- Remember that machinery foundations or angle-iron edges may not feel sharp to the touch but could cut into rigging when under several tons of load.
- Wood, tire rubber, or other pliable materials may be suitable for padding.
- Do not use slings, eyebolts, shackles, or hooks that have been cut, welded, or brazed.
- Install wire-rope clips with the base only on the live end and the U-bolt only on the dead end.
- Follow the manufacturer's recommendations for the spacing for each specific wire size.
- Determine the center of gravity and balance the load before moving it.
- Initially lift the load only a few inches to test the rigging and balance.

32.6. Signaling

A signal person must be provided if the operator's view is obstructed, if site specific safety concerns require it, or if the operator determines that it is necessary. A signal person must be provided for the following situations:

- The point of operation is not in full view of the operator,
- The view is obstructed when the equipment is traveling, or
- The operator or the person handling the load determines it is necessary due to site specific concerns.

Signals to the operator shall be in accordance with the standard hand. Specific requirements include:

- Each movement of equipment shall be proceeded by distinctive signals clearly discernible to all employees endangered by the movement and clearly distinguishable by the operator of the equipment controlled, and a signal which is not understood clearly by the operator of equipment shall be acted upon by him or her as though it were a stop signal.
- An employee shall not cause a signal to be given for the movement of equipment unless he or she has ensured that he or she and all employees within the area for which he or she is responsible are not endangered by the movement.
- Only a designated employee shall cause a signal to be given for the movement of equipment, but employees may cause a stop signal to be given and this signal shall be obeyed promptly and without question.
- An employee designated to direct the movement of equipment shall not be otherwise occupied while the equipment is in motion and he or she shall be prepared to signal to stop during the motion.
- A signaling device that functions unreliably or in a way that might constitute a hazard to an employee shall be removed from service immediately.
- Signals shall always be discernible or audible.
- Some special operations may require addition to or modification of the basic signals.
- For all such cases, these special signals shall be agreed upon and thoroughly understood by both the person giving the signals and the operator and shall not be in conflict with the standard signals.

32.7. Training

Training shall include:

- Documentation of employee, date of training and subject matter, including method used to test knowledge of material.
- No employee shall operate cranes or equipment covered by this program until training has been complete and management has approved and designated him or her as a qualified operator.

Sling Inspection Form

Date of Inspection	Serial number of sling	Type of sling (2-legged, 3 legged, etc.)	Type of material (chain, wire rope, synthetic)	Date purchased	Date placed into service	Date of last inspection	Sling Condition (Excellent, Good, Bad) Note: a sling with a Bad rating must be removed from service.	Date repaired (if applicable)	Date removed from service	Inspected by:

33. HEARING CONSERVATION

33.1. Purpose

The purpose of this program is to provide a process to minimize employee-hearing loss caused by excessive occupational exposure to noise.

33.2. Scope

This program is applicable to all employees who may be exposed to noise in excess of 85 decibels (decibels). When work is performed on a non-owned or operated site, the operator's program shall take precedence, however, this document covers ZAP Engineering employees and contractors and shall be used on owned premises, or when an operator's program doesn't exist or is less stringent.

33.3. Definitions

Audiometric testing - means detection by the person being tested of a series of pure tones. For each tone, the person indicates the lowest level of intensity that they can perceive.

Decibels – means the sound energy measured by a sound level meter using the "A" scale. The "A" scale is electronically weighted to simulate the response of the human ear to high and low frequency noise.

Slow Response – means the setting on the sound level meter that averages out impulses of brief duration that would cause wide fluctuation in the sound level meter reading.
Standard Threshold Shift – means a change in hearing threshold relative to the baseline audiogram of an average of 10 dB (corrected for age) at 2000, 3000 and 4000 Hz in either ear.

33.4. Key Responsibilities

33.4.1. Managers and Supervisors

- Ensure requirements of this program are established and maintained.
- Ensure employees are trained and comply with the requirements of this program.

33.4.2. Employees

- Wear hearing protection when required, attend the training, and cooperate with testing and sampling.

33.5. Procedure

Occupational hearing loss is a cumulative result of repeated or continued absorption of sound energy by the ear; employee protection is based on reduction of the noise level at the ear or limiting the employee's exposure time. ZAP Engineering shall offer hearing protection to all employees exposed to potential high noise levels in working areas and to those employees requesting hearing protection.

33.5.1. Hearing Conservation Program

ZAP Engineering shall implement a hearing conservation program for employees exposed to sound levels 85dbA or greater. A continuing effective hearing conservation program shall be administered when employees are exposed to sound levels greater than 85 dbA on an 8-hour time-weighted average basis.

Employees will wear hearing protection in signed areas while on an owner client facility.

33.5.2. Monitoring Procedures to be Used When Exposure Limits Exceed the Established Level

When information indicates that employee exposure may equal/exceed the 8-hour time-weighted average of 85 decibels, a monitoring program shall be implemented to identify employees to be included in the hearing conservation program.

33.5.3. Surveys

Surveys will be conducted by a qualified employee or third party.

To evaluate noise exposure in terms of possible hearing damage, it is necessary to know the overall sound level ("A" scale measurement), the exposure time of the individual in hours per day and the length of time the individual has worked in the area being surveyed. This data shall be supplemented by the following:

- Name of area and location
- Date and time of survey
- Name of person conducting survey
- Description of instrument used, model and serial number
- Environmental conditions
- Description of people exposed

ZAP Engineering shall notify each employee of their monitoring results, or, if their job is exposed to noise 85 decibels or greater.

A plot of noise levels must be made for owned facilities. The plot must be filed or posted at the facility.

ZAP Engineering shall evaluate hearing protector attenuation for the specific noise environments in which the protector will be used. The adequacy of hearing PPE shall be reevaluated whenever noise exposures increase to the point that the PPE provided may no longer provide adequate protection. ZAP Engineering shall then provide more effective PPE where necessary.

All sound measuring equipment must be calibrated before and after each survey. Records of sound measuring equipment calibration and noise level surveys shall be kept for 20 years.

Noise Surveys must be repeated whenever changes in the workplace may expose additional personnel to high noise or hearing protection being used by employees may not be adequate to reduce the noise exposure to a level below 85 decibels.

<u>Sound Level Surveys</u>

- All owned facilities that are suspected of having noise levels exceeding 85 decibels must be screened.

Exposure Surveys

- A representative sampling of employees shall be conducted to determine the exposure to noise over a period of time.
- Noise dosimeters must be capable of integrating all continuous, intermittent and impulsive sound levels from 80 dB to 130 dB and must be calibrated so a dose of 50% corresponds to a time weighted average of 85 dB.

33.5.4. Signage

Clearly worded signs shall be posted at entrances to, or on the periphery of, areas where employees may be exposed to noise levels in excess of 85 decibels. These signs shall describe the hazards involved and the required protective actions.

33.5.5. Audiometric Testing

ZAP Engineering must establish and maintain an audiometric testing program for all employees whose exposures equal or exceed the 8-hour time-weighted average of 85 dbA and making audiometric testing available to all employees whose exposures equal or exceed an 8 hour time-weighted average of 85 decibels.

Baseline Testing Guidelines

- ZAP Engineering shall establish a baseline audiogram for each exposed employee within 6 months of their first exposure. Within 6 months of an employee's first exposure at or above the action level, a valid baseline audiogram shall be established against which future audiograms can be compared.
- When a mobile van is used the baseline shall be established within one year.
- A qualified third party shall perform all audiometric testing, evaluation, reporting and retesting.
- Prior to establishment of a baseline audiogram at least 14 hours without exposure to workplace noise is observed. Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace noise. Hearing protection may be used to meet the requirement. Employees shall also be notified to avoid high levels of noise.

Annual Testing Guidelines

ZAP Engineering shall provide an annual audiogram and if a standard threshold shift has occurred the employee will be notified in writing within 21 days of determination. At least annually after obtaining the baseline audiogram, ZAP Engineering shall obtain a new audiogram for each employee exposed at or above an 8-hour time-weighted average of 85 decibels. Each employee's annual audiogram shall be compared to that employee's baseline audiogram to determine if the audiogram is valid and if a standard threshold shift has occurred. If a comparison of the annual audiogram to the baseline audiogram indicates a standard threshold shift, the employee shall be informed of this fact in writing, within 21 days of the determination.

Steps That Are Taken When Standard Threshold Shift Occurs

- Hearing protection shall be re-evaluated and/or refitted and,

- If necessary, a medical evaluation may be required and
- The employee shall be advised to wear hearing protection and if necessary, a reassignment of duties may be deemed appropriate.

33.5.6. Required Recordkeeping

ZAP Engineering shall maintain accurate records of all employee exposure measurements and all records are maintained as required by CFR 1910.95 (Occupational Noise Exposure).

Employee audiograms are considered medical/exposure records. These records must be kept for the length of employment plus 30 years.

33.5.7. Hearing Protection Devices

- Hearing protectors are available to all employees exposed to an 8-hour time-weighted average of 85 decibels at no cost to the employee.
- Hearing protection shall be replaced as necessary.
- ZAP Engineering shall ensure that hearing protectors are worn. Employees shall be properly trained in the use, care and fitting of protectors. This is done at no cost to employees.
- Employees shall be given the opportunity to select their hearing protectors from a variety of suitable hearing protectors provided by ZAP Engineering.

33.6. Training

Employees must be provided with training on at least an annual basis and shall be updated to be consistent with changes in the PPE and work processes.

A training program shall be provided for all employees who are exposed to action level noise.

The training shall be repeated annually for each employee. Training shall be updated consistent to changes in PPE and work processes. ZAP Engineering shall make available to affected employees' copies of the noise exposure procedures and shall also post a copy in the workplace. ZAP Engineering shall also allow the Assistant Secretary and the Director access to records.

All training must and shall be documented.

All staff shall have a copy of this program, noise exposure procedures and it shall be posted at the worksite and a copy made available to all employees and their representatives if applicable.

34. LOCKOUT/TAGOUT

34.1. Purpose

The purpose of this program is to establish procedures for affixing appropriate lockout/tagout equipment to energy isolating devices and to otherwise disable machines or equipment to prevent unexpected energization, start up or release of stored energy to prevent injury or incident.

34.2. Scope

This program covers the servicing and maintenance of machines and equipment where the unexpected energization or startup of the machine or equipment, or the release of stored energy could cause an incident. This program establishes minimum performance requirements for the control of such hazardous energy. When work is performed on a non-owned or operated site, the operator's program shall take precedence, however, this document covers ZAP Engineering employees and contractors and shall be used on owned premises, or when an operator's program doesn't exist or is less stringent.

34.3. Definitions

Affected employee - An employee whose job requires them to operate or use a machine or equipment on which servicing and maintenance is being performed under lockout/tagout, or whose job requires the employee to work in an area in which such servicing or maintenance is being performed.

Authorized employee - A person that performs lockout/tagout procedures on machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes authorized when that employee's duties include performing servicing or maintenance covered under this program.

Capable of being locked out - An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out if lockout can be achieved without the need to dismantle, rebuild or replace the energy isolating device or permanently alter its energy control capability.

Energized - Connected to an energy source or containing residual or stored energy.

Energy isolating device - A mechanical device that physically prevents the transmission or release of energy including, but not limited to, the following:

- A manually operated electrical circuit breaker, a disconnect switch, a manually operated switch by which the conductors and no pole can be operated independently, a line valve, a block and any similar device used to block or isolate energy.
- Push buttons, selector switches and other control circuit type devices are not isolating devices.

Lockout - The placement of a lockout device on an energy isolating device in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout device - A device that utilizes a positive means, such as either a key or combination type lock, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.

Normal operation - The utilization of a machine or equipment to perform its intended operation.

Potential Energy Sources - Any source of gas, electrical, mechanical, hydraulic, pneumatic, chemical, gravity, steam, thermal, tension or other energy sources.

Servicing and/or maintenance - Workplace activities such as constructing, setting up, adjusting, inspecting, modifying and maintaining and/or servicing machines and equipment, where the employee may be exposed to an unexpected energization or startup of the equipment or release of a hazardous energy source.

Setting up - Any work performed to prepare a machine or equipment for performing its normal operation.

Tagout - The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout device - A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until tagout device is removed.

34.4. Key Responsibilities

34.4.1. Managers and Supervisors

- Responsible to control and enforce this plan and to see that all their employees and contractors that are affected by lockout/tagout procedures, have the knowledge and understanding required for safe application, usage, and removal of all energy controls and devices.
- Ensure employees are trained and comply with the requirements of this program.

34.4.2. Employees

- Employees who are affected by this program are required to attend training on an annual basis.
- Are required to follow the provisions of this program.

34.5. Procedure

34.5.1. General

Only an authorized employee or employees performing the servicing or maintenance shall perform lockout or tagout.

34.5.2. Devices

Lockout Device - If an energy source can be locked out a device that utilizes a lock to hold an energy isolating device in a safe position shall be used. Each site shall have the same type of lock as specified by ZAP Engineering.

Tagout Device – If an energy source cannot be locked out with a lockout device then a tagout device shall be used. Tagout devices are a warning only level of protection and shall be weather and chemical resistant,

standardized in color with clear written warning of hazardous energy; i.e. Do Not Operate, Do Not Start, Do Not Energize, etc. Each site shall have the same style of tags specified by ZAP Engineering.

34.5.3. Specific Energy Control Procedures

Each manager or supervisor is responsible for developing specific step-by-step shutdown and startup procedures for a particular machine or piece of equipment in their respective area.

- A written, step-by-step isolation procedure for shutdown and startup shall be prepared for each type of machine or piece of equipment.
- This procedure shall include:
  - Equipment number if assigned.
  - Equipment location.
  - Energy Source(s) (i.e. electrical, hydraulic, gas pressure, etc.)
  - Location of isolating controls (i.e. breaker switches, valves, etc.)
  - Quantity of isolating controls
  - Quantity of locks required to isolate the equipment
  - Other hardware required to isolate the equipment (i.e. chains, valve covers, blocks, etc.)
  - List any residual energy required to be dissipated before work begins.

34.5.4. Specific Sequence for Application of Energy Control

Notification

Authorized employees must notify all other affected employees of the application and removal of lockout/tagout devices. Notification shall be given before the controls are applied and before they are removed from the machine or equipment.

Preparation for Shutdown

Before an authorized or affected employee turns off a machine or equipment, the authorized employee shall have knowledge of the type and magnitude of the energy, the hazards of the energy to be controlled and the methods or means to control the energy.

Machine or Equipment Shutdown

The machine or equipment shall be turned off or shutdown using the procedures established for the machine or equipment. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.

Machine or Equipment Isolation

All energy isolating devices that are needed to control the energy to the machine or equipment shall be physically located and operated in such a manner as to isolate the machine or equipment from the energy source.

Lockout/Tagout Devices and Application

- Each authorized employee shall have the proper number of locks and devices to be able to perform proper lockout/tagout procedures for machines or equipment that they may be working on.
- Lockout or tagout devices shall be affixed to each energy isolating device by authorized employees.

- Lockout and tagout devices shall include name of individual placing device. Devices shall indicate the identity of the employee applying the device.
- Lockout devices shall be affixed in a manner to hold the energy isolating devices in a safe or off position.
- Tagout devices shall be affixed in a manner that will clearly indicate that the operation or movement of isolating devices from the safe or off position.
- Tagout devices used with energy isolating devices with the capability of being locked out shall be fastened at the same point at which the lock would have been attached. If a tag cannot be directly attached to the energy isolation device, it shall be located as close as safely as possible to the device in a position that will be immediately obvious to anyone attempting to operate the device.
- Each energy source shall be locked out completely isolating the equipment.
- Isolating machines or equipment shall include, but are not limited to:
    - Pumps, compressors, generators, electric distribution, storage tanks, etc.
    - Each type of equipment to be isolated shall have specific procedures for isolation, i.e. for compressors: suction, discharge, power, starting, fuel, dumps shall be closed, locked and tagged out properly. The blow-down valve shall be opened, locked and tagged out properly. (NOTE): If compressor has a side stream hooked up, the side stream shall be closed, locked and tagged out properly.

<u>Stored Energy and the Possibility of Reaccumulating</u>
Following the application of lockout or tagout devices to energy isolating devices, all potentially hazardous stored or residual energy shall be relieved, disconnected, restrained and otherwise rendered safe.

If there is a possibility of re-accumulation of stored energy, verification of isolation shall be continued until the servicing or maintenance operation is completed, or until the possibility of such accumulation no longer exists.

<u>Verification of Isolation</u>
Prior to starting work on machines or equipment that have been locked or tagged out; the authorized employee shall verify that isolation and deenergization of the machine or equipment have been accomplished.

34.5.5. Procedures for Handling Multiple Groups of Workers Involved in a Group Lockout

A crew of authorized employees may use a group lockout or tagout device. This will afford the group of employees a level of protection equal to that provided by a personal lockout or tagout device. Procedures include:

- A tailgate meeting shall be conducted to review the lockout procedures and other information as required for safe work to continue – all crafts and effected departments shall be involved.
- An authorized employee will isolate the equipment and ascertain the exposure status of individual group members.
- All workers will then place their individual locks on the device's group lockout or tagout device after they have verified the procedure.
- An authorized employee has primary responsibility for a set number of employees working under the protection of a group lockout or tagout device. The authorized

employee should ascertain the exposure status of individual group members. Each ZAP Engineering employee or contractor shall attach a personal lockout or tagout device to the group's device while he/she is working and then removes it when finished.

- During shift change or personnel changes, there are specific procedures to ensure the continuity of lockout or tagout procedures. These include:
    - In the event shift or personnel changes occur during maintenance and/or repair activities, the designated ZAP Engineering employee in charge shall take the necessary steps to maintain the continuity of the lockout/tagout protection. This includes maintaining that all provisions in this procedure are adhered to and the transfer of lockout/tagout devices between authorized employees is accomplished.
    - No work shall be allowed to proceed following personnel or shift change unless these requirements are met. The job supervisor must observe that all personnel or shift change locks or tags are properly transferred during the process.
    - Before the last outgoing person is allowed to leave they must remove their lock (or warning tag) and the incoming ZAP Engineering person shall affix their lock or (warning tag) to prevent the lock out device or tag warning device from ever not being locked or warning if a lock out device is not practicable.
    - This also applies to all group lockout tagout situations.
    - This also applies to all contract personnel working on ZAP Engineering or client projects.
    - If any outgoing person leaves the site and their lock/tag is still attached, then follow Removal of Locks guidelines below.

34.5.6. Release from Lockout/Tagout

When servicing or maintenance is completed or when Lockout / Tagout devices must be temporarily removed, the equipment requires testing and the machine or equipment is ready for testing or to return to normal operating conditions, the following steps shall be taken, in this order:

- Check the machine or equipment and the immediate area surrounding the machine or equipment to ensure that all nonessential items such as tools have been removed and that the machine or equipment components are operationally intact.
- Check the work area to ensure that all personnel have been safely positioned or removed from the area.
- Remove the Lockout/Tagout device
- Energize and proceed with testing
- Deenergize and reapply control methods including Lockout / Tagout devices
- Document the procedure by use of the completed isolation log and provide to supervisor for filing.

34.5.7. Removal of Locks

The authorized employee who applied the lock shall be the one to remove their lock. However, after all work has been completed, certain conditions may arise which prohibit this person from being present to remove the lock.

The following procedures shall be followed to allow for the removal of a lock that another person has applied:

- Every effort shall be made to contact the authorized employee who applied the lock to obtain the key(s).
- If the key(s) cannot be made available, the employee who requests removal of the lock shall contact their supervisor.
- The supervisor shall verify that every effort was made to contact the original authorized employee who applied the lock and to obtain the key(s).
- The employee removing the lock shall note on the Service Report that the lock(s) were removed with permission by supervisor.
- All reasonable efforts will be made by supervisor to notify that employee their lock has been removed, ensuring that the authorized employee has this knowledge before they return to work.
- If the equipment is client owned, the supervisor or employee requesting to remove the lock(s) shall contact the client to get the lock removed. Clients must remove their lock(s).
- NOTE: ZAP Engineering employees shall not remove any client locks.

34.5.8. Contractors

Contractors performing lockout procedures on ZAP Engineering property shall comply with this procedure. Contractors shall supply their own locks. ZAP Engineering shall initially lockout ZAP Engineering/Clients machines and equipment before the contractor will be allowed to apply their own lock in addition to the ZAP Engineering's.

34.5.9. Periodic Inspections of the Energy Control Procedure

Periodic inspections of the energy control procedure are conducted and documented at least annually to ensure procedures and requirements are being followed. Periodic inspections of the energy control procedure must be conducted at least annually to ensure that the procedure is being followed.

The ZAP Engineering Safety Manager or their designee performs the inspection (it must be someone other than those actually using the lockout/tagout in progress). The inspector will produce a certified review of the inspection including date, equipment, employees and the inspection shall be documented. They will verify that:

- Each authorized and/or affected employee has been trained as required.
- Any new equipment added has specific lockout procedures developed and documented.
- Current procedures are adequate for performing complete isolation of equipment and resulting in a zero-energy state.
- A copy of the audit maintained on file at the managers/supervisor's office.

34.6. Training

The training must include recognition of hazardous energy source, type and magnitude of energy available, methods and means necessary for energy isolation and control.

Each authorized employee shall receive adequate training.

All affected employees are instructed in the purpose and use of the energy control procedure.

Any other employees whose work operations are or may be in an area where energy control procedures may be utilized are instructed in the purpose and use of the energy control procedure.

Additional training includes:

- The purpose and use of energy control procedures.
- When tagout systems are used, employees shall also be trained in the following limitations of tags:
  - Tags are essentially warning devices affixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock.
  - When a tag is attached to an energy isolating means, it is not to be removed without authorization of the authorized person responsible for it, and it is never to be bypassed, ignored, or otherwise defeated in any way.
  - Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area, in order to be effective.
  - Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace.
  - Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.
  - Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.

Retraining

Retraining shall be conducted whenever a periodic inspection reveals, or whenever ZAP Engineering has reason to believe that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures.

Retraining is required when there is a change in job assignments, in machines, a change in the energy control procedures, or a new hazard is introduced.

The retraining shall reestablish employee proficiency and introduce new or revised control methods and procedures, as necessary.

Training Documentation

ZAP Engineering shall certify that employee training has been accomplished and is being kept up to date. All training and/or retraining must be documented, signed and certified.

SPECIFIC EQUIPMENT LOCKOUT PROCEDURES

Department_____

Equipment No._____

Energy Source_____

Procedure for Shutdown and Isolation:

(List number of steps required to isolate machine or equipment - write N/A on lines not used or add additional steps if necessary)

STEP NO.

1._____
2._____
3._____
4._____
5._____
6._____
7._____
8._____
9._____
10._____

Additional Information:_____
_____
_____
_____

Prepared By:_____ Date:_____

(This procedure to be communicated to all authorized and affected employees and kept on file at location of machine or equipment)

SAMPLE TAG


DANGER
DO NOT OPERATE
This Lock/Tag may only be removed by:
Name: _____
Date: _____
White letters in a Red oval
Field of Red and White diagonal stripes

ISOLATION LOG

Date of Isolation:

Description of Work:

List of Equipment out of Service:

Necessary Requirements of Clear Isolation:

Authorized Employee Signature: _____

Person Continuing Work Signature: _____

Locks/Tags for GROUP LOCKOUT or Multiple Locks/Tags

Lock # or Tag	Date Installed	Date Removed	Print Name (for Group Lockout)	Signature

(If additional space is needed, please attach an additional page)

ANNUAL AUDIT OF THE CONTROL OF HAZARDOUS ENERGY PROGRAM

I certify that an audit of the ZAP ENGINEERING "Control of Hazardous Energy" Program was conducted, and that each employee has been trained in the recognition and procedures to lockout equipment they may be required to work on or may be affected by.

I further acknowledge that the current procedure is adequate to safely lockout equipment in this department for servicing and maintenance.

Department: _____

Manager (or representative): _____

Date: _____

Original to file: _____

35. MANUAL LIFTING

35.1. Purpose

ZAP Engineering is committed to providing a safe and healthy working environment for all employees. Musculoskeletal disorders (MSD) account for many reported injuries and we must minimize the risk and incidence of MSDs. To achieve this goal, ZAP Engineering requires each worksite to establish and maintain an MSD, Lifting and Handling Loads Program with the following elements:

- Ongoing training of management, supervisors, and employees (including new hires) on MSD awareness hazards and control measures
- Training of specialized staff (designated ZAP Engineering Representative, JHSC members) on MSD hazard assessment and control measures
- Tracking of MSD statistics
- MSD hazard identification and assessment (see MSD Hazard Identification form)
- Control of MSD hazards through the application of engineering and/or administrative controls
- Proactively integrating ergonomics principles into workplace design and work techniques
- A realization that personal protective equipment may only be used as a substitute for engineering or administrative controls if it is used in circumstances in which those controls are not practicable.

35.2. Key Responsibilities

35.2.1. ZAP Engineering Safety Manager

Develops local Lifting and Handling Loads Programs for all worksites in accordance with this procedure and ensures all employees are aware of the requirements of the local Lifting and Handling Loads Program.

- Communicate, promote and support the MSD, Lifting and Handling Loads Program.
- Conduct MSD training sessions and/or provide MSD training materials.
- Maintain records of MSD training that they provide in a manner that supports accuracy and ease of access for monitoring purposes.
- Monitor corrective actions taken as identified on incident reports.
- Support supervisors and the worksite JHSC in the Lifting and Handling Loads Program process.
- Assist in the investigation of MSD incidents to address injury hazards.
- Bring to the attention of ZAP Engineering management any MSD hazards identified during their investigations, audits or inspections.
- Ensure distribution and awareness of MSD Hazard Identification Forms.
- Provide input into purchasing specifications for new tools, equipment and furniture as needed to reduce MSD hazards.
- Provide input into the development of safe work procedures to reduce MSD hazards.

35.2.2. Worksite Manager

Responsible for the implementation and maintenance of the Lifting and Handling Loads Program for their facility and ensuring all assets are made available for compliance with the procedure. He or she will also:

- Ensure that all worksite departments implement and maintain the provisions of the Lifting and Handling Loads Program.
- Seek regular reports to ensure that their worksite follows the Lifting and Handling Loads Program.
- Manual lifting equipment such as dollies, hand trucks, lift-assist devices, jacks, carts, hoists must be provided for employees. Other engineering controls such as conveyors, lift tables, and workstation design should be considered.
- Use of provided manual lifting equipment by employees must be enforced.

35.2.3. Employees

- Shall attend all MSD related training for the task they are performing.
- Practice MSD prevention strategies as per MSD training.
- Comply with safe work procedures.
- Correctly use the equipment provided by ZAP Engineering, according to manufacturers' recommendations.
- Report to the supervisor any unsafe acts, unsafe tasks, unsafe conditions or equipment problems that create MSD hazards.
- Report any MSD incidents to the supervisor and cooperate in the investigation process.

35.3. Procedure

35.3.1. Worksite Assessment

Before manual lifting is performed, a hazard assessment must be completed. The assessment must consider size, bulk, and weight of the object(s), if mechanical lifting equipment is required, if two-man lift is required, whether vision is obscured while carrying and the walking surface and path where the object is to be carried. The assessment shall also include:

- Use of the MSD Hazard Identification form contained within this procedure
- Physical Demands
  - Neck Back Shoulder Wrist
  - Hand
  - Knee Ankle/
  - Feet
- Force Required and Working Distance
  - Do employees push, pull, lift, lower, or carry objects that are too heavy or require too much force; away from the center of the body or in a jerky or twisting manner?
- Work Postures
  - Is the back is curved too much or in a stooped position?
  - Is the back is twisted during movements?
  - Is the neck bent or twisted?
  - Are the arms away from the body?
  - Are the wrists flexed, extended or pinched positions?
- Repetitive Use of Similar Muscles
  - Do employees perform movements over and over in the same way?

- Static Muscle Use and Duration
  - Do employees hold any of the above work postures for > 20 sec.?
  - Stand for long periods with their knees locked?
  - Stand in one position without moving or stretching?
- Contact Stress
  - Do employees put localized pressure on any part of their body?
- Workspace Layout and Conditions
  - Are there working heights, reaches in workspace, equipment, tool design, storage conditions, etc., that cause or contribute to employees experiencing any of the physical demands risk factors?
  - Also consider seating, floor surfaces, the characteristics of objects handled, including size and shape, load condition and weight distribution, and container as well as tool and equipment handles.
- Organization of Work
  - Are there work processes, monotonous job tasks, work recovery cycles, task variability, work rate, machine paced tasks or peak activity demands that cause or contribute to rushing, frustration, fatigue or other visible signs of stress?
- Environmental Conditions
  - Are employees exposed to poor lighting, vibration, cold or hot air/wind/water?

35.4. Work Controls

ZAP Engineering must ensure based on the assessment, implement control measures to eliminate, minimize or reduce, so far as is reasonably practicable, the risk of musculoskeletal injury to the worker.

35.4.1. Handling Heavy or Awkward Loads

ZAP Engineering will take all practicable means to adapt the heavy or awkward loads to facilitate lifting, holding or transporting by workers or to otherwise minimize the manual handling required. Those include:

- Where use of lifting equipment is impractical or not possible, two-man lifts must be used.
- All loads carried on handcarts shall be secured.
- All awkward type loads shall be secured to prevent tip page.
- Additional methods include:
  - Reducing the weight of the load by dividing it into two or more manageable loads
  - Increasing the weight of the load so that no worker can handle it and therefore mechanical assistance is required
  - Reducing the capacity of the container
  - Reducing the distance, the load must be held away from the body by reducing the size of the packaging
  - Providing hand holds
  - Team lift the object with two or more workers
  - Improve the layout of the work process to minimize the need to move materials

- Reorganize the work method(s) to eliminate or reduce repeated handling of the same object
- Rotate workers to jobs with light or no manual handling
- Use mobile storage racks to avoid unnecessary loading and unloading.

35.4.2. Incidents and Injuries

If an employee reports symptom of an MSI ZAP Engineering will:

- Musculoskeletal injuries caused by improper lifting must be investigated and documented. Incorporation of investigation findings into work procedures must be accomplished to prevent future injuries.
- Injuries must be recorded and reported as required by 29 CFR Part 1904.

35.4.3. Review & Updating Lifting and Handling Loads Program

- Supervision must periodically evaluate work areas and employees' work techniques to assess the potential for and prevention of injuries. New operations should be evaluated to engineer out hazards before work processes are implemented.

35.5. **Training**

ZAP Engineering shall ensure that a worker who may be exposed to the possibility of musculoskeletal injury is trained in specific measures to eliminate or reduce that possibility. Our training shall include:

- General principles of ergonomics,
- Recognition of hazards and injuries,
- Procedures for reporting hazardous conditions, and
- Methods and procedures for early reporting of injuries.

Additionally, job specific training will be given on safe lifting and work practices, hazards, and controls.

36. PPE

36.1. **Purpose**

The purpose of the Personal Protective Equipment section is to set forth the procedures for the use, care, and maintenance of personal protective equipment required to be used by employees for the prevention of injuries.

36.2. **Scope**

Applies to all ZAP Engineering employees. When work is performed on a non-owned or operated site, the operator's program shall take precedence, however, this document covers ZAP Engineering employees and contractors and shall be used on owned premises, or when an operator's program doesn't exist or is less stringent.

36.3. **Key Responsibilities**

36.3.1. HSE Manager

- Assists in the selection of appropriate PPE. If a task exposes an employee to hazards which cannot be eliminated through engineering or administrative controls, the HSE Manager assists the supervisor and project manager to identify and select PPE suitable for the specific task performed, conditions present, and frequency and duration of exposure. Employees need to give feedback to the supervisor about the fit, comfort, and suitability of the PPE being selected. Employees are provided reasons for selection of PPE.
- Assists supervisor and site managers in assuring all PPE obtained meets regulatory and this procedure's requirements.
- Performs Worksite Hazard Assessments - The hazard assessment must indicate a determination if hazards are present or are likely to be present, which necessitate the use of PPE. Sources of hazards include but are not limited to hazards from impact/motion, high/low temperatures, chemicals, materials, radiation, falling objects, sharp objects, rolling or pinching objects, electrical hazards, and workplace layout. Certifies in writing the tasks evaluated, hazards found, and PPE required to protect employees against hazards and ensures exposed employees are made aware of hazards and required PPE before they are assigned to the hazardous task. Certificate shall include certifier's name, signature, dates and identification of assessment documents.

36.3.2. Managers and Supervisors

- Supervisors and managers shall regularly monitor employees for correct use and care of PPE and obtain follow-up training if required to ensure each employee has adequate skill, knowledge, and ability to use PPE.
- Supervisors and managers shall enforce PPE safety rules following the guidance of the ZAP Engineering progressive disciplinary procedures and ensure Required PPE Poster is posted properly.

36.3.3. Employees

- Complying with the correct use and care of PPE.
- Reporting changes in exposure to hazardous conditions that might require a follow-up assessment of the task for PPE.
- Reporting and replacing defective or damaged PPE, which shall not be used.
- Wearing of required PPE is a condition of employment.

36.4. Procedure

36.4.1. General

Protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.

Employee owned equipment is NOT permitted, except for safety toe footwear and prescription safety glasses. ZAP Engineering is still responsible for the assurance of its adequacy, maintenance and sanitation of those two items.

All PPE issued shall be at no cost to the employee. All employees will know and follow the procedures outlined in this Program.

36.4.2. Eye Protection

Employees must use appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids or chemical gases or vapors. Eye and Face PPE must comply with ANSI Standard Z87.1-2003 (Z87+), *Occupational and Educational Personal Eye and Face Protective Devices.*

Safety Glasses

Safety glasses, with side shields, that meet ANSI Z-87.1-2003 standards with "high Impact lenses" are required to be worn by all employees, subcontractors, and visitors while on ZAP Engineering property, at all times, as described below:

- At field locations, in shops and warehouses, except in approved, designated, striped safety zones.
- In all yard work zones or by everyone when in the vicinity of loading or unloading equipment, performing mechanic or maintenance work, test stand operations, operating equipment such as forklifts, welding, or any type of work which has the potential to inflict an eye injury.
- In any office, restroom, or any other building while performing any type of work where a potential eye injury may be present.
- Visitors will be provided with visitor glasses. In the absence of approved prescription safety glasses, "Over the glass" type safety glasses or goggles, must be worn over the non-safety glasses until approved prescription safety glasses are obtained.
- Workers assisting welders must wear absorbent safety glasses that protect the wearer from ultra-violet (UV) and/or infrared rays (IR).
- Dark shaded lens (sunglasses) darker than a # 1 shade is prohibited to be worn indoors unless welding or assisting a welder.
- A doctor must support "exceptions for medical reasons" in writing to exempt safety eyewear requirements.
- Safety glasses are not required:
    - Inside offices.
    - Parking lots when traveling from vehicles to and from office buildings by way of main doors that do not pass through shops.

Goggles

- Chemical splash proof goggles shall be worn when handling or mixing liquid chemicals, solvents, paints, etc., and/or as recommended on the Safety Data Sheet of the material being handled.
- Dust proof goggles shall be worn when blowing equipment down with air or while performing other jobs where safety glasses are not adequate to prevent airborne particles from entering the openings around the lenses and side shields.

Face Shields

- Full face shields shall be worn over safety glasses when operating handheld or stationery grinders with abrasive or wire wheels, while chipping paint or concrete or, performing jobs where there is the potential for flying objects striking the face and safety glasses or goggles would not provide adequate protection.

36.4.3. Head Protection

Employees must wear protective helmets when working in areas where there is a potential for injury to the head from employee-initiated impact or impact from falling or other moving objects. Helmets must comply with ANSI Standard Z89.1-1997 Class E, *American National Standard for Industrial Head Protection* for Type II head protection or be equally effective.

- Employees must wear protective helmets when working in areas where there is a potential for injury to the head from falling objects.
- Hardhats are to be worn at all field, shop and warehouse locations, or where deemed necessary as per each location's PPE Hazard Assessment.
- Hardhats will not be altered in any way.
- Do not paint or apply unauthorized stickers, name plates, etc.
- Do not drill, cut, bend, or apply heat.
- Do not alter the suspension system.
- Hardhats will be inspected by the employee regularly for cracks, chips, scratches, signs of heat exposure (sun cracks), etc.
- Defective hardhats will be replaced immediately.
- Hardhats shall not be placed in rear windows of vehicles where they will be exposed to the sun or become projectiles during an accident.
- A supply of hardhats must be made available to visitors.
- ZAP Engineering shall provide hardhats.
- Employees will be trained in the use, care and maintenance of head protection equipment.

36.4.4. Hearing Protection

Hearing protection is required to be worn by all employees, subcontractors, and visitors while in posted "High Noise" areas. Refer to the ZAP Engineering Hearing Conservation Program for more information.

Warning signs will be posted in areas known or suspected to have noise levels exceeding 85 dBA either constantly or intermittently.

When signs are not posted, employees shall wear hearing protection when noise caused by machinery, tools, etc., prevents normal conversations to be heard clearly.

Rule of thumb: If you must yell to be heard, hearing protection is required

Types

- Molded Inserts (ear plugs)
- Canal Caps (head band type)
- Muff, either headband or hard hat mounted Earmuffs and earplugs shall be provided to the employee in sizes and configurations that will be comfortable to the employee.

Care and Maintenance

- Inspect hearing protection prior to each use.
- Hearing protection must be kept clean to prevent ear infections.
- Most earplugs used today are disposable and must be discarded when they become dirty, greasy, or cracked.
- Earmuffs that have deteriorated foam inserts, cracked seals or are defective must be replaced.

Fit

- Due to individual differences, not everyone can wear the same type of hearing protection. A variety of styles may have to be tried before one is found to be comfortable and provide adequate protection.
- Employees shall be instructed how to obtain the proper fit.

36.4.5. Hand Protection

Gloves

- Gloves are required to be worn when performing work, which may expose the hands to extreme temperatures, cuts and abrasions, or exposure to chemicals.
- Welding: Welding gloves made of leather or other heat resistant materials shall be worn when performing arc welding or oxy/gas cutting.
- Chemical: Impervious (chemical resistant) gloves shall be worn when handling chemicals that specify gloves as personal protection equipment when handling.
- Refer to the specific chemical's Safety Data Sheet for the correct glove type.
- Persons assigned to working with chemicals, i.e., solvent vats, shall be issued their own individual gloves for hygiene purposes.
- Leather: Leather gloves should be worn when working with sharp materials or when handling rigging equipment.
- Cloth: Cloth gloves should be worn when handling objects or materials, which could cause blisters, splinters, cuts, etc.
- Heat Resistant: Heat resistant gloves shall be worn when handling hot bearings, races, or other materials or objects that have been heated beyond ambient temperatures.
- Insulated: Insulated gloves shall be worn to prevent frostbite in extreme cold climates.
- Glove Inspections
    - Gloves shall be inspected before each use for holes, tears, and worn areas.
    - Chemical gloves shall be periodically air tested for pinholes by twisting the cuff tightly, apply low air pressure to expand the glove, and then submersing in water to check for bubbles.
    - Defective gloves shall be discarded immediately. Exception: machinists are exempted from wearing gloves while working with rotating machinery.

36.4.6. Foot Protection

Safety footwear shall be worn by all employees with regularly assigned duties at field locations, in shops and warehouses.

- Office workers and visitors who enter these areas on an infrequent basis will not be required to wear foot protection provided they stay clear of the work being performed.

- If required to be in the proximity of the work, the work will be stopped while visiting the area or safety footwear will be worn.
- Shops, Field Locations, Warehouses and Parts Departments: Leather or equivalent boots, either lace up or pull up, shall be worn.
- The boot must provide ankle protection and have soles designed to protect from punctures with defined heels for climbing ladders.
- Metatarsal guards will be worn when duties present a hazard of equipment or material crushing the foot.
- All safety footwear must meet ANSI Z41-1999 standards.
- Client locations may require safety footwear to be worn by everyone; check with the local supervisor for client requirements before visiting field locations.

36.4.7. Fall Protection

Personal fall protection is required when performing certain elevated jobs in excess of six feet. Consult the ZAP Engineering Fall Protection Program.

36.4.8. Electrical Protection

Consult the ZAP Engineering Electrical Safety Program.

36.4.9. Worksite Hazard Assessment

A written hazard assessment shall be performed. During the hazard assessment a determination if hazards are present or are likely to be present, this necessitates the use of PPE. The following sample hazard sources will be identified:

- High or low temperatures; Chemical exposures (use SDS for guidance)
- Flying particles, molten metal or other eye, face, or skin hazards
- Falling objects or potential for dropping objects; employee falling from a height of 6' or more
- Sharp objects; Rolling or pinching that could crush the hands or feet;
- Electrical hazards

Where these hazards could cause injury to employees, personal protective equipment must be selected to substantially eliminate the injury potential. Employees will be notified for the selection and reason.

The results of this assessment shall be communicated to each affected employee and kept at the local office.

Selected/identified PPE shall be fitted to each affected employee. Fitting, including proper donning, doffing, clean and maintenance of PPE is addressed in the Training section. Exemptions for use of PPE must be supported by the PPE hazard assessment.

36.4.10. Monitoring

Supervisors and site managers monitor worksite tasks for changes in, or the introduction of new hazards. If new hazards are discovered, they advise the HSE Manager who then conducts a hazard assessment for

appropriate PPE. The HSE Manager monitors the effectiveness of the PPE Procedure and makes recommendations to management to improve the procedure.

36.5. Training

Employees who require or may need to wear PPE shall be properly trained and PPE must be fitted to each affected employee. Training shall include:

- When PPE is necessary.
- What PPE is necessary?
- How to properly don, doff, adjust and wear PPE.
- The limitations of PPE.
- Useful life and disposal of PPE.
- How to clean and maintain PPE in a sanitary and reliable condition.
- Reporting and replacing defective or damaged PPE, which shall NOT be used.

36.5.1. Retraining

Retraining is required when:

- The workplace changes, making the previous training obsolete.
- The type of PPE changes.
- When the employee demonstrates lack of use, improper use, or insufficient skill or understanding in PPE selection, necessity, use and limitations.

36.5.2. Documentation

Training shall be documented, and records kept at the local office. The training certification shall include:

- Name of employee(s) trained;
- The dates of training; and
- The certification subjects.

37. RESPIRATORY PROTECTION

37.1. Purpose

It is the intention of ZAP Engineering to provide a respirator protection program that meets or exceeds all federal standards. ZAP Engineering will attempt to engineer potential harmful vapors and oxygen deficient atmosphere exposure hazards out of the work environment. If engineering control measures are not feasible or during emergency situations with high exposure, then respirators shall be provided which are applicable and suitable for purpose intended.

37.2. Scope

This program applies to all ZAP Engineering projects and operations.

37.3. Respiratory Program Administrator

Overall responsibility for the respiratory protection program is assigned to the ZAP Engineering Safety Manager in order to ensure that specific requirements are followed.

The Administrator must be knowledgeable of the complexity of the program, able to conduct evaluations and have the proper training.

This assignment is made, however, with the understanding that individual supervisors will have to implement and enforce major portions of the program. It is understood that the Program Administrator will report performance problems to the appropriate manager for resolution. The person who will have responsibility for administering all the aspects of this program will be the Project Manager or their designee.

The responsibilities of the Program Administrator will include, but are not limited to:

- Conducting an annual written evaluation of the program. The program evaluation should be completed no later than December 31, of each year.
- Ensuring an adequate supply of respirators, cartridges, and repair/replacement parts. The Program Administrator may delegate this duty but will retain overall responsibility. The person(s) to whom this duty has been delegated is the Project Manager and/or Field Supervisor.
- Identifying hazards and ensuring only NIOSH certified respirators must be selected and provided based on those hazards and factors affecting performance.
- Ensuring that all respirator users have been trained in the use, selection and limitations of the type of respirators they will be using prior to the first time the respirator must be used. While the duty of conducting the training may be delegated, the Program Administrator retains final responsibility for seeing that all employees are appropriately trained.
- Ensuring that all respirator users have been medically evaluated and found fit to use the type of respirators that will be required in their job. The medical evaluation must be completed prior to assigning any employee to a task that requires use of a respirator.
- Ensuring that all respirator users are fit-tested at least annually and more often if other federal requirements apply.
- Ensuring that respirators are individually issued, are cleaned and sanitized on a regular basis, and respirators are stored in a clean and accessible location. This duty may also be delegated but the Program Administrator retains final responsibility for seeing that it is done.
- Ensuring that respirators are selected based on the hazard that will be encountered. This program describes the basic respirators that will be used at this site and the tasks for which they will be required. In special circumstances, the Program Administrator will contact the corporate health and safety staff for guidance in selecting the correct respirator.
- Ensuring that employee exposure is monitored to assure correct respirator type is used. Exposure monitoring may be delegated to others; however, the Program Administrator has final responsibility of monitoring completion and to request assistance when necessary.
- Ensuring surveillance of employees who wear respirators shall leave the area to wash, change cartridges or if they detect break through or resistance.

- Ensuring that the elements of the Respiratory Protection Program for the selection, use, cleaning/maintenance, storage and fit testing of respirators are followed.
- Ensuring that respirator parts are not exchanged between brands of respirators.
- Ensuring medical evaluations, respirators and required training are provided at no cost to the employee.

37.4. Medical Requirements

37.4.1. General

ZAP Engineering shall provide a medical evaluation to determine the employee's ability to use a respirator, *before* the employee is fit tested or required to use the respirator in the workplace. ZAP Engineering may discontinue an employee's medical evaluations when the employee is no longer required to use a respirator.

37.4.2. Medical Evaluation Procedures

ZAP Engineering shall identify a physician or other licensed health care professional (PLHCP) to perform medical evaluations using a medical questionnaire or an initial medical examination that obtains the same information as the medical questionnaire. The medical evaluation shall obtain the information requested by the Medical Questionnaire in Forms section (or equivalent).

The medical evaluation prior to fit-testing will be confidential, conducted during normal working hours, be at a convenient time and location, be understandable and the employee will be given a chance to discuss the results with the PLHCP.

37.4.3. Supplemental Information for the PLHCP

The following information must be provided to the PLHCP before the PLHCP makes a recommendation concerning an employee's ability to use a respirator:

- The type and weight of the respirator to be used by the employee;
- The duration and frequency of respirator use (including use for rescue and escape);
- The expected physical work effort;
- Additional protective clothing and equipment to be worn; and
- Temperature and humidity extremes that may be encountered.

ZAP Engineering shall provide the PLHCP with a copy of the ZAP Engineering Respiratory Protection Program.

Note: When ZAP Engineering replaces a PLHCP, ZAP Engineering must ensure that the new PLHCP obtains this information, either by providing the documents directly to the PLHCP or having the documents transferred from the former PLHCP to the new PLHCP. However, OSHA does not expect employers to have employees medically re-evaluated solely because a new PLHCP has been selected.

37.4.4. Medical Determination

In determining the employee's ability to use a respirator, ZAP Engineering shall obtain a written recommendation regarding the employee's ability to use the respirator from the PLHCP. The recommendation shall provide only the following information:

- Any limitations on respirator use related to the medical condition of the employee, or relating to the workplace conditions in which the respirator will be used, including whether the employee is medically able to use the respirator;
- The need, if any, for follow-up medical evaluations; and
- A statement that the PLHCP has provided the employee with a copy of the PLHCP's written recommendation.

All recommendations are to be sent to ZAP Engineering's Safety Manager.

Additional Medical Evaluations

At a minimum, ZAP Engineering shall provide additional medical evaluations that comply with the requirements of this program if:

- An employee reports medical signs or symptoms that are related to ability to use a respirator;
- A PLHCP, supervisor, or the respirator Program Administrator informs ZAP Engineering that an employee needs to be re-evaluated;
- Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for employee re-evaluation; or
- A change occurs in workplace conditions (e.g., physical work effort, protective clothing, and temperature) that may result in a substantial increase in the physiological burden placed on an employee.

37.5. Work Site Procedures

Each work site where respirators are required to protect the health of the worker shall have work site procedures that follow the guidelines of this program. Specific procedures may also be required by our client which will be followed. The following areas shall be included:

- Identification of specific hazard requiring respiratory protection
- The selection of the appropriate respiratory protection equipment based on the specific hazard and concentration levels, characteristics, etc. Specific brand and models of respiratory equipment to be used shall be identified in the procedures.
- Verification that each user of respiratory protection is qualified (medical approval, current fit test, annual training and demonstrates competency.

37.6. Respirator Selection Criteria

The selection of the respiratory equipment is based on the hazards the employee is exposed to. ZAP Engineering shall:

- Perform hazard identification,
- Select and provide respirators based on those hazards and factors affecting performance,

- Establish brands and models to be used, and
- Estimate exposures and contaminant information.

37.6.1. Hazard Identification

Due to the many varied work locations ZAP Engineering's identification of respiratory hazards will be contained in the various work site specific safety plans. However, common respiratory hazards that will be encountered include:

- Dust
- Fumes
- Gases
- Chemical particles
- Oxygen Deficiency

Characteristics of Hazardous Operation or Process

- Hot operations: welding, chemical reactions, soldering, melting, melding and burning
- Liquid operations: painting, degreasing, dipping, spraying, brushing, coating, etching, cleaning, pickling, plating, mixing, galvanizing and chemical reactions
- Solid operations: pouring, mixing, separations, extraction, crushing, conveying, loading, bagging and demolition.
- Pressurized spraying: cleaning parts, applying pesticides, degreasing, sand blasting and painting
- Shaping operations: cutting, grinding, filing, milling, melding, sawing and drilling

Gaseous Contaminants

- Inert gases (helium, argon, etc.), which do not metabolize in the body but displace air to produce an oxygen deficiency.
- Acid gases (SO2, H2S, HCl, etc.) which are acids or produce acids by reaction with water.
- Alkaline gases (NH3, etc.), which are alkalis or produce alkalis by reaction with water.
- Organic gases (butane, acetone, etc.), which exist as true gases or vapors from organic liquids.
- Organometallic gases (tetraethyl lead, organo-phosphates, etc.), which have metals attached to organic groups.

Particulate contaminants

- Dusts are mechanically generated solid particulates (0.5 to 10µm)
- Fumes are solid condensation particles of small diameter (0.1 to 1.0 µm)
- Mists are liquid particulate matter (5 to 100 µm)
- Smoke is chemically generated particulates (solid and liquid) of organic origins (0.01 to 0.3 µm)

37.6.2. Selection of Respirator

The following factors shall be taken into account when selecting the proper respirator:

Concentration and Type of Contaminant

The concentration and type of contaminant will determine the model and type of respirator and cartridges/filters or filters to be used. The concentration is based on a sampling of the atmosphere.

Location of Hazardous Area
(Confined Space, nearby contaminants, etc.)

Worker Activity
(Extreme heat, cold, welding hood requirement, etc.)

Types of Respirators

Air-purifying respirators can be either full-face or half masks with mechanical or chemical cartridges to filter dusts, mists, fumes, vapors or gases.

Powered air-purifying respirators use a blower to pass the contaminated air through a filter. The purified air is then delivered into a mask or hood. They filter dusts, mists, fumes, vapors and gases, just like ordinary air-purifying respirators.

Air-purifying respirators cannot be used in oxygen-deficient atmospheres, which can result when another gas displaces the oxygen or consumption of oxygen by a chemical reaction occurs. Oxygen levels below 19.5% require either a source of supplied air or supplied-air respirator protection. Levels below 16% are considered to be unsafe and could cause death. To determine the proper cartridge for air-purifying respirators contact the ZAP Engineering Safety Manager or a qualified on-site safety representative of the client. You should also consult the Material Safety Data Sheet of the substance that needs to be filtered.

All cartridges are assigned a color designating the type of contaminant they will filter:

White:	Acid gas
Black:	Organic vapors
Green:	Ammonia gas
Yellow:	Acid gas and organic vapors
Purple:	Radioactive materials
Orange:	Dust, fumes and mists
Olive:	Other gases and vapors

Once the wearer of the respirator can detect an odor, irritation, or taste of the contaminant, the cartridge should be replaced. All cartridges and/or filters shall be changed at the beginning of each shift.

Supplied-air respirators provide the highest level of protection against highly toxic and unknown materials. Supplied air refers to self-contained breathing apparatuses (SCBAs) and air-line respirators. SCBAs have a limited air supply that is carried by the user, allowing for good mobility and fewer restrictions than air-line respirators.

Air-line respirators have an air hose that is connected to a fresh air supply from a central source. The source can be from a compressed air cylinder or air compressor that provides at least Grade D breathing air.

Emergency Escape Breathing Apparatuses (EEBAs) provide oxygen for 5, 10 or 15 minutes depending on the unit. These are for emergency situations in which an employee must escape from environments immediately dangerous to life or health (IDLH).

SCBA (Self Contained Breathing Apparatus)

ZAP ENGINEERING does NOT allow employees to work in an Immediately Dangerous to Life and Health (IDLH) environment.

In order to maintain the NIOSH/MSHA approval of any respirator, mixing parts from other respirator manufacturers is prohibited. This includes airline hoses, valves, gaskets, cartridges, etc. For example, do not use North cartridges or valve gaskets with an MSA product.

37.6.3. Brand and Models

ZAP Engineering has selected North Safety as its NIOSH-certified respirator. Only this brand of respirator shall be used in compliance with the conditions of the certification of its Respiratory Protection Program (fit testing model, no mixing of different manufacturer parts, cartridges, filters, etc.).

The specific model will be based on the hazard, concentration of contaminant, oxygen level, work environment and type of work being performed. To aid in the selection process the following will be used to identify the proper North respiratory equipment for the work being performed and hazard that is present.

- NIOSH Pocket Guide to Chemicals
- North Cartridge Selection Guide
- North Respirator Selection Guide

37.6.4. Estimate of Exposures and Contaminant Information

- No employee shall enter an IDLH environment.
- Normal oxygen levels shall be maintained.
- No employee shall be exposed to an atmosphere containing concentrations that would exceed the STEL or PEL for the identified atmospheric hazard.

37.7. Respirator Fit Testing

Before an employee may be required to use any respirator with a negative or positive pressure tight-fitting face piece, the employee must be fit tested with the same make, model, style, and size of respirator that will be used. This section specifies the kinds of fit tests allowed, the procedures for conducting them, and how the results of the fit tests must be used.

All respirator users are fit-tested at least annually and more often if other federal requirements apply.

Supplied Air Respirators are required to be fit tested as well.

ZAP Engineering shall ensure that employees using a tight-fitting face piece respirator pass an appropriate qualitative fit test (QLFT) or quantitative fit test (QNFT) as stated in this program.

ZAP Engineering shall ensure that an employee using a tight-fitting face piece respirator is fit tested prior to initial use of the respirator, whenever a different respirator face piece (size, style, model or make) is used, and at least annually thereafter.

ZAP Engineering shall conduct an additional fit test whenever the employee reports, or ZAP Engineering's PLHCP, supervisor, or Program Administrator makes visual observations of, changes in the employee's

physical condition that could affect respirator fit. Such conditions include, but are not limited to, facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight.

If after passing a QLFT or QNFT, the employee subsequently notifies ZAP Engineering, Program Administrator, supervisor, or PLHCP that the fit of the respirator is unacceptable, the employee shall be given a reasonable opportunity to select a different respirator face piece and to be retested.

The fit test shall be administered using an OSHA-accepted QLFT or QNFT protocol. The OSHA-accepted QLFT and QNFT protocols and procedures are contained in this section.

QLFT may only be used to fit test negative pressure air-purifying respirators that must achieve a fit factor of 100 or less. Half face air filtering respirators may be fit tested with irritant smoke while full face air filtering respirators require Porta count fit testing.

If the fit factor, as determined through an OSHA-accepted QNFT protocol, is equal to or greater than 100 for tight-fitting half face pieces, or equal to or greater than 500 for tight-fitting full-face pieces, the QNFT has been passed with that respirator.

Fit testing of tight-fitting atmosphere-supplying respirators and tight-fitting powered air-purifying respirators shall be accomplished by performing quantitative or qualitative fit testing in the negative pressure mode, regardless of the mode of operation (negative or positive pressure) that is used for respiratory protection.

Qualitative fit testing of these respirators shall be accomplished by temporarily converting the respirator user's actual face piece into a negative pressure respirator with appropriate filters, or by using an identical negative pressure air-purifying respirator face piece with the same sealing surfaces as a surrogate for the atmosphere-supplying or powered air-purifying respirator face piece.

Quantitative fit testing of these respirators shall be accomplished by modifying the face piece to allow sampling inside the face piece in the breathing zone of the user, midway between the nose and mouth. This requirement shall be accomplished by installing a permanent sampling probe onto a surrogate face piece, or by using a sampling adapter designed to temporarily provide a means of sampling air from inside the face piece.

Any modifications to the respirator face piece for fit testing shall be completely removed, and the face piece restored to NIOSH-approved configuration, before that face piece can be used in the workplace.

37.7.1. Fit Test Procedures

The requirements in this section apply to all OSHA-accepted fit test methods, both QLFT and QNFT.

The test subject shall be allowed to pick the most acceptable respirator from a sufficient number of respirator sizes so that the respirator is acceptable to, and correctly fits, the user.

Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine an acceptable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject's formal training on respirator use, because it is only a review.

The test subject shall be informed that he/she is being asked to select the respirator that provides the most acceptable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.

The test subject shall be instructed to hold each chosen face piece up to the face and eliminate those that obviously do not give an acceptable fit.

The more acceptable face pieces are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the following points:

- If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.
- Position of the mask on the nose
- Room for eye protection
- Room to talk
- Position of mask on face and cheeks

The following criteria shall be used to help determine the adequacy of the respirator fit:

- Chin properly placed;
- Adequate strap tension, not overly tightened;
- Fit across nose bridge;
- Respirator of proper size to span distance from nose to chin;
- Tendency of respirator to slip;
- Self-observation in mirror to evaluate fit and respirator position.
- Use the Fit Test form.

37.7.2. User Seal Check

Before conducting the negative and positive pressure checks, the subject shall be told to seat the mask on the face by moving the head from side-to-side and up and down slowly while taking in a few slow deep breaths. The test subject shall conduct a user seal check, either the negative or positive pressure seal checks described below:

Positive Pressure Check

Close off the exhalation valve and exhale gently into the face piece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the face piece without any evidence of outward leakage of air at the seal. For most respirators this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve and then carefully replacing it after the test.

Negative Pressure Check

Close off the inlet opening of the canister or cartridge(s) by covering with the palm of the hand(s) or by replacing the filter seal(s), inhale gently so that the face piece collapses slightly, and hold the breath for ten seconds. The design of the inlet opening of some cartridges cannot be effectively covered with the palm of the hand. The test can be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove. If the face piece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

The test shall not be conducted if there is any hair growth between the skin and the face piece sealing surface, such as stubble beard growth, beard, moustache or sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed, including glasses.

If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician or other licensed health care professional, as appropriate, to determine whether the test subject can wear a respirator while performing her or his duties. If the employee finds the fit of the respirator unacceptable, the test subject shall be given the opportunity to select a different respirator and to be retested.

Prior to the commencement of the fit test, the test subject shall be given a description of the fit test and the test subject's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.

The fit test shall be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use which could interfere with respirator fit.

Test Exercises

Each test exercise shall be performed for one minute except for the grimace exercise which shall be performed for 15 seconds. The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried. If due to medical or health conditions the employee cannot perform the test exercises the fit test shall not be performed and the employee not allowed to use a respirator until all elements of the fit test can be achieved.

The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

The following test exercises are to be performed for all fit testing methods prescribed in this procedure:

- Normal breathing. In a normal standing position, without talking, the subject shall breathe normally.
- Deep breathing. In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as not to hyperventilate.
- Turning head side to side. Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.
- Moving head up and down. Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).
- Talking. The subject shall talk out loud slowly and loud enough to be heard clearly by the test conductor. The subject shall read from the Rainbow Passage

Rainbow Passage

> "When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends

apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow." Continue to read for one minute.

- Grimace. The test subject shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT)
- Jogging in place. The test subject shall jog in place being careful to be aware of their surroundings.
- Normal breathing. Same as exercise (1).

37.7.3. Qualitative Fit Test (QLFT) Protocols

General

ZAP Engineering shall ensure that persons administering QLFT are able to prepare test solutions, calibrate equipment and perform tests properly, recognize invalid tests, and ensure that test equipment is in proper working order. ZAP Engineering shall ensure that QLFT equipment is kept clean and well maintained so as to operate within the parameters for which it was designed.

Irritant Smoke (Stannic Chloride) Protocol

This qualitative fit test uses a person's response to the irritating chemicals released in the ``smoke'' produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator.

General Requirements and Precautions. The respirator to be tested shall be equipped with high efficiency particulate air (HEPA) or P100 series filter(s).

Only stannic chloride smoke tubes shall be used for this protocol. No form of test enclosure or hood for the test subject shall be used.

The smoke can be irritating to the eyes, lungs, and nasal passages. The test conductor shall take precautions to minimize the test subject's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken when performing the sensitivity screening checks that determine whether the test subject can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the test subject.

The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the build-up of irritant smoke in the general atmosphere.

The person to be tested must demonstrate his or her ability to detect a weak concentration of the irritant smoke.

- The test operator shall break both ends of a ventilation smoke tube containing stannic chloride and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute, or an aspirator squeeze bulb. The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.
- The test operator shall advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his/her eyes closed while the test is performed.

- The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he/she can detect it.

37.7.4. Irritant Smoke Fit Test Procedure

- The person being fit tested shall don the respirator without assistance and perform the required user seal check(s).
- The test subject shall be instructed to keep his/her eyes closed if wearing a half face respirator.
- The test operator shall direct the stream of irritant smoke from the smoke tube toward the face seal area of the test subject, using the low flow pump or the squeeze bulb. The test operator shall begin at least 12 inches from the face piece and move the smoke stream around the whole perimeter of the mask. The operator shall gradually make two more passes around the perimeter of the mask, moving to within six inches of the respirator.
- If the person being tested has not had an involuntary response and/or detected the irritant smoke, proceed with the test exercises.
- The exercises identified in the Test Exercises of this procedure shall be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at six inches.
- If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being retested must repeat the entire sensitivity check and fit test procedure.
- Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.
- If a response is produced during this second sensitivity check, then the fit test is passed. The glass tube shall be disposed of properly.

<u>Quantitative Fit Test (QNFT) Protocols</u>

Using controlled negative pressure and appropriate instrumentation to measure the volumetric leak rate of a face piece to quantify the respirator have been demonstrated to be acceptable to OSHA.

ZAP Engineering shall ensure that persons administering QNFT are able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly and ensure that test equipment is in proper working order.

ZAP Engineering shall ensure that QNFT equipment is kept clean, and is maintained and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.

Porta count Fit Test Requirements

- Check the respirator to make sure the respirator is fitted with a high-efficiency filter and that the sampling probe and line are properly attached to the face piece.
- Instruct the person to be tested to don the respirator for five minutes before the fit test starts. This purges the ambient particles trapped inside the respirator and permits the wearer to make certain the respirator is comfortable. This individual shall already have been trained on how to wear the respirator properly.
- Check the following conditions for the adequacy of the respirator fit: Chin properly placed; Adequate strap tension, not overly tightened; Fit across nose bridge; Respirator of proper size to span distance from nose to chin; Tendency of the respirator to slip; Self-observation in a mirror to evaluate fit and respirator position.
- Have the person wearing the respirator do a user seal check. If leakage is detected, determine the cause. If leakage is from a poorly fitting face piece, try another size of the same model respirator, or another model of respirator.
- Follow the manufacturer's instructions for operating the Portacount and proceed with the test.
- The test subject shall be instructed to perform the exercises in Test Exercises section of this procedure.
- After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.

Portacount Test Instrument

The Porta count will automatically stop and calculate the overall fit factor for the entire set of exercises. The overall fit factor is what counts. The Pass or Fail message will indicate whether the test was successful. If the test was a Pass, the fit test is over. Since the pass or fail criterion of the Porta count is user programmable, the test operator shall ensure that the pass or fail criterion meet the requirements for minimum respirator performance.

A record of the test needs to be sent to the Safety Manager and kept on file, assuming the fit test was successful. The record must contain the test subject's name; overall fit factor; make, model, style, and size of respirator used; and date tested.

37.8. Use, Maintenance, and Care of Respirators

This section requires ZAP Engineering to provide for the use, cleaning and disinfecting, storage, inspection, and repair of respirators used by employees. Appendix B - Respirator Cleaning Procedures (Mandatory) shall be followed.

37.8.1. Use

- Items that can affect the face to mask seal are prohibited. This includes facial hair, glasses, clothing, etc.
- Each time a respirator is put on a positive and negative pressure check shall be performed.

37.8.2. Cleaning and Disinfecting Requirements

ZAP Engineering shall provide each respirator user with a respirator that is clean, sanitary, and in good working order. ZAP Engineering shall ensure that respirators are cleaned and disinfected using the procedures in this Respiratory Protection Program, or procedures recommended by the respirator manufacturer, provided that such procedures are of equivalent effectiveness. The respirators shall be cleaned and disinfected at the following intervals:

- Respirators issued for the exclusive use of an employee shall be cleaned and disinfected by the employee as often as necessary to be maintained in a sanitary condition,
- Respirators used in fit testing and training shall be cleaned and disinfected after each use by the Safety Manager or designated person.
- Everyone who is assigned a cartridge respirator is responsible for seeing that the respirator is cleaned, inspected and properly stored.

37.8.3. Cleaning Procedures

- Remove filters, cartridges, or canisters. Disassemble face pieces by removing speaking diaphragms, demand and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.
- Wash components in warm water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.
- Rinse components thoroughly in clean, warm, preferably running water. Drain.
- When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in commercially available cleansers of equivalent disinfectant quality. Another alternative is to use wipes containing alcohol that are intended for use with respirators.
- Rinse components thoroughly in clean, warm, preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on face pieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.
- Components should be hand-dried with a clean lint-free cloth or air dried. Reassemble face piece, replacing filters, cartridges, and canisters where necessary. Test the respirator to ensure that all components work properly.

37.8.4. Storage and Inspection

- Respiratory equipment shall be stored in a manner to protect it from damage, contamination, temperature extreme, etc.
- Respiratory equipment intended for emergency use shall be stored in an area that is readily accessible and be clearly marked.

ZAP Engineering shall ensure that respirators are inspected as follows:

- All respirators used in routine situations shall be inspected by the employee before each use and during cleaning;
- A check by the employee of respirator function, tightness of connections, and the condition of the various parts including, but not limited to, the face piece, head straps, valves, connecting tube, and cartridges, canisters or filters; and
- A check of elastomeric parts for pliability and signs of deterioration.

- Emergency respiratory equipment will be inspected at least monthly, and before and after each use.
- Escape only respiratory equipment will be inspected before being carried into workplace.

37.8.5. Breathing Air Quality and Use

ZAP Engineering shall ensure that compressed air accords with the following specifications:

- Compressed breathing air shall meet at least the requirements for Type 1-Grade D breathing air described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989, to include:
    - Oxygen content (v/v) of 19.5-23.5%;
    - Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less;
    - Carbon monoxide (CO) content of 10 ppm or less;
    - Carbon dioxide content of 1,000 ppm or less; and
    - Lack of noticeable odor.

- ZAP Engineering shall ensure that oxygen is not used in compressed air units.
- ZAP Engineering shall ensure that oxygen concentrations greater than 23.5% are used only in equipment designed for oxygen service or distribution.
- ZAP Engineering shall ensure that cylinders used to supply breathing air to respirators meet DOT requirements and that:
    - Cylinders are tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR part 173 and part 178);
    - Cylinders of purchased breathing air have a certificate of analysis from the supplier that the breathing air meets the requirements for Type 1--Grade D breathing air; and
    - The moisture content in the cylinder does not exceed a dew point of -50 deg. F (-45.6 deg. C) at 1 atmosphere pressure.

- ZAP Engineering shall ensure that compressors used to supply breathing air to respirators are constructed and situated to:
    - Prevent entry of contaminated air into the air-supply system;
    - Minimize moisture content so that the dew point at 1 atmosphere pressure is 10 degrees F (5.56 deg. C) below the ambient temperature;
    - Have suitable in-line air-purifying sorbent beds and filters to further ensure breathing air quality. Sorbent beds and filters shall be maintained and replaced or refurbished periodically following the manufacturer's instructions.

- Have a tag containing the most recent change date and the signature of the person authorized by ZAP Engineering to perform the change. The tag shall be maintained at the compressor.
- For compressors that are not oil-lubricated, ZAP Engineering shall ensure that carbon monoxide levels in the breathing air do not exceed 10 ppm.

- For oil-lubricated compressors, ZAP Engineering shall use a high-temperature or carbon monoxide alarm, or both, to monitor carbon monoxide levels. If only high-temperature alarms are used, the air supply shall be monitored at intervals enough to prevent carbon monoxide in the breathing air from exceeding 10 ppm.
- ZAP Engineering shall ensure that breathing air couplings are incompatible with outlets for nonrespirable worksite air or other gas systems. No asphyxiating substance shall be introduced into breathing air lines.

37.8.6. Repairs

ZAP Engineering shall ensure that respirators that fail an inspection or are otherwise found to be defective are immediately removed from service, and are discarded or repaired or adjusted in accordance with the following procedures:

- Repairs or adjustments to respirators are to be made only by persons appropriately trained to perform such operations and shall use only the respirator manufacturer's NIOSH-approved parts designed for the respirator;
- Repairs shall be made according to the manufacturer's recommendations and specifications for the type and extent of repairs to be performed.

37.8.7. Voluntary Use

If an employee chooses to voluntarily wear a respirator when not required by this Program (contaminants do not meet protection standards, odors, etc.) they will be advised of the following in their training:

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for employees.

However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the employee. Sometimes, employees may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If your employer provides respirators for your voluntary use, of if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following:

- Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirator's limitations.
- Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.
- Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.
- Keep track of your respirator so that you do not mistakenly use someone else's respirator.

37.9. Workplace Monitoring

A program of monitoring potential employee exposures has been implemented through the corporate health and safety department. Project personnel may also be assigned with the task of conducting air monitoring. Direct-reading instruments will also be used in the characterization of potential exposures. All the data collected is used to determine the appropriateness of the respiratory equipment.

37.10. Recordkeeping

ZAP Engineering will establish and retain written information regarding medical evaluations, fit testing and the respirator program. Records of medical evaluations required by this section must be retained and made available in accordance with 29 CFR 1910.1020. ZAP ENGINEERING shall provide the employee with an opportunity to discuss the questionnaire and examination results with the PLHCP.

Records will be treated confidentially and maintained on file in the ZAP Engineering corporate office by the Safety Manager.

37.11. Program Evaluation

ZAP Engineering shall conduct evaluations of the workplace as necessary to ensure that the provisions of the current written program are being effectively implemented and that it continues to be effective.

ZAP Engineering shall regularly consult employees required to use respirators to assess the employees' views on this program's effectiveness and to identify any problems. Any problems that are identified during this assessment shall be corrected. Factors to be assessed and verified include, but are not limited to:

- Respirator fit (including the ability to use the respirator without interfering with effective workplace performance); Appropriate respirator selection for the hazards to which the employee is exposed;
- Proper respirator use under the workplace conditions the employee encounters; and
- Proper respirator maintenance.

37.12. Training

All employees will receive respirator training during their initial health and safety training class and on at least an annual basis, if required for their job classification. Training shall address employee knowledge of respirators, fit, use, limitations, emergency situations, wearing, fit checks, maintenance & storage, medical signs and symptoms of effective use and general requirements of the OSHA standard. The training must be provided before requiring the employee to use the respirator.

37.12.1. Retraining

Retraining shall be administered annually, and when the following situations occur:

- Changes in the workplace or the type of respirator render previous training obsolete;
- Inadequacies in the employee's knowledge or use of the respirator indicate that the employee has not retained the requisite understanding or skill; or
- Any other situation arises in which retraining appears necessary to ensure safe respirator use.

ZAP ENGINEERING Qualitative Respiratory Fit Test Record Sheet

Note: Employee Must Have Completed Respiratory Protection Training and Passed Airway Exam Prior To Fit Testing

Test Date: _____

Employee Name: _____ **SS#** _____

Test Agent: Irritant Smoke (Stannic Chloride)

Respirator Identification:

Model: North 7700 Series Half Mask Size (circle one): Small Medium Large
Manufacturer: North Safety Products Approval No: 42 CFR 84
Additional Information: Respirator must be equipped with North HEPA filters

Fit Test Protocol (Test Subject Initials indicate steps were performed):

___ TOLD TO KEEP EYES CLOSED DURING SMOKE EXPOSURE

___Test subject smelled irritant smoke before fit test
___Protocol reviewed before fit test
___Shown how to wear respirator
___Mirror available for use by subject
___Must wear PPE (hard hat, etc.) if needed
___Wore respirator 5 minutes before fit test
___Test subject did not have hair in fitting area
___Performed positive pressure & negative fit check successfully after seating respirator

Fit Test Steps (1 minute each except Grimace = 15 seconds)

___ Breath normally
___ Nod up and down
___ Jog in place
___ Breathe deeply
___ Talking (Read Rainbow Passage)
___ Breath normally
___ Turned head side to side
___ Grimace

"When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow".

Fit Test Results: _____ Pass _____ Fail
Test Subject Signature: _____ Date: _____

Examiner's Name: _____ Examiner's Signature: _____ Date: _____

Distribution: **Employee Local File - ZAP ENGINEERING Safety & Training Dept**

38. SHORT SERVICE EMPLOYEE

38.1. Purpose

The purpose of the Short Service Employee (SSE) Management program is to prevent work related injuries and illnesses to new hires and temporary workers. The Supervisors and co-workers must be able to readily identify Short Service Employee participants. ZAP Engineering will assign experienced employees to oversee the daily activities of those assigned to the SSE program.

38.2. Scope

Applies to all ZAP Engineering employees in shop and field operations. Applies to all newly hired ZAP Engineering employees (regardless of experience), temporary agency personnel or our independent contractors working on ZAP Engineering or client locations/ facilities.

38.3. Definitions

Short Service Employee (Who is Covered Under the Short Service Employee Program) – An employee or sub-contractor employee with less than six months experience in the same job or with his/her present employer.

Mentor – An experienced employee, who has been assigned to help and work with a new Short Service Employee by his/her supervisor.

38.4. Key Responsibilities

Managers and Supervisors shall ensure that this program is implemented and followed.
Employees shall follow the requirements of this program.

38.4.1. Monitoring of Short Service Employees at the Job Site

ZAP Engineering shall monitor its employees, including SSE personnel, for HES awareness. If, at the end of the six-month period, the SSE has worked safely, adhered to HES policies and has no recordable incident attributable to him/her, the SSE identifier may be removed at the discretion of ZAP Engineering. ZAP Engineering shall require any employee that does not complete the six-month period recordable free to get operator approval in writing prior to returning to operator property.

38.4.2. Subcontractors

Subcontractors must adhere to the requirements of the Short Service Employee program. Subcontractors must manage their Short Service Employees in accordance with the requirements of the Short Service Employee program.

38.5. Procedure

38.5.1. General

A Short Service Employee may not work alone. A Short Service Employee may not work alone. A work crew of less than 5 employees may not have more than one Short Service Employee.

Supervisors will assure that all new, transferred and temporary employees have been through ZAP Engineering Safety Orientation and have a complete knowledge of the expectations for their job function.

38.5.2. Mentoring Oversight and Monitoring

A Short Service Employee is mentored by an experienced/ knowledgeable employee. A mentoring system shall be implemented to provide guidance to Short Service Employees and assist with their development. A mentor may only be assigned to one crew that includes Short Service Employees and he/she must remain on site with them.

Supervisors will identify all employees and temporary personnel with less than 180 days of service, or those employees they desire to return to a mentoring status for improvement in job and/or safety performance. Any Short Service Employee experiencing an OSHA Recordable injury during the initial 180 days will repeat the mentoring program or shall be dismissed for poor performance.

Managers and the Safety Department will randomly audit for process compliance. This will involve interviewing employees in the Short Service Employee program (documentation is not required).

Short Service Employees are monitored for compliance with HSE policies and procedures. Short Service Employees shall be monitored for compliance with health, safety and environmental policies and procedures. Once the Short Service Employee has demonstrated competency and compliance with HSE policies and procedures, the contractor may remove the hi-visibility identifier.

38.5.3. Short Service Employee Identification

Short Service Employees must wear uniquely colored hardhats (or another type of identifier). Short Service Employees shall be visibly identified using a different colored hardhat or other method of identification. The method used to identify SSEs should be communicated to the Owner Client.

38.5.4. Notification and Communication Processes

The host facility must be notified when a Short Service Employee will be working at their site. Prior to starting work, ZAP Engineering shall notify the host facility (project coordinator, contractor contact, and/or on-site supervisor) if Short Service Employees are present on work crews.

Mentors will converse daily with those persons assigned to them, preferably at the start of the day. This will be in addition to other tailgate or daily safety meetings held in the work area.

39. SPILL PREVENTION

39.1. Purpose

The purpose of this plan is to document spill prevention and response requirements. Each ZAP Engineering work site will develop a spill prevention and response plan based on the requirements and template provided.

39.2. Scope

This procedure applies to all ZAP Engineering operations. When work is performed on a non-owned or operated site, the operator's program shall take precedence, however, this document covers ZAP Engineering employees and contractors and shall be used on owned premises, or when an operator's program doesn't exist or is less stringent.

39.3. Requirements

Each work site spill prevention and response plan shall contain the following requirements.

- Chemical substances should be stored in proper containers to minimize the potential for a spill. Whenever possible, chemicals should be kept in closed containers and stored so they are not exposed to storm water.
- The program must identify chemicals used that may be potentially spilled or released. This will include both liquid chemicals used at our facilities or brought on to owner client sites.
- Spill kits must be adequate for any anticipated spills. A proper spill kit must contain the appropriate supplies for materials that may be spilled. Supplies must be easily accessible when required, and considerations must be made for both the type and quantity of materials. The contents of spill response kits shall be periodically assessed to ensure the availability of adequate spill response supplies and adjust inventory as necessary.
- ZAP Engineering shall ensure the availability of adequate spill response supplies by periodic inspection to assess their availability and adjust the inventory as necessary.
- Employees must be instructed on spill prevention and the proper response procedures for spilled materials. The training should include materials available for use, proper waste disposal and communication procedures.
- Areas where chemicals may be used or stored must be maintained using good housekeeping best management practices. This includes, but is not limited to clean and organized storage, labeling and secondary containment where necessary.
- Proper communication measures for employees to initiate in the event of a spill will be created on a site by site basis. Communication procedures will be based on type and quantity of materials spilled.
- Environmental spills shall be reported to environmental authorities when required. Reporting procedures will be based on type and quantity of materials spilled.

The following template shall be used for each work site.

Copies of this plan are located at the facility and are available to all employees.

Location(s) of plan(s): _____

Facility Information

Facility Name: _____

Mailing Address: _____
_____

Physical address if different: _____
_____
_____

Owner Name: _____

Owner Address: _____
_____

Primary Contact Name: _____
Work Phone Number: _____
Home Phone Number: _____
Mobile Phone Number: _____

Secondary Contact Name: _____
Work Phone Number: _____
Home Phone Number: _____
Mobile Phone Number: _____

Date of Initial Operation: _____

Site Assessment

Location - Describe where facility is located.

_____
_____
_____
_____
_____
_____

Facility Description

Facilities and Equipment (*examples are shown but complete per site description*):

___ Garage for vehicle processing
___ Parts storage
___ Manufacturing Building
___ Spill kit/emergency equipment
___ Refrigerant (Freon) extractor

___ Parts washer

Please list: _____
_____
_____

Services:

___ Dismantler/Recycler
___ Equipment Repair
___ Moving Equipment
___ Painting/Sandblasting
___ Manufacturing

Please list: _____
_____

Fixed Storage - List capacity and contents of each storage container. For example, "One 6,000 gallon above ground tank containing diesel fuel." Be sure to include diesel, gasoline, waste oil, heating oil, kerosene, paint thinner and other solvents. Also describe the construction of the containers, secondary containment for each, liquid level indicators, alarms and method of corrosion protection for each container._____
_____
_____
_____
_____
_____
_____

Non-Fixed Storage - List capacity and contents of each storage container. For example, "One 55-gallon drum for recycled oil." Be sure to indicate what each container is used for; its condition and construction and how secondary containment is provided. _____
_____
_____
_____
_____
_____

Total quantity of stored materials: - The combined quantity of the materials listed above: _____ gallons

Oil spill history

Place an X on the appropriate line and proceed accordingly.

___ There has never been a significant spill at the above-named facility.

___ There have been one or more significant spills at the above-named facility. Details of such spill(s) are described below. For each spill that occurred, supply the following information:

- Type and amount of oil spilled
- Location, date and time of spill(s)

- Watercourse affected
- Description of physical damage
- Cost of damage
- Cost of clean-up
- Cause of spill
- Action taken to prevent recurrence

Potential Spill Volumes and Rates

Fill in all applicable blanks.

Potential Event	Volume Released	Spill Rate
Complete failure of a full tank*	___ gallons	instantaneous
Partial failure of a full tank*	1 to ___ gallons	gradual to instantaneous
Tank overflow**	1 to ___ gallons	up to ___ gallons per minute
Leaking during unloading***	up to ___ gallons	up to ___ gallons per minute
Pipe failure****	up to ___ gallons	up to ___ gallons per minute
Leaking pipe or valve****	several ounces to gallons	up to ___ gallons per minute
Fueling operations****	several ounces to gallons	up to ___ gallons per minute
Oil and grease	several ounces to quarts	spotting

* Volume of largest tank
** Calculate using the rate at which fuel is dispensed from the delivery truck into your tank(s).
*** Calculate using the rate at which petroleum would be withdrawn from the tank if it should have to be emptied (*e.g.,* if it was being taken out of service).
**** Calculate based on the specifications of your equipment.

Spill Prevention and Control

Spill Prevention - Provide specific descriptions of containment facilities and practices. Include description of items such as double-walled tanks, containment berms, emergency shut-offs, drip pans, fueling procedures and spill response kits. Also, describe how and when employees are trained in proper handling procedures and spill prevention and response procedures.

Spill discharge and flow - For each potential spill source; describe where petroleum would flow in the event of a spill. For example, "The 6,000-gallon diesel tank has a pre-manufactured secondary containment system capable of holding 110 percent of the total volume of the tank" and, "A spill from engine repair would be contained inside the shop building and quickly cleaned up with oil absorbents." Incorporate site map by reference (see instructions under *Appendices*).

Spill response - Identify what equipment would be deployed by whom and in what situation. Also, include phone numbers for response agencies, *e.g.,* U.S. Coast Guard, fire department, spill response contractors, etc. A copy of your spill response plan may be attached as an appendix to this plan in lieu of completing this section.

Security - Provide a description of how all containers are protected when the facility is not in operation or unattended. Include a description of fencing, access control, gates, locks, etc. that prevent access by unauthorized individuals.

Facility Inspections

Routine Inspections - Name facilities and the frequency with which they are inspected. For example, "The fuel pumps are inspected daily. The materials storage area is inspected monthly." Describe all facility containers, piping, etc. that is to be inspected. Name the person who has responsibility to implement preventative maintenance programs, oversee on-site inspections, coordinate employee training, maintain records, update the plan as necessary, and ensure that reports are submitted to the proper authorities.

Annual Inspections - Include a description of annual comprehensive inspections. For example, "A site inspection is also conducted annually by appropriate responsible personnel to verify that the description of potential pollutant sources are accurate, that the map reflects current site conditions, and that the controls to reduce the pollutants identified in this plan are being implemented and are adequate. This annual inspection will be conducted above and beyond the routine inspections done focusing on designated equipment and areas where potential sources are located."

Record Keeping

Describe record keeping procedures. For example, "Record keeping procedures consist of maintaining all records a minimum of three years. The following items will be kept on file: current plan, internal site reviews, training records, and documentation of any spills or maintenance conducted in regard to these sites." *Maintenance Inspection, Employee Training,* and *Record Keeping* logs are included in this template for your use.

Maintenance Inspections

Maintenance Coordinator Name:

Maintenance Coordinator responsibilities include implementation of preventative maintenance programs and oversight of on-site inspections.

Use this table to record inspections:

Facility Inspected	Date of Inspection	Name of Inspector	Result Pass/Fail	Comments

Employee Training

Employee Training Coordinator Name: _____

Use this table to record spill prevention and response training.

Name of Employee	Date of Training	Type of Training/Topics Addressed

Record Keeping of Incidental Spills

Record Keeper Name:

Record Keeper responsibilities include maintaining records of incidents, updating the plan as necessary and ensuring reports are submitted to the proper authorities when necessary.

Incident No.	Type of Incident	Date of Occurrence	How it was Cleaned Up

Appendices

Site map - Attach a site map as Appendix A to this plan. You may attach an existing site map or create your own. If you use an existing map, be sure that the items listed below are included. If you need to create a site map, use a large enough piece of paper so all site plan elements may be seen and try to keep the map to a scale (e.g. 1" = 20' The following instructions should guide you step-by-step. Please use a straight edge (ruler) while creating the sketch.

- The sketch should be oriented as if you were in a plane looking down on your property (an aerial view), with North at the top (draw an arrow indicating north).
- Draw and label all roadways surrounding the work site.
- Draw and label all facilities within the work site as close proportionately as possible.
- Draw an arrow(s) pointing in the direction of downhill flow of water when it rains.
- Draw the location and general layout of all vehicles associated with the work site.
- Label any rivers or waterways surrounding the work site.
- Draw and label all methods of entry to the work site.
- Draw and label the location of all fuel containment facilities.
- Draw and label the location of all in-place spill prevention, control and countermeasure devices.

Other attachments - List any additional information to be attached as Appendix B, C, D, etc. Label and staple the attachments to the end of this plan.

Appendix A: Site Map
Appendix B: Emergency Response Posting Locations

Appendix C: _____
Appendix D: _____

Management Approval

I certify that I have personally examined and am familiar with the information submitted in this document and that, based on my inquiry of those individuals responsible for obtaining this information, the information submitted is true, accurate and complete.

_____ _____
Signature Title

_____ _____
Printed name Date

40. STOP WORK AUTHORITY

40.1. Purpose

The Stop Work Authority process involves a stop, notify, correct and resume approach for the resolution of a perceived unsafe condition, act, error, omission or lack of understanding that could result in an undesirable event. All ZAP Engineering employees have the authority and obligation to stop any task or operation where concerns or questions regarding the control of health, safety or environmental risks exist.

40.2. Scope

This program applies to all ZAP Engineering projects and operations.

40.3. Key Responsibilities

Employees are responsible to initiate a Stop Work Intervention when warranted and management is responsible to create a culture where SWA is exercised freely.

Supervisors are responsible to ensure a culture is created where SWA is exercised and honored freely to resolve issues before operations resume and recognize proactive participation.

Management must establish and support clear expectations to exercise SWA, create a culture where SWA is exercised freely and hold those accountable that chose not to comply with established SWA policies.

40.4. Stop Work Authority Procedure

When an unsafe condition is identified the Stop Work Intervention will be initiated, coordinated through the supervisor, initiated in a positive manner, notify all affected personnel and supervision of the stop work issue, correct the issue and resume work when safe to do so.

No work will resume until all stop work issues and concerns have been adequately addressed.

Any form of retribution or intimidation directed at any individual or ZAP Engineering for exercising their right to issue a stop work authority will not be tolerated by the host nor by ZAP Engineering.

40.5. Follow-Up

All Stop Work Interventions shall be documented for lessons learned and corrective measures to be put into place.

Stop Work reports shall be reviewed by supervision order to measure participation, determine quality of interventions and follow-up, trend common issues, identify opportunities for improvement, and facilitate sharing of learning.

It is the desired outcome of any Stop Work Intervention that the identified safety concern(s) have been addressed to the satisfaction of all involved persons prior to the resumption of work. Most issues can be adequately resolved in a timely manner at the job site, occasionally additional investigation and corrective actions may be required to identify and address root causes.

40.6. Training

Employees shall receive Stop Work Authority training before their initial assignment. The training will be documented including the employee name, the dates of training and subject matter.

STOP WORK FORM

Section 1: Stop Work Issuance			
Location of operation		Date & Time	
Supervisor		Phone	
Person initiating stop work			
Person performing work			
Work operation or condition (include names of individuals performing work)			
Hazard (as stated by person initiating stop work)			

Section 2: Date / Time Informed			
Supervisor		Safety Manager	
Area Manager		Client Safety (If required)	

Section 3: Follow-up Action (Be specific – what by, who by, when by to correct hazard)			
Section 4: Restart Concurrence			
Supervisor		Date	
Area Manager		Date	
Safety Manager		Date	

EXHIBIT E – CONSTRUCTION REPORT & INSPECTION FORMS

CLIENT _____ PROJECT _____

FACILITY _____ PROJECT NO. _____

LOCATION _____ REPORT NO. SAMPLE

CONSTRUCTION STATUS REPORT

WEEK ENDING - 8/30/2020

SAFETY

SAFETY HOURS:

ZAP:	7,679	MAN HOURS
OUTRIGGER	2,352	MAN HOURS
WOOD	107,077	MAN HOURS
MMR:	8,909	MAN HOURS
HEATH STEEL	1,114	MAN HOURS
NDT	345	MAN HOURS
OTHER	1,709	MAN HOURS
VISITORS	5,215	MAN HOURS
OVERALL TOTAL:	134,400	MAN HOURS

Total HAZIDs for Reporting Period:		Total ZAP Safety Audits for Reporting Period:	

Incident Description: NONE

Preventative Action Taken: NONE

SCHEDULE UPDATE

Project Milestones Description	Baseline Milestone Date	Actual Milestone Date	Schedule Milestone Date	Critical Coordination Items
60% MODEL REVIEW	31-Mar	31-Mar		
PHA COMPLETE	17-Apr	16-Apr		
90% MODEL REVIEW	7-May	28-Apr		
ENGINEERING COMPLETE	4-Jun	28-May		
CONSTRUCTION MOBILIZATION	6-Jun	8-Jun		
MAJOR FOUNDATIONS COMPLETE	13-Aug		14-Sep	
MAJOR EQUIPMENT SET	9-Sep		26-Sep	
PRESSURE TESTING & RESTORATION COMPLETE	20-Nov		11-Nov *	

*Items marked with an asterisk have been revised since the last status report.

CRITICAL ITEMS / KEY DATES

Critical Issues / Risks

- Equipment Delivery Schedule
  - * Delivery of Propane Compressor B - 10/23, possibility to improve
  - * MV PDC Building - 9/24
- LV PDC Building Punchlist

Key Dates

- Major Foundations Complete - 9/14 - Cryo Area Sump
- Major Equipment Set - 9/26 - MV PDC Building

CLIENT _____ PROJECT _____

FACILITY _____ PROJECT NO. _____

LOCATION _____ REPORT NO. SAMPLE

CONSTRUCTION STATUS REPORT

WEEK ENDING - 8/30/2020

WEEKLY PHOTOS



Dehy Dust Filter Piping



MV Transformer Set



Slop Tank Containment



Demeth Tower Downcomer Insulation



Cable Tray on Rack 400



Stabilizer OH Compressors Set

CLIENT _____ PROJECT _____

FACILITY _____ PROJECT NO. _____

LOCATION _____ REPORT NO. SAMPLE

CONSTRUCTION STATUS REPORT

WEEK ENDING - 8/30/2020

STATUS REPORT

FROM PAST WEEK:

ENGINEERING

Project Management
- Construction Support

Process /Mechanical
- Construction Support

Electrical
- Construction Support
- Picking up OE2 comments on Heat Trace Package

Instrumentation & Controls
- Construction Support

Civil / Structural
- Construction Support

Procurement
- Weekly vendor meetings
- Tracking Report

Piping / Drafting
- None

CONSTRUCTION

Structural
- Poured south side wall of the residue compressor building and began backfill for SOG
- Poured ladder pads and misc. piers
- Started epoxy grout on three residue compressors and installed containment

Mechanical
- Continued pipe fabrication
- Installed downcomers on demeth tower
- Set overhead compressors and instrument air skid

Electrical
- Installed cable penetrations in PDC-2 for main feeds
- Installed fire alarm strobes, horns, gas detectors and ESDs
- Installed conduit to lighting, control room and stabilizer booster pumps
- Completed cable pulls to residue compressor coolers and stabilizer NGL pipeline pumps
- Installed cable tray in Areas 2000, 4000 and RIO Panels

CLIENT _____ PROJECT _____

FACILITY _____ PROJECT NO. _____

LOCATION _____ REPORT NO. SAMPLE

CONSTRUCTION STATUS REPORT

WEEK ENDING - 8/30/2020

TASKS TO BE COMPLETED IN THE NEXT 3 WEEKS:

ENGINEERING

Project Management
- Construction Support

Process / Mechanical
- Construction Support

Electrical
- Construction Support

Instrumentation & Controls
- Construction Support

Civil / Structural
- Finalize Bollard Plan
- Construction Support

Procurement
- Weekly vendor meetings
- Tracking Report

Piping / Drafting
- None

CONSTRUCTION

Structural
- Pour remaining SOG for residue compressor building
- Pour remaining piers in Area 2000
- Complete epoxy grout for compressors

Mechanical
- Work on pressure testing activities
- Set demeth tower and slop tanks
- Load pipe in the rack and bolt up to equipment

Electrical
- Cable pulls to propane condensers, lighting, RIOs, fire alarm systems, transformers and control room building
- Install conduit to skids in cryo and dehy areas
- Cable tray on piperack 400 and in area 2000
- Grounding to equipment
- Phone, meg and terminate motors, instruments and RIOs

CLIENT _____ PROJECT _____

FACILITY _____ PROJECT NO. _____

LOCATION _____ REPORT NO. SAMPLE

CONSTRUCTION STATUS REPORT

WEEK ENDING - 8/30/2020

EQUIPMENT / MATERIAL DELIVERIES

Current Week

- Stabilizer Compressors
- Medium Voltage Transformer

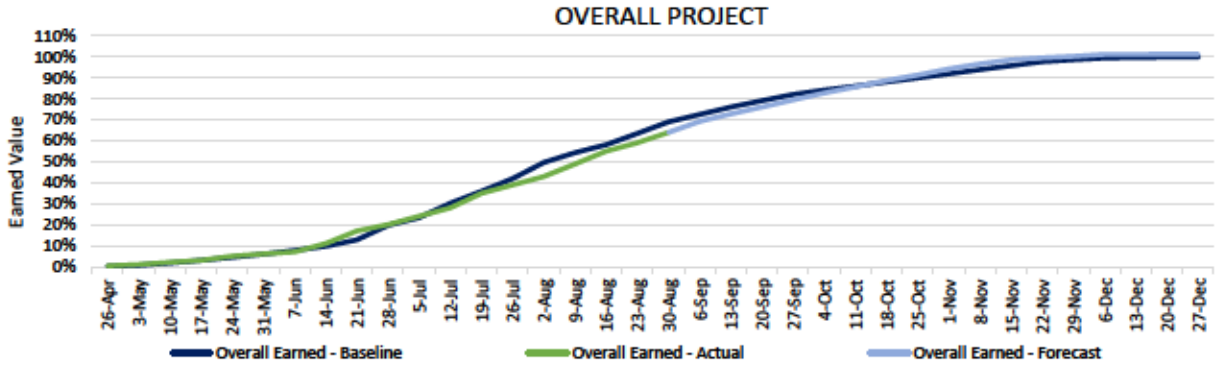
Next Week

- RSV Exchanger
- Cold Separator
- RSV Subcooler Heat Exchanger
- Dehy Inlet Coalescing Filter
- Dehy Valve Skid
- Low Voltage Transformers

CONSTRUCTION PROGRESS

OVERALL PROJECT

DESCRIPTION	WEIGHTED PERCENTAGE	PERCENT COMPLETE
CONCRETE	28%	94%
STRUCTURAL	12%	83%
PIPING	35%	62%
ELECTRICAL	25%	27%
TOTALS	**100%**	**65%**



CLIENT _____ PROJECT _____

FACILITY _____ PROJECT NO. _____

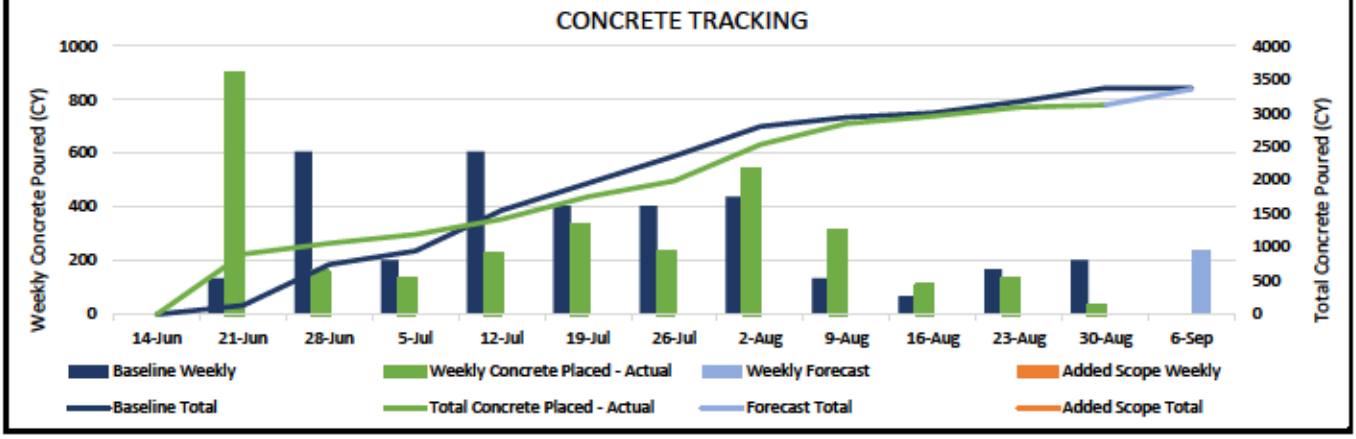
LOCATION _____ REPORT NO. SAMPLE

CONSTRUCTION STATUS REPORT

WEEK ENDING - 8/30/2020

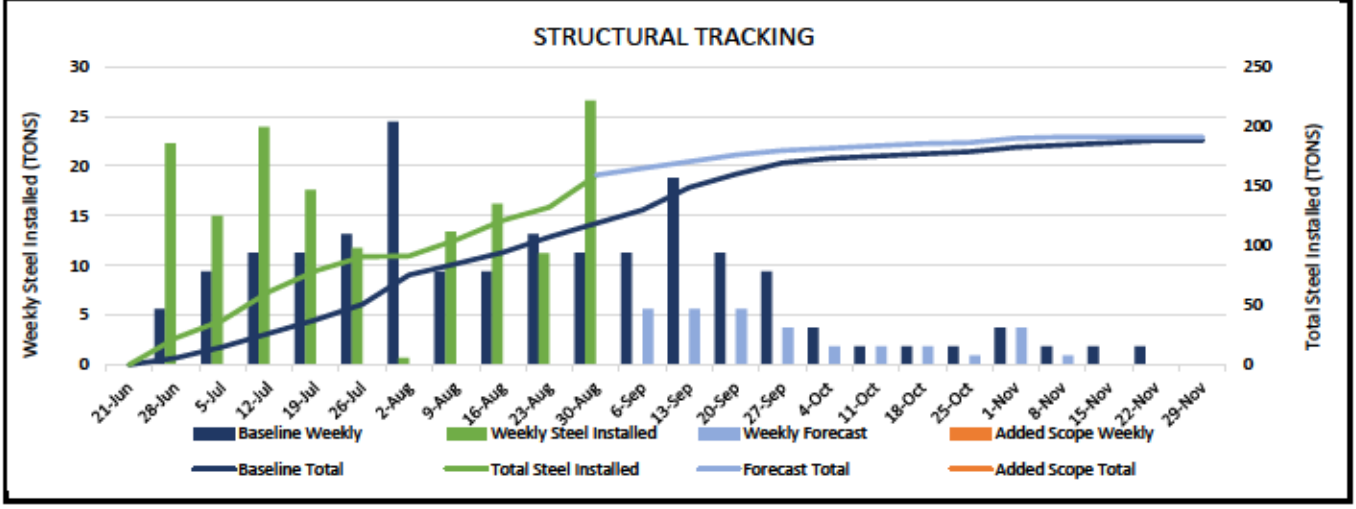
CONCRETE

DESCRIPTION	WEIGHTED PERCENTAGE	TOTAL YARDS (CY)	EXCAVATION & COMPACTION	REBAR INSTALLED	FORM & STRIP	CONCRETE PLACED	BACKFILL	PERCENT COMPLETE
BUILDINGS	16%	548	100.0%	94.3%	88.6%	81.3%	85.9%	88%
TANKS	4%	126	98.4%	98.4%	98.4%	97.9%	98.4%	98%
MAJOR EQUIPMENT	68%	2,283	97.7%	97.0%	97.0%	95.4%	95.2%	96%
LIGHT POLES	0%	4	100.0%	100.0%	100.0%	100.0%	100.0%	100%
PIPE RACK FOUNDATIONS	8%	277	98.0%	91.0%	91.0%	91.1%	91.0%	91%
MISC. SUPPORTS	3%	116	91.4%	91.4%	91.4%	91.6%	91.4%	91%
BALANCE OF PLANT	0%	15	51.0%	51.0%	51.0%	51.0%	51.0%	51%
TOTALS	100%	3,369	98%	96%	95%	93%	93%	94%



STRUCTURAL

DESCRIPTION	WEIGHTED PERCENTAGE	EXPECTED (TONS)	INSTALLED (TONS)	PERCENT COMPLETE
PIPE RACK & PLATFORMS	75%	144	121	84%
MISC SUPPORTS	25%	47	38	82%
TOTALS	100%	191	159	83%



CLIENT _____ PROJECT _____

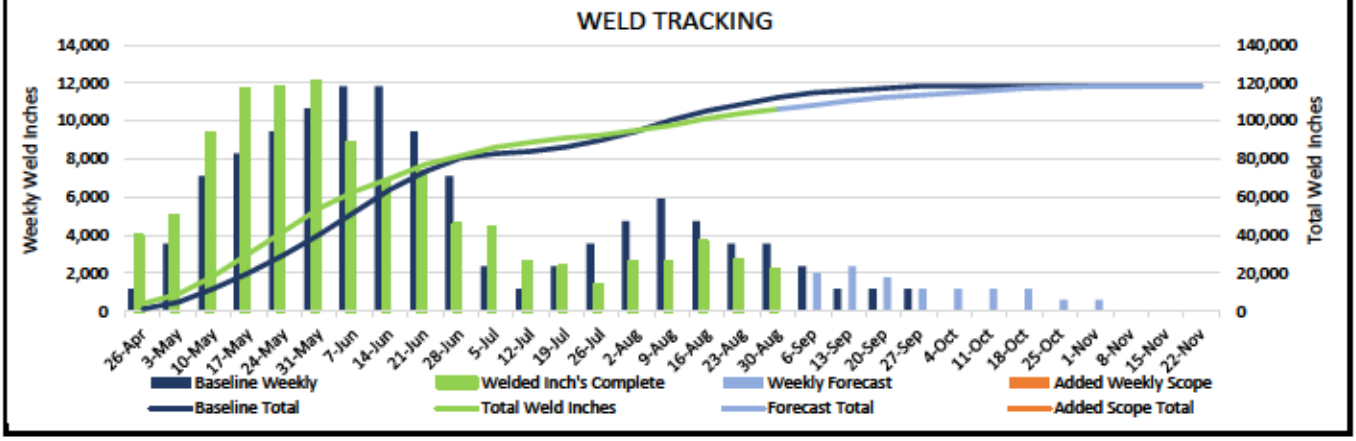
FACILITY _____ PROJECT NO. _____

LOCATION _____ REPORT NO. SAMPLE

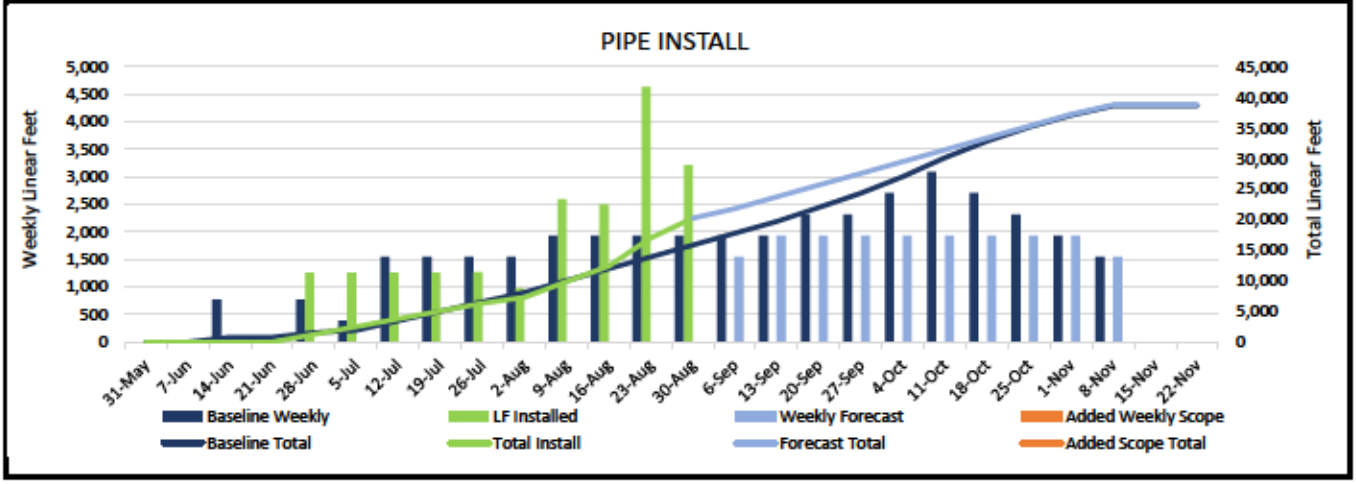
CONSTRUCTION STATUS REPORT

WEEK ENDING - 8/30/2020

PIPING - WELD INCHES				
DESCRIPTION	WEIGHTED PERCENTAGE	EXPECTED	COMPLETE	PERCENT COMPLETE (INCL. XRAY)
WELD INCHES - SHOP FAB	71%	83,842	83,842	100%
WELD INCHES - FIELD FAB	29%	34,519	22,386	63%
WELD INCHES - ADDED SCOPE	0%	0	0	0%
TOTALS	100%	118,361	106,228	89%



PIPING - INSTALL				
DESCRIPTION	WEIGHTED PERCENTAGE	EXPECTED (LF)	COMPLETE (LF)	PERCENT COMPLETE
INSTALLATION	60%	38,616	20,080	52%
PRESSURE TESTING	30%	38,616	3,089	8%
RESTORE	10%	38,616	1,609	4%
TOTALS	100%	38,616	24,779	34%



CLIENT _____ PROJECT _____

FACILITY _____ PROJECT NO. _____

LOCATION _____ REPORT NO. SAMPLE

CONSTRUCTION STATUS REPORT

WEEK ENDING - 8/30/2020

ELECTRICAL

DESCRIPTION	WEIGHTED PERCENTAGE	EXPECTED QUANTITY	COMPLETED QUANTITY	PERCENT COMPLETE
DUCT BANK (LF)	10%	3,690	3,545	96%
CABLE TRAY (LF)	5%	6,690	4,470	67%
GROUNDING	10%	36,830	20,050	54%
ABOVEGROUND CONDUIT (LF)	20%	25,233	7,925	31%
TERMINATIONS (COUNT)	15%	7,855	96	1%
CABLE PULLS (LF)	15%	282,200	39,498	14%
HEAT TRACE	15%	0	0	0%
LOOP CHECKS (COUNT)	10%	352	0	0%
TOTALS	100%			27%

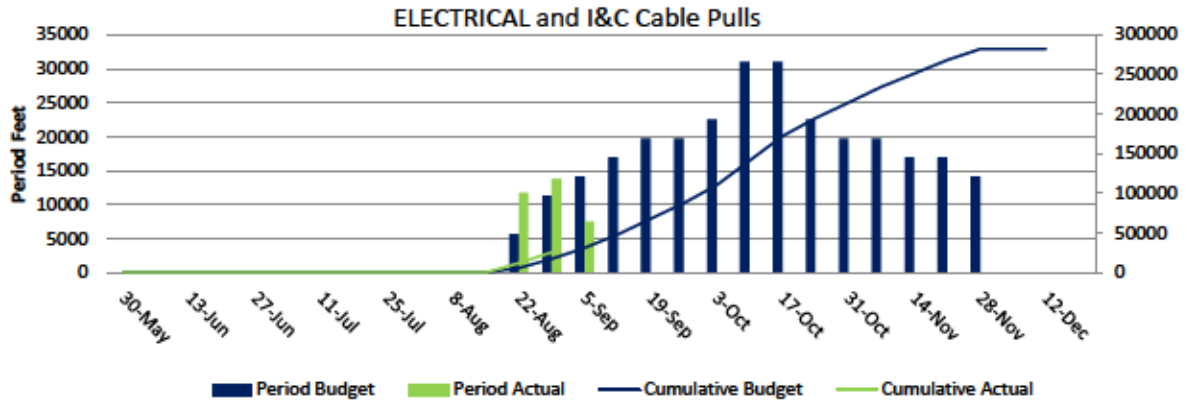
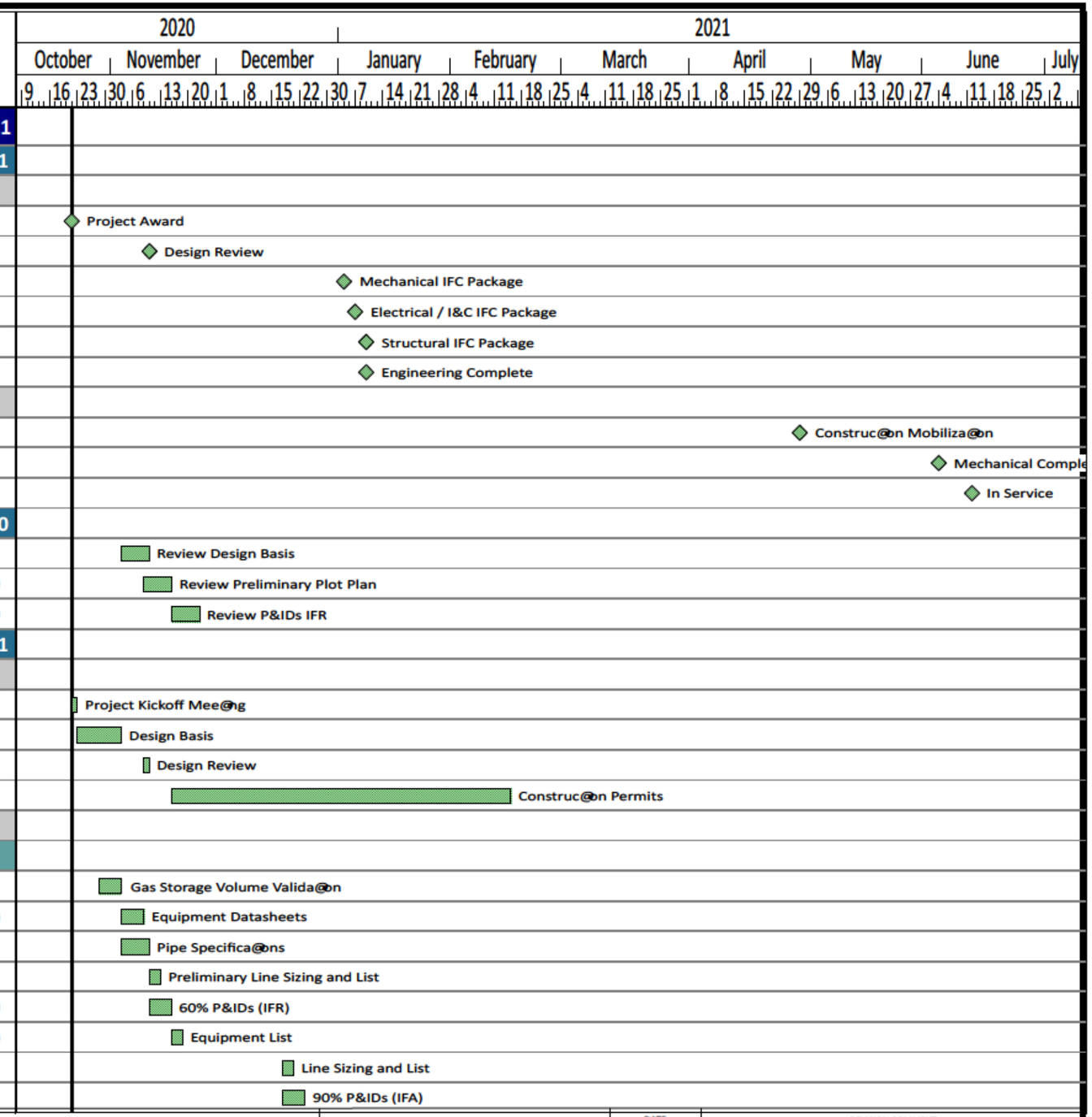


EXHIBIT F – PROJECT SCHEDULE

Line	Task ID	Task Name	Original Duration	Start	Finish
	0	BioCNG EPC	162d	Thu 10/22/20	Mon 06/14/21
	10	Project Milestones	162d	Thu 10/22/20	Mon 06/14/21
3	0011	Engineering Milestones	53d	Thu 10/22/20	Fri 01/08/21
4	20	Project Award	0d	Thu 10/22/20	Thu 10/22/20
5	30	Design Review	0d	Tue 11/10/20	Tue 11/10/20
6	80	Mechanical IFC Package	0d	Mon 01/04/21	Mon 01/04/21
7	90	Electrical / I&C IFC Package	0d	Wed 01/06/21	Wed 01/06/21
8	60	Structural IFC Package	0d	Fri 01/08/21	Fri 01/08/21
9	100	Engineering Complete	0d	Fri 01/08/21	Fri 01/08/21
10	1780	Construction Milestones	31d	Thu 04/29/21	Mon 06/14/21
11	1800	Construction Mobilization	0d	Thu 04/29/21	Thu 04/29/21
12	1830	Mechanical Completion	0d	Fri 06/04/21	Fri 06/04/21
13	1860	In Service	0d	Mon 06/14/21	Mon 06/14/21
	1710	Grand Junction	14d	Wed 11/04/20	Mon 11/23/20
15	1730	Review Design Basis	5d	Wed 11/04/20	Tue 11/10/20
16	1720	Review Preliminary Plot Plan	5d	Tue 11/10/20	Mon 11/16/20
17	1740	Review P&IDs IFR	5d	Tue 11/17/20	Mon 11/23/20
	130	ZAP Engineering	79d	Thu 10/22/20	Mon 02/15/21
19	140	Project Management	79d	Thu 10/22/20	Mon 02/15/21
20	150	Project Kickoff Meeting	1d	Thu 10/22/20	Thu 10/22/20
21	160	Design Basis	8d	Fri 10/23/20	Tue 11/03/20
22	0161	Design Review	1d	Tue 11/10/20	Tue 11/10/20
23	1741	Construction Permits	60d	Tue 11/17/20	Mon 02/15/21
24	200	Process/Mechanical Engineering	44d	Thu 10/29/20	Mon 01/04/21
25	0210	Process/Mechaical Engineering Tasks	39d	Thu 10/29/20	Thu 12/24/20
26	0301	Gas Storage Volume Validation	4d	Thu 10/29/20	Tue 11/03/20
27	240	Equipment Datasheets	4d	Wed 11/04/20	Mon 11/09/20
28	250	Pipe Specifications	5d	Wed 11/04/20	Tue 11/10/20
29	220	Preliminary Line Sizing and List	2d	Wed 11/11/20	Thu 11/12/20
30	270	60% P&IDs (IFR)	4d	Wed 11/11/20	Mon 11/16/20
31	230	Equipment List	2d	Tue 11/17/20	Wed 11/18/20
32	290	Line Sizing and List	2d	Thu 12/17/20	Fri 12/18/20
33	310	90% P&IDs (IFA)	4d	Thu 12/17/20	Tue 12/22/20



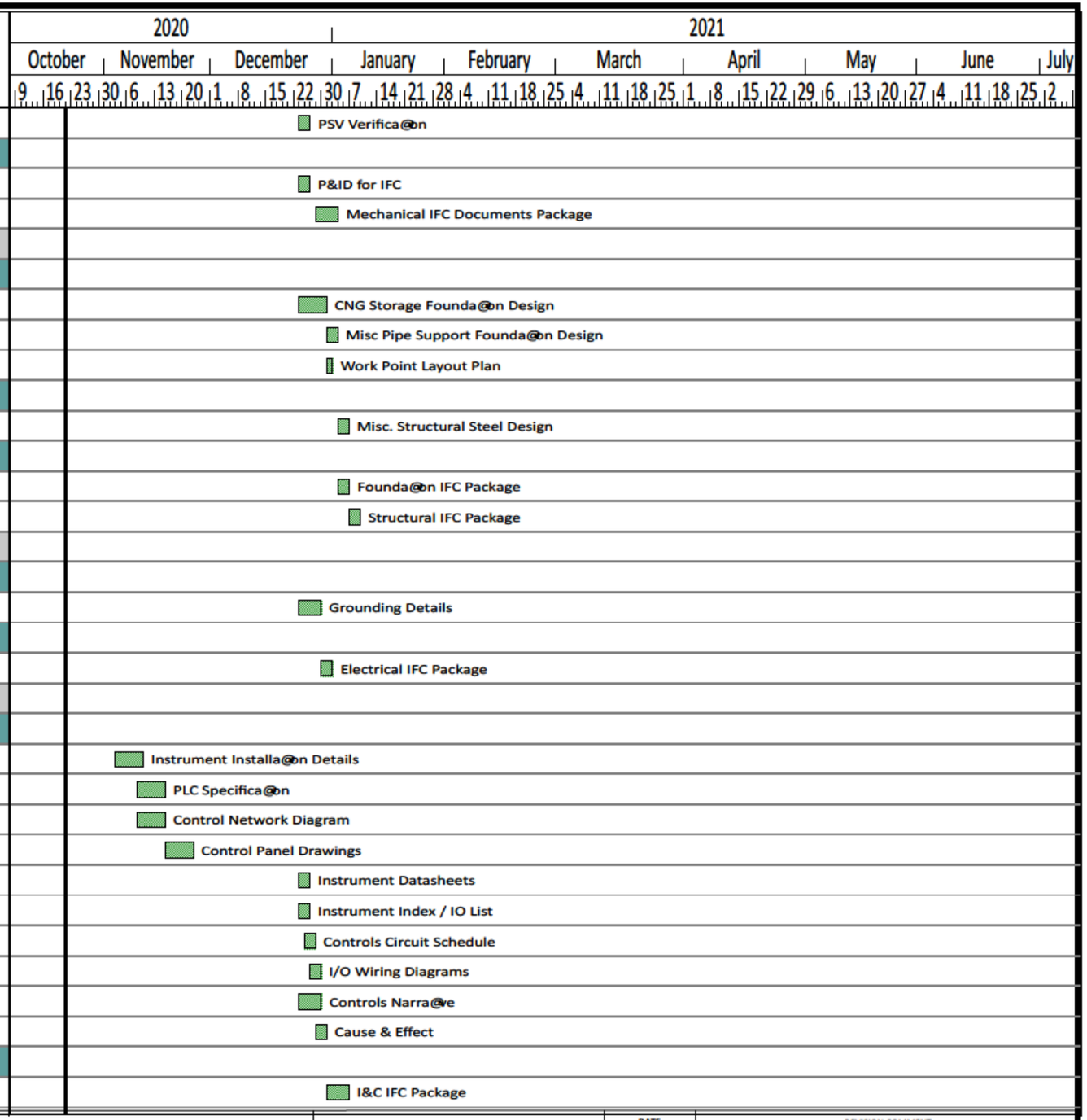
Grand Junction - BioCNG

JOB #: 920289

ZAP ENGINEERING & CONSTRUCTION SERVICES, INC.

DATE	REVISION COMMENT
9/3/2020	Proposal

Line	Task ID	Task Name	Original Duration	Start	Finish
34	300	PSV Verification	2d	Wed 12/23/20	Thu 12/24/20
35	**340**	**Process / Mechanical IFC Deliverables**	**7d**	**Wed 12/23/20**	**Mon 01/04/21**
36	350	P&ID for IFC	2d	Wed 12/23/20	Thu 12/24/20
37	360	Mechanical IFC Documents Package	4d	Tue 12/29/20	Mon 01/04/21
38	**370**	**Civil / Structural**	**11d**	**Wed 12/23/20**	**Fri 01/08/21**
39	**410**	**Foundation Design Tasks**	**7d**	**Wed 12/23/20**	**Mon 01/04/21**
40	420	CNG Storage Foundation Design	5d	Wed 12/23/20	Wed 12/30/20
41	480	Misc Pipe Support Foundation Design	2d	Thu 12/31/20	Mon 01/04/21
42	0411	Work Point Layout Plan	1d	Thu 12/31/20	Thu 12/31/20
43	**490**	**Structural Steel Design Tasks**	**2d**	**Tue 01/05/21**	**Wed 01/06/21**
44	510	Misc. Structural Steel Design	2d	Tue 01/05/21	Wed 01/06/21
45	**520**	**Structural IFC Package Deliverables**	**4d**	**Tue 01/05/21**	**Fri 01/08/21**
46	530	Foundation IFC Package	2d	Tue 01/05/21	Wed 01/06/21
47	540	Structural IFC Package	2d	Thu 01/07/21	Fri 01/08/21
48	**550**	**Electrical**	**6d**	**Wed 12/23/20**	**Thu 12/31/20**
49	**0551**	**Electrical Engineering Tasks**	**4d**	**Wed 12/23/20**	**Tue 12/29/20**
50	610	Grounding Details	4d	Wed 12/23/20	Tue 12/29/20
51	**670**	**Electrical IFC**	**2d**	**Wed 12/30/20**	**Thu 12/31/20**
52	680	Electrical IFC Package	2d	Wed 12/30/20	Thu 12/31/20
53	**690**	**I&C**	**47d**	**Wed 11/04/20**	**Wed 01/13/21**
54	**0691**	**I&C Engineering Tasks**	**38d**	**Wed 11/04/20**	**Wed 12/30/20**
55	730	Instrument Installation Details	5d	Wed 11/04/20	Tue 11/10/20
56	700	PLC Specification	5d	Tue 11/10/20	Mon 11/16/20
57	770	Control Network Diagram	5d	Tue 11/10/20	Mon 11/16/20
58	0820	Control Panel Drawings	5d	Tue 11/17/20	Mon 11/23/20
59	0850	Instrument Datasheets	2d	Wed 12/23/20	Thu 12/24/20
60	740	Instrument Index / IO List	2d	Wed 12/23/20	Thu 12/24/20
61	760	Controls Circuit Schedule	2d	Thu 12/24/20	Mon 12/28/20
62	750	I/O Wiring Diagrams	2d	Mon 12/28/20	Tue 12/29/20
63	720	Controls Narrative	4d	Wed 12/23/20	Tue 12/29/20
64	710	Cause & Effect	2d	Tue 12/29/20	Wed 12/30/20
65	**780**	**I&C IFC**	**10d**	**Wed 12/30/20**	**Wed 01/13/21**
66	790	I&C IFC Package	4d	Thu 12/31/20	Wed 01/06/21



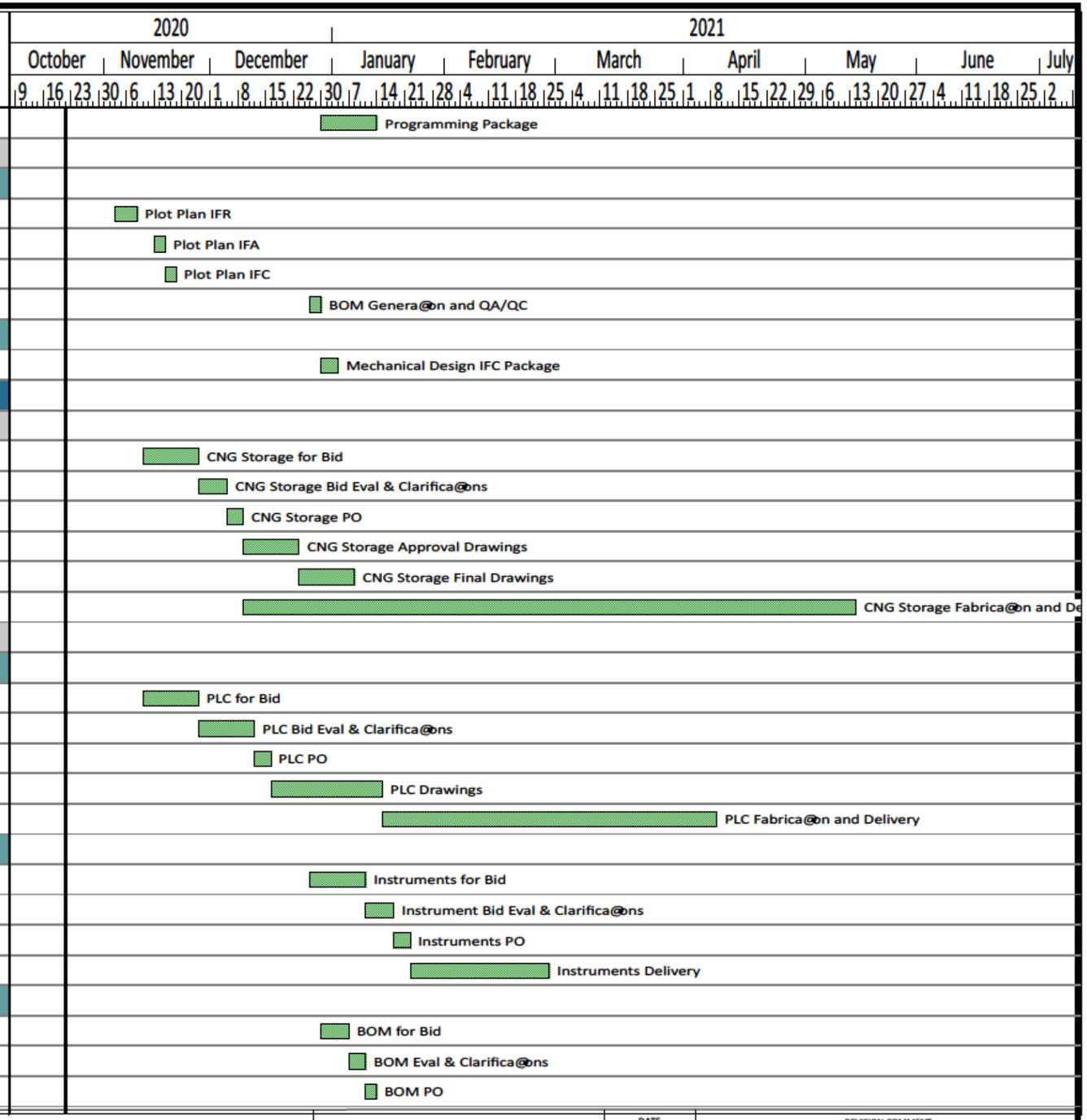
Grand Junction - BioCNG

JOB #: 920289

ZAP ENGINEERING & CONSTRUCTION SERVICES, INC.

DATE	REVISION COMMENT
9/3/2020	Proposal

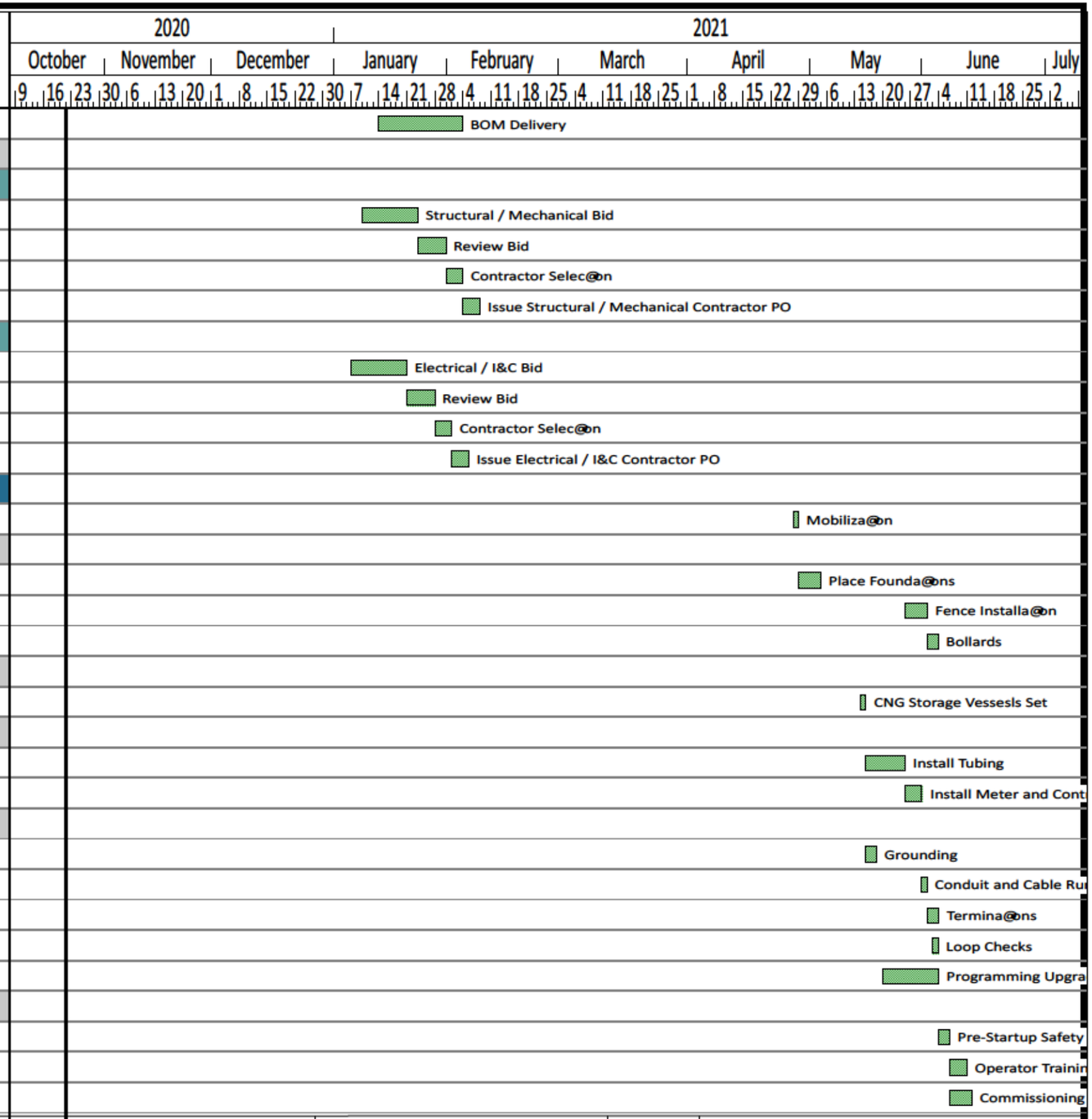
Line	Task ID	Task Name	Original Duration	Start	Finish
67	3327	Programming Package	10d	Wed 12/30/20	Wed 01/13/21
68	800	**Mechanical Design**	**40d**	**Wed 11/04/20**	**Mon 01/04/21**
69	810	**Mechanical Design IFR**	**37d**	**Wed 11/04/20**	**Tue 12/29/20**
70	820	Plot Plan IFR	4d	Wed 11/04/20	Mon 11/09/20
71	830	Plot Plan IFA	2d	Fri 11/13/20	Mon 11/16/20
72	840	Plot Plan IFC	2d	Tue 11/17/20	Wed 11/18/20
73	850	BOM Generation and QA/QC	2d	Mon 12/28/20	Tue 12/29/20
74	890	**Mechanical Design IFC Package**	**3d**	**Wed 12/30/20**	**Mon 01/04/21**
75	900	Mechanical Design IFC Package	3d	Wed 12/30/20	Mon 01/04/21
	920	**Procurement**	**128d**	**Wed 11/11/20**	**Thu 05/13/21**
77	1070	**CNG Storage**	**128d**	**Wed 11/11/20**	**Thu 05/13/21**
78	1080	CNG Storage for Bid	10d	Wed 11/11/20	Tue 11/24/20
79	1090	CNG Storage Bid Eval & Clarifications	5d	Wed 11/25/20	Thu 12/03/20
80	1100	CNG Storage PO	3d	Fri 12/04/20	Tue 12/08/20
81	1110	CNG Storage Approval Drawings	10d	Wed 12/09/20	Tue 12/22/20
82	1120	CNG Storage Final Drawings	10d	Wed 12/23/20	Thu 01/07/21
83	1130	CNG Storage Fabrication and Delivery	110d	Wed 12/09/20	Thu 05/13/21
84	1460	**Other**	**103d**	**Wed 11/11/20**	**Thu 04/08/21**
85	1470	**PLC**	**103d**	**Wed 11/11/20**	**Thu 04/08/21**
86	1480	PLC for Bid	10d	Wed 11/11/20	Tue 11/24/20
87	1490	PLC Bid Eval & Clarifications	10d	Wed 11/25/20	Thu 12/10/20
88	1500	PLC PO	3d	Fri 12/11/20	Tue 12/15/20
89	3067	PLC Drawings	20d	Wed 12/16/20	Thu 01/14/21
90	1510	PLC Fabrication and Delivery	60d	Fri 01/15/21	Thu 04/08/21
91	1520	**Instruments**	**43d**	**Mon 12/28/20**	**Thu 02/25/21**
92	1530	Instruments for Bid	10d	Mon 12/28/20	Mon 01/11/21
93	1531	Instrument Bid Eval & Clarifications	5d	Tue 01/12/21	Mon 01/18/21
94	1540	Instruments PO	3d	Tue 01/19/21	Thu 01/21/21
95	1550	Instruments Delivery	25d	Fri 01/22/21	Thu 02/25/21
96	1560	**BOM**	**25d**	**Wed 12/30/20**	**Wed 02/03/21**
97	1570	BOM for Bid	5d	Wed 12/30/20	Wed 01/06/21
98	1571	BOM Eval & Clarifications	3d	Thu 01/07/21	Mon 01/11/21
99	1580	BOM PO	2d	Tue 01/12/21	Wed 01/13/21



ZAP ENGINEERING & CONSTRUCTION SERVICES, INC.

DATE	REVISION COMMENT
9/3/2020	Proposal

Line	Task ID	Task Name	Original Duration	Start	Finish
100	1590	BOM Delivery	15d	Thu 01/14/21	Wed 02/03/21
101	**1600**	**Contractors**	**23d**	**Thu 01/07/21**	**Mon 02/08/21**
102	**1610**	**Structural / Mechanical Contractor**	**21d**	**Mon 01/11/21**	**Mon 02/08/21**
103	1620	Structural / Mechanical Bid	10d	Mon 01/11/21	Fri 01/22/21
104	1630	Review Bid	5d	Mon 01/25/21	Fri 01/29/21
105	1640	Contractor Selection	3d	Mon 02/01/21	Wed 02/03/21
106	1650	Issue Structural / Mechanical Contractor PO	3d	Thu 02/04/21	Mon 02/08/21
107	**1660**	**Electrical / I&C Contractor**	**21d**	**Thu 01/07/21**	**Thu 02/04/21**
108	1670	Electrical / I&C Bid	10d	Thu 01/07/21	Wed 01/20/21
109	1680	Review Bid	5d	Thu 01/21/21	Wed 01/27/21
110	1690	Contractor Selection	3d	Thu 01/28/21	Mon 02/01/21
111	1700	Issue Electrical / I&C Contractor PO	3d	Tue 02/02/21	Thu 02/04/21
	1770	**Construction**	**32d**	**Wed 04/28/21**	**Fri 06/11/21**
113	1771	Mobilization	1d	Wed 04/28/21	Wed 04/28/21
114	**3208**	**Structural**	**25d**	**Thu 04/29/21**	**Thu 06/03/21**
115	3227	Place Foundations	4d	Thu 04/29/21	Tue 05/04/21
116	3228	Fence Installation	5d	Wed 05/26/21	Tue 06/01/21
117	3229	Bollards	2d	Wed 06/02/21	Thu 06/03/21
118	**3138**	**Major Equipment Set**	**1d**	**Fri 05/14/21**	**Fri 05/14/21**
119	3168	CNG Storage Vessesls Set	1d	Fri 05/14/21	Fri 05/14/21
120	**3287**	**Piping**	**9d**	**Mon 05/17/21**	**Fri 05/28/21**
121	3248	Install Tubing	6d	Mon 05/17/21	Tue 05/25/21
122	3249	Install Meter and Control Valves	3d	Wed 05/26/21	Fri 05/28/21
123	**3268**	**Electrical & Instrumentation**	**13d**	**Mon 05/17/21**	**Thu 06/03/21**
124	3277	Grounding	2d	Mon 05/17/21	Tue 05/18/21
125	3297	Conduit and Cable Runs	2d	Mon 05/31/21	Tue 06/01/21
126	3307	Terminations	2d	Wed 06/02/21	Thu 06/03/21
127	3427	Loop Checks	1d	Thu 06/03/21	Thu 06/03/21
128	3278	Programming Upgrades	10d	Thu 05/20/21	Thu 06/03/21
129	**3298**	**Start Up**	**6d**	**Fri 06/04/21**	**Fri 06/11/21**
130	3317	Pre-Startup Safety Review	2d	Fri 06/04/21	Mon 06/07/21
131	3318	Operator Training	3d	Tue 06/08/21	Thu 06/10/21
132	3337	Commissioning and Startup	4d	Tue 06/08/21	Fri 06/11/21



Grand Junction - BioCNG

JOB #: 920289

ZAP ENGINEERING & CONSTRUCTION SERVICES, INC.

DATE	REVISION COMMENT
9/3/2020	Proposal

EXHIBIT G – REFERENCES

ENGINEERING & CONSTRUCTION SERVICES, INC.

Customer Surveys

"ZAP has provided numerous project responses on a variety of issues from major projects to earthquake response. ZAP are SVM's go to contractor on many aspects."

- Karl Cleary, Engineering Manager, Searles Valley Minerals

"ZAP, in general, does very well (for me) in all facets of a project. For improvements, I can't think of anything off hand. You guys have done everything we have asked for, and then some. ZAP has a GREAT group of folks working on our projects and I am thankful to work with ZAP."

- Lance McCaskill, Facilities Engineer, Devon Energy

"ZAP has deployed very motivated and capable people that have been very responsive and attentive to project needs, new challenges, and responding to issues along the way. ZAP has been flexible to take input and use existing processes and further develop processes tailored to our needs. ZAP has provided technically competent project management and leadership that knows what we're building, how you build it, and where we can safely save costs."

- Mark Doyle, Project Manager, Occidental

"All ZAP personnel have been professional and helpful.....it's good to have partners that perform on time and budget."

- Randy Askey, Process Engineer, Aka Energy

"ZAP has been very responsive to our project schedule and requirements. I have enjoyed working with ZAP on all of the projects I have been involved with."

- Phil Hines, Maintenance & Reliability, Searles Valley Minerals

ENGINEERING & CONSTRUCTION SERVICES, INC.

ZAP Engineering and Construction Services, Inc.
Customer Reference List

Occidental Petroleum (Formally Anadarko)

Julia Eichenberger
1099 18th Street, Suite 1800
Denver, CO 80202
Julia_Eichenberger@oxy.com
(720) 929-3201
Wellpad Program 2014-2019

Occidental Petroleum (Formally Anadarko)

Mark Doyle
1099 18th Street, Suite 1800
Denver, CO 80202
Mark_Doyle2@oxy.com
(720) 929- 6931
West Texas Regional Oil Treating Facilities-
FEED-Engineering

Liberty Midstream Solutions

Eric Bengtson
1200 17th Street, Suite 2200
Denver, CO 80202
Eric.Bengtson@lmsllc.com
(303) 886-7046
20MM Refrigeration Gas Plant
FEED-Engineering-Procurement and
Construction Support

Searles Valley Minerals

Ray Becker
13200 Main St.
Trona, CA
becker@svminerals.com
(913) 344-9500
Rotary Dryer Detailed Design

Evolution Midstream

Chris Falso
707 17th Street, Suite 2550
Denver, CO 80202
chris.falso@evolutionmidstream.com
(720) 457-9298 x114
Joule 40MM RJT Plant
FEED-Engineering-Procurement, Construction
and Commissioning Support

3 Bear Energy

Stephanie Swanson
1512 Larimer St., Suite 540
Denver, CO 80202
Stephanie@3bearllc.com
(720) 272-6791
Exterran 60MM Cryo
FEED-Engineering-Procurement and
Construction Support

Outrigger Energy II

Andrew Perdue
1200 17th Street, Suite 900
Denver, CO 80202
aperdue@outriggerenergy.com
(720) 361-2580
60MM UOP Cryo
Full EPC

DCP Midstream

Jordan Ingram
370 17th Street, Suite 2500
Denver, CO 80202
jingram@dcpmidstream.com
(970) 378-6392
Multiple Solar Turbine Stations
Full EPC

Letter of Recommendation

ZAP Engineering and Construction Services

To whom it may concern,

In 2014, I was the DCP project manager/engineer responsible for adding a turbine field compressor station in DCP's Colorado asset. The station consisted of two Solar turbine compressors, inlet liquids handling, and TEG dehydration at a design throughput of 100MMSCFD. ZAP Engineering and Construction Services was originally contracted to engineer and design this facility. They have a high level of experience designing natural gas compressor station, gathering, and processing facilities. Before this project, ZAP had engineered and designed projects that I was part of including a 120 MMSCFD Exterran Cryogenic Plant along with a handful of 50 MMSCFD reciprocating compressor stations. Through us, they continually monitored performance at these previous projects and used that information to better design this facility from an operability and environmental standpoint as well. They were also good about offering up experiences gained from other clients to better the overall facility design. As such, this turbine compressor station was very well designed and, based on my discussions with old colleagues, remains the standard for new compressor stations in that asset.

Upon completion of the design, ZAP was tasked with the ePC of the project. Major equipment was ordered by DCP to meet the in-service date. ZAP provided the balance of equipment, PVF, electrical, construction, and start up support. The construction fell behind early in the project due to the civil/mechanical contractor having internal issues. ZAP quickly recognized this and did not hesitate swapping out the contractor to prevent further schedule slips despite the tribulation it caused ZAP. They also worked with the new contractor to pull the schedule back in. The project was completed on time and the quality of work was great. Change orders were well documented, brought to my attention immediately, and agreed upon before the additional work was started.

Overall, I had a great experience working with ZAP and have continued to consistently bid them and utilize their service over the last 6 years.

Sincerely,



Brian Petko

Letter of Reference

(720) 666-2303 peters.christopher14@gmail.com

August 16, 2020

To Whom It May Concern:

In early 2016 while employed by Tesoro Logistics, I contracted ZAP Engineering & Construction Services (ZAP) to engineer, design, and ultimately construct the Walker Hollow gas turbine-driven compressor station in Uintah County, UT. I have been engaged in constructing and/or supporting the operation of dozens of gas turbine-driven compressors - including the Solar family of Saturn, Centaur, Taurus, Mars, and Titan units - and Walker Hollow was uniformly my most positive construction, pre-startup, commissioning, and post-startup experience involving turbines to-date. When complete, the Walker Hollow facility epitomized safety, compliance, operational flexibility, and reliability.

Regarding project execution, ZAP excelled at project controls, consistently utilizing requests-for-information (RFI's) and potential change notices (CN's) to keep the project on-track. Ultimately, the project was completed with only 2.7% in incremental change orders (all of which were thoroughly documented, approved in writing prior to work starting, and resulting from a customer-requested increase in scope).

ZAP utilized Primavera P6 for scheduling and we conducted weekly, transparent progress meetings from mobilization through demobilization. Baseline/contract schedule (from contract award to start-up) was established at 238 days; despite the typical obstacles encountered in construction (incl. a streak of poor weather that limited productivity), ZAP achieved substantial completion in 230 days. Additionally, ZAP completed the post-startup punch-list items in accordance with its baseline schedule (demobilizing from the site approximately 1.5 months after achieving mechanical completion). The thorough and constructive 'Lessons Learned' meeting conducted at the conclusion of the project became the standard template utilized at Tesoro (Andeavor) for future capital projects.

ZAP's performance on the Walker Hollow project was exemplary and I wouldn't hesitate to solicit proposals from ZAP for similar work in the future.

Sincerely yours,



Christopher Peters
VP Engineering & Construction
Targa Resources

EXHIBIT H – BID BOND AND CERTIFICATE OF INSURANCE

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 08/12/2020

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER CA#0H64724 1-913-982-3650 IMA, Inc. (NE Kansas Division) 51 Corporate Woods 9393 W. 110th Street, Suite 600 Overland Park, KS 66210	CONTACT NAME: PHONE (A/C, No, Ext): FAX (A/C, No): E-MAIL ADDRESS: lynne.cox@imacorp.com
INSURED ZAP Engineering & Construction Services, Inc. 333 South Allison Pkwy, #100 Lakewood, CO 80226	INSURER(S) AFFORDING COVERAGE — NAIC # INSURER A : ZURICH AMER INS CO — 16535 INSURER B : AMERICAN GUAR & LIAB INS — 26247 INSURER C : UNDERWRITERS AT LLOYDS — 32727 INSURER D : INSURER E : INSURER F :

COVERAGES **CERTIFICATE NUMBER:** 59997953 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE X OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: POLICY X PRO-JECT X LOC OTHER:			GLO012065804	08/15/20	08/15/21	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG 	$ 2,000,000 $ 300,000 $ 5,000 $ 2,000,000 $ 4,000,000 $ 4,000,000 $
A	AUTOMOBILE LIABILITY X ANY AUTO ALL OWNED AUTOS SCHEDULED AUTOS X HIRED AUTOS X NON-OWNED AUTOS			BAP012066004	08/15/20	08/15/21	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident) 	$ 1,000,000 $ $ $ $
B	X UMBRELLA LIAB X OCCUR EXCESS LIAB CLAIMS-MADE DED RETENTION $ N/A			AUC012066104	08/15/20	08/15/21	EACH OCCURRENCE AGGREGATE 	$ 10,000,000 $ 10,000,000 $
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y/N: N / N/A If yes, describe under DESCRIPTION OF OPERATIONS below			WC012065904	08/15/20	08/15/21	X PER STATUTE OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $ 1,000,000 $ 1,000,000 $ 1,000,000
C	Professional Liability Pollution Liability			B0146LDUSA2004826	08/15/20	08/15/21	Each Claim Aggregate	10,000,000 10,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CERTIFICATE HOLDER

ZAP Engineering & Construction Services, Inc.

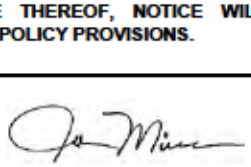
333 S Allison Parkway Suite 100

Lakewood, CO 80226 USA

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE



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SUPPLEMENT TO CERTIFICATE OF INSURANCE

DATE
08/12/2020

NAME OF INSURED: ZAP Engineering & Construction Services, Inc.

SUPP (10/00)

THE AMERICAN INSTITUTE OF ARCHITECTS

AIA Document A310

Bid Bond

KNOW ALL MEN BY THESE PRESENTS, THAT WE Zap Engineering & Construction Services, Inc.
333 South Allison Parkway, #100, Lakewood, CO 80226
as Principal, hereinafter called the Principal, and North American Specialty Insurance Company
1200 Main Street, Suite 800, Kansas City, MO 64105
a corporation duly organized under the laws of the State of NH
as Surety, hereinafter called the Surety, are held and firmly bound unto City of Grand Junction, Colorado
2145 River Road, Grand Junction, CO 81505
as Obligee, hereinafter called the Obligee, in the sum of Five Percent of Amount Bid
Dollars ($ 5%),
for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for Design/Build Grand Junction Bio Compressed Natural Gas (BioCNG) Storage and Fueling Station Optimization Project; Grand Junction, CO; RFP-4813-20-DH

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and materials furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this 3rd day of September , 2020

Attest:

By: _____
(Witness)

Zap Engineering & Construction Services, Inc.
(Principal) (Seal)

By: _____
(Title)

Witness:

By: Kelly Martinez
(Witness)
Kelly Martinez, Surety Witness

North American Specialty Insurance Company
(Surety) (Seal)

By: Sheryll Shaw
Attorney-in-Fact Sheryll Shaw
(Title)

IMA
1705 17th Street, Suite 100
Denver, CO 80202
Phone 303.534.4567

North American Specialty Insurance Company - Digital Seal

This Digital Seal is being provided in lieu of a physical corporate seal to accomodate extraordinary circumstances.

The Digital Seal has been designated for a single use on a specific Bond, described as follows:

Type of Bond: Bid ✔ Performance/Payment____ Other (specify)_____

Bond Number (not required on bid bonds) Bid Bond

Penal Sum of Bond or Bid Penalty Percentage Five Percent of Amount Bid (5%)

Principal Name Zap Engineering & Construction Services, Inc.

Obligee Name City of Grand Junction, Colorado

Date of Bond September 3, 2020

As part of business continuity efforts during the ongoing COVID-19 pandemic, North American Specialty Insurance Company has authorized the use of this Digital Seal for the execution of this Bond. North American Specialty Insurance Company agrees and affirms that this Digital Seal is deemed affixed to the Bond described above with the same force and effect as a physical corporate seal.



Agency ID# 5132307

Verification Service Available

The validity of this Digital Seal can be verified by sending an email to Surety_Forms@swissre.com. Please include the basic Bond information found on this Digital Seal and the Agency ID number in the inquiry. A response will be provided by the conclusion of the next business day.

SWISS RE CORPORATE SOLUTIONS

NORTH AMERICAN SPECIALTY INSURANCE COMPANY
WASHINGTON INTERNATIONAL INSURANCE COMPANY
WESTPORT INSURANCE CORPORATION

GENERAL POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS, THAT North American Specialty Insurance Company, a corporation duly organized and existing under laws of the State of New Hampshire, and having its principal office in the City of Kansas City, Missouri and Washington International Insurance Company a corporation organized and existing under the laws of the State of New Hampshire and having its principal office in the City of Kansas City, Missouri, and Westport Insurance Corporation, organized under the laws of the State of Missouri, and having its principal office in the City of Kansas City, Missouri, each does hereby make constitute and appoint:

SARAH FINN, SHERYLL SHAW, MICHAEL LISCHER, JR., NICOLE L. McCOLLAM, BRANDI J. TETLEY.

JENNIFER L. CLAMPERT, AND AMY COONTS JOINTLY OR SEVERALLY

Its true and lawful Attorney(s)-in-Fact, to make, execute, seal and deliver, for and on its behalf and as its act and deed, bonds or other writings obligatory in the nature of a bond on behalf of each of said Companies, as surety, on contracts of suretyship as are or may be required or permitted by law, regulation, contract or otherwise, provided that no bond or undertaking or contract or suretyship executed under this authority shall exceed the amount of:

TWO HUNDRED MILLION ($200,000,000.00) DOLLARS

This Power of Attorney is granted and is signed by facsimile under and by the authority of the following Resolutions adopted by the Boards of Directors of North American Specialty Insurance Company and Washington International Insurance Company at meetings duly called and held on March 24, 2000 and Westport Insurance Corporation by written consent of its Executive Committee dated July 18, 2011.

"RESOLVED, that any two of the President, any Senior Vice President, any Vice President, any Assistant Vice President, the Secretary or any Assistant Secretary be, and each or any of them hereby is authorized to execute a Power of Attorney qualifying the attorney named in the given Power of Attorney to execute on behalf of the Company bonds, undertakings and all contracts of surety, and that each or any of them hereby is authorized to attest to the execution of any such Power of Attorney and to attach therein the seal of the Company; and it is

FURTHER RESOLVED, that the signature of such officers and the seal of the Company may be affixed to any such Power of Attorney or to any certificate relating thereto by facsimile, and any such Power of Attorney or certificate bearing such facsimile signatures or facsimile seal shall be binding upon the Company when so affixed and in the future with regard to any bond, undertaking or contract of surety to which it is attached."

NORTH AMERICAN SPECIALTY INSURANCE COMPANY CORPORATE SEAL 1973 NEW HAMPSHIRE

WASHINGTON INTERNATIONAL INSURANCE COMPANY CORPORATE SEAL NEW HAMPSHIRE

By _____
Steven P. Anderson, Senior Vice President of Washington International Insurance Company
& Senior Vice President of North American Specialty Insurance Company
& Senior Vice President of Westport Insurance Corporation

By _____
Michael A. Ito, Senior Vice President of Washington International Insurance Company
& Senior Vice President of North American Specialty Insurance Company
& Senior Vice President of Westport Insurance Corporation

WESTPORT INSURANCE CORPORATION CORPORATE SEAL MISSOURI

IN WITNESS WHEREOF, North American Specialty Insurance Company, Washington International Insurance Company and Westport Insurance Corporation have caused their official seals to be hereunto affixed, and these presents to be signed by their authorized officers this this 26TH day of FEBRUARY, 20 20.

North American Specialty Insurance Company
Washington International Insurance Company
Westport Insurance Corporation

State of Illinois
County of Cook ss:

On this 26TH day of FEBRUARY, 20 20, before me, a Notary Public personally appeared Steven P. Anderson, Senior Vice President of Washington International Insurance Company and Senior Vice President of North American Specialty Insurance Company and Senior Vice President of Westport Insurance Corporation and Michael A. Ito Senior Vice President of Washington International Insurance Company and Senior Vice President of North American Specialty Insurance Company and Senior Vice President of Westport Insurance Corporation, personally known to me, who being by me duly sworn, acknowledged that they signed the above Power of Attorney as officers of and acknowledged said instrument to be the voluntary act and deed of their respective companies.

OFFICIAL SEAL
M. KENNY
Notary Public - State of Illinois
My Commission Expires
12/04/2021

M. Kenny, Notary Public

I, Jeffrey Goldberg, the duly elected Vice President and Assistant Secretary of North American Specialty Insurance Company, Washington International Insurance Company and Westport Insurance Corporation do hereby certify that the above and foregoing is a true and correct copy of a Power of Attorney given by said North American Specialty Insurance Company, Washington International Insurance Company and Westport Insurance Corporation which is still in full force and effect.

IN WITNESS WHEREOF, I have set my hand and affixed the seals of the Companies this 3rd day of September, 20 20.

Jeffrey Goldberg, Vice President & Assistant Secretary of Washington International Insurance Company & North American Specialty Insurance Company & Vice President & Assistant Secretary of Westport Insurance Corporation

EXHIBIT I – SOLICITATION RESPONSE FORM

SECTION 7.0: SOLICITATION RESPONSE FORM

RFP-4813-20-DH

"Design/Build Grand Junction Bio Compressed Natural Gas (BioCNG) Storage and Fueling Station Optimization Project"

Offeror must submit entire Form completed, dated and signed.

1) **Cost plus a Fixed Fee with a Guaranteed Maximum Price:**

Fixed Fee $ 100,000

WRITTEN: one hundred thousand **dollars.**

Guaranteed Maximum Price $ 715,380

WRITTEN: seven hundred fifteen thousand, three hundred and eighty **dollars.**

The Owner reserves the right to accept any portion of the work to be performed at its discretion

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The undersigned has thoroughly examined the entire Request for Proposals and therefore submits the proposal and schedule of fees and services attached hereto. This offer is firm and irrevocable for sixty (60) days after the time and date set for receipt of proposals.

The undersigned Offeror agrees to provide services and products in accordance with the terms and conditions contained in this Request for Proposal and as described in the Offeror's proposal attached hereto; as accepted by the Owner.

Prices in the proposal have not knowingly been disclosed with another provider and will not be prior to award.

- Prices in this proposal have been arrived at independently, without consultation, communication or agreement for the purpose of restricting competition.
- No attempt has been made nor will be to induce any other person or firm to submit a proposal for the purpose of restricting competition.
- The individual signing this proposal certifies they are a legal agent of the offeror, authorized to represent the offeror and is legally responsible for the offer with regard to supporting documentation and prices provided.
- Direct purchases by the City of Grand Junction are tax exempt from Colorado Sales or Use Tax. Tax exempt No. 98-903544. The undersigned certifies that no Federal, State, County or Municipal tax will be added to the above quoted prices.
- City of Grand Junction payment terms shall be Net 30 days.
- Prompt payment discount of 0 percent of the net dollar will be offered to the Owner if the invoice is paid within NA days after the receipt of the invoice.

RECEIPT OF ADDENDA: the undersigned Contractor acknowledges receipt of Addenda to the Solicitation, Specifications, and other Contract Documents. State number of Addenda received: 4.

It is the responsibility of the Proposer to ensure all Addenda have been received and acknowledged.

ZAP Engineering and Construction Services, Inc.	Frank E. Lousberg
Company Name – (Typed or Printed)	Authorized Agent – (Typed or Printed)
	303-565-5535
Authorized Agent Signature	Phone Number
333 S. Allison Parkway Suite 100	lousbergf@zapecs.com
Address of Offeror	E-mail Address of Agent
Lakewood, Colorado 80203	September 3, 2020
City, State, and Zip Code	Date

EXHIBIT J – FINANCIAL STATEMENTS

ZAP Engineering & Construction Services, Inc.

BALANCE SHEET

December 31, 2019

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INDEPENDENT ACCOUNTANTS' REVIEW REPORT

To the Board of Directors
ZAP Engineering & Construction Services, Inc.
Lakewood, CO

We have reviewed the accompanying financial statement of ZAP Engineering & Construction Services, Inc., which comprises the balance sheet as of December 31, 2019 and the related notes to the balance sheet. A review includes primarily applying analytical procedures to management's financial data and making inquiries of company management. A review is substantially less in scope than an audit, the objective of which is the expression of an opinion regarding the financial statements as a whole. Accordingly, we do not express such an opinion.

Management's Responsibility for the Financial Statements
Management is responsible for the preparation and fair presentation of this financial statement in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement whether due to fraud or error.

Accountant's Responsibility
Our responsibility is to conduct the review engagement in accordance with Statements on Standards for Accounting and Review Services promulgated by the Accounting and Review Services Committee of the AICPA. Those standards require us to perform procedures to obtain limited assurance as a basis for reporting whether we are aware of any material modifications that should be made to the financial statement for them to be in accordance with accounting principles generally accepted in the United States of America. We believe that the results of our procedures provide a reasonable basis for our conclusion.

Accountant's Conclusion
Based on our review, we are not aware of any material modifications that should be made to the accompanying financial statement in order for it to be in accordance with accounting principles generally accepted in the United States of America.

Lang Allan Company

March 13, 2020

Lang Allan & Company, CPAs
A Professional Corporation
6130 Greenwood Plaza Blvd, Ste 130
Greenwood Village, CO 80111
info@langallancpa.com
www.langallancpa.com
t 303.792.9445
f 303.792.9449

ZAP Engineering & Construction Services, Inc.
BALANCE SHEET

December 31, 2019

ASSETS

CURRENT ASSETS		
Cash and cash equivalents	$	9,198,813
Accounts receivable, net of allowance for doubtful accounts of $17,415		15,855,442
Contract assets		4,657,345
Inventory		32,460
Prepaid expenses and other current assets		751,531
TOTAL CURRENT ASSETS		30,495,591
PROPERTY AND EQUIPMENT at cost, less accumulated depreciation and amortization		1,372,724
OTHER ASSETS		2,737
TOTAL ASSETS	$	31,871,052

LIABILITIES

CURRENT LIABILITIES		
$4,000,000 Line of credit	$	-
Accounts payable		4,728,864
Contract liabilities		13,041,976
Accrued liabilities -		
Payroll, taxes and withholdings		1,372,136
Profit sharing and other		27,836
TOTAL CURRENT LIABILITIES		19,170,812

STOCKHOLDERS' EQUITY

COMMON STOCK $1 par value, 10,000 shares authorized, 4,850 shares issued and outstanding		4,850
ADDITIONAL PAID IN CAPITAL		758,170
RETAINED EARNINGS		11,937,220
TOTAL STOCKHOLDERS' EQUITY		12,700,240
TOTAL LIABILITIES AND STOCKHOLDERS' EQUITY	$	31,871,052

See independent accountants' review report and accompanying notes to the financial statements.

(1) Summary of significant accounting policies

Nature of operations – ZAP Engineering & Construction Services, Inc. ("Engineering"), a full-service provider of project solutions for the oil and gas and heavy industrial industries, specializing in upstream, midstream and terminal projects, was incorporated in Colorado in May 2001.

Operating cycle – Assets and liabilities related to long-term construction contracts are included in current assets and current liabilities in the accompanying balance sheet as they will be liquidated in the normal course of contract completion, although this may require more than one year.

Use of estimates – Management uses estimates and assumptions in preparing these financial statements in accordance with U.S. generally accepted accounting principles. Those estimates and assumptions affect the reported amounts of assets and liabilities, the disclosure of contingent assets and liabilities, and the reported revenues and expenses. Actual results could vary from the estimates that were used. Management's estimates and assumptions include, but are not limited to estimates of contract revenue, costs and gross profit, backlog, collectability of accounts receivable, salvage values and estimated useful lives of property and equipment. Management's estimates and assumptions are derived from and are continually evaluated based upon available information, judgment, and experience. Because of inherent uncertainties in estimating costs on construction contracts, it is at least reasonably possible that the estimates used will change within the near term.

The cumulative effects of revisions to contract revenue and estimated completion costs are recorded in the accounting period in which the amounts become evident and can be reasonably estimated. These revisions can include such items as the effects of change orders, change in estimated materials based on assessments in the field, change in estimated cost of materials based on market conditions or any number of additional factors.

Revenues from contracts with customers - Revenues derived from construction projects are recognized over time as the Company satisfies its performance obligations by transferring control of the asset created or enhanced by the project to the customer. Recognition of revenues and cost of revenues for construction projects requires significant judgment by management, including, among other things, estimating total costs expected to be incurred to complete a project and measuring progress toward completion. Management reviews contract estimates regularly to assess revisions of estimated costs to complete a project and measurement of progress toward completion.

Management believes the Company maintains reasonable estimates based on prior experience; however, many factors contribute to changes in estimates of contract costs. Accordingly, estimates made with respect to uncompleted projects are subject to change as each project progresses and better estimates of contract costs become available. All contract costs are recorded as incurred, and revisions to estimated total costs are reflected as soon as the obligation to perform is determined. Provisions are recognized for the full amount of estimated losses on uncompleted contracts whenever evidence indicates that the estimated total cost of a contract

exceeds its estimated total revenue, regardless of the stage of completion. When the Company incurs additional costs related to work performed by subcontractors, the Company may be able to utilize contractual provisions to back charge the subcontractors for those costs. A reduction to costs related to back charges is recognized when estimated recovery is probable and the amount can be reasonably estimated. Contract costs consist of (i) direct costs on contracts, including labor, materials, and amounts payable to subcontractors and (ii) indirect costs related to contract performance, such as insurance, employee benefits, and equipment (primarily depreciation, fuel, maintenance and repairs).

Progress toward completion is estimated using the input method, measured by the relationship of total cost incurred through the measurement date to total estimated costs required to complete the project (cost-to-cost method). The Company believes this method best depicts the transfer of goods and services to the customer because it represents satisfaction of the Company's performance obligation under the contract, which occurs as the Company incurs costs. The Company measures percentage of completion based on the performance of a single performance obligation under its construction projects. Each of the Company's construction contracts represents a single performance obligation to complete a defined construction project. This is because goods and services promised for delivery to a customer are not distinct, as the customer cannot benefit from any individual portion of the services on its own. All deliverables under a contract are part of a project defined by a customer and represent a series of integrated goods and services that have the same pattern of delivery to the customer and use the same measure of progress toward satisfaction of the performance obligation as the customer's asset is created or enhanced by the Company. The Company's obligation is not satisfied until the entire project is complete.

Revenue recognized during a reporting period is based on the cost-to-cost input method (formerly known as the percentage-of-completion method) applied to the total transaction price, including adjustments for variable consideration, such as liquidated damages, penalties or bonuses, related to the timeliness or quality of project performance. The Company includes variable consideration in the estimated transaction price at the most likely amount to which the Company expects to be entitled or the most likely amount the Company expects to incur, in the case of liquidated damages or penalties. Such amounts are included in the transaction price for which it is probable that a significant reversal in the amount of cumulative revenue recognized will not occur when the uncertainty is resolved. The Company accounts for changes to the estimated transaction price using a cumulative catch-up adjustment.

The Company's construction contracts are primarily fixed total price contracts, also known as lump sum contracts, which require the total amount of work be performed for a single price. Contract cost is recorded as incurred, and revisions in contract revenue and cost estimates are reflected in the accounting period when known. Changes in job performance, job conditions and estimated profitability, including those changes arising from contract change orders, penalty provisions and final contract settlements, may result in revisions to estimated revenues and costs and are recognized in the period in which the revisions are determined.

Change orders are modifications of an original contract that effectively change the existing provisions of the contract and become part of the single performance obligation that is partially

satisfied at the date of the contract modification. This is because goods and services promised under change orders are generally not distinct from the remaining goods and services under the existing contract, due to the significant integration of services performed in the context of the contract. Accordingly, change orders are generally accounted for as a modification of the existing contract and single performance obligation. The Company accounts for the modification using a cumulative catch-up adjustment. Either the Company or its customers may initiate change orders, which may include changes in specifications or designs, manner of performance, facilities, equipment, materials, sites and period of completion of the work.

Revenues derived for engineering service in which the company has the right to consideration from the customer in an amount that corresponds directly with the value to the customer of the company's performance completed to date, revenue is recognized when services are performed and contractually billable. Revenue recognized on service contracts that have not been billed to clients is classified as a current asset under contract assets on the balance sheet. Amounts billed to clients in excess of revenue recognized on service contracts to date are classified as a current liability under contract liabilities. Customer payments on service contracts are typically due within 30 to 90 days of billing, depending on the contract.

Contract Assets and Contract Liabilities - Billing practices for the Company's contracts are governed by the contract terms of each project based on (i) progress toward completion approved by the owner, (ii) achievement of milestones or (iii) pre-agreed schedules. Billings do not necessarily correlate with revenues recognized under the cost-to-cost input method (formerly known as the percentage-of-completion method). The Company records contract assets and contract liabilities to account for these differences in timing on a contract by contract basis at the end of each reporting period. The Company classifies the contract assets and liabilities as current as they will be liquidated in the normal course of contract completion, although this may be longer than one year.

The contract asset, "Costs and estimated earnings in excess of billings on uncompleted contracts," arises when the Company recognizes revenues for services performed under its construction projects, but the Company is not yet entitled to bill the customer under the terms of the contract. Amounts billed to customers are excluded from this asset and reflected on the Balance Sheet as "Accounts receivable, net." Included in costs and estimated earnings on uncompleted contracts are amounts the Company seeks or will seek to collect from customers or others for (i) errors, (ii) changes in contract specifications or design, (iii) contract change orders in dispute, unapproved as to scope and price, or (iv) other customer-related causes of unanticipated additional contract costs (such as claims). Such amounts are recorded to the extent the amount can be reasonably estimated and recovery is probable. Claims and unapproved change orders made by the Company may involve negotiation and, in rare cases, litigation. Unapproved change orders and claims also involve the use of estimates, and revenues associated with unapproved change orders and claims are included in the transaction price for which it is probable a significant reversal in the amount of cumulative revenue recognized will not occur when the uncertainty is resolved. The Company did not recognize any material amounts associated with claims and unapproved change orders during the periods presented.

Retainage receivables represent amounts invoiced to customers where payments have been

withheld pending the completion of certain milestones, other contractual conditions, or upon the completion of the project. Retainage agreements vary from project to project and balances could be outstanding for several months or years depending on a number of circumstances such as contract-specific terms, project performance, and other variables that may arise as the Company makes progress towards completion.

Deferred contract costs primarily represent costs to obtain a contract and costs to fulfill a contract. Costs to obtain a contract are recorded as a deferred contract cost if (1) the cost is incremental and (2) the cost is expected to be recovered. Costs to fulfill a contract are recorded as a deferred contract cost if the costs (1) directly relate to an existing or anticipated contract, (2) generate or enhance resources that will be used in satisfying performance obligations in the future and (3) are expected to be recovered through the contract. If a cost to obtain or fulfill a contract is deferred and it is material, the cost is capitalized as an asset, amortized over the expected duration of the contract, and tested for impairment. The Company did not have any deferred contract costs on open contracts at December 31, 2019.

Unbilled receivables, which represent an unconditional right to payment subject only to the passage of time, are reclassified to accounts receivable when they are billed under the terms of the contract. Unbilled receivables at December 31, 2019, are related to the Company's service revenues.

The contract liability, "Billings in excess of costs and estimated earnings on uncompleted contracts," represents the Company's obligation to transfer goods or services to a customer for which the Company has been paid by the customer or for which the Company has billed the customer under the terms of the contract. Revenue for future services reflected in this account are recognized, and the liability is reduced, as the Company subsequently satisfies the performance obligation under the contract.

Costs and estimated earnings in excess of billings on uncompleted contracts and billings in excess of costs and estimated earnings on uncompleted contracts are typically resolved within one year and are not considered significant financing components.

Accounts receivable - Accounts receivable are uncollateralized customer obligations due under normal trade terms requiring payment within 30 - 45 days from the invoice date, however management may have lien rights if needed and available against certain properties. Accounts receivable are stated at the contractual amount billed to the customer. Customer account balances with invoices dated over 90 days old are considered past due.

It is common in the construction industry for a small portion of either progress billings or the contract price, typically 10%, to be withheld by the customer until the Company completes a project to the satisfaction of the customer in accordance with contract terms. Such amounts, defined as retainage, represent a contract asset and are included on the balance sheet under the caption "Contract assets." Based on the Company's experience with similar contracts in recent years, billings for such retainage balances are generally collected within one year of the completion of the project.

Management allocates customer payments of accounts receivable to the specific invoices identified on the customer's remittance advice or, if unspecified, management applies the payment to the oldest unpaid invoices.

Management reduces the carrying amount of accounts receivable by an allowance for credit losses that reflects management's best estimate of the amounts that will not be collected. Management individually reviews each customer balance where all or a portion of the balance exceeds 90 days from the invoice date. Based on management's assessment of the customer's current creditworthiness, management estimates the portion, if any, of the balance that will not be collected. Management writes off receivables as a charge to the allowance for credit losses when, in their estimation, it is probable that the receivable is worthless.

Sales taxes – The Company records revenues net of any sales tax collected.

Income taxes – The stockholders of the Company have elected to be taxed under the provisions of Subchapter S of the Internal Revenue Code. Under these provisions, the Company does not have to pay corporate income taxes on its income, nor is it allowed a net operating loss carryforward or a carryback as a deduction. Instead, the stockholders are liable for income tax on the Company's taxable income or loss. The Company consults with third party consultants to review their current tax filings and evaluate for uncertain tax positions. The years ended December 31, 2016 – 2019 are open for examination by the Internal Revenue Service and various state agencies. The Company recognizes interest accrued related to unrecognized tax benefits in interest expense and penalties in operating expenses. No such interest or penalties were recognized during the periods presented. The Company had no accruals for interest or penalties at December 31, 2019.

Cash and cash equivalents – The Company considers cash on hand, bank checking accounts and temporary investments with an original maturity of three months or less to be cash equivalents. The Company maintains all of its cash at three banks which, at times, are in excess of federally insured limits. These balances are insured by the Federal Deposit Insurance Corporation, up to $250,000 per financial institution. The balances at these banks in excess of $250,000 are uninsured and therefore subject to additional credit risk. Management monitors the soundness of these financial institutions and feels the Company's risk is negligible. The Company has not experienced any losses in such accounts to date.

Property and equipment – Depreciation of property and equipment (net of estimated salvage values) is computed by the straight-line method over their estimated useful lives. Property acquired under capital lease is depreciated over the lease term or estimated useful life, whichever is shorter. Amortization of equipment under capital lease is included in depreciation and amortization.

Assets	Methods	Useful Lives
Equipment	Straight – line	5-7 years
Furniture and fixtures	Straight – line	5-7 years
Automobiles and trucks	Straight – line	5-10 years
Leasehold improvements	Straight – line	10-20 years

Long-lived assets – Long-lived assets to be held and used are tested for recoverability whenever events or changes in circumstance indicate that the related carrying amount may not be recoverable. When required, impairment losses on assets to be held and used are recognized based on the excess of the asset's carrying amount over fair value of the asset. Certain long-lived assets to be disposed of by sale are reported at the lower of the carrying amount or fair value less cost to sell.

Fair value disclosures – The fair value of financial instruments including cash and cash equivalents, accounts receivable, accounts payable, accrued expenses and line of credit approximates carrying value, principally because of the short maturity of those items. The fair value of notes payable approximates the carrying value, principally because of the maturity dates of those notes and the current terms applicable to each note.

Equity-Based Compensation - The Company recognizes compensation expense associated with equity-based compensation as a component of "Selling, operating and administrative expenses" in the accompanying statement of income. All equity-based compensation is required to be measured at fair value, is expensed over the requisite service period and requires an estimate of forfeitures when calculating compensation expense. The Company recognizes compensation expense on awards on a straight-line basis over the requisite service period for the entire award.

Treasury stock – Under Colorado law, the Company may not hold shares of common stock in treasury. As a result, if and when the Company buys back issued and outstanding shares of its common stock, it purchases the shares and cancels them so they become available. Accordingly, the Company reduces the corresponding shares issued and outstanding at par value and any additional paid in capital (to the extent available) and then any remaining amounts will reduce retained earnings.

New accounting pronouncements adopted in current year - On January 1, 2019, the company adopted ASC Topic 606 and corresponding accounting standards updates ("ASU"). ASU 2014-09 "Revenue from Contracts with Customers," outlines a single comprehensive model for entities to use in accounting for revenue arising from contracts with customers and supersedes most current revenue recognition guidance, including industry-specific guidance. ASU 2014-09 outlines a five-step process for revenue recognition that focuses on transfer of control, as opposed to transfer of risk and rewards, and also requires enhanced disclosures regarding the nature, amount, timing and uncertainty of revenues and cash flows from contracts with customers. Major provisions include determining which goods and services are distinct and represent separate performance obligations, how variable consideration (which may include change orders and claims) is recognized, whether revenue should be recognized at a point in time or over time and ensuring the time value of money is considered in the transaction price.

The Company adopted this update for the year beginning January 1, 2019, using a modified retrospective approach. Under this approach, the Company's financial statements are prepared under the revised guidance for the year of adoption, but not for prior years, and the Company recognizes a cumulative adjustment to the opening balance of retained earnings for contracts that still require performance by the Company at the date of adoption. The adoption of ASC 606 on January 1, 2019 did not result in a material impact that required recognition of a cumulative

adjustment of the opening retained earnings balance for contracts that still required performance at December 31, 2018.

Management's assessment of the Company's construction contracts under the new standard supports the recognition of revenue over time using the cost-to-cost input method (formerly known as the percentage-of-completion method of accounting), measured by the relationship of total cost incurred to total estimated contract costs, which is consistent with the Company's historical revenue recognition practices. As such, the Company's construction contracts continue to be recognized over time considering the continuous transfer of control to its customers during the performance of construction projects.

New accounting pronouncements - *Leases (Topic 842)* In February 2016, the FASB issued ASU No. 2016-02, Leases. This ASU is intended to improve the reporting of leasing transactions to provide users of financial statements with more decision-useful information. This ASU will require companies that lease assets to recognize on the balance sheet the assets and liabilities for the rights and obligations created by those leases. The amendments in this update are effective for private companies with fiscal years beginning after December 15, 2019 (i.e. fiscal 2020), including interim periods within those fiscal years. Early adoption is permitted. Based on the current leases in effect as of the date of this report, this new standard is not expected to have a material impact on the financial statements, however future leases entered into for long-term, may have a significant impact to the total assets and total liabilities at a future date.

Additional accounting pronouncements have been issued recently; none of the additional pronouncements are expected to have a material impact on the Company's financial statements.

(2) Accounts receivable

Completed contracts	$	3,129,417
Contracts in progress		12,743,440
Less allowances for losses		(17,415)
Accounts receivable, net	$	15,855,442

(3) Contract assets and liabilities and work in process

Contract assets		
Contract retention receivable	$	2,870,892
Costs and estimated earnings in excess of billings on uncompleted contracts		1,082,637
Unbilled receivables		703,816
Total contract assets	$	4,657,345

Contract liabilities		
Contract retention payables	$	(929,299)
Billings in excess of costs and estimated earnings on uncompleted contracts		(12,112,677)
Total contract liabilities	$	(13,041,976)
Work in process		
Costs incurred on uncompleted contracts	$	75,658,652
Estimated earnings		13,205,241
Total costs and estimated earnings on uncompleted contracts		88,863,893
Less billings to date		(99,893,933)
	$	(11,030,040)

Included in the accompanying balance sheet under the following captions:

Contract assets		
Costs and estimated earnings in excess of billings on uncompleted contracts	$	1,082,637
Contract liabilities		
Billings in excess of costs and estimated earnings on uncompleted contracts		(12,112,677)
	$	(11,030,040)

(4) Property and equipment

Cost		
Equipment	$	1,304,630
Furniture and fixtures		254,280
Automobiles and trucks		214,881
Building and improvements		981,734
Total cost		2,755,525
Less accumulated depreciation and amortization		(1,382,801)
Net property and equipment	$	1,372,724

(5) Line of credit

The Company has a $4,000,000 line of credit with a bank, that expires in June 2020, at which date all unpaid interest and principal then outstanding will be due. The line of credit is guaranteed by the majority stockholder of the Company, has a right of offset of available funds with the bank held by the Company and limited to 80% of eligible accounts receivable plus 50% of eligible inventory. At December 31, 2019, the balance on the line of credit was $0 and all of the cash and cash equivalents are held with this bank.

(6) Operating leases

Unrelated parties- equipment expense
The Company leases certain office equipment from unrelated parties under operating leases that expire at various dates between 2020 and 2022. No renewal options were provided for in the above leases. In the normal course of business, operating leases are generally renewed or replaced by other leases.

Unrelated party- office space expense
In March and November 2018, January and May 2019, the Company leased office space from an unrelated third party. The lease included a base rent of approximately $14,000 (per year) plus general escalations, the Company's share of operating costs of the building and expires May 2021.

In March 2018, the Company leased office space from an unrelated third party. The lease included a base rent of approximately $48,000 (per year) for one suite, plus general escalations, the Company's share of operating costs of the building and expires May 2021. In addition, during the current year, the Company leased two other office suites from this entity on a month to month basis, rent for these two other offices was approximately $3,400 a month, plus the Company's share of operating costs of the building. The Company terminated these two additional spaces in November 2019.

Related party – expense
During 2018, the Company's lease with a related party (owned by the Company's majority shareholder) for the majority of its operations and personnel, expired. The Company rents this same space on a month-to-month basis, at a current cost of approximately $63,000 per month. As the terms of a new lease are not finalized as of the date of this report, no amounts are included below for future lease payments.

Minimum future lease payments under non-cancelable operating leases with terms in excess of one year are as follows:

	Offices and facilities Unrelated Party	Equipment Unrelated Party	Totals
2020	$ 36,205	$ 9,919	$ 46,124
2021	10,000	1,488	11,488
2022	-	124	124
	$ 46,205	$ 11,531	$ 57,736

(7) Retirement plans

The Company sponsors a 401(k)-profit sharing plan covering substantially all of their employees. In accordance with the plan, the Company may contribute a matching contribution equal to a percentage of the participant's elective contributions. In addition, the Company may contribute an additional amount to each participant's account. The matching contribution and the additional contributions are at the discretion of the Company's management and are determined on an annual basis.

(8) Common stock

Common stock
The Company's articles of incorporation authorized 10,000 shares of $1 par value common stock available, of which 4,850 were issued and outstanding at December 31, 2019.

Equity-Based Compensation
In September 2013, the Board of Directors of the Company authorized and approved the 2013 Restricted Stock Plan & Stockholder Agreement ("2013 Plan"). The main purpose of the 2013 Plan is to enable the Company to attract, retain and motivate members of the management of the Company by providing for or increasing their proprietary interest in the Company. Upon creation of the 2013 Plan, 4,000 shares of restricted common stock were made available under the 2013 Plan. Shares of common stock issued by the Company pursuant to the 2013 Plan have certain restrictions and are then subject to the terms and conditions of the Company's stockholder agreements.

Under the 2013 Plan, the Company is required to repurchase any shares issued and outstanding under the 2013 Plan if the employee separates from employment due to death or disability prior to December 31, 2017 or voluntarily terminates their employment at certain predefined amounts as either fair value or book value, depending on the reason of the employment status. The restricted stock also has certain transfer restrictions to third parties and allows the Company and other stockholders the right to first refusal to purchase all of a selling stockholders' stock of the Company and contains certain drag-along rights.

Upon creating the plan in September 2013, the board of directors granted 650 shares of common stock to four employees under the 2013 Plan ("Initial Grant") of which 500 shares have been issued and fully vested as of December 31, 2019. No grants were made or vested during the year ended December 31, 2019.

(9) Major customers and risk concentrations

As of December 31, 2019, approximately 76% of the Company's accounts receivable came from two customers.

For the year ended December 31, 2019, the Company operated within 22 states, with specific geographical concentrations in Colorado and Texas, of 69% and 15%, respectively, of Company's total revenues.

(10) Commitments and contingencies

The Company is occasionally engaged in legal disputes which arise in the ordinary course of business. Management intends to vigorously defend such matters. Management does not believe that the disputes will have a material adverse impact on the results of operations or financial position of the Company.

Under the Company's organizational documents, the Company's officers, employees and directors are indemnified against certain liabilities arising out of their performance of their duties. The Company's maximum exposure under these arrangements is unknown, as this would involve future claims that may be made against the Company that have not yet occurred. However, based on experience, the Company expects any risk of loss to be remote.

The Company entered into employment agreements and amended the terms of the shareholder agreement with the three minority shareholders, that include certain termination clauses. If a triggering event, as defined in the agreements were to occur, bonuses of approximately $1,400,000 would be due to the minority shareholders. In addition, if the minority shareholders were to resign or be terminated from the Company (outside of a triggering event), their outstanding shares of stock in the Company have a redemption clause whereby the Company is required to buy back their shares at fair value, as determined by a third-party appraisal. The purchase price would be paid off over a three-year time period.

(11) Subsequent events

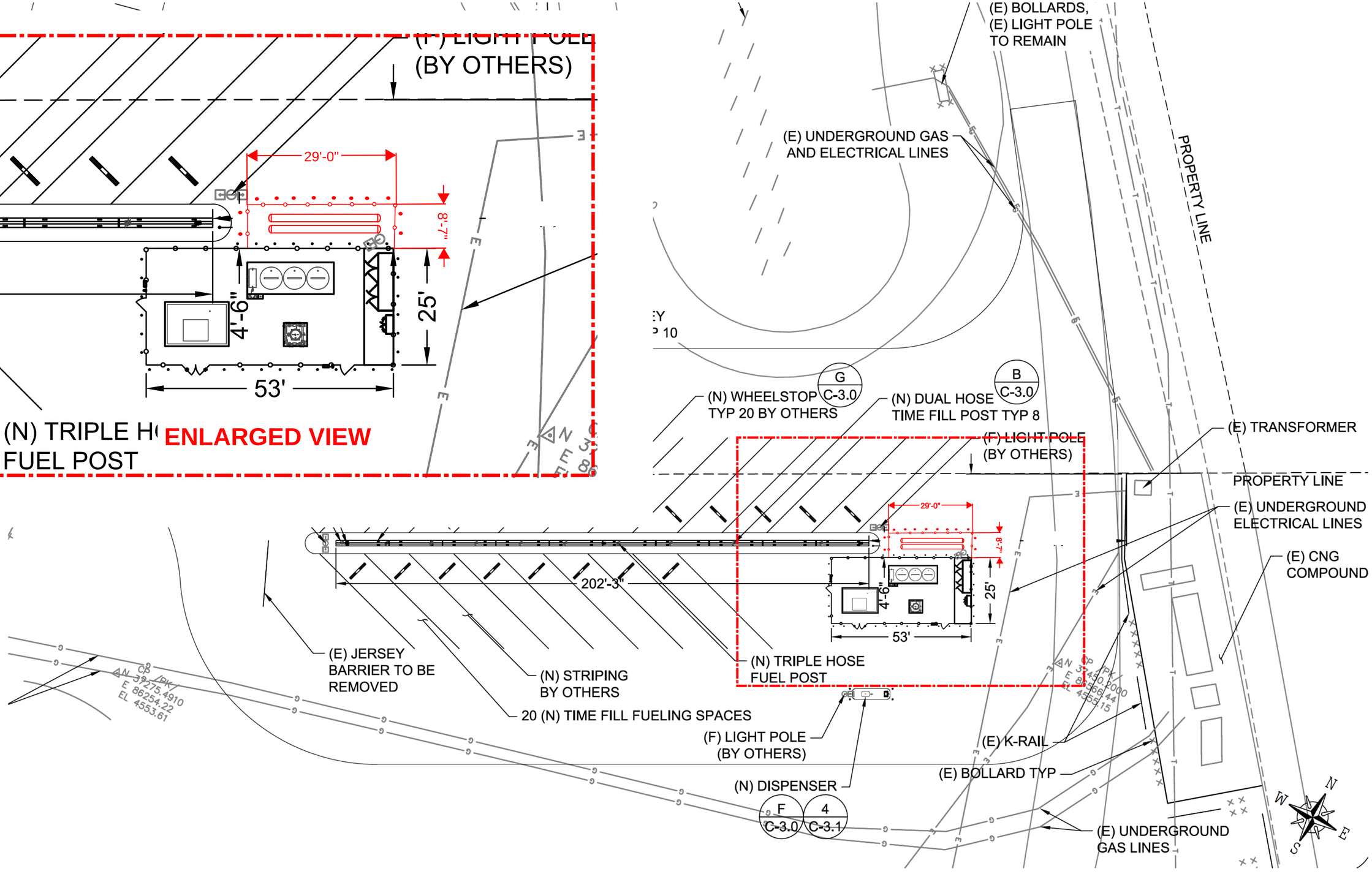
Management has evaluated subsequent events through March 13, 2020, the date the financial statements were available to be issued. The following items were noted, not previously disclosed in the above footnotes:

- The Company made distributions of approximately $3,000,000.
- On March 11, 2020 the World Health Organization declared the novel strain of coronavirus (COVID-19) a global pandemic and recommended containment and mitigation measures worldwide. In addition, several states in the U.S., including Colorado, where we are headquartered and primarily operate, have declared a state of emergency. The Company's operations will be affected by this pandemic, as suppliers may not be able to produce and deliver materials, travel restrictions may restrict access to client work sites and government shut downs could delay formal project inspections. As of the date of this report, some of the Company's projects have been impacted by temporary delays or reduced work-site hours. Management cannot reasonably estimate the length or severity of this pandemic, but currently anticipate a material adverse impact on the Company's financial position, results of operations, and cash flows in 2020.

****

ZAP's financial documents have been provided in a separate document.

EXHIBIT K – PLOT PLAN



THIS DRAWING HAS NOT BEEN PUBLISHED BUT RATHER HAS BEEN PREPARED BY ZAP ENGINEERING & CONSTRUCTION SERVICES, INC. FOR USE BY THE CLIENT NAMED IN THE TITLE BLOCK SOLELY IN RESPECT OF THE CONSTRUCTION, OPERATION AND MAINTENANCE OF THE FACILITY NAMED IN THE TITLE BLOCK AND SHALL NOT BE USED FOR ANY OTHER PURPOSE OR FURNISHED TO ANY OTHER PARTY WITHOUT THE EXPRESS CONSENT OF ZAP ENGINEERING & CONSTRUCTION SERVICES, INC.

REFERENCED DRAWINGS

DRAWING NUMBER	TITLE
–	–

DRAWING REVISIONS

REV	DESCRIPTION	BY	CHK	APVD	DATE
A	ISSUED FOR PROPOSAL	JAR			9/3/2020

ZAP ENGINEERING & CONSTRUCTION SERVICES, INC.

GRAND JUNCTION BIO CNG
FLEET FILLING
PLOT PLAN

JOB NO: **920289**

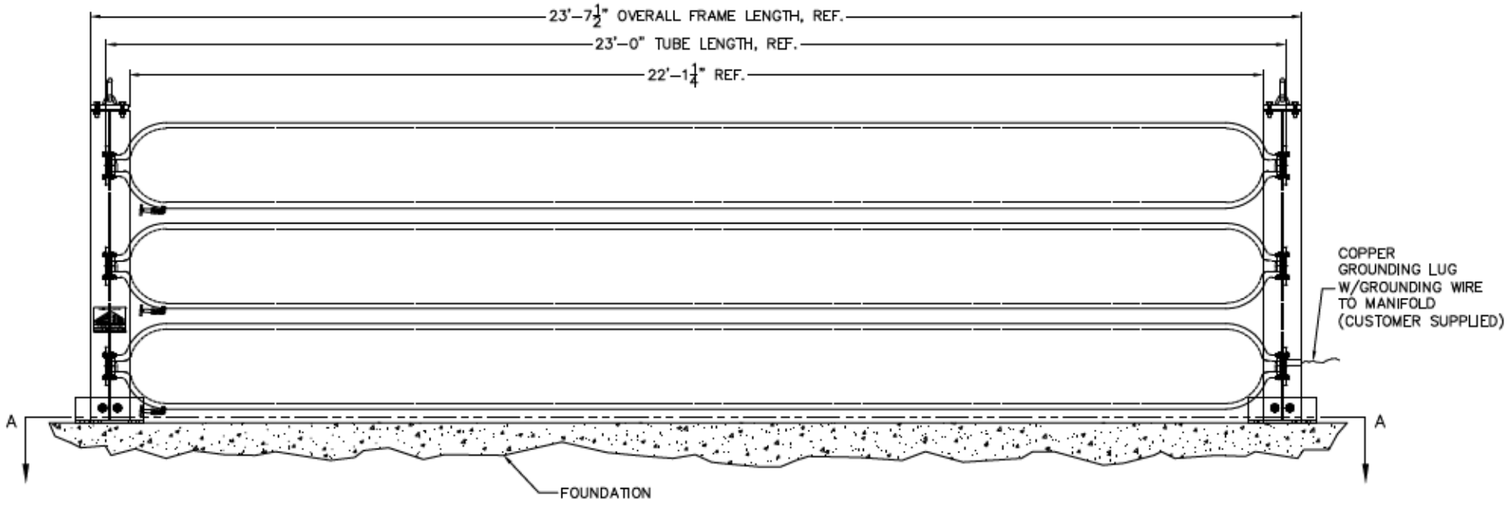
DRAWING NO: **920289-G01-1000**

REV: **A**

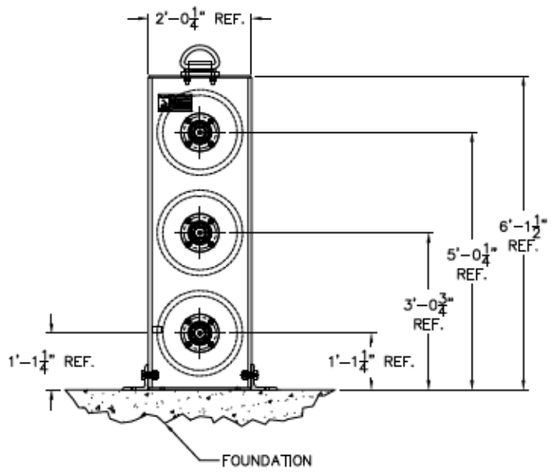
PLOT SIZE: ANSI D

SCALE: AS NOTED

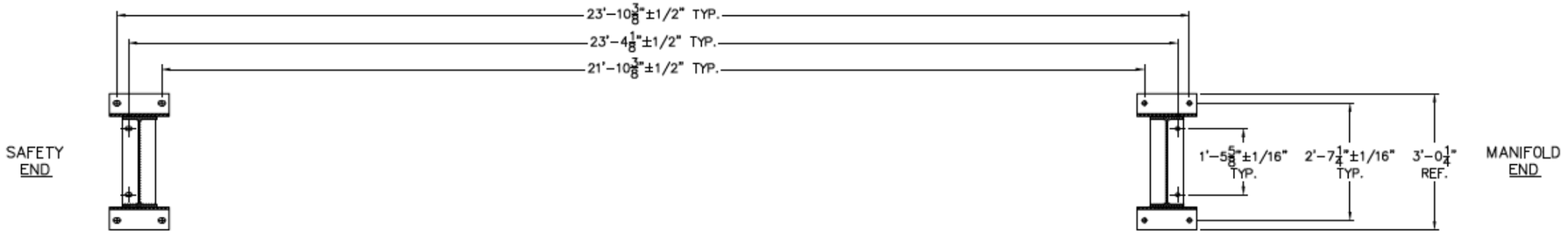
EXHIBIT L – CNG STORAGE VESSEL DRAWING



SIDE VIEW



MANIFOLD END VIEW
(MANIFOLD NOT SHOWN FOR CLARITY)



SECTION VIEW "A–A

NOTES:

1 – PRODUCT: COMPRESSED NATURAL GAS, DIVISION 2.1, UN1971.
NOT FOR SOUR GAS SERVICE.

2 – PRESSURE VESSEL DESIGN CODE: ASME SEC. VIII DIV.1, APPENDIX 22.

3 – VESSEL DESIGN DATA:
– SA372, GRADE J, CLASS 70, 20" O.D. x 23'–0" LG., MIN. WALL 1.304", NOMINAL WATER VOLUME 34.13 CU.FT., DESIGN PRESSURE 5,500 PSIG, NOMINAL WEIGHT 6,771 LBS.

4 – PRODUCT CAPACITY: 38,230 SCF OF CNG @ 5,500 PSIG.
– NOMINAL CAPACITY CALCULATED AT 70° F. ACTUAL CAPACITY WILL VARY BASED ON GAS FILL TEMPERATURE, TUBE, AND RELIEF VALVE SET PRESSURE TOLERANCE.

5 – NOMINAL WEIGHTS:
– TUBES: 20,313 LBS.
– FRAME ASSEMBLY: 1,507 LBS.
– TARE WEIGHT: 21,820 LBS.
– PRODUCT: 1,718 LBS.
– GROSS WEIGHT: 23,538 LBS.

6 – FOUNDATION RECOMMENDATION:
– THE OWNER / INSTALLATION CONTRACTOR IS TO OBTAIN THE SERVICES OF A REGISTERED CIVIL/STRUCTURAL ENGINEER TO PROVIDE A FOUNDATION DESIGN. THE REGISTERED ENGINEER SHALL BE FAMILIAR WITH REGULATORY REQUIREMENTS AT THE INSTALLATION SITE, INCLUDING CONTROLLING BUILDING CODES, SOIL BEARING PRESSURE, CONTROLLING SEISMIC OR WIND CRITERIA, EXTREME FROST PENETRATION, FLOODING, AND OTHER SPECIFIC DESIGN REQUIREMENTS WHICH APPLY.
– THE FOUNDATION SHOULD BE PROPORTIONED, TESTED, MIXED, INSTALLED, AND CURED IN ACCORDANCE WITH CONTROLLING BUILDING CODES AND ACCEPTED CONCRETE DESIGN/CONSTRUCTION CODES PRIOR TO INSTALLATION.

7 – UNLESS OTHERWISE SPECIFIED:
– TOLERANCES – FRACTIONAL – ± 1/8"
– ANGULAR – ± 0.5°
– ALL DIMENSIONS ARE IN INCHES.

8 – CLEAN AS PER FIBA–P–11: "GENERAL CLEANING OF GASEOUS SYSTEM COMPONENTS."

9 – PAINT AS PER FIBA–P–24: "PROCEDURE FOR APPLICATION OF COATINGS ON ALL SKID CONTAINERS, TRAILERS, AND GROUND STORAGE UNITS." TOP COAT TO BE WHITE.

10 – LEAK TEST PRESSURES:
– SAFETY RELIEF VALVE INSTALLED: 4,950 PSIG (0.9 SRV SET PRESSURE).
– SAFETY RELIEF VALVE NOT INSTALLED: 6,050 PSIG (1.1 MAWP).

12 – SHIP WITH < 20 PSIG NITROGEN.

13 – DRY TO < 20 PPM.

14 – CAULK FLANGE x TUBE INTERFACE, BOTH ENDS.

15 – THE CUSTOMER WILL BE RESPONSIBLE FOR PROPERLY SECURING ANY VENT STACKS IN PLACE AND IS RESPONSIBLE FOR ASSEMBLING THE VENT STACK DISCHARGE SO AS NOT TO IMPINGE UPON EQUIPMENT OR PERSONNEL. RECOMMENDED MIN. VENT STACK HEIGHT:
– 10'–0" ABOVE GRADE.
– 2'–0" MIN. ABOVE ADJACENT EQUIPMENT.
– 5'–0" ABOVE ROOFTOPS.

No	DATE	BY	REVISIONS

WARNING NOTICE
THIS DOCUMENT IS THE PROPERTY OF FIBA TECHNOLOGIES, INC. AND IS DELIVERED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE DISCLOSED, REPRODUCED IN WHOLE OR IN PART, OR USED FOR MANUFACTURE FOR ANYONE OTHER THAN FIBA TECHNOLOGIES WITHOUT ITS WRITTEN CONSENT AND THAT NO RIGHT IS GRANTED TO DISCLOSE OR SO USE ANY INFORMATION CONTAINED IN SAID DOCUMENT.

QUALITY PRODUCTS – SERVICE
FIBA TECHNOLOGIES, INC.
53 AYER ROAD, LITTLETON, MA. 01460
PHONE # (978) 887-7100, FAX # (978) 742-4908

DRAWN BY	CHECKED BY	APPROVED BY	DATE
KEG			03/11/16

TITLE: 03 TUBE, COMPRESSED NATURAL GAS (CNG), 20" O.D. x 23'–0" LG., ASME TUBES, GROUND STORAGE PACK, GENERAL ARRANGEMENT, FIBA STANDARD

SCALE	SIZE	DRAWING NUMBER	REV
NTS	D	AS–03–CNG–FIBA–06	00

AIA® Document A312™ – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

ZAP Engineering & Construction Services, Inc.
333 South Allison Parkway, Suite 100
Denver, CO 80226

SURETY:
(Name, legal status and principal place of business)

North American Specialty Insurance Company
1200 Main Street, Suite 800
Kansas City, MO 64105-2478

OWNER:
(Name, legal status and address)

City of Grand Junction, Colorado
2145 River Road
Grand Junction, CO 81505

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

AIA Document A312–2010 combines two separate bonds, a Performance Bond and a Payment Bond, into one form. This is not a single combined Performance and Payment Bond.

CONSTRUCTION CONTRACT
Date: December 3, 2020

Amount: One Million Thirteen Thousand Six Hundred Forty and 00/100 Dollars ($1,013,640.00)

Description:
(Name and location)

Design/Build Grand Junction Bio Compressed Natural Gas (BioCNG) Storage and Fueling Station Optimization Project
Grand Junction, CO
RFP-4813-20-DH

BOND
Date: December 9, 2020
(Not earlier than Construction Contract Date)

Amount: One Million Thirteen Thousand Six Hundred Forty and 00/100 Dollars ($1,013,640.00)

Modifications to this Bond: ☒ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
ZAP Engineering & Construction Services, Inc.		North American Specialty Insurance Company	
Signature:		Signature:	
Name and Title:	Frank E. Lousberg President	Name and Title:	Amy Coonts Attorney-in-Fact

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

IMA, Inc.
1705 17th Street, Suite 100
Denver, CO 80202
303.534.4567

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

.1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature: N/A		Signature: N/A	
Name and Title:		Name and Title:	
Address		Address	

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

AIA® Document A312™ – 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)

ZAP Engineering & Construction Services, Inc.
333 South Allison Parkway, Suite 100
Denver, CO 80226

SURETY:
(Name, legal status and principal place of business)

North American Specialty Insurance Company
1200 Main Street, Suite 800
Kansas City, MO 64105-2478

OWNER:
(Name, legal status and address)

City of Grand Junction, Colorado
2145 River Road
Grand Junction, CO 81505

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

AIA Document A312–2010 combines two separate bonds, a Performance Bond and a Payment Bond, into one form. This is not a single combined Performance and Payment Bond.

CONSTRUCTION CONTRACT
Date: December 3, 2020

Amount: One Million Thirteen Thousand Six Hundred Forty and 00/100 Dollars ($1,013,640.00)

Description:
(Name and location)

Design/Build Grand Junction Bio Compressed Natural Gas (BioCNG) Storage and Fueling Station Optimization Project
Grand Junction, CO
RFP-4813-20-DH

BOND
Date: December 9, 2020
(Not earlier than Construction Contract Date)

Amount: One Million Thirteen Thousand Six Hundred Forty and 00/100 Dollars ($1,013,640.00)

Modifications to this Bond: ☒ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
ZAP Engineering & Construction Services, Inc.		North American Specialty Insurance Company	
Signature:		Signature:	
Name and Title:	Frank E Lalisky President	Name and Title:	Amy Coonts Attorney-in-Fact

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

IMA, Inc.
1705 17th Street, Suite 100
Denver, CO 80202
303.534.4567

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

.2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- **.1** the name of the Claimant;
- **.2** the name of the person for whom the labor was done, or materials or equipment furnished;
- **.3** a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- **.4** a brief description of the labor, materials or equipment furnished;
- **.5** the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- **.6** the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- **.7** the total amount of previous payments received by the Claimant; and
- **.8** the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature: N/A		Signature: N/A	
Name and Title:		Name and Title:	
Address		Address	

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

SWISS RE CORPORATE SOLUTIONS

NORTH AMERICAN SPECIALTY INSURANCE COMPANY
WASHINGTON INTERNATIONAL INSURANCE COMPANY
WESTPORT INSURANCE CORPORATION

GENERAL POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS, THAT North American Specialty Insurance Company, a corporation duly organized and existing under laws of the State of New Hampshire, and having its principal office in the City of Kansas City, Missouri and Washington International Insurance Company a corporation organized and existing under the laws of the State of New Hampshire and having its principal office in the City of Kansas City, Missouri, and Westport Insurance Corporation, organized under the laws of the State of Missouri, and having its principal office in the City of Kansas City, Missouri, each does hereby make constitute and appoint:

SARAH FINN, SHERYLL SHAW, MICHAEL LISCHER, JR., NICOLE L. McCOLLAM, BRANDI J. TETLEY.

JENNIFER L. CLAMPERT, AND AMY COONTS JOINTLY OR SEVERALLY

Its true and lawful Attorney(s)-in-Fact, to make, execute, seal and deliver, for and on its behalf and as its act and deed, bonds or other writings obligatory in the nature of a bond on behalf of each of said Companies, as surety, on contracts of suretyship as are or may be required or permitted by law, regulation, contract or otherwise, provided that no bond or undertaking or contract or suretyship executed under this authority shall exceed the amount of:

TWO HUNDRED MILLION ($200,000,000.00) DOLLARS

This Power of Attorney is granted and is signed by facsimile under and by the authority of the following Resolutions adopted by the Boards of Directors of North American Specialty Insurance Company and Washington International Insurance Company at meetings duly called and held on March 24, 2000 and Westport Insurance Corporation by written consent of its Executive Committee dated July 18, 2011.

"RESOLVED, that any two of the President, any Senior Vice President, any Vice President, any Assistant Vice President, the Secretary or any Assistant Secretary be, and each or any of them hereby is authorized to execute a Power of Attorney qualifying the attorney named in the given Power of Attorney to execute on behalf of the Company bonds, undertakings and all contracts of surety, and that each or any of them hereby is authorized to attest to the execution of any such Power of Attorney and to attach therein the seal of the Company; and it is

FURTHER RESOLVED, that the signature of such officers and the seal of the Company may be affixed to any such Power of Attorney or to any certificate relating thereto by facsimile, and any such Power of Attorney or certificate bearing such facsimile signatures or facsimile seal shall be binding upon the Company when so affixed and in the future with regard to any bond, undertaking or contract of surety to which it is attached."

By _____
Steven P. Anderson, Senior Vice President of Washington International Insurance Company
& Senior Vice President of North American Specialty Insurance Company
& Senior Vice President of Westport Insurance Corporation

By _____
Michael A. Ito, Senior Vice President of Washington International Insurance Company
& Senior Vice President of North American Specialty Insurance Company
& Senior Vice President of Westport Insurance Corporation

IN WITNESS WHEREOF, North American Specialty Insurance Company, Washington International Insurance Company and Westport Insurance Corporation have caused their official seals to be hereunto affixed, and these presents to be signed by their authorized officers this this 26TH day of FEBRUARY, 20 20.

North American Specialty Insurance Company
Washington International Insurance Company
Westport Insurance Corporation

State of Illinois
County of Cook ss:

On this 26TH day of FEBRUARY, 20 20, before me, a Notary Public personally appeared Steven P. Anderson, Senior Vice President of Washington International Insurance Company and Senior Vice President of North American Specialty Insurance Company and Senior Vice President of Westport Insurance Corporation and Michael A. Ito Senior Vice President of Washington International Insurance Company and Senior Vice President of North American Specialty Insurance Company and Senior Vice President of Westport Insurance Corporation, personally known to me, who being by me duly sworn, acknowledged that they signed the above Power of Attorney as officers of and acknowledged said instrument to be the voluntary act and deed of their respective companies.

OFFICIAL SEAL
M. KENNY
Notary Public - State of Illinois
My Commission Expires
12/04/2021

M. Kenny, Notary Public

I, Jeffrey Goldberg, the duly elected Vice President and Assistant Secretary of North American Specialty Insurance Company, Washington International Insurance Company and Westport Insurance Corporation do hereby certify that the above and foregoing is a true and correct copy of a Power of Attorney given by said North American Specialty Insurance Company, Washington International Insurance Company and Westport Insurance Corporation which is still in full force and effect.

IN WITNESS WHEREOF, I have set my hand and affixed the seals of the Companies this 9th day of December, 20 20.

Jeffrey Goldberg, Vice President & Assistant Secretary of Washington International Insurance Company &
North American Specialty Insurance Company & Vice President & Assistant Secretary of Westport Insurance Corporation

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 12/10/2020

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER CA#0H64724 1-913-982-3650 IMA, Inc. (NE Kansas Division) 51 Corporate Woods 9393 W. 110th Street, Suite 600 Overland Park, KS 66210	CONTACT NAME: PHONE (A/C, No, Ext): FAX (A/C, No): E-MAIL ADDRESS: lynne.cox@imacorp.com
INSURED ZAP Engineering & Construction Services, Inc. 333 South Allison Pkwy, #100 Lakewood, CO 80226	INSURER(S) AFFORDING COVERAGE / NAIC # INSURER A : ZURICH AMER INS CO 16535 INSURER B : AMERICAN GUAR & LIAB INS 26247 INSURER C : UNDERWRITERS AT LLOYDS 32727 INSURER D : INSURER E : INSURER F :

COVERAGES **CERTIFICATE NUMBER:** 60852713 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY			GLO012065804	08/15/20	08/15/21	EACH OCCURRENCE	$ 2,000,000
	CLAIMS-MADE X OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 300,000
							MED EXP (Any one person)	$ 5,000
							PERSONAL & ADV INJURY	$ 2,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$ 4,000,000
	POLICY X PRO-JECT X LOC						PRODUCTS - COMP/OP AGG	$ 4,000,000
	OTHER:							$
A	AUTOMOBILE LIABILITY			BAP012066004	08/15/20	08/15/21	COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
	X ANY AUTO						BODILY INJURY (Per person)	$
	ALL OWNED AUTOS / SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	X HIRED AUTOS / X NON-OWNED AUTOS						PROPERTY DAMAGE (Per accident)	$
								$
B	X UMBRELLA LIAB X OCCUR			AUC012066104	08/15/20	08/15/21	EACH OCCURRENCE	$ 10,000,000
	EXCESS LIAB / CLAIMS-MADE						AGGREGATE	$ 10,000,000
	DED / RETENTION $ N/A							$
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y/N			WC012065904	08/15/20	08/15/21	X PER STATUTE / OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? N / N/A (Mandatory in NH)						E.L. EACH ACCIDENT	$ 1,000,000
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$ 1,000,000
							E.L. DISEASE - POLICY LIMIT	$ 1,000,000
C	Professional Liability			B0146LDUSA2004826	08/15/20	08/15/21	Each Claim	10,000,000
	Pollution Liability						Aggregate	10,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

RE: Design/Build Grand Junction Bio Compressed Natural Gas (BioCNG) Storage and Fueling Station Optimization Project: RFP-4813-20-DH. City of Grand Junction, CO., and all other parties required by contract are included as Additional Insured for Ongoing and Completed Operations on the General Liability Policy and as Additional Insured on the Automobile Liability and Umbrella Liability Policies if required by written contract or agreement and with respect to work performed by Insured subject to the policy terms and conditions. This Insurance is Primary and Non-Contributory on the General Liability, Automobile Liability and Umbrella Liability Policies subject to the policy terms and conditions.

CERTIFICATE HOLDER

City of Grand Junction, CO

2145 River Road

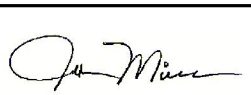
Grand Junction, CO 81505

USA

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE



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SUPPLEMENT TO CERTIFICATE OF INSURANCE

DATE
12/10/2020

NAME OF INSURED: ZAP Engineering & Construction Services, Inc.

SUPP (10/00)