



AGENDA
CITY OF GLENWOOD SPRINGS
REGULAR CITY COUNCIL MEETING
FEBRUARY 4, 2021
101 W. 8TH STREET
6:15 PM

The agenda is subject to *change, including the addition of items 24 hours in advance or the deletion of items at any time.*
The order and times of agenda items listed are approximate and intended as a guideline for the City Council.

ZOOM INSTRUCTIONS

1. You are invited to a Zoom webinar.

When: Feb 4, 2021 03:30 PM Mountain Time (US and Canada)

Topic: 2021/02/04 Regular Council Meeting

Please click the link below to join the webinar:

<https://us02web.zoom.us/j/89178632136>

Or iPhone one-tap :

US: +12532158782,,89178632136# or +13462487799,,89178632136#

Or Telephone:

Dial(for higher quality, dial a number based on your current location):

US: +1 253 215 8782 or +1 346 248 7799 or +1 669 900 6833 or +1 301 715 8592 or +1 312 626 6799 or +1 929 205 6099

Webinar ID: 891 7863 2136

International numbers available: <https://us02web.zoom.us/j/89178632136>

WORK SESSION

3:00	2. Planning and Zoning Interviews	Information/Discussion
3:30	3. River Commission	Information/Discussion
4:15	4. Blake Street Configuration	Information/Discussion

REGULAR SESSION

- 6:15 5. Roll Call
6. Pledge of Allegiance
7. Agenda Changes & Conflicts

- | | | |
|------|---|--------------------------|
| 6:15 | 8. Citizens Appearing Before Council (for items not on the Agenda-comments limited to 3 minutes) | |
| 6:30 | 9. Council Comments | |
| 6:45 | 10. Consent Agenda | Discussion and/or Action |
| | <i>All matters under consent are considered to be routine and will be enacted by one motion and vote. The titles will not be read aloud. There will be no separate discussion on these items unless a Councilmember or Audience Member so requests.</i> | |
| | A. Approval of Minutes from January 21, 2021 Meeting | |
| | B. Lift Station 16000 Construction Agreement | |
| | C. Annual Ride Glenwood Operating Agreement with RFTA | |

ACTIONS AND/OR PRESENTATIONS

- | | | |
|------|---|--------------------------|
| 6:45 | 11. Planning and Zoning Commission Appointments | Discussion and/or Action |
| 6:50 | 12. Airport Commission Appointments | Discussion and/or Action |
| 6:55 | 13. Arts and Culture Board Appointments | Discussion and/or Action |
| 7:00 | 14. Positive Youth Development Proposal | Discussion and/or Action |
| 7:45 | 15. City Council Meeting Interpretation | Discussion and/or Action |
| 8:05 | 16. Inclusionary Housing Update | Information/Discussion |
| 8:20 | 17. Conservation Easement at Silver Sage Preserve | Discussion and/or Action |
| 8:50 | 18. Blake Street Configuration | Discussion and/or Action |
| 9:20 | 19. Report from City Administration | |
| | A. City Manager | |
| | B. City Attorney | |
| | C. Correspondence Incoming/Outgoing | |
| 9:30 | 20. Adjournment | |



City Council
STAFF REPORT
City of Glenwood Springs
February 4, 2021

Agenda Item: Planning and Zoning Interviews

Action Requested: Work session to interview two Planning and Zoning Commission candidates.

Department: City Administration

Presented By: Gretchen Ricehill, Assistant Director of Economic and Community Development

Background Info: George Shaver and Amber Wissing currently serve on the Planning and Zoning Commission. Both are eligible for and have reapplied for second terms.

We received a third application, however since applying, the candidate moved outside of the city limits and is no longer eligible to serve on the Commission per the Municipal Code residency requirements for Planning & Zoning Commissioners.

Issues: None.

Staff Recommendation: None.

Respondent



7

Anonymous



38:10

Time to complete



Planning and Zoning Commission Application

Thank you for your interest and time commitment in serving your community. Please complete all questions on this application.

Personal Information

1. Name *

George Shaver

2. Home Address *

1836 Midland Avenue Glenwood Springs CO 81601

3. Mailing Address *

1836 Midland Avenue Glenwood Springs CO 81601

4. Home Phone *

9703791933

5. Work Phone *

9703791933

6. Mobile Phone *

9703791933

7. Email Address *

Georgeshaver1836@gmail.com

8. Occupation *

Similar-retired residential general contractor

Personal and Professional Interests

9. Why are you interested in serving on the Planning and Zoning Commission? *

I wish to continue working on the commission. I feel I have I can offer a valuable perspective as a builder as well as a long time resident of our community.

10. What do you view as your role if selected as a member to the Planning and Zoning Commission? *

1) Evaluate applications conformance to the development code and compressive plan and/or variance criteria. 2) Continue the fine tuning of the recently adopted development code. 3) Help in the comprehensive plan re-write.

11. What experience have you had in the land use approval process? *

As a builder, I have often had experience with permitting for construction projects mostly in communities up valley. In Glenwood there was a process required due to the proximity to the river, the requirements of HPOZ on the steepness of the lot and a variance for a retaining wall for our home construction in 2013.

12. Do you have any particular areas of interest or a particular perspective relating to land use development in Glenwood Springs? *

I would like to see Glenwood develop in such a way that it maintains economic vibrancy without losing its small town atmosphere and respects the residents that live here. I don't have a specific vision, only an eye to the long term outcomes.

13. Can you describe an experience making a decision that made people unhappy? *

There have been numerous denials of applications that I have been involved with on this commission as well as my time on the Basalt Sanitation board. I am sure there were people that were unhappy as a result of my vote.

14. Can you separate yourself from personal opinions and represent the City's goals, policies, plans, and the Glenwood Springs Municipal Code in an equitable fashion? *

I have tried to do just that. It is not always easy to do so. On the other hand, I think part of our function on the commission is to help guide those goals, policies, etc.

15. The Planning and Zoning Commission members generally attend two meetings a month and can have extensive packet materials to review in preparation for meetings. Do you have any existing time commitments that will hamper your ability to serve? *

No.

16. Are you aware of and understand the quasi-judicial function of the Planning and Zoning Commission? *

If you were to ask me to explain 'quasi-judicial' in clear and precise terms, I would find that very difficult. I am not a lawyer or educated in that area. However, from a practical perspective and from experience, I have understanding of how it works.

17. What experience do you have working with people on a board, commission, or committee? *

14 years on the Basalt Sanitation board. Appointed alternate 1/2017 and commissioner 5/2019 to this P&Z

18. Please select today's date. *

1/8/2021



19. Have you served on the Planning and Zoning Commission before? *

☐ No

☒ Yes

Reappointment Applicants

20. Why do you think you should be reappointed? *

I think I still have something to offer to the commission. I feel I bring a different perspective than others. From a personal perspective, it is a way for me to be involved with the community and I continue to learn from my fellow commissioners, the city staff and from people who come before us to present their applications.

21. Have you served more than two full terms on the Planning and Zoning Commission? *

I am complicating the remainder of my first.

Powers and Duties of the Planning and Zoning Commission

(as defined in Title 020 of the Glenwood Springs Municipal Code)

Composition of the Planning and Zoning Commission:

a. Seven (7) citizens who are residents of the City.

f. Powers and Duties

The powers and duties of the Planning and Zoning Commission shall be:

(1) To develop and recommend a master plan subject to the approval of the City Council and its environ in accordance with the provisions of this Code and the laws of the State.

(2) To recommend to the City Council boundaries of zone districts and regulations to be enforced therein, in accordance with the provisions of this Code and the laws of the State.

(3) To review proposals relating to subdivision, development and use of land and make decisions or recommendations on such proposals, in accordance with the procedures and provisions set forth in this Code.

(4) To hear and decide appeals wherein there is a question of interpretation of the zone district map, the master plan or related documents and similar questions as they may arise in the administration of this Code.

(5) The Planning and Zoning Commission shall have the duty and power to act on appeals with regard to matters arising from enforcement of provisions of Title 070 of this Code, including:

a. Review of administrative decisions. To hear and decide appeals where it is alleged there is error in any action,

including any order, interpretation, requirement, decision or determination made by an administrative official

of the city in the enforcement of Title 070 of this Code.

b. Variances. To hear and decide requests for variances from the zoning provisions and sign regulation provisions

where there are unique, unnecessary and unreasonable hardships in the way of carrying out the strict letter of said

provisions; and to hear and decide requests for variances to allow deviations from restrictions upon the

construction and placement of buildings and other structures on site. Examples of such variances include, but are

not limited to, modifications of minimum area requirements, building coverage and setback restrictions. Variances

from permitted and special review uses in zone district text shall not be considered.

(6) To perform such other functions as required by the provisions of Title 070.

Appointment, Removal, Term and Vacancies of Boards and Commissions

Glenwood Springs, CO Municipal Code 020.020.040

(a) Appointment and term of members. Except as otherwise provided, all appointments to the boards and commissions shall be by the City Council for terms of three (3) years each, and each member shall serve until his/her successor is appointed and takes office; provided, however, that the initial terms of office may be shortened by the City Council so as to provide overlapping terms of office. Appointments shall expire the day before the first regular meeting of the City Council in each month according to the following schedule:

(1) February:

Planning and Zoning Commission;
Finance Advisory Board;
Tourism Promotion Board;
Building Board of Appeals.

(2) March:

Transportation Commission;
Arts and Culture Board;
Parks and Recreation Commission;
Airport Board;
River Commission.

(3) April:

Local Liquor Licensing Authority;
Victim's Witnesses Assistance and Law Enforcement Board;
Historic Preservation Commission;
Glenwood Springs Housing Commission.

(b) Alternate members. The City Council at its discretion may appoint up to three (3) persons as alternate members for each board or commission. If a regular member of a board or commission is to be absent from a meeting, the presiding officer for the meeting may select an alternate member to fill such absence and to attend and serve at the meeting. The alternate member may exercise all powers at the meeting which the absent regular member could exercise, and the alternate's powers and privileges shall terminate at the end of the meeting attended. The presiding officer may at his/her discretion select the same alternate to serve at successive meetings in the absence of any member.

(c) Limit to term of members. No Board member shall serve more than two (2) terms on the same board or commission.

(d) Removal of members. All appointed members of a board or commission shall be subject to removal, at any time, by the City Council. In the event an appointed member of a board or commission ceases to qualify for membership, his or her appointment is immediately terminated.

(e) Vacancies. The City Council shall fill all vacancies on boards and commissions by appointment

for the unexpired term.

(Code 1971 §§ 2-63, 2-64, 2-67; 6-95 § 1; 10-07 § 2; Ord. No. 9-2018 , § 2, 4-20-2018)

Respondent



8

Anonymous



46:34

Time to complete



Planning and Zoning Commission Application

Thank you for your interest and time commitment in serving your community. Please complete all questions on this application.

Personal Information

1. Name *

Amber Wissing

2. Home Address *

1543 Shepherds Lane Glenwood SP, CO 81601

3. Mailing Address *

1543 Shepherds Lane Glenwood SP, CO 81601

4. Home Phone *

970-948-9774

5. Work Phone *

970-945-9119

6. Mobile Phone *

970-948-9774

7. Email Address *

amberewissing@gmail.com

8. Occupation *

Office Manager

Personal and Professional Interests

9. Why are you interested in serving on the Planning and Zoning Commission? *

I am interested in continuing my service on the P&Z Commission after 3 years. It has been quite the education! It has also provided me with a way to serve my community as well as prepare me for a potential bid for City Council in the future.

10. What do you view as your role if selected as a member to the Planning and Zoning Commission? *

As Ingrid can attest, I view my role as the voice of the common citizen. I bring no expertise in land use or other professionally applicable skills to the table. All I can bring is my heart to do what is fair by the residents of a town I love.

11. What experience have you had in the land use approval process? *

Outside of my P&Z service, the only land use approval process experience I have had is as a Board Member for the Cardiff Glen HOA. I have served on that Board for 12 years. Cardiff Glen has had a long and sortied past in history of it's development. I have been involved with all aspects of the HOA involving that process since becoming a Cardiff Glen owner and resident.

12. Do you have any particular areas of interest or a particular perspective relating to land use development in Glenwood Springs? *

Glenwood Springs is my home town. I am invested in making it the best place to live, work and raise a family. Outside of that perspective, I have no professional interests regarding land use within the city.

13. Can you describe an experience making a decision that made people unhappy? *

A recent decision that I supported was the highly emotional decision for riparian zone set backs. While I understood the concern of the property owners, our rivers are a resource that should be protected at the highest level. Finding a fair balance was challenging and unpopular among some property owners, but I stand by my decision to protect our precious river resource.

14. Can you separate yourself from personal opinions and represent the City's goals, policies, plans, and the Glenwood Springs Municipal Code in an equitable fashion? *

Yes. I believe myself to be a very fair minded decision maker. As the president of our HOA, I have had a lot of practice holding friends and neighbors accountable to our covenants despite relationships and emotions.

15. The Planning and Zoning Commission members generally attend two meetings a month and can have extensive packet materials to review in preparation for meetings. Do you have any existing time commitments that will hamper your ability to serve? *

No.

16. Are you aware of and understand the quasi-judicial function of the Planning and Zoning Commission? *

Yes.

17. What experience do you have working with people on a board, commission, or committee? *

I believe that I have answered this in the previous sections. I also serve on Glenwood Medical's Citizen Advisory Board and the Two Rivers Community Foundation Board.

18. Please select today's date. *

1/12/2021



19. Have you served on the Planning and Zoning Commission before? *

☐ No

☒ Yes

Reappointment Applicants

20. Why do you think you should be reappointed? *

I believe that I am a valuable Commissioner because I come to the table to authentically listen, evaluate, and make a decision that is as fair as possible for all parties involved. I do not take this responsibility lightly. From my time serving on my HOA Board, I know first hand what it is like to stand up in a meeting as a resident trying to protect your community with your nerves shaking, your mind racing, just hoping that you can get your points across to a Commission you hope is listening. Staff, professionals and community members can count on me to do my solid best to serve in this position with integrity.

21. Have you served more than two full terms on the Planning and Zoning Commission? *

My first term expires next month.

Powers and Duties of the Planning and Zoning Commission

(as defined in Title 020 of the Glenwood Springs Municipal Code)

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administrative official

of the city in the enforcement of Title 070 of this Code.

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provisions; and to hear and decide requests for variances to allow deviations from restrictions upon the

construction and placement of buildings and other structures on site. Examples of such variances include, but are

not limited to, modifications of minimum area requirements, building coverage and setback restrictions. Variances

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Building Board of Appeals.

(2) March:

Transportation Commission;

Arts and Culture Board;

Parks and Recreation Commission;

Airport Board;

River Commission.

(3) April:

Local Liquor Licensing Authority;

Victim's Witnesses Assistance and Law Enforcement Board;

Historic Preservation Commission;

Glenwood Springs Housing Commission.

(b) Alternate members. The City Council at its discretion may appoint up to three (3) persons as alternate members for each board or commission. If a regular member of a board or commission is to be absent from a meeting, the presiding officer for the meeting may select an alternate member

to fill such absence and to attend and serve at the meeting. The alternate member may exercise all powers at the meeting which the absent regular member could exercise, and the alternate's powers and privileges shall terminate at the end of the meeting attended. The presiding officer may at his/her discretion select the same alternate to serve at successive meetings in the absence of any member.

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(e) Vacancies. The City Council shall fill all vacancies on boards and commissions by appointment for the unexpired term.

(Code 1971 §§ 2-63, 2-64, 2-67; 6-95 § 1; 10-07 § 2; Ord. No. 9-2018 , § 2, 4-20-2018)

**City of Glenwood Springs**

Office of the City Clerk

101 West 8th Street

Glenwood Springs, CO 81601

Fax: 970-945-5023

Email: Catherine.mythen@cogs.us

**PLANNING AND ZONING COMMISSION
APPLICATION**

(for Powers and Duties, see page 3)

Section 1 – Name and AddressName Joy WhiteHome Address 365 Vista Dr Glenwood Springs ,CO 81601Mailing Address " "**Section 2 – Contact Information**Home 970-366-9636

Work _____

Fax _____

Mobile 970-366-9636Email joy@masonmorse.com**Section 3 - Occupation**Occupation Real Estate Broker**Section 4 – Personal and Professional Interests****1. Why are you interested in serving on the Planning and Zoning Commission?**

I have a keen interest in being instrumental in the planning and zoning decisions that affect the Glenwood Springs community. I have been a long-term resident in Glenwood and have a heart for the community and a vested interest in positive development outcomes in our beautiful town.

2. What do you view as your role if selected as a member of the Planning and Zoning Commission?

As a professional in the real estate community, a mother of four children growing up in our town and an individual who intends to continue to invest in property in the city limits - I see I can bring industry expertise coupled with a well-rounded community approach to decisions made on the commission. As a new member I intend to learn from the existing commissioners and add a fresh, sound approach as is appropriate.

3. What experience have you had in the land use approval process?

I have collaborated with the Glenwood Springs and Garfield County Community Development Departments on parcel research for development, existing land use guidelines associated with real estate transactions. I thrive in helping my clients navigate the intricacies of land use. There is always more to learn, which is thrilling.



City of Glenwood Springs
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101 West 8th Street
Glenwood Springs, CO 81601
Fax: 970-945-5023
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PLANNING AND ZONING COMMISSION APPLICATION

(for Powers and Duties, see page 3)

Section 4 – Personal and Professional Interests (Continued)

4. Do you have any particular areas of interest or a particular perspective relating to land use development in Glenwood Springs?

No particular interest.

5. Can you describe an experience making a decision that made people unhappy?

As a real estate broker you are consistently involved in emotionally charged transactions. There are tough negotiations and though you always try to reach amicable solutions it is not always possible. You do your best to represent your client and work hard to that end. There are people are upset but ultimately, if you are kind, professional and hard-working there can be respect for all parties regardless of whether the outcome has been a tough decision.

6. Can you separate yourself from your personal opinions and represent the City's goals, policies, plans and the Glenwood Springs Municipal Code in an equitable fashion?

I have also worked in the non-profit sector prior to my employment in the real estate world and understand that to be successful the well-being of the community, at large, must always be upheld. Goals, policies and plans cannot be made in self-interest but rather should serve all community members, as best as possible.

7. The Planning and Zoning Commission members generally attend two meetings a month and can have extensive packet materials to review in preparation for the meetings. Do you have any existing time commitments that will hamper your ability to serve?

No

8. Are you aware of and understand the quasi-judicial function of the Planning and Zoning Commission?

Yes

9. What experience do you have working with people on a board, commission or committee?

I have served on non-profit committees, work related advisory boards, and am currently on the Andy Zanca Youth Empowerment Board.

Thank you for your interest and time commitment in serving your community

Please complete and submit this application online or
mail to: City Clerk, 101 West 8th Street, Glenwood Springs, CO 81601;
fax to: 970-945-5023;
email: catherine.mythen@cogs.us



City of Glenwood Springs

Office of the City Clerk

101 West 8th Street

Glenwood Springs, CO 81601

Fax: 970-945-5023

Email: Catherine.mythen@cogs.us

**PLANNING AND ZONING COMMISSION
APPLICATION**

(for Powers and Duties, see page 3)

POWERS AND DUTIES OF THE PLANNING AND ZONING COMMISSION

(as defined in Title 020 of the Glenwood Springs Municipal Code)

Composition of the Planning and Zoning Commission:

- a. Seven (7) citizens who are residents of the City.

Powers and Duties:

(f) Powers and Duties of Planning and Zoning Commission. The powers and duties of the Planning and Zoning Commission shall be:

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 - b. Variances. To hear and decide requests for variances from the zoning provisions and sign regulation provisions where there are unique, unnecessary and unreasonable hardships in the way of carrying out the strict letter of said provisions; and to hear and decide requests for variances to allow deviations from restrictions upon the construction and placement of buildings and other structures on site. Examples of such variances include, but are not limited to, modifications of minimum area requirements, building coverage and setback restrictions. Variances from permitted and special review uses in zone district text shall not be considered.
- (6) To perform such other functions as required by the provisions of Title 070.



City Council
STAFF REPORT
City of Glenwood Springs
February 4, 2021

Agenda Item: Blake Street Configuration

Action Requested: Review and approval of an option for Blake.

Department: Engineering

Presented By: Terri Partch, City Engineer

Background Info: In 2010, the City Council and the Colorado State Transportation Commission approved the recommendations of a study that evaluated reducing congestion on SH 82. One of the many recommendations was to open Blake Gate to allow local traffic to use the City street network instead of getting on SH 82.

Many residents on Blake fear that opening Blake Gate will lead to additional traffic on their street. It is true that particularly in the afternoons, traffic on SH 82 will try to get off of the road and find a faster way to I-70.

With the development of the new multi-family housing at Blake and Palmer, the traffic study done for the project modeled the gate as open, to split the traffic impact of the new development between 27th and the Blake intersection on SH 82. At the time, the Council directed that the gate be opened for construction purposes, and then permanently opened with the occupancy of the development.

The development was sold and re-entitled. Council in October voted to delay the opening of the Gate until the issuance of a certificate of occupancy or temporary certificate of occupancy for any building part of the Triumph-Bell Rippy development.

Staff met with the new developer, groups of residents and held another public meeting to get input on the gate opening, and options for controlling speed and cut-through on Blake.

The neighborhood is still concerned about the possibility of cut-through traffic and pedestrian safety, and would prefer a one-way southbound orientation on Blake between 26th and 27th to prevent traffic coming off of SH 82 and avoid congestion. This is also the recommendation of the Transportation Commission.

Issues: Changing the road configuration to one way changes existing traffic patterns, increases traffic on other roads that weren't previously affected and creates "dead end" streets where a turn around would be needed. One way roads also reduce the City's circulation and emergency response.

The Community Development Department has received construction drawings for approval for the Bell Rippy project and will be negotiating the development agreement as part of the final land use approval, before the building permit submittal, in the next month to six weeks.

Staff Recommendation: Staff recommends keeping all roads with a two way configuration, but adding traffic calming elements outlined in the presentation or advisory bike lanes to slow cut through and neighborhood traffic.

Blake Avenue Improvements

City Council Meeting

February 4, 2021



Agenda

- **Alternative Overview**
 - Alternate A: Replace in kind
 - Alternate B: One-Way
 - Alternate C: Advisory Bike Lane
 - Alternate D: Two-Way with Raised Path
- **Questions**



February 4, 2021

Blake Avenue Alternative A: Replace in kind only



February 4, 2021

26th Street Alternative A: Replace in kind only



Evaluation of Alternative A: Replace Existing Condition

Benefits:

- Lowest cost option
 - 1.0 Cost Magnitude
 - Assumed with no traffic calming, roadway improvements (curb, gutter, striping, etc)
 - Facilitated within existing Right of Way
 - Minimal materials
- Maintains city circulation
- Low impact to neighbors

Drawbacks:

- No curb and gutter
- Does not provide pedestrian facilities (sidewalk)
- Does not provide bicycle facilities (bike lanes, sharrows may be accommodated)
- No traffic calming
- No improvements to Palmer Avenue
- Could lead to congestion during peak hours

February 4, 2021



Blake Avenue Alternative B: One-Way

Neighborhood traffic heading NB on SH 82

- Forced to 24th Street or 23rd Street

One way SB from 23rd Street to 26th Street

- NB traffic is forced to Palmer Avenue at 26th Street

One way SB from 26th Street to 27th Street

- Blake Avenue traffic NB is forced to the SH 82 Intersection
 - Potentially lower LOS at 27th, 29th, and Blake Avenue intersections with SH82
 - CDOT will not allow more time at the signals, may require improvements
 - Road length is less than 190 feet at 27th Street
 - Current AM/PM LOS D @ 27th Street/SH 82 Intersection
 - Approximately 26-31 seconds is allotted to clear the west-bound leg
 - Significant cost Acquisition of Right of Way (Carpet One)
- More traffic at 27th Street could limit RFTA exiting traffic
- Could increase *standing traffic* in the Blake Avenue neighborhood during high traffic times or delays
- People may ignore one way

SB through the old Blake Gate Location

- Narrow road section (10') EMS does not currently access through this location. If they needed to, they could go the wrong direction
 - Potentially lower LOS at 29th Street and Blake Avenue intersections with SH82.
 - Increase turn arounds at Wal-Mart, potential unsafe movements if people elect to travel the wrong direction through this location

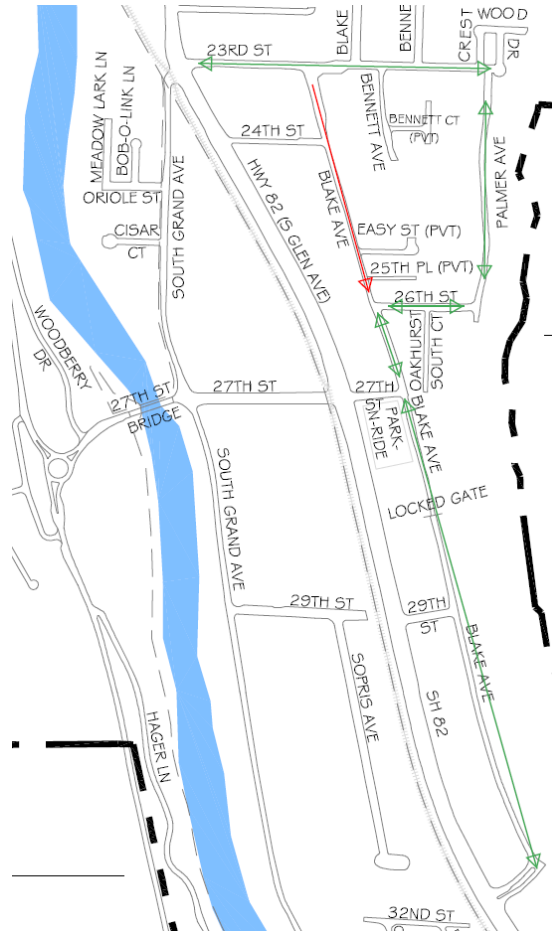
February 4, 2021



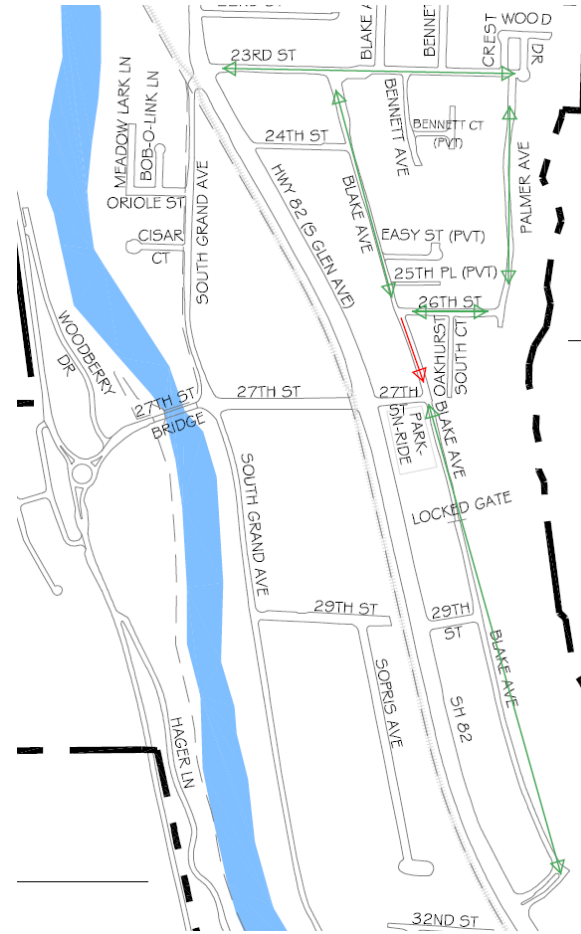
Blake Avenue Alternative B: One-Way

Similar to Alternative A/1

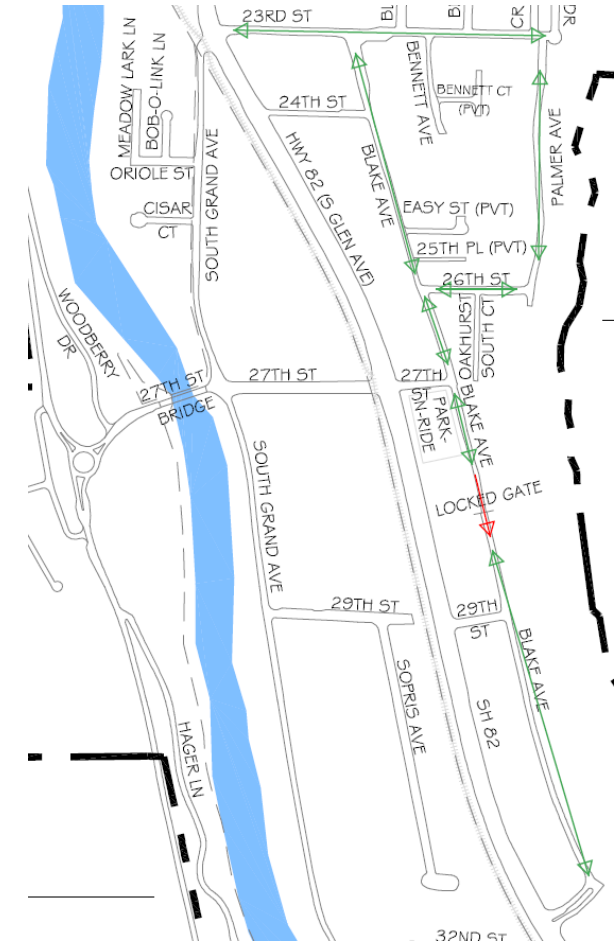
- Minimum width of 20' for emergency response, but could be less at current gate location.



SB from 23rd Street to 26th Street



SB from 26th Street to 27th Street



SB through the old Blake Gate Location

February 4, 2021

Evaluation of Alternative B: Blake Avenue One-Way

Benefits:

- **Southbound movement**
 - Lowers volumes
 - Discourages SH 82 traffic from taking Blake Avenue
- **Lower cost option**
 - Cost Magnitude varies (1.2-1.7)
 - Dependent on traffic calming options used, the location of the one-way and the length of the one-way
 - Facilitated within existing Right of Way
 - Minimal materials
- **Could facilitate a separate pedestrian facility (with added costs)**
- **Easily converted to another design if not successful**
- **Low impact to neighbors**

Drawbacks:

- **No curb and gutter**
 - Does not consider drainage (currently)
- **Bicycle traffic would oppose vehicular traffic**
- **Physical barriers and signage necessary**
 - Some neighbors and commuters will choose to go the wrong direction rather than drive out of direction/take the long way
- **Lower city circulation**
 - Less options
- **Increase Palmer Avenue traffic during periods of congestion**
- **Increased backups in the neighborhood**
- **Would limit RFTA Access**
- **Lowers LOS across multiple SH82 accesses**
 - 29th is slated for a ¾ movement (no SB 82 Access)

February 4, 2021



Public Feedback

My concerns about a one-way Blake Avenue configuration (select all that apply)

	TOTAL	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7	Person 8	Person 9	Person 10	Person 11	Person 12
I do not have concerns	2	1								1			
One way would make travel difficult for the neighborhood	5		1			1	1				1		1
Engineering has concerns about circulation needs for the city as a whole	3		1				1				1		
One way south bound would force afternoon back up traffic onto Palmer	6		1	1		1			1		1		1
This could delay traffic more in the event of an evacuation	2		1			1							
Other	4		1	1			1	1					

Other comments:

- Blake Ave one-way southbound from 24th to 26th Streets will be the most definitive solution for keeping drive-off commuter traffic from utilizing Blake Ave ALL the way through town from McDonalds to 8th or 9th Street. It would also maintain this NARROW section of Blake as a neighborhood street rather than a highway 82 bypass. Palmer Ave gets an assortment of traffic discouraging and calming measures.
- This gate/traffic issue has been uncomfortable for us as the one-way issue seemed to put some of us at odds, when for years we have been of one mind about most shared issues
- It will not be in anyway fair to add the traffic from the residents that live on Blake Avenue to have to travel around the block, up 26th and down Palmer just to get to the grocery store or town core.
- I think one way between 26th and 27th on Blake is a great idea. We are talking about cut through traffic and it is not tourists, it is locals that do it every day. This stops it. I do not think this puts much more pressure on the 27th and Blake intersection. You have 29th and the McDonalds to get on 82 north bound
- I would most like to see Blake Street one way from 26th to 27th if not permanently than at least until ALL discussed improvements are completed. Planters could be put on both side of Blake at the top of 27th to discourage drivers from going the wrong way on Blake.
- Feedback would say the idea of one way south of Blake between 26th - 27th should receive consideration. This includes input from residents of OakHurst, as it seems it will affect their access the most.

February 4, 2021





Alternative C: Advisory Bike Lanes

FHWA Guidance:

- Low-volume roads
 - 6,000 ADT or less
 - 3,000 ADT or less preferred
- Low-speed roads
 - 35 mph or less
 - 25 mph or less preferred
- Two-lane roads
- No centerline striping
- Roads with adequate sight distance
- Locations with constrained connections between biking and walking facilities
- Avoidance of bus or truck routes preferred
- Roads that are too narrow for typical biking facilities

February 4, 2021

Current Condition:

- Blake Avenue and Palmer Avenue have a combined ADT of less than 1500.
 - Counts were taken during significant congestion on SH 82, week of South Canyon Fire.

- Busses and trucks remain on SH 82

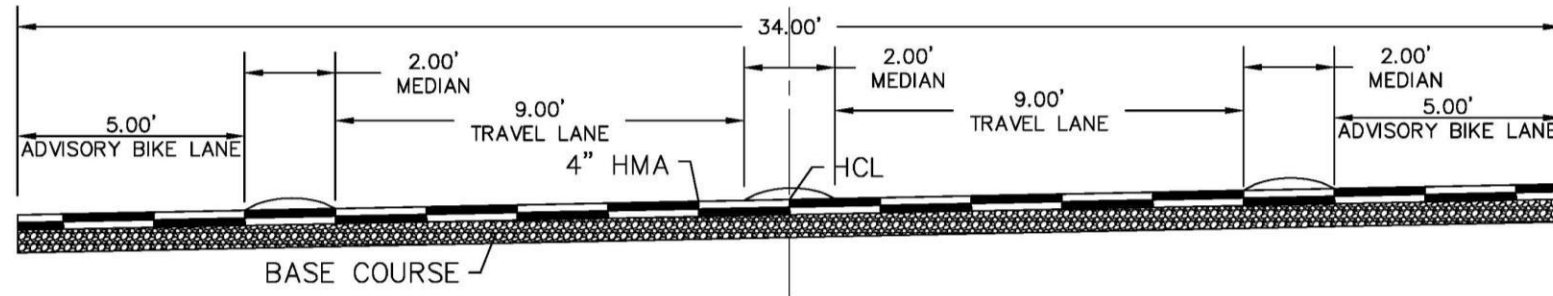
Blake Avenue:

- 15 MPH (23rd – 27th Street)
- Not striped
- Adequate sight distances
- Identified bike route in the Long-Range Transportation Plan
- Narrow Right of Way
 - Down to 26.5 feet, averages 30-35 feet

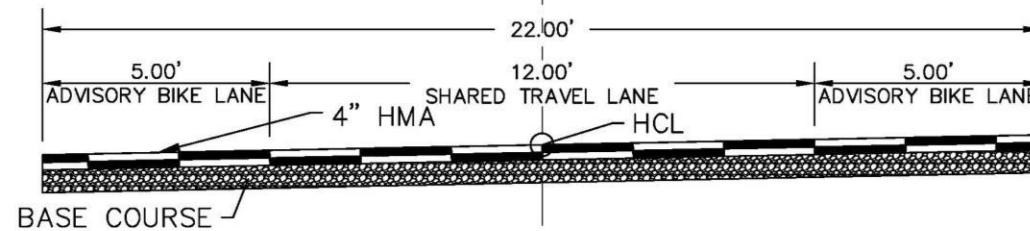
Palmer Avenue:

- 25 MPH, not signed
- Not striped
- Adequate sight distances

Blake Avenue Alternative C: Advisory Bike Lane



TWO WAY AT INTERSECTION
SCALE: 1" = 5'



TWO WAY BLAKE AVENUE ADVISORY BIKE LANE
SCALE: 1" = 5'

NOTE:

1. BLAKE AVENUE WAS SURVEYED FROM 23RD STREET TO 26TH STREET. REMAINING RIGHT OF WAY LINES AND PROPERTY LINES ARE APPROXIMATE AND NOT SURVEY ACCURATE. THEY ARE FOR INFORMATION PURPOSES ONLY.

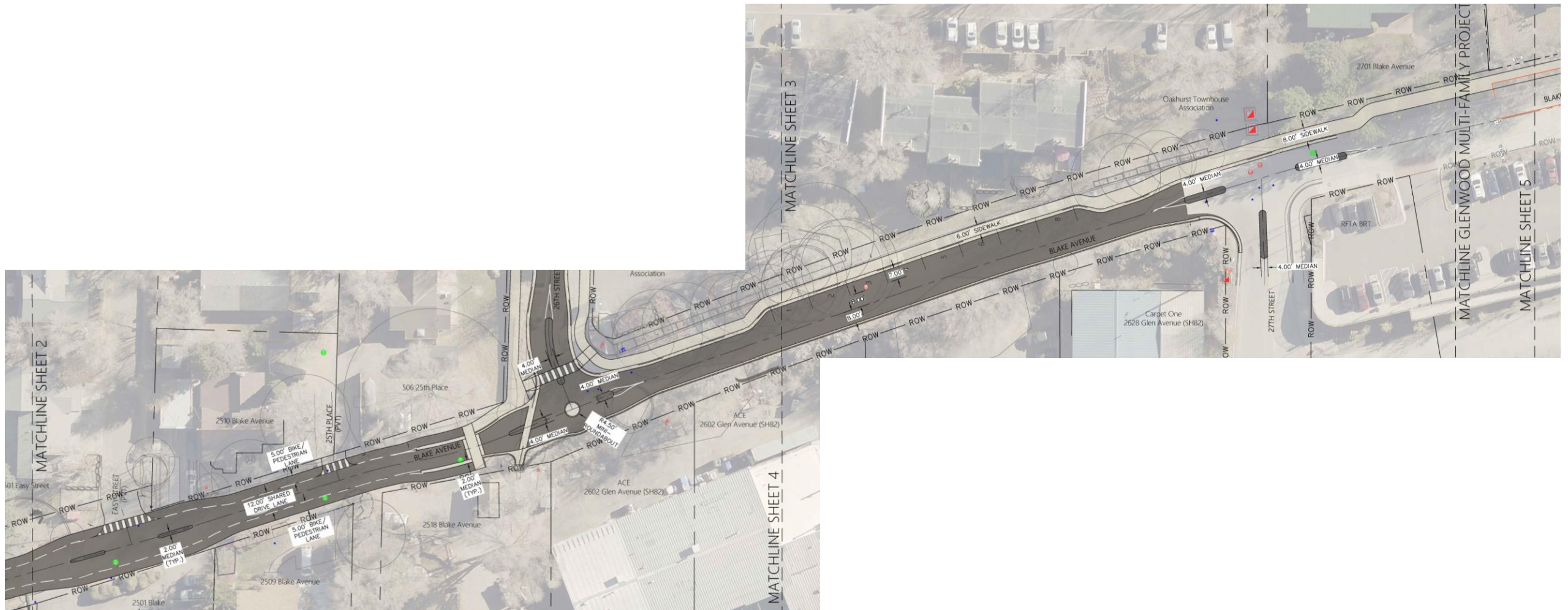
February 4, 2021

Blake Avenue Alternative C: Advisory Bike Lane Sketch



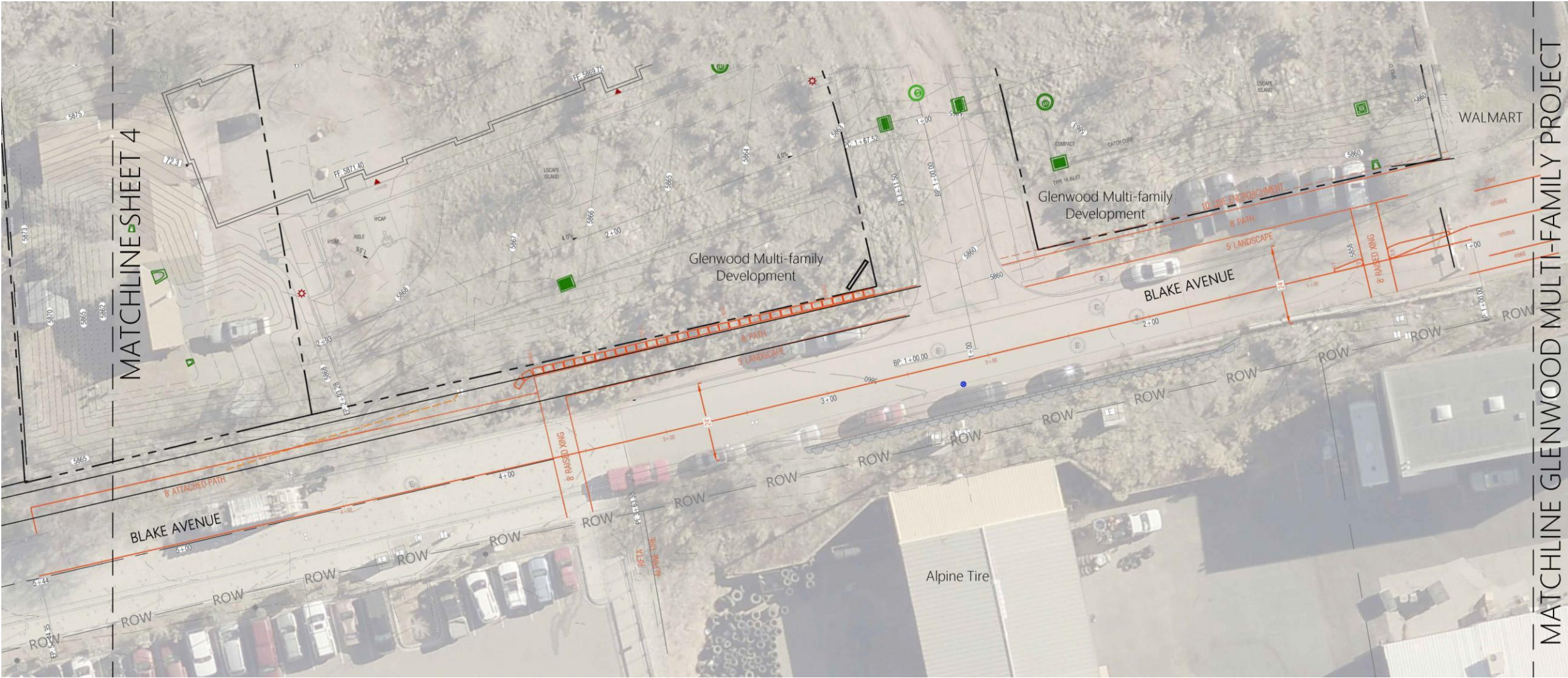
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Blake Avenue Alternative C: Advisory Bike Lane Sketch



February 4, 2021

Blake Avenue Alternative C: Advisory Bike Lane Sketch





February 4, 2021

Palmer Avenue Alternative C: Advisory Bike Lane Sketch



February 4, 2021

26th Street: Connection to Advisory Bike Lane Sketch



February 4, 2021

17

Evaluation of Alternative C: Advisory Bike Lanes

Benefits:

- **Prioritizes Bicycles and Pedestrians**
 - Equal users
- **Lower cost option**
 - Cost Magnitude (1.3)
 - Assumed colored pavement and striping
 - Not considered: curb and gutter, traffic calming
 - Facilitated within existing Right of Way
 - Minimal materials
- **Maintains city circulation**
- **Facilitates the missing bike connection outlined in the Long Range Transportation Plan**
- **Easily converted to another design if not successful**
- **Low impact to neighbors**

Drawbacks:

- **No curb and gutter**
 - Does not consider drainage (currently)
- **Does not provide pedestrians a separate (protected) space**
- **No on street parking**
- **Education is required for success**
 - Signage
- **Could lead to congestion during peak hours**

February 4, 2021



Feedback

Option A – Advisory Bike Lane – Two-way traffic in a shared middle lane, with vulnerable road users utilizing a path on the edge of either side of the roads.

My concerns about Option A are (select all that apply)

	TOTAL	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7	Person 8	Person 9	Person 10	Person 11	Person 12
I do not have any concerns about this approach	4		1			1	1						1
Traffic volumes are too high for this to work well	4	1		1				1				1	
Problematic during backups on Highway 82	6	1		1					1	1	1	1	
It will require a lot of education for this configuration and could be dangerous as people learn to use it	2			1						1			
Could be difficult during inclement weather	4			1			1		1	1			
Other	2			1					1				

I like the Advisory Bike Lane because

	TOTAL	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7	Person 8	Person 9	Person 10	Person 11	Person 12
I do not like this approach	1	1											
It would not require expansion of the roadway platform for a sidewalk/curb and gutter (which would impact houses along the road)	6	1					1		1	1		1	1
It offers a lower cost solution that could be implemented for a longer stretch of road initially	4		1				1		1	1			
The guidance says that an Advisory Bike Lane makes it easier to remove snow	3		1							1			1
It prioritizes vulnerable road users (cyclists and pedestrians)	6		1	1				1	1	1	1		
This approach will slow traffic down	7			1		1	1		1	1	1		1

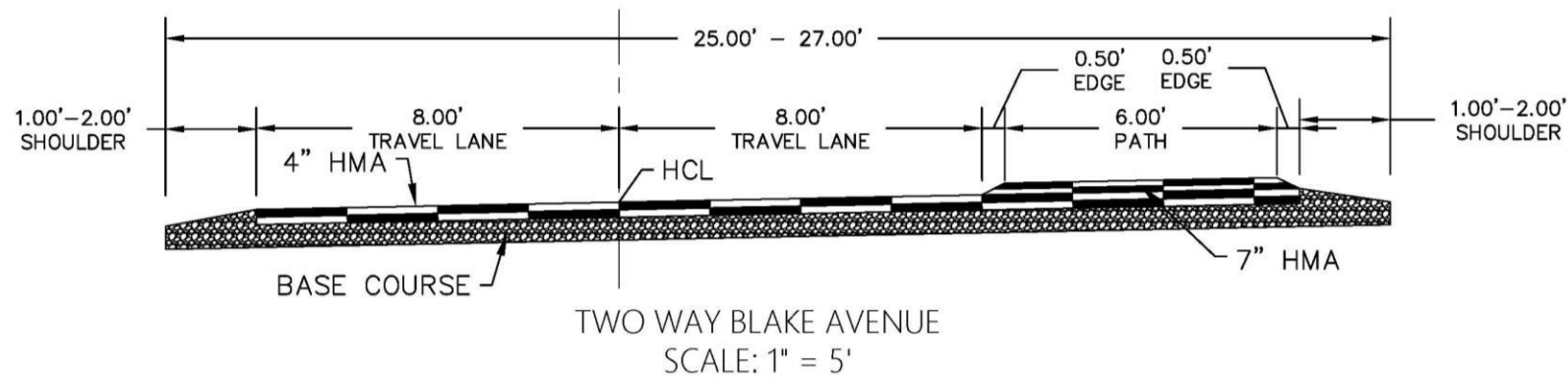
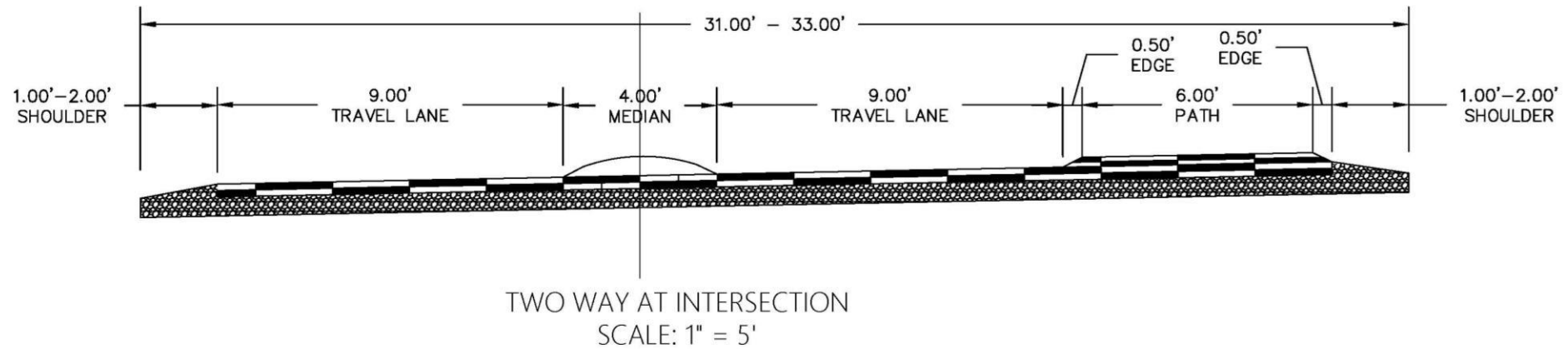
Other comments:

- I'd like to commend the staff for some "out of the box" thinking. Out of all that was presented, I like the advisory bike lanes. I would strongly urge colored asphalt be used rather than paint to make the paths pop out more and for more durability as well as traffic tables or speed humps with a gap in the middle to facilitate drainage.

February 4, 2021



Blake Avenue Alternative D: Two-Way with Raised Path



NOTE:

1. BLAKE AVENUE WAS SURVEYED FROM 23RD STREET TO 26TH STREET. REMAINING RIGHT OF WAY LINES AND PROPERTY LINES ARE APPROXIMATE AND NOT SURVEY ACCURATE. THEY ARE FOR INFORMATION PURPOSES ONLY.

February 4, 2021

Blake Avenue Alternative D: Two-Way with Raised Path



February 4, 2021

Blake Avenue Alternative D: Two-Way with Raised Path

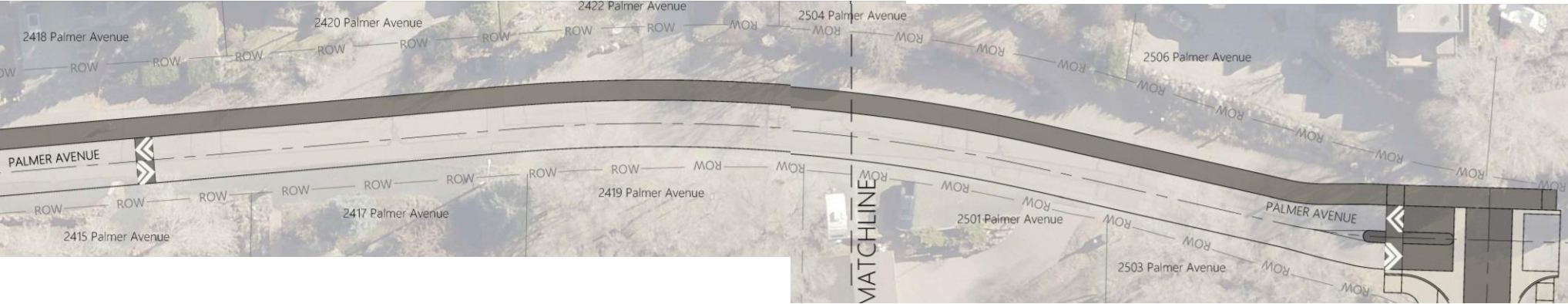


February 4, 2021

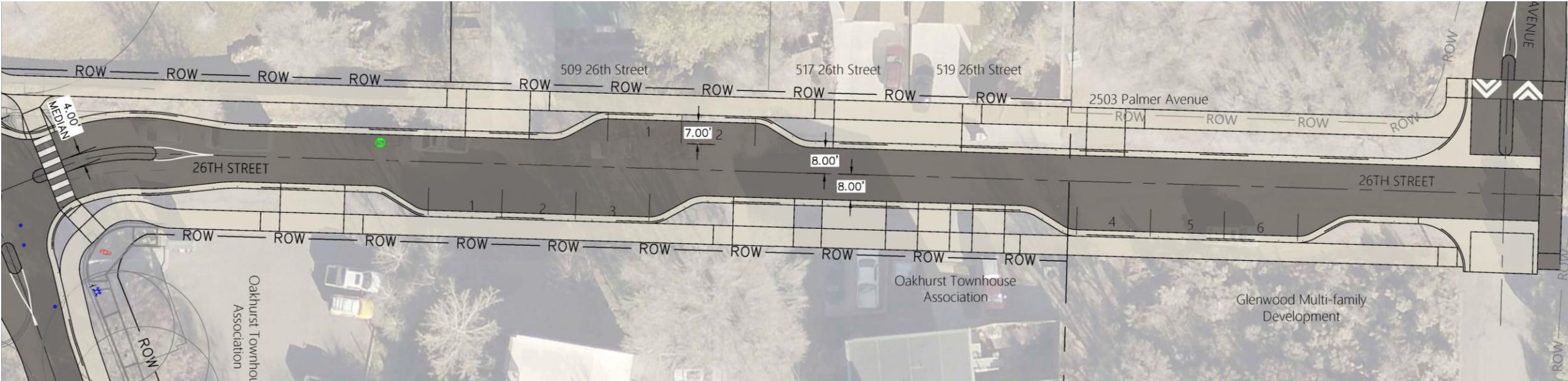


February 4, 2021

Palmer Avenue Alternative D: Two-Way with Raised Path



26th Street: Connection to Two-Way with Raised Path



Evaluation of Alternative D: Two-Way with Raised Path

Benefits:

- Separates pedestrians
 - Physical (vertical) separation
- Separation is mountable
 - Gives Cyclists the option to be on the path or in the roadway
- Lower cost option
 - Cost Magnitude (1.3)
 - Not considered: colored pavement, striping, curb and gutter, traffic calming
 - Facilitated within existing Right of Way
 - Minimal materials
- Maintains city circulation
- Facilitates the missing bike connection outlined in the Long Range Transportation Plan

Drawbacks:

- Separation is mountable
- Drainage will need to be considered
 - Potential pavement increase
 - May need curb and Gutter
- No on street parking
- Could lead to congestion during peak hours
- Harder to convert if not successful, but could mill and re-configure

February 4, 2021



Public Feedback

My concerns about two-way traffic with a path on the east side of Blake Avenue (select all that apply)

	TOTAL	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7	Person 8	Person 9	Person 10	Person 11	Person 12
I do not have any concerns about this approach	2		1										1
An improved road with two-way circulation will encourage cut-through traffic	7	1		1			1		1	1	1	1	
It will take the city too long to get through all of the phases	3			1					1	1			
People might park on the roadway or on the path	3			1			1				1		
Not enough rooms for pedestrians/cyclists	5					1		1	1	1	1		

I like two-way traffic with a path on the east side of Blake Avenue because (select all that apply)

	TOTAL	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7	Person 8	Person 9	Person 10	Person 11	Person 12
I do not like this approach	8	1				1	1	1	1	1	1	1	
There is a path created for pedestrians/cyclists	3		1	1						1			
An improved road with two-way circulation will encourage cut-through traffic	1		1										
This is a narrower section that will have less impacts to my property (neighboring properties)	1		1										
This is a narrower section that will slow traffic down	3		1	1									1

Other comments:

- No direct comments about this configuration, however it is obvious that this was the least liked configuration

February 4, 2021

Final Conclusions/Recommendations

- Neighborhood would prefer a one-way SB from 26th Street to 27th Street.
- Transportation Commission recommends one-way SB from 26th Street to 27th Street.
- City Staff does not support this configuration.
 - In a one-way SB configuration from 26th Street to 27th Street NB evening traffic entering the Blake or Palmer Neighborhood (including the Oakhurst Townhomes) will be forced up to 23rd Street or 24th Street, potentially causing congestion.
 - Without accurate analysis and counts, it is likely to cause a traffic overload at the 27th Street/SH 82 intersection during peak traffic hours.
 - NB traffic may ignore signage or other restrictions and still elect to make movements NB between 26th Street and 27th Street.
 - SB traffic looking to avoid the 27th Street/SH 82 intersection will continue south on Blake Avenue. If the Blake Avenue/SH 82 intersection is also backed up, traffic could head to 29th Street, which is slated to be a $\frac{3}{4}$ movement intersection. Impatience with traffic could lead to riskier movements by the travelling public and potentially lead to more traffic incidents.
- If one way on Blake Avenue is considered, Staff recommends a restricted movement with a 10' asphalt section from the Wal-Mart entrance to the New Palmer Avenue connection.
 - EMS currently does not access through the gate at this location, so a restricted roadway section will not hinder their response.
- City Staff supports maintaining full function of all public roads with two-way traffic and a raised sidewalk or advisory bike lanes.

February 4, 2021





Questions?

February 4, 2021

Review

- Options:

- Replace in kind (Alternative A)
 - 1.0 Cost Magnitude
 - Assumed with no traffic calming, roadway improvements (curb, gutter, striping, etc)
 - revised from last meeting, previously 16' section
 - 20' minimum for fire access
- Replace with a one way (Alternative B)
 - Cost Magnitude varies (1.2-1.7)
 - Dependent on traffic calming options used, the location of the one-way and the length of the one-way
 - Cost Magnitude varies due to location and length of One-Way
 - Still requires 20' for fire access
- Replace with an Advisory Bike lane (Alternative C)
 - Cost Magnitude (1.3)
 - Assumed colored pavement and striping.
 - Not considered: curb and gutter, traffic calming
 - 12' shared lane, 5' bike/pedestrian lanes
- Replace with two way and raised asphalt path (Alternative D)
 - Cost Magnitude (1.3)
 - Not considered: colored pavement, striping, curb and gutter, traffic calming
 - 16' travel lanes with a 6' path
- Replace with upgraded section, two-way traffic (Would need significant funding and planning)
 - 2.5 Cost Magnitude
 - 20' asphalt, curb and gutter, and 4' sidewalk
 - Will require ROW acquisition

February 4, 2021





MINUTES
CITY OF GLENWOOD SPRINGS
SPECIAL
CITY COUNCIL MEETING
July 23, 2020
101 W. 8TH STREET
7:00 P.M.

2. Roll Call

Mayor Jonathan Godes called the meeting to order at 7:00 PM. Present at roll call: Charlie Willman, Rick Voorhees, Tony Hershey, Jonathan Godes, Shelley Kaup, Paula Stepp and Steve Davis.

Also present were Debra Figueroa; City Manager, Karl Hanlon; City Attorney, Catherine Fletcher; City Clerk, Jenn Ooton; Assistant City Manager, Steve Boyd, COO; Yvette Gustad; Finance Director, Terri Partch; City Engineer, Matt Langhorst; Public Works Director, and Gretchen Ricehill; Assistant Director for Economic and Community Development.

3. Pledge of Allegiance

Mayor Godes led in the Pledge of Allegiance.

ACTIONS AND/OR PRESENTATIONS

4. CONTINUED FROM JULY 16 REGULAR CITY COUNCIL MEETING

Planning Item 04-20 Consideration of a Major Site/Architectural Plan Review, Rezoning from RH Residential High-Density to RT Residential Transitional for the construction of 100 Multifamily multi-family apartment and duplex units on approximately 5.74 acres (PIN 2185-153-04-001, 2185-153-02-008, and 2185-211-00-002)

All members of City Council acknowledged they had reviewed all written comments that came in and were part of the packet, which was supplemented up to and including the last set of comments at 6:33 PM.

Trent Hyatt, Senior Planner – Presented additional information addressing questions from City Council.

Councilor Davis, seconded by Mayor Godes moved to open Blake Gate in 2020 pending community outreach meetings and staff recommendations; to bring the decision back to Council as to whether it's a one way or two-way street.

Ayes: Voorhees, Davis, Godes, Hershey

Nays: Willman, Kaup, Stepp

Mayor Pro Tem Kaup, seconded by Councilor Voorhees moved to uphold the recommendation of the Planning and Zoning Commission and approve Planning Item 04-20 Consideration of a Major Site/Architectural Plan Review, Rezoning from RH Residential High-Density to RT Residential Transitional for the construction of 100 Multifamily multi-family apartment and duplex units on approximately 5.74 acres (PIN 2185-153-04-001, 2185-153-02-008, and 2185-211-00-002) as amended in Option C with the findings and conditions outlined on pages 1-3 of July 23, 2020 suggested motions If determined as necessary by City Council after study of the Blake Gate reopening; to include the two conditions presented by Trent Hyatt regarding parking management and emergency access to the adjacent property.

Ayes: Hershey, Godes, Davis, Kaup, Willman, Voorhees

Nays: Stepp

Motion passed.

5. CONTINUED FROM JULY 16 REGULAR CITY COUNCIL MEETING

Ordinance No. 20, Series of 2020; An Ordinance of the City Council of the City of Glenwood Springs, Colorado, Rezoning Property Owned by Bell Rippey Glenwood, LLC Known as 2710 Blake Avenue, Glenwood Springs Colorado, from Residential High-Density(RH) to Residential Transitional (RT) Zoning (FIRST READING)

Councilor Willman, seconded by Mayor Pro Tem Kaup moved to approve Ordinance No. 20, Series of 2020; An Ordinance of the City Council of the City of Glenwood Springs, Colorado, Rezoning Property Owned by Bell Rippey Glenwood, LLC Known as 2710 Blake Avenue, Glenwood Springs Colorado, from Residential High-Density(RH) to Residential Transitional (RT) Zoning (FIRST READING) and uphold the recommendations of the Planning and Zoning Commission, and approve the rezoning subject to the findings and conditions outlined on page one of the July 23, 2020 suggested motions included in the staff report packet.

Motion passed unanimously.

6. Adjournment

Adjournment at 8:08 PM.



MAYORS AGENDA
CITY OF GLENWOOD SPRINGS
REGULAR CITY COUNCIL MEETING
OCTOBER 1, 2020
101 W. 8TH STREET
6:15 PM

REGULAR SESSION

5. Roll Call

Mayor Jonathan Godes called the meeting to order at 6:15 PM. Present at roll call: Charlie Willman, Rick Voorhees, Shelley Kaup, Jonathan Godes, Steve Davis, Paula Stepp, and Tony Hershey.

Also present were Debra Figueroa; City Manager, Karl Hanlon; City Attorney, Catherine Fletcher; City Clerk, Jenn Oton; Assistant City Manager, Steve Boyd, COO; Yvette Gustad; Finance Director, Terri Partch; City Engineer, Matt Langhorst; Public Works Director, Brian Smith; Parks and Recreation Director, and Gretchen Ricehill; Assistant Director for Economic and Community Development, and Lieutenant Bill Kimminau.

6. Pledge of Allegiance

Mayor Godes led in the pledge of allegiance.

7. Agenda Changes & Conflicts

Item 11 was a work session item that was moved to the regular agenda after the initial publication.

8. Citizens Appearing Before Council (for items not on the Agenda-comments limited to 3 minutes)

Cassandra Irving, Executive Director of Game on Camps, asked for a permit to use Sayer Park for their championship basketball tournament next weekend and that their athletes may be mask free.

Cindy gave her support to the Game on Camps request.

Ann O'Brien gave her support to the Game on Camps request.

City Manager, Debra Figueroa, said that the State discourages youth not to wear masks during contact sports, the County Health Department does not support or recommend this request. The staff recommends following the State and County guidelines and does not support this request as well.

Council agrees with staff.

9. Council Comments

Councilor Voorhees announced that tonight would be his last meeting.

Mayor Pro Tem Kaup encouraged the community to hang in there with the mask mandate.

Councilor Willman wanted to extend exemptions of sections of the sign code to help our local businesses. He also brought up the uncertainty of Halloween for discussion

Parks and Recreation Director, Brian Smith, said the City is working on a Halloween Spectacular that would include a Downtown pumpkin scavenger hunt with participating businesses and a festive event at the Community Center

that will include movies.

10. Consent Agenda

- A. Award of FFTP Wholesale Voice Provider Service per Bid 2020-024 to Momentum Telecom
- B. Resolution 2020-30; A Resolution of the City Council of the City of Glenwood Springs, Colorado Adjusting Community Broadband Network Rates for Telephone Services
- C. Pre-Annexation Agreement for water service to a mixed-use building located at 172 Darrow Road in unincorporated Garfield County per the requirements of Municipal Code Section 080.040.030(c)
- D. Resolution 2020-31; A Resolution of the City Council of the City of Glenwood Springs, Colorado Supporting the Colorado River Water Conservation District's Ballot Issue 7A
- E. July 16 Regular Minutes, July 22 and July 23 Special Meeting Minutes

Councilor Willman, seconded by Councilor Stepp moved to approve the consent agenda.

Motion passed unanimously

11. Aspen Valley Land Trust Presentation

Garfield County Commissioner Tom Jankovsky, Erin Quinn, Aspen Valley Land Trust, Laura Speck, Parks and Rec Commission, and Ron Rash, Roaring Fork Outdoor Volunteers, presented.

Tom Jankovsky asked if there is anything that can be done about the extensive trash on the land East of Bell Rippy and East of Walmart. He also said that the landowner wanted to donate the land to either the County or the City to use as an open space. The county did not have a use for the land.

Erin Quinn said this is a great opportunity to use this property as a recreation spot. She does recognize the property is currently a health and fire hazard and needs work and the cost that involves. She said the Aspen Valley Land Trust is willing to help with this cost. She stated that they are trying to apply for a \$150,000 grant that would cover some of the cost but in order to apply it would require the property being under long term ownership.

Ron Rash stated that their organization was willing and could build trails, benches, and picnic tables. They would also be able to help remove the trash once the hazardous material is removed.

Parks and Recreation Director, Brian Smith recommends letting this proposal go to the Parks and Rec Commission first. He also states that the main issue is the homeless encampment.

Lieutenant Bill Kimminau said there would be enforcement issues both legally and logistically.

Mayor Godes opened the item for public comment.

No comments were made.

Mayor Godes closed the item for public comment.

Council requested that Aspen Valley Land Trust apply for the grant and had the support of the council. They also took staff's recommendation.

12. CONTINUED FROM SEPTEMBER 17, 2020 MEETING Appointments to Boards and Commissions
-Historical Preservation Commission

Councilor Willman, seconded by Mayor Pro Tem Kaup, moved to table item 12 until a later point in the meeting.

Motion passed unanimously

13. Budget 2021 Discussion

Debra Figueroa, City Manager, and Steve Boyd, COO, presented.

Mayor Pro Tem Kaup, seconded by Mayor Godes, moved to authorize staff to publish the draft 2021 budget for the public to view.

Motion passed unanimously

14. RWAPA IGA and Bylaws

Councilor Willman, seconded by Councilor Davis, moved to table item 14 until the next Council meeting.

Motion passed unanimously

15. GoEV City

Stefan Johnson, Transportation Program Manager with CLEER, presented the GoEV City initiative. This initiative requests that the city fleet would become electric as well as working with RFSD and RFTA to have them transition their buses to electric. Also, it asks that the City make it convenient for citizens to own electric vehicles.

Council directs staff to work with Stefan for further analysis and information.

16. Blake Gate

Councilor Davis, seconded by Mayor Godes, moved to accept, without a presentation, staff's recommendation in the report to open the Blake Gate at that time in the future.

Motion passed unanimously

17. IGA Agreement Approval with NWCCOG for Co-located Rack Space within the 910 Telecom Internet Leasing Location in Denver, Colorado

Matt Langhorst, Public Works Director, presented that Denver wanted to share a location with us. This will cut costs on the City's broadband.

Councilor Davis, seconded by Councilor Willman, moved to approve the IGA Agreement Approval with NWCCOG for Co-located Rack Space within the 910 Telecom Internet Leasing Location in Denver, Colorado.

Ayes: Kaup, Stepp, Voorhees, Godes, Davis, Willman

Nays: Hershey

Motion passed.

18. Award of Bid BD2020-031 for Networking Equipment and Associated Accessories to One Technology Corporation

Matt Langhorst, Public Works Director, presented that this item is regarding the router that is going to be put in the Denver location.

Councilor Davis, seconded by Councilor Willman, moved to approve the Award of Bid BD2020-031 for Networking Equipment and Associated Accessories to One Technology Corporation.

Ayes: Kaup, Stepp, Voorhees, Godes, Davis, Willman

Nays: Hershey

Motion passed.

CONTINUED FROM SEPTEMBER 17, 2020 MEETING Appointments to Boards and Commissions
-Historical Preservation Commission

- 19.

Councilor Hershey, seconded by Councilor Willman, moved to table Appointments to Boards and Commissions-Historical Preservation Commission- until the next Council meeting.

Motion passed unanimously

20. Report from City Administration

- A. City Manager
- South Midland Construction Bidding Update

Terri Partch, City Engineer, reported that the South Midland construction bid went out yesterday and the City expects the bids to come back by October 30th. Also, South Bridge is on the verge of being signed by CDOT and FHWA.

- B. City Attorney

- C. Correspondence Incoming/Outgoing

21. Adjournment

Meeting adjourned at 9:50 PM.



City Council
STAFF REPORT
City of Glenwood Springs
February 4, 2021

Agenda Item: Approval of Minutes from January 21, 2021 Meeting

Action Requested: Approval of minutes from last meeting.

Department: City Clerk

Presented By: Steve Boyd, COO

Background Info:

Issues:

Staff Recommendation:



AGENDA
CITY OF GLENWOOD SPRINGS
REGULAR CITY COUNCIL MEETING
JANUARY 21, 2021
101 W. 8TH STREET
6:15 PM

MEETING MINUTES

Note: Official meeting minutes are located on the City website via YouTube video at the following link: <https://www.youtube.com/user/GlenwoodSprings1885/videos>. The times indicated in agenda items indicate approximately where the item can be found on the YouTube video timeline.

Roll Call

All Councilor present. Also present were Debra Figueroa, City Manager; Steve Boyd, COO, Jenn Ooton, Asst City Manager and Karl Hanlon, City Attorney.

Pledge of Allegiance

Mayor Godes led the Pledge.

7:14 Agenda Changes & Conflicts

7:20 Citizens Appearing Before Council

Mayor Godes made a statement regarding a picture he posted on social media of Congresswoman Boebert and apologized to the individuals in a photo posted of her with several supporters making a hand gesture.

Sherona Bishop from Garfield County commented that she appreciated Mayor Godes' apology but condemned his comments on social media.

17:00 Council Comments

Councilor Hershey asked that the Code of Conduct include a provision that Councilor comments be held to 3 minutes and other questions/comments also be timed in certain instances.

Councilor Willman said the Rules and Procedures document addresses this with a three-minute limit that the Mayor can then extend. Also asked P&Z to evaluate and make recommendations on storage units being placed in town.

Councilor Stepp said a citizen missed an electric bill and received a notice. Was concerned that there was not a Spanish translation, instead just a note to ask a friend to translate. Councilor Stepp asks that a translation be included. Resident also mentioned there is no way to ask for financial assistance and that an avenue for help be communicated. Also wants a method of automatic payment. Councilor Stepp would like a timeline to open restrooms and communicate it to the community. Debra mentioned some of them cannot be winterized.

Councilor Davis stated that there is in fact an autopayment option the City has for water, wastewater and electric payments.

25:10 Consent Agenda

Councilor Hershey moved and Mayor Pro Tem Kaup seconded a motion to approve consent agenda.

Passed unanimously.

25:50 South Midland Progress Report

Kathleen Wanatowiz updated Council on South Midland progress. Phase 1 through July 2021. Hotline has been quiet. Said expect 4-5-minute waits throughout the project and expressed appreciation for motorist patience. Black Hills project is also underway. There is a 27th Street project that will close the bridge for parts of the weekend unrelated to the South Midland project.

Mayor Godes opened it to public comment, none were offered.

33:10 Spring Cleanup Options and Discussion for 2021

Matt Langhorst stated the pandemic is again impacting a full spring clean-up and offered two alternatives:

1. Same as we did in 2019, hired a couple of trucks to help haul things to the landfill, do extra maintenance and clean-up work in public right of ways.
2. Provide a Thurs-Sat period where we bring in big containers and staff to a site for people to bring metal, branches, trash, etc. Combine it with hazardous waste day and make it a community event. For people that cannot haul we could get community volunteers and clubs to pre-schedule residential pick-ups for the City. This option would be much more efficient and eliminate the problem of people piling things that are not allowed to seep into the storm system.

52:35 Motion by Kaup motioned to do a voucher similar to last year and hazardous waste day in the fall, revisit in 2022. Second by Hershey.

Motion passed unanimously.

54:00 Broadband Budget and Construction Update - Approval of Lightworks Change Order to Extend Construction to Phases 1 through 5 per CO # to Bid 2020-007 FTTH

Matt Langhorst described a change order to continue construction of the broadband build-out in 2021. Michael Gardner and Dave Stockton from Uptown Services presented a budget update for the project that included approximately a \$55,000 underage in operating expenses and a \$387,000 underage in the capital project budget. Expects bond proceeds to be reduced to about \$1.5 million at the peak of our capital needs. Councilor Kaup asked that the presentation be sent to Council.

1:03:55 Councilor Willman moved to approve change order #1 to increase contract amount per the staff report. Second by Councilor Stepp.

Ayes: Godes, Kaup, Davis, Willman, Stepp, Wussow

Naye: Hershey

Motion passed 6-1

1:05:20 Middle Colorado Watershed Council Presentation

Doug Winter from Middle Colorado Watershed Council presented an overview of projects coming up in the next year and asked for a letter of support for grants that include Colorado Conservation Board for water plan grant for integrated water management plan, a CWCD grant related to fire restoration, and a non-point source grant through the State of Colorado.

1:18:30 Motion by Councilor Willman, second by Councilor Kaup to sign appropriate support letters to assist in our watershed areas.

Approved Unanimously through Voice Vote.

1:20:25 Fee Waiver Agreement for Affordable Housing

Councilor Willman recused himself from the discussion on fee waivers for an affordable housing project in West Glenwood because he represents a neighboring property owner and it would be a conflict for him to participate in this item. City Planner Hannah Klausman provided an overview of the project that contains several AMI threshold rental units that would not participate in the voluntary deed-restriction program that is already in place in the City. Mike Surak and Jeff Ryan described the project in more detail. Ronda Weybright from Real America, the builder, outlined their experience in the area with similar projects.

1:47:45 Motion by Mayor Pro-Tem Kaup, second by Councilor Stepp to approve fee waiver agreement for as outlined in staff reports.

Ayes: Godes, Kaup, Davis, Stepp, Hershey, Wussow

Nayes: None

Recused: Willman

Passed 6-0

1:52:00 Resolution 2021-2 DOLA Grant Application for Comprehensive Plan

Assistant City Manager Jenn Ooton asked Council for support in seeking grants through application from DOLA for financial assistance for a comprehensive plan.

Mayor Godes opened it to public comment, none offered.

1:54:00 Mayor Godes moved, second by Councilor Davis to approve Resolution 2021-2.

Motion carried unanimously through voice vote.

1:57:00 Resolution 2021-3 Adopting Recreation Economy for Rural Communities Community Action Plan

Matt Nunez presented overview of the Recreation for Rural Communities Action Plan. Jim Neu expressed appreciation for everyone's efforts.

2:07:00 Councilor Stepp moved, second by Mayor Pro-Tem Kaup to adopt Resolution 2021-3.

Passed unanimously through voice vote.

2:09:00 Report from City Administration

Manager Figueroa said there will be overnight work on the 27th Street Bridge.

City Attorney Hanlon said he was hopeful to have a conversation in the next month or so regarding where we are going with the RMI issue.

Mayor Godes adjourned meeting in record time at 8:22 pm. Total time 2:11:00.



City Council
STAFF REPORT
City of Glenwood Springs
February 4, 2021

Agenda Item:	Lift Station 16000 Construction Agreement
Action Requested:	Approval of the Iron Mountain Hot Springs/City of Glenwood Springs Construction Agreement for the 50% cost sharing of the Lift Station Design, Construction and Construction Management Fees for the Project.
Department:	Public Works
Presented By:	Matthew Langhorst, Public Works Director
Background Info:	Iron Mountain Hot Springs brought to the City in 2019 that they would like to relocate the existing lift station 16000 at the end of Centennial Street to another location on the property. The request included shifting the lift station to the north west so that IMHS could more efficiently utilize their property and to upsize the lift station to meet the future demands of the area. The original lift station was coming to its functional end of lift, so the City agreed to pay for 50% of the cost of the new lift station design, permitting, construction, testing, survey and construction management. This will provide the City with a more maintenance free facility that will also help the development potential of this section of town. To formalize this arrangement the City and IMHS have drafted the attached Construction Agreement with attachments A-E that will require the Mayor's signature. The City budgeted \$500,000 for this project in 2021. You will see within Exhibit E that the overall fee for the project is \$362,555.16, well under the 2021 budgeted amount. Project is ready to commence and anticipated to be completed by June 2021.
Issues:	None
Staff Recommendation:	Staff is recommending the Approval of the Iron Mountain Hot Springs/City of Glenwood Springs Construction Agreement for the 50% cost Sharing of the Lift Station Design, Construction and Construction Management Fees for the Project and Authorization for the Mayor to sign the Attached Agreement.

CONSTRUCTION AGREEMENT REGARDING CENTENNIAL STREET LIFT STATION

THIS AGREEMENT made this _____ day of _____, 2021, between CITY OF GLENWOOD SPRINGS (the "City") and IRON MOUNTAIN HOT SPRINGS LLC ("IMHS").

RECITALS

WHEREAS, the City is desirous of entering into a contract with IMHS for the work described below and in Exhibits A-C attached hereto and incorporated herein by this reference;

NOW, THEREFORE, in consideration of the mutual covenants set forth herein and other good and valuable consideration, the receipt and sufficiency of which is acknowledged, the parties agree as follows:

1. Statement of Project. IMHS shall design, manage and supervise the construction of the project more fully described on the plans and specifications attached as Exhibit A, the CDPHE Construction Permit attached as Exhibit B, and the CDPHE Site Location Agreement attached as Exhibit C (the "Project") and generally described as follows: Lift Station and existing 4-inch, approximately 1,730 linear feet PVC Force Main, Design Capacity 100 gpm (peak hourly flow) - replacement of a duplex submersible grinder pump lift station that ties into an existing 4-inch pressurized force main with the following components: Wetwell, duplex submersible pumps, electrical, controls, alarms, notification system, and appurtenances, emergency storage, backup power generator (the "Lift Station"). Any substantial modifications to the Project shall be submitted to and approved by the CDPHE. IMHS shall (a) furnish all tools, equipment, supplies, superintendence, transportation and other construction accessories, services and facilities; (b) furnish all materials, supplies, and equipment specified to be incorporated into and form a permanent part of the Project; (c) provide and perform all necessary labor in a substantial and skillful manner and in accordance with the provisions of this Agreement; and (d) execute, construct and complete all work included in and covered by this Agreement in conformity with Exhibits A - C.

2. Project Costs. IMHS will enter into a construction agreement with the selected contractor. Any changes to the contractor's bid must be approved by both IMHS and the City. The contractor's proposal for the Project is attached as Exhibit D and additional anticipated costs are set forth on Exhibit E. Exhibits D and E reflect the budget for the Project. The City shall pay IMHS one-half of all costs reflected on Exhibits D and E. IMHS will bill the City in AIA format for the City's one-half portion of all bills received for construction of the Project every thirty (30) days and the City will remit payment to IMHS within fifteen (15) days of the City's receipt and approval of the bill. Upon receiving the final payment for the Project, IMHS shall deliver to the City a lien waiver.

3. Time of Commencement and Completion. Work on the Project shall commence in January 2021 and is anticipated to be completed by June 1, 2021. IMHS shall not be responsible for any delays in performance or completing the work by the anticipated completion date. IMHS shall use its best efforts to complete the work by the stated completion date, but failure to do so shall not constitute a default hereunder. Unless terminated earlier pursuant to Paragraph 8 below, this Agreement shall terminate upon the City's acceptance of the Lift Station pursuant to Paragraph 11.

4. Observation and Inspection of Work. The City may designate or hire a representative to observe and inspect the ongoing construction of the Project. The City's representative shall have unrestricted access to the Project at all times. In the event the City's representative has concerns about any aspect of the Project, the City's representative will contact the construction manager for IMHS to address and resolve any outstanding concerns regarding the Project.

5. Liability for Damages. The City, its officers, agents, employees, or consultants shall not in any manner be responsible for any loss or damage to the Project; for any loss or damage to any materials, building, equipment or other property that may be used or employed in Project, or placed on the worksite during the Project; for any injury done or damages or compensation required to be paid under any present or future law, to any person, whether an employee or contractor of IMHS or otherwise; or for any damage to any property occurring during or resulting from the work on the Project. IMHS shall indemnify the City, its officers, agents, employees and consultants against all such injuries, damages and compensation arising or resulting from causes other than the City's neglect, or that of its officers, agents, employees or contractors.

6. Workmanship and Materials. All work performed by IMHS, its consultants, contractors, equipment vendors and suppliers shall be performed in a safe and workmanlike manner. To the extent the work includes installation of materials or equipment furnished by others, it shall be the responsibility of IMHS to ensure the materials or equipment are installed with such skill and care as to ensure a satisfactory and proper installation. IMHS will provide the City with notice and an opportunity to inspect materials before installation. Such notice shall be provided 48 hours prior to the scheduled delivery of the materials. Loss or damage to any such materials or equipment shall be the responsibility of IMHS. IMHS shall clean up all debris generated by its work.

7. Permits and Inspections. IMHS shall secure all necessary certificates, licenses and permits from municipal or other public authorities required in connection with the work contemplated by this Agreement, including but not limited to a grading permit from the City's Engineering Department and a building permit from the Building Department. IMHS shall give all notices required by law, ordinance or regulation. Any changes to the Development Permit for the Project shall be submitted to the City's Community Development Department for review and approval. Periodic inspections shall be completed as required by applicable building and safety codes. IMHS shall notify the City building department when the Project is completed to obtain all inspections required

under all applicable codes, including a final building inspection to confirm that the Lift Station complies with applicable codes. The City will not accept the Lift Station until this inspection has been completed, testing has been performed and approved and such compliance has been confirmed by the building inspector and City Staff. Any costs of these inspections and/or any permit application or permit fees will be shared equally between the City and IMHS.

8. Compliance with Laws. IMHS and every contractor or person doing or contracting to do any work contemplated by this Agreement shall keep himself or herself fully informed of all national and state laws and all municipal ordinances and regulations in any manner affecting the work and shall at all times observe and comply with such laws, ordinances and regulations, whether or not the laws, ordinances or regulations are mentioned in this Agreement, and shall indemnify the City, its officers, agents and employees, against any claim or liability arising from or based on the violation of any such laws, ordinances or regulations.

9. Termination. This Agreement may be terminated in the following circumstances: (a) by mutual agreement among the Parties; (b) by either the City or IMHS in the event of any material breach of this Agreement by the other party after providing notice to the breaching party and a 7 day opportunity to cure; (c) by the City if funds necessary to meet the City's financial obligations under this Agreement are not appropriated, budgeted or otherwise available, in which case the Agreement shall terminate automatically after the city provides notice, on the first fiscal year, for which funds are not appropriated. In the event of termination, the City shall be liable to pay IMHS for costs incurred as of the effective date of termination. In the event of breach of the Agreement that is not cured in accordance with this paragraph, the non-breaching party may institute legal proceedings to enforce the terms of this Agreement.

10. Insurance. IMHS shall not commence work on the Project until it has obtained all insurance required under this section and the insurance has been approved by the City. Similarly, IMHS shall not allow any approved subcontractor to commence work on his or her subcontract until all similar insurance required of subcontractor has been so obtained and approved. The following insurance shall be required:

A. Commercial General Liability Insurance: At a minimum, combined single limits of \$1,000,000 per occurrence and \$1,000,000 for general aggregate for bodily injury and property damage, which coverage shall include products/completed operations, independent contractors, and contractual liability each at \$1,000,000 per occurrence.

B. Workers' Compensation: Workers' compensation insurance for all of IMHS employees engaged in the Project occupational disease coverage in accordance with scope and limits as required by the State of Colorado.

C. Comprehensive Automobile Liability Insurance: Including coverage for all owned, non-owned, and rented vehicles with \$1,000,000 combined single limit for

each occurrence.

The City shall be named as an additional insured. The City reserves the right to request IMHS to provide certificates of insurance to confirm coverage at any time. IMHS shall indemnify and hold harmless the City from any acts attributable to the negligence of IMHS or its contractors, vendors or suppliers for which the City may be held liable that are not covered by IMHS's insurance.

11. Project Completion and Acceptance. Upon completion of the Project, IMHS shall request acceptance of the Lift Station from the City Manager, which acceptance shall be granted only after confirmation that the Project satisfies all applicable codes pursuant to Paragraph 7. IMHS shall be responsible for the maintenance of the Lift Station until the City begins testing. Thereafter, IMHS shall be responsible for the maintenance of the non-effluent aspects of the Lift Station until it is accepted by the City. The City shall be responsible for maintenance of the effluent aspects of the Lift Station once the City begins testing. Contemporaneously with the acceptance date, IMHS shall dedicate or convey to the City all rights of way and easements required for the operation, maintenance, and repair of the Lift Station free and clear of all liens and encumbrances that might adversely affect the use of the Lift Station for its intended purpose. IMHS shall also execute a bill of sale conveying the Lift Station and associated structures free and clear of all liens and encumbrances.

12. Warranty. IMHS shall warrant the work against all deficiencies and defects in materials or workmanship for a period of two years from the date of the City's acceptance of the Project and will obtain a similar two (2) year warranty from the general contractor, all subcontractors, suppliers and equipment vendors.

13. Governmental Immunity Act. No term or condition of this Agreement shall be construed or interpreted as a waiver, express or implied, of any of the immunities, rights, benefits, protections, or other provisions of the Colorado Governmental Immunity Act, C.R.S. §§ 24-10-101, et seq.

14. Fees and costs. Each party will pay its own legal, accounting, tax and other costs associated with the Project.

15. Waiver of Breach. In the event that either party hereto waives a breach of this Agreement by the other party, such waiver shall not be deemed to be or be construed a waiver of any subsequent breach of the terms hereof.

16. Colorado Law and Attorneys' Fees. This Agreement shall be construed, interpreted and governed by the laws of the State of Colorado. In the event that legal proceedings are instituted by either of the parties for enforcement of this agreement, such proceedings shall be brought in the Garfield County District Court, and the prevailing party shall be entitled to reasonable attorneys' fees.

17. Remedies. Either party may, in addition to any other rights or remedies, institute an equitable action to cure, correct, or remedy any default, enforce any provision of this Agreement, enjoin any threatened or attempted violation thereof, enforce by specific performance the obligations and rights of the parties, or to obtain any remedies consistent with the foregoing and the purpose of the Agreement.

18. No Presumption Against Drafting Party. The parties agree and acknowledge that both parties have participated in the negotiation and drafting of this Agreement and no presumption shall exist in favor of either party hereto. This Agreement shall not be construed against either party merely because of said party's drafting of this Agreement.

19. Severability. If any term or provision of this Agreement, or the application of any term or provision of this Agreement to a particular situation, is held by a court of competent jurisdiction to be invalid, void or unenforceable, the remaining terms and provisions of this Agreement, or the application of this Agreement to other situations, shall continue in full force and effect unless amended or modified by mutual consent of the Parties.

20. Successors and Assigns and Amendments. This Agreement shall be binding upon the parties hereto, their partners, successors and assigns. This Agreement and the documents incorporated herein by reference constitute the entire agreement between the parties and may be altered, amended or repealed only by duly executed written agreement.

21. Counterparts. This Agreement may be executed in counterparts, each of which shall be deemed an original and all of which together shall constitute one and the same instrument.

CITY OF GLENWOOD SPRINGS

Iron Mountain Hot Springs, LLC

Jonathan Godes, Mayor

By: _____
Title : _____

Ryan Muse, Assistant City Clerk

APPROVED AS TO FORM:

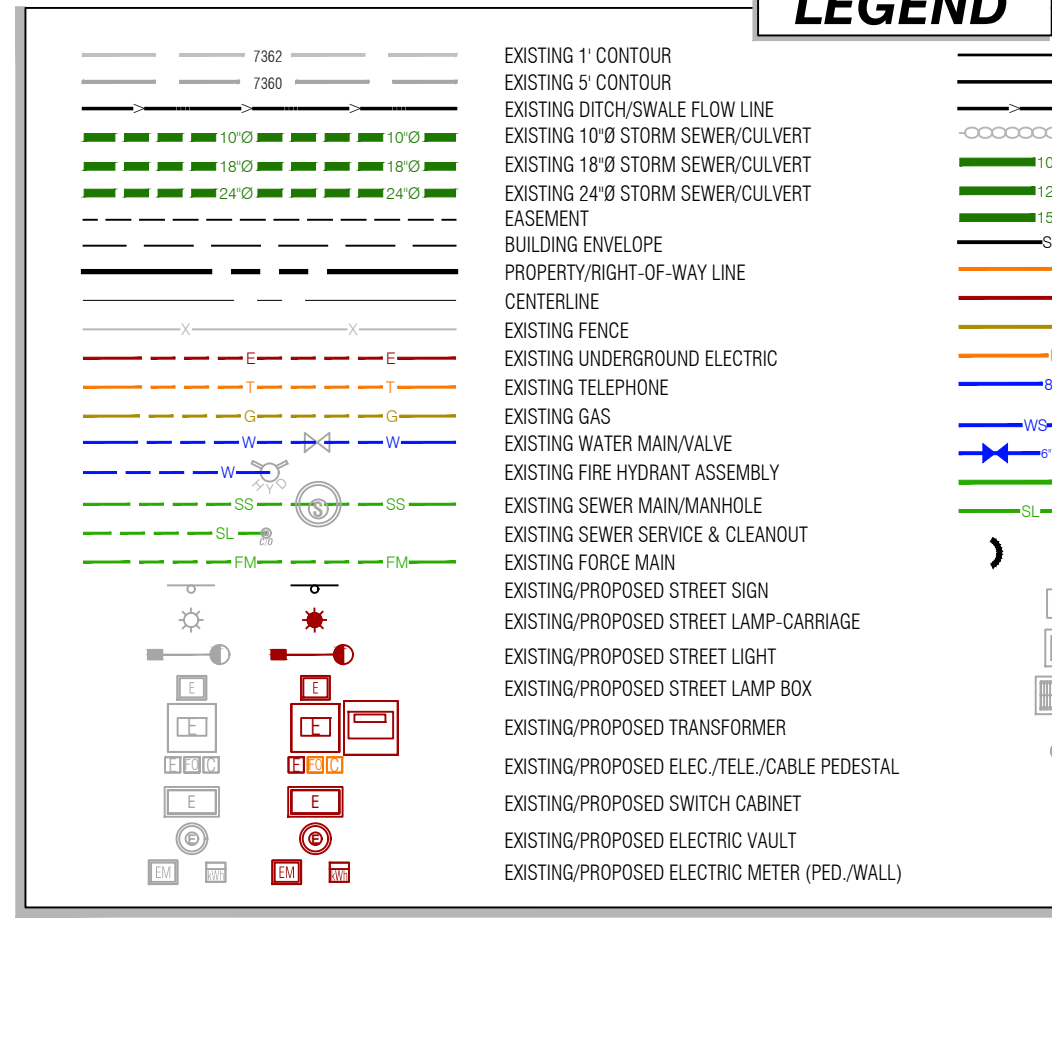
STATE OF COLORADO)
) ss.
COUNTY OF _____)

Witness my hand and official seal.

Notary Public

Center

Sheet No.	Index of Sheets
C.1	Cover Sheet
C.2	Civil - Demolition Plan
C.3	Civil - Geothermal Raw Water Plan
C.4	Civil - Utility Plan
C.5	Civil - Site & Grading Plan
C.6	Civil - Miscellaneous Details
C.7	Civil - Miscellaneous Details
C.8	Civil - Facility Piping Plan
A2.0	Architectural - Building Elevations
S.1-S.3	Structural Plans
E.1-E.4	Electrical Plans
E.2.1-E.2.11	Control System Plans
M1-1	Mechanical Plan



STORM SEWER NOTES

1. STORM SEWER PIPE MATERIALS SHALL BE WATER TIGHT HOE DOUBLE-WALL, SMOOTH INTERIOR (12-MT W/ ENGINEER APPROVED EQUAL) OR RUBBER GASKET REINFORCED CONCRETE PIPE (RCP) OTHERWISE SPECIFIED IN THE PLANS.
2. STORM SEWER PIPE SHALL BE BEDDED, INSTALLED, AND BACKFILLED IN ACCORDANCE WITH THE CODES INCLUDED IN THE PLANS, MANUFACTURERS' INSTALLATION REQUIREMENTS, AND/OR STANDARD OF PRACTICE BY REFERENCE.

SITE BENCHMARK:

CONTOURS ARE SHOWN AT ONE FOOT INTERVALS. HORIZONTAL AND VERTICAL CONTROL IS BASED CITY DATA. THE THREE (3) LOGICAL CONTROL POINTS ARE :

# 10	N42413.553	E15760.363	EL5721.810	1.29" VPC-LS#15710
# 14	N42813.534	E15985.320	EL5737.590	1.5" AC-ILLES
# 4	N42917.890	E15895.479	EL5737.962	1.5" AC-ILLES

REQUIRED SHOP DRAWINGS:

- AGGREGATES
- CONCRETE
- STEEL
- ASPHALT MIX DESIGN
- FLOWABLE FILL
- ALL UTILITY STRUCTURES, PIPE & FITTINGS
- CONTROL PANELS, P.C. WIRING & POWER PANEL
- ANY OTHERS INDICATED WITHIN THE PLANS OR AS REQUESTED BY THE TOWN/CITY OR THE ENGINEER.

CONTRACTOR SHALL COORDINATE DEMOLITION AND/OR RELOCATION OF EXISTING UTILITIES WITH THE APPROPRIATE UTILITY OWNER AND IN ACCORDANCE WITH THE UTILITY OWNERS REQUIREMENTS. INTERRUPTIONS IN SERVICE SHALL BE COORDINATED WITH THE UTILITY OWNER AND PROPERTY OWNERS IMPACTED. CONTRACTOR SHALL COORDINATE WITH THE UTILITY OWNER AND PROPERTY OWNERS IMPACTED TO MINIMIZE THE IMPACT TO THE UTILITY COMPANY'S FORCES, AND PROVIDE ADEQUATE NOTICE FOR SCHEDULING. THE CONTRACTOR IS RESPONSIBLE FOR PAYING ALL FEES AND CHARGES, UNLESS OTHERWISE PAID BY THE OWNER prior to CONSTRUCTION. UTILITY REPAIRS SHALL BE BACKFILLED WITH APPROVED MATERIAL AND MEET COMPACTION REQUIREMENTS PER THE GEO TECHNICAL REPORT.

12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOADING AND HAULING SALVAGED MATERIALS TO THE CITY MATERIALS STORAGE YARD LOCATED NEAR THE AREA (BKA "Avenale").

13. ALL EXISTING UNDESIRABLE SERVICE LINES FOR WATER AND WASTEWATER SHALL BE REMOVED PER LOCAL UTILITY COMPANY STANDARDS. ALL EXISTING UNDER GAS, TELEPHONE, FIBER OR ELECTRIC LINE SERVICE SHALL BE COORDINATED FOR REMOVAL WITH THE UTILITY PROVIDER.

14. THE CONTRACTOR IS RESPONSIBLE FOR DEMOLITION, REMOVAL, AND DISPOSING IN A MANNER APPROVED BY ALL GOVERNING AUTHORITIES FOR ALL STRUCTURES, PAVES, WALLS, PANS, FOUNDATIONS, PAVEMENT, UTILITIES, ETC. TO BE DEMOLISHED, SUCH THAT THE IMPROVEMENTS SHOWN ON THE PLANS CAN BE CONSTRUCTED. DEMOLITION AND DISPOSAL PERMITS SHALL BE THE CONTRACTOR'S RESPONSIBILITY. ALL FACILITIES TO BE REMOVED SHALL BE REMOVED TO APPROVED DISposal FACILITIES OR TO BE SHIPPED UP TO PROPOSED GRADE WITH SUITABLE COMPACTED FILL. MATERIAL PER THE GEO TECHNICAL REPORT.

15. DURING DEMOLITION OPERATIONS, THE CONTRACTOR MUST PROTECT THE PUBLIC AT ALL TIMES USING MEANS OF THEIR CHOICE.

16. CONTRACTOR SHALL PRESERVE ALL LANDSCAPING NOT TO BE REMOVED FOR CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING ALL AREAS OUTSIDEY OF CONSTRUCTION.

17. SAWCUT ALL ASPHALT AND CONCRETE TO BE REMOVED. ASPHALT LOCATED WITHIN THE GLENNWOOD SPRINGS RIGHT-OF-WAY OR PRIVATE PROPERTIES SHALL BE REPLACED WITH 9" THICK ASPHALTIC PAVEMENT OVER 8" CLASS 5.6 CRUSHED COURSE. CONCRETE SHALL BE REPLACED WITH 8" THICK CONCRETE. WHEN REPAIRING CONCRETE, MATCH EDGES OF SAWCUT CONCRETE AND MAINTAIN INTEGRITY OF DRAINAGE PATTERNS. SAWCUTS SHALL BE TO FULL DEPTH OF EXISTING PAVEMENT. CONCRETE PAVEMENT SHALL BE REMOVED TO THE NEAREST EXISTING JOINT WHEN LESS THAN 9' FROM A PROPOSED SAWCUT.

18. A GRADING PERMIT AND A SIDEWALK/CURB/GUTTER PERMIT ARE NOT REQUIRED FOR THIS PROJECT.

STORMWATER MANAGEMENT AND EROSION/SEDIMENTATION CONTROL NOTES

1. THE PREPARATION OF STORMWATER MANAGEMENT PLANS, PERMITTING AND COMPLIANCE ARE THE RESPONSIBILITY OF THE CONTRACTOR. THIS PROJECT MAY ALSO REQUIRE A PERMIT FOR STORMWATER DISCHARGE TO A RECEIVING WATER BODY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS TO COMMENCE WORK ON THE SITE ONLY AFTER AN ACTIVE PERMIT NUMBER HAS BEEN OBTAINED FROM THE STATE OF CALIFORNIA. THE STORMWATER MANAGEMENT PLANS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CONTRACTOR IS TO PROVIDE EROSION CONTROL, IN ACCORDANCE WITH STATE OF CALIFORNIA GUIDELINES.

2. THE CONTRACTOR SHALL CONTINUOUSLY PROVIDE ADEQUATE STORMWATER MANAGEMENT IN ACCORDANCE WITH AN APPROVED STORMWATER MANAGEMENT PLAN (SWMP) FROM THE STATE OF CALIFORNIA.

3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING THE PUBLIC STREETS, ACCESS ROADS, AND WATERWAYS IN THE VICINITY OF THE JOB SITE CLEAN AND FREE OF ROCKS, SOIL, DIRT, AND DEBRIS.

4. THE CONTRACTOR SHALL INSTALL EROSION AND SEDIMENTATION CONTROL, "BEST MANAGEMENT PRACTICES" (BMPs) PRIOR TO ANY SITE PREPARATION WORK (E.G., CLEARING, GRUBBING, DEMOLITION, OR EXCAVATION).

5. THE PLACEMENT OF EROSION AND SEDIMENT BMPs SHALL BE IN ACCORDANCE WITH THE EROSION AND SEDIMENT CONTROL PLAN IF IT WAS PREPARED FOR THE PROJECT. CONTRACTOR TO ADJUST QUANTITY, LOCATION, AND TYPE OF BMPs TO MEET CONSTRUCTION CONTROL BMPs AS NECESSARY FOR THE VARIOUS PHASES OF THE WORK AND AS ACTUAL CONDITIONS WARRANT. CONTRACTOR SHALL CONTINUOUSLY MODIFY THE EROSION AND SEDIMENT CONTROL PLAN WITH CURRENT BMPs IN ACCORDANCE WITH THE CONSTRUCTION STORMWATER MANAGEMENT PLAN. ADDITIONAL BMPs MAY BE REQUIRED TO PREVENT EROSION AND SEDIMENTATION FROM THIS DISCRETION WILL NOT BE MEASURED OR PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE PERMIT.

6. A GROUNDWATER DISCHARGE PERMIT MAY BE REQUIRED FROM THE STATE GOVERNING AUTHORITY PRIOR TO BEING DISCHARGED. TESTING SHALL BE SAMPLED AND SENT TO AN APPROVED LABORATORY FOR TESTING PRIOR TO BEING DISCHARGED. TESTING SHALL BE IN ACCORDANCE WITH THE PERMIT FOR STORMWATER DISCHARGE.

7. APPROVED EROSION AND SEDIMENT CONTROL BMPs SHALL BE MAINTAINED AND KEPT IN GOOD REPAIR FOR THE DURATION OF THIS PROJECT. UNLESS OTHERWISE REQUIRED BY THE STATE CONTRACTOR STORMWATER PERMIT, TO MAINTAIN THE CONTRACTOR SHALL INSPECT ALL BMPs EVERY 14 DAYS, AND AT ANY TIME THAT SIGNIFICANT PRECIPITATION EVENTS I.E. RAINFALL, SNOWMELT, OR NECESSARY MAINTENANCE AND REPAIR ACTIVITIES SHALL BE COMPLETED WITHIN TWENTY-FOUR (24) HOURS AFTER DISCUSS BY THE INSPECTOR. ACCUMULATED SEDIMENT ON CONSTRUCTION DEPOSITS SHALL BE REMOVED IMMEDIATELY. BMPs SHALL BE MAINTAINED TO PREVENT OR CONSTRUCTION DEPOSITS ADVERSELY IMPACTS THE FUNCTIONING OF THE BMPs.

8. TOPSOIL AND SUITABLE EARTHEN MATERIALS SHALL BE SEGREGATED AND STOCKPILED WITHIN THE LIMITS OF CONSTRUCTION FOR USE ON AREAS TO BE FILLED AND RE-VEGETATED. ANY AND ALL STOCKPILES SHALL BE PLACED IN AN APPROVED LOCATION AND PROTECTED FROM EROSION ELEMENTS USING MEASURES SPECIFIED IN THE EROSION/SEDIMENTATION CONTROL PLAN AND APPROVED STORMWATER MANAGEMENT PLAN (SWMP) FROM THE STATE OF CALIFORNIA.

9. SOILS THAT WILL BE STOCKPILED FOR MORE THAN THIRTY (30) DAYS SHALL BE MULCHED AND SEEDED WITH A TEMPORARY OR PERMANENT GRASS COVER WITHIN FOURTEEN (14) DAYS OF STOCKPILE CONSTRUCTION.

10. ANY SETTLEMENT OR SOIL ACCUMULATIONS BEYOND THE LIMITS OF CONSTRUCTION DUE TO GRADING OR EROSION SHALL BE REPAIRED IMMEDIATELY BY THE CONTRACTOR. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR REMEDIATION OF ANY ADVERSE IMPACTS TO ADJACENT WATERWAYS, WETLANDS, PROPERTIES, ETC. RESULTING FROM SUCH SETTLEMENTS AS PART OF THE PROJECT.

11. A WATER SOURCE MUST BE AVAILABLE ON SITE DURING EARTHWORK OPERATIONS AND UTILIZED AS REQUIRED TO MINIMIZE DUST FROM EARTHWORK EQUIPMENT AND WIND.

12. THE CONTRACTOR MUST KEEP ALL POLLUTANTS, INCLUDING SEDIMENT, CONSTRUCTION DEBRIS, AND TRENCH BACKFILL MATERIALS FROM ENTERING THE STORM SEWER SYSTEM.

13. ALL SPILLS INCLUDING, BUT NOT LIMITED TO, PETROLEUM PRODUCTS, SOLVENTS, AND CEMENT SHALL BE CLEANED UP IMMEDIATELY. THE LOCAL TOWN/CITY/COUNTY AND STATE'S GOVERNING AUTHORITY SHALL BE NOTIFIED IMMEDIATELY.

14. THE CONTRACTOR SHALL ENSURE THAT ALL PILES OF DIRT AND FILL MATERIAL, IMPORTED OR EXPORTED FROM THE PROJECT, ARE PROTECTED FROM THE PROJECT LOCATION. ALL MATERIAL STOCKPILED DURING THE RIGHT-OF-WAY MATERIAL EXPORTED FROM THE SITE SHALL BE DISPOSED OF AT A SITE PERMITTED TO ACCEPT SUCH MATERIAL.

15. THE USE OF REBAR, STEEL STAKES OR STEEL FENCE POSTS FOR STAKING DOWN STORM OR HAY BALES, OR TO SUPPORT SILL FENCING USED AS AN EROSION CONTROL MEASURE, IS PROHIBITED.

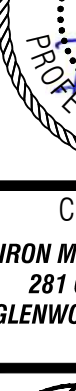
16. THE CLEANING OF CONCRETE DELIVERY TRUCK CHUCKS IS RESTRICTED TO APPROVED LOCATIONS ON THE JOB SITE. THE WASHING OF WATER WHEELS OR TIRE CHUCKS FROM CONCRETE DELIVERY TRUCKS SHALL NOT BE ALLOWED. ALL CONCRETE WASHING SHALL BE PROPERLY CLEANED UP AND DISPOSED OF AT AN APPROPRIATE LOCATION.

17. CONTRACTOR SHALL PROVIDE A COMPLETED NOTICE OF TERMINATION TO OWNER, FOR OWNERS SUBMIT TO THE STATES GOVERNING AUTHORITY ONCE THE PROJECT IS COMPLETE. ALL DISTURBED AREAS HAVE BEEN

	THE CONTRACTOR SHALL CLEAN OUT ALL EXISTING AND PROPOSED LINES, PIPES AND MANHOLES OF DEBRIS AND SEDIMENTATION AT COMPLETION OF STATIONING. THIS WORK SHALL BE DONE AT THE SANITATION OF THE OWNER AND LOCAL AUTHORITIES. ANY CONSTRUCTION DEBRIS OR DUMP DROPPED INTO MANHOLES, LINES, PIPES OR TRACKED OUTSIDE EXISTING ROADWAYS SHALL BE REMOVED IMMEDIATELY BY THE CONTRACTOR. THE CONTRACTOR SHALL REPAIR ANY EXCAVATIONS ON PAVEMENT FAILURES CAUSED BY HIS OWNERS' INSTRUCTION.
20.	ALL DITCHES & EROSION CONTROL SHOULD BE COMPLETED TO THE RECEIVING STREAM.
21.	THE CONTRACTOR SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO SIGNIFICANTLY REDUCE ANY POTENTIAL POLLUTION CAUSED BY HIS ACTIVITIES, INCLUDING VEHICLE FUELING, STORAGE OF FERTILIZERS OR CHEMICALS, ETC. THE CONTRACTOR SHALL HAVE ACTIVITIES PROCEDURE FOR HANDLING POTENTIAL POLLUTANTS AND HAVE TRUCKS OUTSIDE EXISTING ROADWAYS SHALL BE REMOVED IMMEDIATELY BY THE CONTRACTOR. THE PROJECT SITE SHALL BE PROTECTED BY A DITCH OR EROSION CONTROL MEASURES TO PREVENT ANY POLLUTION FROM THE PROJECT SITE.
22.	ALL EROSION CONTROL FABRIC SHALL BE NORTH AMERICAN GRASS 50250 OR ENGINEER APPROVED UNLESS SPECIFIED DIRECTLY.
SITE PLAN NOTES	
1.	DIMENSIONS SHOWN ON THE SITE PLAN ARE TO FACE OF CURB LINE (FLOWLINE) IN CURVED AREAS, EDGE OF ASPHALT, AND EXTERIOR FACE OF BUILDING, UNLESS OTHERWISE SPECIFIED.
2.	ALL SIGNAGE SHALL BE INSTALLED PER MUTCO STANDARDS. A SEPARATE SIGN APPLICATION TO THE TOWN CITY MAY BE REQUIRED FOR ALL SIGNS.
GRADING PLAN NOTES	
1.	PRIOR TO ANY GRADING OPERATIONS, ALL EROSION AND SEDIMENT CONTROL DEVICES SHALL BE ADEQUATELY IN PLACE, REFER TO THE EROSION AND SEDIMENT CONTROL PLAN, IF PROVIDED, FOR REQUIREMENTS.
2.	THE CONTOUR LINES, SPOT ELEVATIONS AND BUILDING FLOOR ELEVATIONS SHOWN ARE TO FINISH GRADE SURFACE OF PAVEMENT, TOP OF SIDEWALKS AND CURBS, TOP OF FLOOR SLABS, ETC. REFER TO TYPICAL, SECTIONS FOR MULLA, SOI, PAVING, SLAB AND AGGREGATE BASE THICKNESS TO DEDUCT FOR SUBGRADE ELEVATIONS.
3.	IF APPLICABLE, ALL TOP OF CURB AND SIDEWALK ELEVATIONS SHALL BE 0.5 ABOVE OTHER ELEVATIONS UNLESS OTHERWISE SPECIFIED. IN AREAS WITH SIDEWALK ABUTTING BACK OF CURB, TOP OF CURB ELEVATIONS SHALL BE EQUAL TO SIDEWALK ELEVATIONS.
4.	THE CONTRACTOR SHALL CONSTRUCT FINISH GRADE SLOPES NO STEEPER THAN AS SHOWN ON THESE PLANS.
5.	SITE AND BUILDING PAD PREPARATION, GRADING AND EXCAVATION PROCEDURES SHALL CONFORM TO THE RECOMMENDATIONS OUTLINED IN THE PROJECT GEOTECHNICAL REPORT.
6.	THE CONTRACTOR SHALL GRADE LANDSCAPED AREAS TO PROVIDE POSITIVE DRAINAGE AWAY FROM BUILDINGS AND SIDEWALKS IN CONFORMANCE WITH THE REQUIREMENTS OF THE PROJECT GEOTECHNICAL REPORT.
7.	IN CASE OF ANY DISCREPANCIES REGARDING EARTHWORK BETWEEN THE GEOLOGICAL REPORT AND THE SPECIFICATIONS SHOWN IN THESE PLANS, THE PROJECT ENGINEER AND OWNER'S CONTRACTOR PROJECT MANAGER INDICATIVELY.
8.	THE UPPER 24" OF ALL UTILITY TRENCHES IN UNFINISHED AREAS SHALL BE BACKFILLED WITH COMPACTED COHESIVE SOILS. 24" OF CONCRETE CURB FOR COMPACTION AND MOISTURE RETENTION.
9.	FINAL PAVEMENT SUBGRADES SHALL BE PROOF ROLLED WITH TWENTY (40) TONS HOUR FOR THE PLACEMENT OF THE PAVEMENT TO DETECT LOCALIZED AREAS OF INSTABILITY.
10.	SUITABLE FILL MATERIALS SHALL BE PLACED IN THIN LIFTS OF 4 TO 8 INCHES-LOOSE MEASUREMENT, UNLESS OTHERWISE ALLOWED IN THE GEOLOGICAL REPORT.
11.	IF REQUIRED, THE CONTRACTOR SHALL OBTAIN ALL LOCAL AND STATE PERMITS AND AUTHORIZATION TO DISCHARGE FROM DRAINAGE AGENCIES.
12.	THE CONTRACTOR SHALL DRAINAGE ALL EXCAVATIONS AND TRENCHES AS NEEDED FOR THE CONSTRUCTION OF THE PROJECT USING MEANS/METHODS OF HIS CHOICE. REFER TO THE GEOLOGICAL REPORT FOR ANTICIPATED LOCALIZED AREAS OF INSTABILITY.
13.	ALL EXCAVATIONS, RETAINING WALLS, ROADWAYS, DRAINAGE FACILITIES, BUILDING STRUCTURES AND TRENCHES SHALL BE SLOPED/CHAINED/BRACED FOR PROTECTION OF PERSONNEL, IN ACCORDANCE WITH OSHA AND/OR CDOT REGULATIONS AND AT THE CONTRACTOR'S FULL DISCRETION BASED ON THE SITE CONDITIONS. OPEN EXCAVATIONS SHALL BE ADEQUATELY PROTECTED AND/OR FENCED AS NECESSARY AND FOR THE SAFETY OF THE PUBLIC.
PAVING NOTES	
1.	ALL PAVING WORK AND SUBGRADE PREPARATION/STABILIZATION SHALL CONFORM TO THE REQUIREMENTS OF THE GEOLOGICAL REPORT, PREPARED BY PCL, TNSPEP, INC. DATED 06/07/14, PROJECT NO. 555075-145, IN CASE OF ANY CONFLICT WITH THESE DETAILS, THE OWNER'S INSTRUCTION WILL PREVAIL.
2.	IF REQUIRED, UNLESS PROVIDED FOR IN THE PLANS, THE CONTRACTOR SHALL DEVELOP A CONCRETE PAVEMENT JOINTING PLAN USING THE PROPOSED PAVING PLAN AND SITE CONDITIONS. JOINT LAYOUT SHALL BE IN ACCORDANCE WITH AASHTO 309-15 "GUIDE FOR CONSTRUCTION OF CONCRETE PAVEMENTS," AASHTO 309-12R-02, "CONCRETE JOINTING OF JOINTED PAVEMENTS FOR STREETS AND LOCAL ROADS" AND STANDARD CONSTRUCTION PRACTICES. JOINT DETAILS SHALL BE IN ACCORDANCE WITH CDOT STANDARD DETAILS. THE CONTRACTOR SHALL PROVIDE A PAVEMENT JOINTING PLAN FOR OWNER APPROVAL.
3.	IF REQUIRED, ALL CONCRETE PAVEMENT AND CONSTRUCTION SHALL MEET SPECIFICATIONS OUTLINED IN THE GEOLOGICAL REPORT. CONCRETE PAVEMENT SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4000 PSI. TYPE I PORTLAND CEMENT SHALL BE USED FOR PAVEMENTS FOR STREETS AND LOCAL ROADS" AND STANDARD CONSTRUCTION PRACTICES. JOINT DETAILS SHALL BE IN ACCORDANCE WITH CDOT STANDARD DETAILS. THE CONTRACTOR SHALL PROVIDE A PAVEMENT JOINTING PLAN FOR OWNER APPROVAL.
4.	IF REQUIRED, ALL CONCRETE PAVEMENT AND CONSTRUCTION SHALL MEET SPECIFICATIONS OUTLINED IN THE GEOLOGICAL REPORT. CONCRETE PAVEMENT SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4000 PSI. TYPE I PORTLAND CEMENT SHALL BE USED FOR PAVEMENTS FOR STREETS AND LOCAL ROADS" AND STANDARD CONSTRUCTION PRACTICES. JOINT DETAILS SHALL BE IN ACCORDANCE WITH CDOT STANDARD DETAILS. THE CONTRACTOR SHALL PROVIDE A PAVEMENT JOINTING PLAN FOR OWNER APPROVAL.
5.	PAVEMENT SHALL HAVE A SOLAR REFLECTANCE INDEX (SRI) OF 20 OR HIGHER.
6.	ALL RADIIUS DIMENSIONS SHOWN ON THE PAVING PLAN ARE TO FLOWLINE OF CURB UNLESS OTHERWISE NOTED.
7.	95% STANDARD PRACTICE IS REQUIRED FOR ALL SIDEWALK & DRIVEWAY CONSTRUCTION AND TRENCH BACKFILL UNDER THE ROADWAYS, PARKING AREAS, TRAILS, SIDEWAYS, PUBLIC ROW, ACCESS EASEMENTS UNLESS NOTED OTHERWISE. THE PROJECT ENGINEER AREAS SHALL BE ATTACHED AND CONSTRUCTION RESULTS SUBMITTED TO THE TOWN CITY. THE PROJECT ENGINEER SHALL BE NOTIFIED OF ANY CHANGES TO THE PROJECT. THE PROJECT ENGINEER SHALL BE NOTIFIED OF ANY CHANGES TO THE PROJECT. THE PROJECT ENGINEER SHALL BE NOTIFIED OF ANY CHANGES TO THE PROJECT.
8.	THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ALL ACCESSIBLE AREAS AND ROUTES ARE BUILT IN ACCORDANCE WITH THE PLANS AND THE "2010 ADA STANDARDS FOR ACCESSIBLE DESIGN." THE SITE MAY BE INSPECTED BY TOWN CITY PERSONNEL FOR COMPLIANCE WITH THE STANDARDS.
9.	ALL CONCRETE SHALL OBTAIN CDOT APPROVED FRESH MESH REINFORCEMENT AT 3.5 LBS PER CUBIC YARD.
10.	CONCRETE SIDEWALK THICKNESS SHALL BE 4" MIN. AND INCREASED TO 6" MIN. IN RAMPS, DRIVEWAY CROSSINGS, OR AS INDICATED ON THE DETAILS. CONCRETE PAVEMENT SHALL BE PLACED IN TRENCHES PER THE DETAILS. COLOR ADJUSTMENTS: COLOR SAMPLES SHALL BE PROVIDED TO THE PROJECT ENGINEER FOR SELECTION PRIOR TO CONSTRUCTION.
11.	CALCIUM CHLORIDE OR ADMIXTURES CONTAINING MORE THAN 0.6% CHLORIDE IONS OR THIOCYANATE IONS ARE NOT PERMITTED.
12.	ALL REINFORCING STEEL SHALL BE EPOXY COATED GRADE 40 #4 OR SMALLER AND GRADE 60 #4 OR 5/8" AND LARGER. ALL REINFORCING STEEL IN SLABS AND WALLS SHALL BE HELD AT CORNER DISTANCES FROM FORMS BY ADEQUATE CONCRETE BLOCKS, STEEL CHAIRS, OR TIES IN ACCORDANCE WITH LATEST ACI DETAILING PRACTICES.

[illegible]

FORM SEWER NOTES				
1.	STORM SEWER PIPE MATERIALS SHALL BE WATER TIGHT HOPE DOUBLE-WALL, SMOOTH INTERIOR PIPE (ADS N-12-WT OR ENGINEER APPROVED EQUIVA) OR RUBBER GASKET REINFORCED CONCRETE PIPE (RCP) UNLESS OTHERWISE SPECIFIED IN THE PLANS.			
2.	STORM SEWER PIPE SHALL BE BEEDED, INSTALLED, AND BACKFILLED IN ACCORDANCE WITH THE DETAILS INCLUDED IN THE PLANS, MANUFACTURERS INSTALLATION REQUIREMENTS, AND/OR STANDARD DETAILS INCLUDING BY REFERENCE.			
SITE BENCHMARK:- CONTOURS ARE SHOWN AT ONE FOOT INTERVALS, HORIZONTAL, AND VERTICAL CONTROL IS BASED CITY DATUM.				
THE THREE (3) LOCAL UTILIZED CONTROL POINTS ARE:				
#	Easting	Northing	ELEVATION	
# 10	N 420413.553	E 15740.363	EL.5737.810	1.25' PLY-LSP=15710
# 14	N 420513.534	E 15955.320	EL.5737.860	1.5 AC-KLEG
# 4	N 421917.890	E 15859.479	EL.5717.962	1.5 AC-KLEG
REQUIRED SUPPLIES:				
• CONCRETES • AGGREGATE • STEEL • ASPHALT MIX DESIGN • FLOWABLE FILL • ALL UTILITY STRUCTURES, PIPE & FITTINGS • CONTROL PANELS, PLC WIRING & POWER PANEL • ANY OTHERS INDICATED WITHIN THE PLANS OR AS REQUIRED BY THE TOWN/CITY OR THE ENGINEER'S CONTROL.				
UTILITY PROVIDERS/OWNERS:				
ELECTRIC:	DOUG HAZARD	CITY ELECTRIC SYSTEM	970.384.6353	
FIBER OPTIC:	ERIC ARNETTE	CITY BROADBAND	970.384.6416	
WATER/SAN. SEWER:	MIKE HARTCH	CITY WWW	970.384.6343	
STORM/IRRIGATION:	TERRI PORTCH	CITY ENGINEERING	970.384.6435	
STREETS:	JACK VELASQUEZ	CITY STREETS	970.384.6379	
NATURAL GAS:	DAVID COX	BLACK HILLS ENERGY	970.456.3117	
TELECOMMUNICATIONS:	MICHAEL JOHNSON	COMCAST	970.930.4713	
TELECOMMUNICATIONS:	JASON SHARPE	CENTURYLINK	970.384.0238	
MATERIAL TESTING/QUALITY ASSURANCE NOTES:				
1.	THE OWNER WILL PROVIDE A QUALIFIED SOILS ENGINEER TO INSPECT EXCAVATIONS, SUBGRADES, AND BACKFILL THE TESTING OF PREPARED SUBGRADE AND ANY OR ALL LIFTS OF COMPACTED FILL OR BACKFILL WILL BE AT DISCRETION OF THE ENGINEER. THE CONTRACTOR SHALL GIVE THE ENGINEER TWENTY-FOUR HOURS NOTICE BEFORE REMEDIATION OR BETWEEN LIFTS OF EMBANKMENT LAYS, BACKFILLING OR SUBGRADE PREPARATION TO PERFORM ADEQUATE NOTIFICATION TO THE TESTING PERSONNEL. THE CONTRACTOR SHALL NOT PROCEED WITH WORK UNTIL FAVORABLE CONDITIONS ARE CONFIRMED BY THE TEST RESULTS.			
2.	THE OWNER WILL ENGAGE AN INDEPENDENT TESTING LABORATORY OR OTHERWISE PROVIDE FOR EARTHWORK TESTING COSTS FOR ALL SUCH TESTING WILL BE PAID BY THE OWNER. EXCEPT THE CONTRACTOR SHALL BEA COST OF TESTING AND REINSPECTION OF FIELD TESTS THAT DOES NOT PASS REQUIREMENTS OF THE SPECIFICATIONS. WHEN THE TESTS INDICATE THAT THE DENSITY OF ANY LAYER OF FILL OR PORTION THEREOF BELOW THE SPECIFIED DENSITY, THE PARTICULAR LAYER OR PORTION SHALL BE REMOVED UNTIL THE SPECIFIC DENSITY IS OBTAINED.			
3.	TESTS SHALL BE MADE BY AN INDEPENDENT TESTING LABORATORY AND BE ACCEPTABLE TO THE CITY, PROJECT MANAGER AND PROJECT ENGINEER. EXCEPT AS OTHERWISE PROVIDED, SAMPLING OF MATERIALS, TESTING METHODS AND TESTING EQUIPMENT SHALL BE IN ACCORDANCE WITH THE LATEST STANDARDS OR TENTATIVE METHOD OF THE NOTIFIED SPECIFICATIONS.			
4.	CONTRACTOR TO NOTIFY ENGINEER OF RECORD WHEN TOPSOIL/OrganicS HAVE BEEN STRIPPED TO CONFIRM REMOVAL IS ADEQUATE.			
5.	ENGINEER OF RECORD AND TESTING AGENT TO FIELD VERIFY SUBGRADE BY WITNESSING A LOADED TANDEM M ROLL TEST OF SUBGRADE FOR CURB/ASPHALT.			
6.	TESTING FREQUENCY SHALL CONFORM TO THE CDOT FIELD MATERIALS MANUAL, LATEST EDITION, OF THE FOLLOWING, WHICHEVER IS MORE FREQUENT: AT A MINIMUM, TESTING AGENT TO PERFORM NUCLEAR DENSITY TESTING OF THE FOLLOWING: 6.a. TRENCHES: EVERY 100 FEET FOR THE LOWER 12-INCHES OF FILL AND EACH 24 INCHES OF FILL THEREAFTER. 6.b. STRUCTURAL FILL: EVERY 100 FEET, OR 3 TESTS PER BLOCK MIN., FOR EACH 2-FEET OF FILL. 6.c. SUBGRADE: EVERY 100 FEET, OR 3 TESTS PER BLOCK MIN. 6.d. BASE COURSE: EVERY 100 FEET, OR 3 TESTS PER BLOCK MIN. 6.e. ASPHALT: EVERY 100 FEET, OR 3 TESTS PER BLOCK MIN.			
7.	TESTING AGENT SHALL OBTAIN CONCRETE CYLINDERS FOR TESTING EACH DAY CONCRETE IS POURED.			
8.	TESTING AGENT SHALL FORM A MARSHAL TEST OF THE ASPHALT.			
9.	CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE MATERIAL AND COMPACTION TESTING WITH PROJECT ENGINEER AND TESTING AGENT AND ADHERING TO THE TESTING SCHEDULE DEFINED.			
10.	CONTRACTOR SHALL PROVIDE THE CITY AND ENGINEER OF RECORD WITH COPIES OF ALL TEST RESULTS AND REPORTS CONFIRMING COMPLIANCE.			
CONTACT INFORMATION:				
3.a.	QUALITY ASSURANCE - PROJECT ENGINEER/ENGINEER OF RECORD: DERIC J. WALTER, PE BOUNDARIES UNLIMITED INC. 970.945.5292			
3.b.	MATERIALS TESTING - TESTING AGENT: BY THE CONTRACTOR AND AS APPROVED BY THE TOWN/CITY.			

 Civil Engineering Surveying & Beyond Boundaries Unlimited Inc.	
923 Cooper Ave., Ste. 201 Glenwood Springs, CO 81601 (770) 945.5252 www.bu-inc.com	
Subsurface Utility Engineering (SUE) Required Project: Yes If "Yes", SUE Certification by: Firm: 2018-208.004 Job #: SGM, Inc. Date: July 2020	
Engineer or Surveyor Seal 	
Client Information: IRON MOUNTAIN HOT SPRINGS 281 CENTENNIAL STREET GLENWOOD SPRINGS, CO 81601 970.945.4768	
 NORTH  Scale: 1" = 400'	
 Know what's below. Call before you dig.	
Centennial Street Lift Station (LS16000)	
GLENWOOD SPRINGS, CO Cover Sheet Construction Set	
PROJECT NO: 17015.02 Designer: DJW Checker: BDJ Date: 1/28/21 Sheet C.1	
File Name: 17015-c-lift-site.dwg	

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Boundaries Unlimited Inc.

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Glenwood Springs, CO 81601
(T) 970.945.5252
www.bu-inc.com

Subsurface Utility Engineering (SUE)
Required Project: **Yes**
If "Yes", SUE Certification by:
Firm: **2018-208-004**
Job #: **SGM, Inc.**
Date: **July 2020**

Engineer or Surveyor Seal

COLORADO LICENSED
SURVEYOR
01/26/21
37110
Professional Engineer

Client Information:
IRON MOUNTAIN HOT SPRINGS
281 CENTENNIAL STREET
GLENWOOD SPRINGS, CO 81601
970.945.4766

NORTH

01020
Scale: 1" = 10'

811

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GLENWOOD SPRINGS, CO

Centennial Street Lift Station (LS16000)

Civil-Geothermal Raw Water Plan

Construction Set

No.	Date	Revision	By
1			
2			
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PROJECT NO.
17015-02
Designer:
DJW
Checker:
BUI
Date:
1/26/21

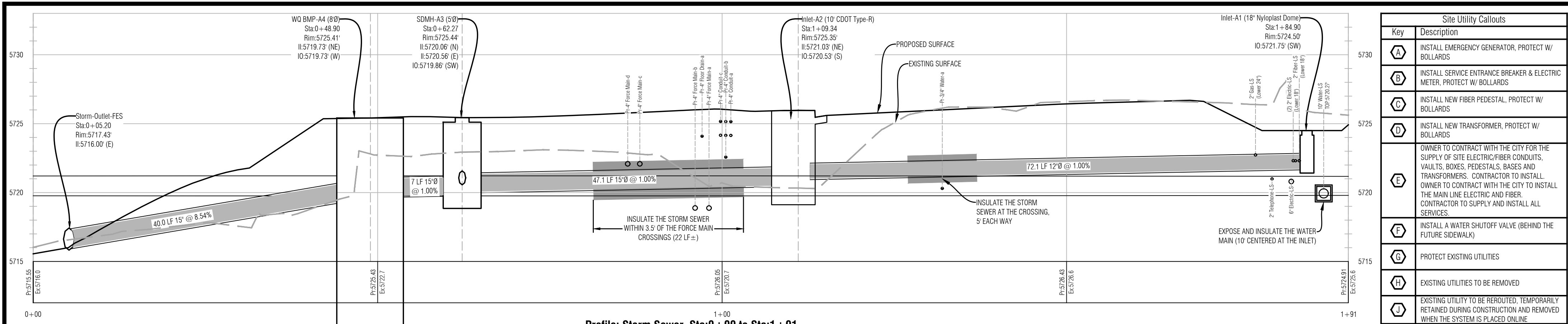
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C.3

File Name: 17015-C-00-site.dwg

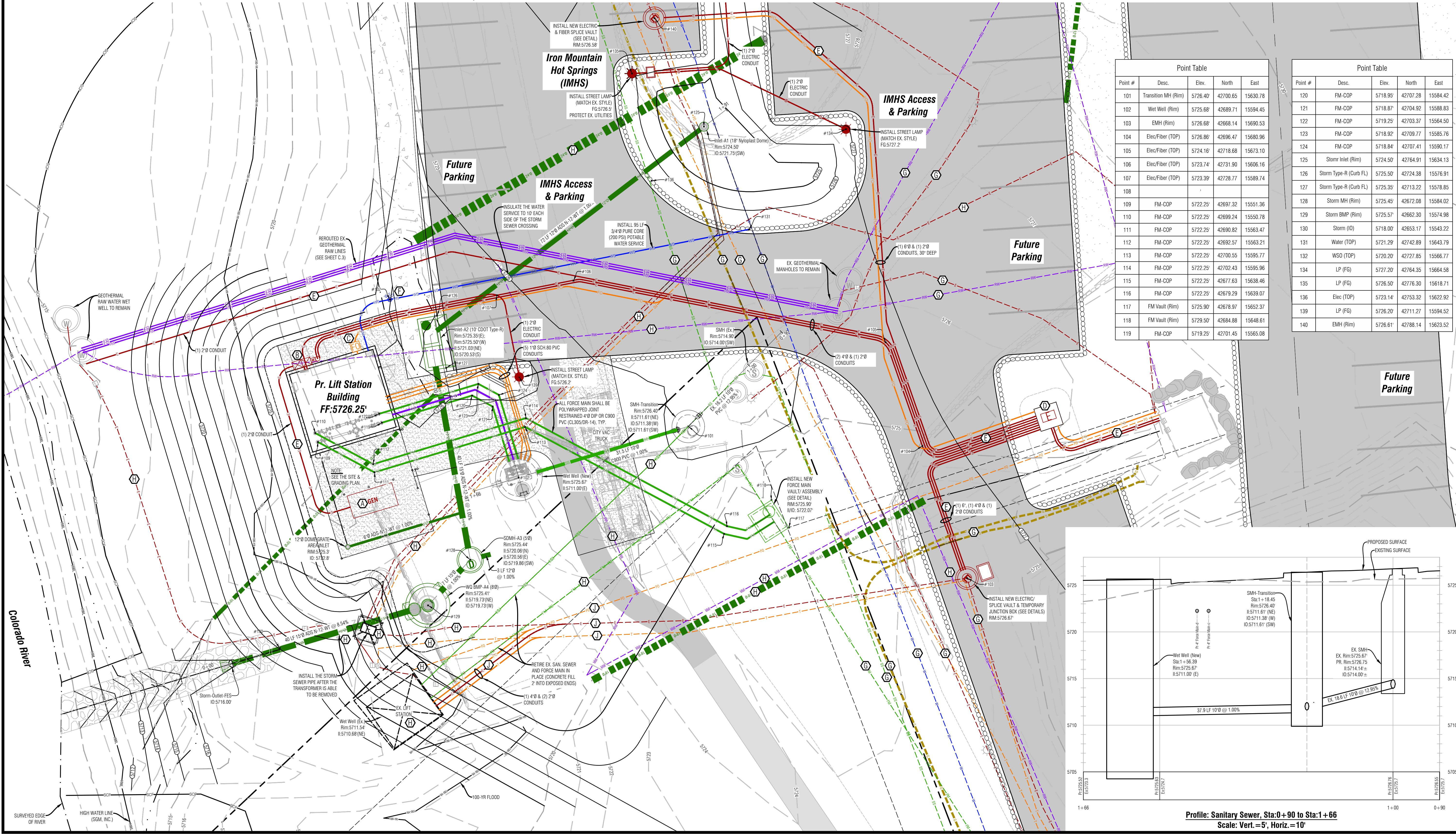
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Scale: Vert.=5', Horiz.=10'

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Packet Page 73



Site Utility Callouts	
Key	Description
A	INSTALL EMERGENCY GENERATOR, PROTECT W/ BOLLARDS
B	INSTALL SERVICE ENTRANCE BREAKER & ELECTRIC METER, PROTECT W/ BOLLARDS
C	INSTALL NEW FIBER PEDESTAL, PROTECT W/ BOLLARDS
D	INSTALL NEW TRANSFORMER, PROTECT W/ BOLLARDS
E	OWNER TO CONTRACT WITH THE CITY FOR THE SUPPLY OF SITE ELECTRIC/FIBER CONDUITS, VALVES, BOXES, PEDESTALS, BASES AND TRANSFORMERS. CONTRACTOR TO INSTALL. OWNER TO CONTRACT WITH THE CITY TO INSTALL THE MAIN LINE ELECTRIC AND FIBER. CONTRACTOR TO SUPPLY AND INSTALL ALL SERVICES.
F	INSTALL A WATER SHUTOFF VALVE (BEHIND THE FUTURE SIDEWALK)
G	PROTECT EXISTING UTILITIES
H	EXISTING UTILITIES TO BE REMOVED
I	EXISTING UTILITY TO BE REROUTED, TEMPORARILY RETAINED DURING CONSTRUCTION AND REMOVED WHEN THE SYSTEM IS PLACED ONLINE



Boudaries Civil Engineering Surveying & Beyond

923 Cooper Ave., Ste. 201
Glenwood Springs, CO 81601
(T) 970.945.5252
www.bu-inc.com

Subsurface Utility Engineering (SUE)
Required Project: **Yes**
If Yes: SUE Certification by:
Firm: **2018-208-004**
Job #: **SGM, Inc.**
Date: **July 2020**

Engineer or Surveyor Seal

COLORADO LICENSED
SURVEYOR
01/26/21
37110
James Boudaries
PROFESSIONAL ENGINEER

Client Information:
IRON MOUNTAIN HOT SPRINGS
281 CENTENNIAL STREET
GLENWOOD SPRINGS, CO 81601
970.945.4766

NORTH

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Centennial Street Lift Station (LS16000)
Civil-Utility & Storm Sewer Plan
Construction Set

GLENWOOD SPRINGS, CO

By: _____
Revision: _____
Date: _____

PROJECT NO. **17015-02**
Designer: **DJW**
Checker: **BUI**
Date: **1/26/21**

Sheet **C.4**

File Name: **17015-02R-site.dwg**

Point Table				
Point #	Desc.	Elev.	North	East
200	FG @ Bldg Cor	5725.75	42717.97	15563.56
201	FG @ Bldg Cor	5725.75	42712.21	15544.44
202	FG @ Bldg Cor	5725.75	42694.36	15549.81
203	FG @ Bldg Cor	5725.75	42700.12	15568.93
206	TW/Walk	5726.15	42725.61	15568.12
207	TW	5725.50	42712.97	15540.03
208	TW	5725.50	42671.19	15552.62
209	TW	5725.54	42669.67	15561.43
210	TW	5725.25	42655.15	15569.98
211	TW	5725.60	42655.48	15584.96
212	FG	5725.54	42678.48	15578.08
213	FG	5725.73	42689.91	15572.01
214	FG-Walk	5726.12	42710.81	15570.67
215	FG	5726.31	42781.26	15633.42
216	FG	5726.62	42780.28	15618.42
217	FG	5726.88	42776.04	15614.72
218	FG	5726.72	42758.70	15618.13
219	FG	5726.69	42746.59	15629.02
220	FG	5726.86	42742.01	15646.99
221	FG	5726.95	42742.52	15654.97
222	FG	5726.93	42747.59	15665.27

Point Table				
Point #	Desc.	Elev.	North	East
223	FG	5727.20	42758.46	15668.97
224	FG	5727.38	42764.61	15668.57
225	FG	5727.42	42768.35	15664.32
226	FG	5727.12	42767.38	15649.35
227	FG	5724.50	42772.34	15634.00
228	FG	5724.50	42771.17	15625.93
229	FG	5724.50	42763.31	15627.63
230	FG	5724.50	42755.27	15634.87
231	FG	5724.50	42753.09	15646.27
232	FG	5724.50	42754.08	15654.92
240	FG	5726.64	42696.35	15674.02
241	FG	5726.49	42712.79	15661.80
242	FG	5726.24	42717.05	15636.86
243	FG	5726.07	42715.82	15614.01
244	FG	5725.58	42696.70	15618.29
245	FG	5725.41	42677.81	15623.52
246	FG	5725.09	42673.00	15607.21
247	FG	5725.72	42695.32	15596.08
248	FG	5725.90	42707.03	15593.45
249	FG	5725.65	42714.72	15596.90

FEMA FLOODPLAIN NOTES:
THE 100-YEAR FLOOD BOUNDARY DEPICTED HEREON IS BASED ON ELEVATIONS PROVIDED ON FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD INSURANCE RATE MAP (FIRM) PANEL 1432 OF 1900, COMMUNITY PANEL NUMBER 090071 1432 C, REVISED OCTOBER 15, 1985. THE VERTICAL DATUM FOR THAT MAP INCLUDES REFERENCE MARK RM27 ELEVATION 5764.00 (FT. NGVD) BEING DESCRIBED ON SAID FIRM MAP AS BEING A STANDARD DISK AT GLENWOOD SPRINGS, GARFIELD COUNTY, APPROXIMATELY 180 FEET NORTH OF THE INTERSECTION OF 6TH AND PINE STREETS, AT THE MAIN ENTRANCE TO THE COLORADO HOTEL (1908) AND IN THE FACE OF THE STONE COLUMN, A U.S. GEOLOGICAL SURVEY STANDARD DISK STAMPED 5764.0 (FT). THE TOPOGRAPHIC SURVEY FOR THIS PROJECT WAS PREPARED BY SGM, INC. USING NAVD88 DATUM. ACCORDING TO THE NATIONAL GEODETIC SURVEY (NGS) DATABASE, THE NGVD ELEVATION FOR RM27 WAS SUPERCEDED BY A NAVD88 ELEVATION OF 5766.6 FEET. THEREFORE, TO ESTIMATE THE 100-YR FLOODPLAIN ELEVATIONS AND BOUNDARY DEPICTED HEREON, THE MAPPED FEMA FIRM CROSS SECTIONS ADJACENT TO THIS PROPERTY WERE DIGITIZED ONTO THE SGM, INC. SURVEY AND RAISED 2.6 FEET.

Colorado River



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Subsurface Utility Engineering (SUE)
Required Project: **Yes**
If "Yes": SUE Certification by:
Firm: **2018-208-004**
Job #: **SGM, Inc.**
Date: **July 2020**

Engineer or Surveyor Seal

Colorado Licensed
Professional Engineer
01/26/21
37110
James W. Smith

Client Information:
IRON MOUNTAIN HOT SPRINGS
281 CENTENNIAL STREET
GLENWOOD SPRINGS, CO 81601
970.945.4766

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Centennial Street Lift Station (LS16000)

Civil-Site & Grading Plan

Construction Set

By

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Date

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4

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9

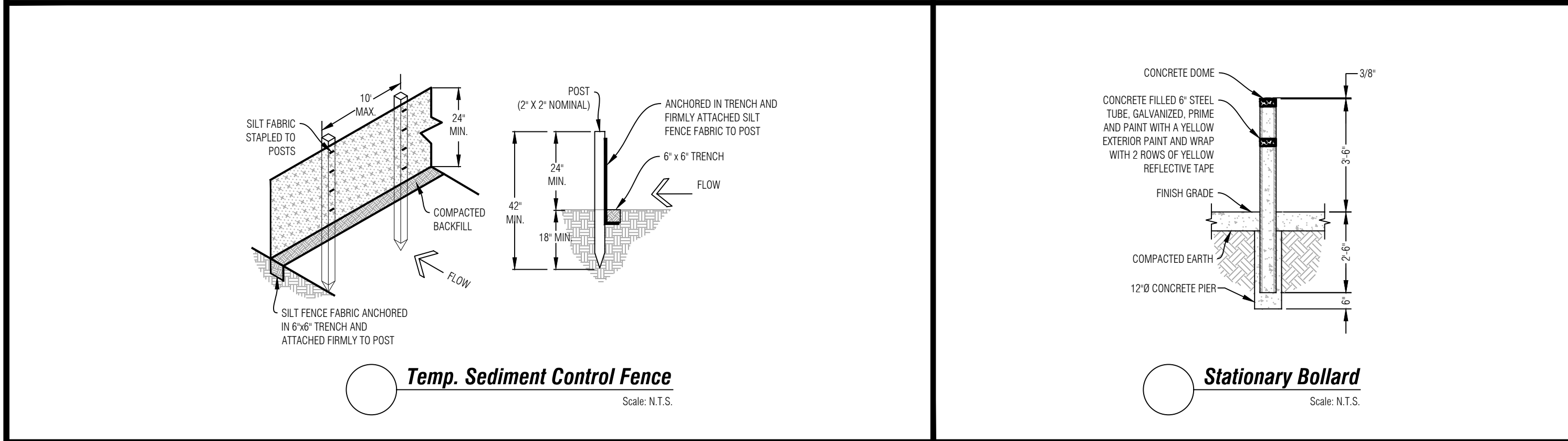
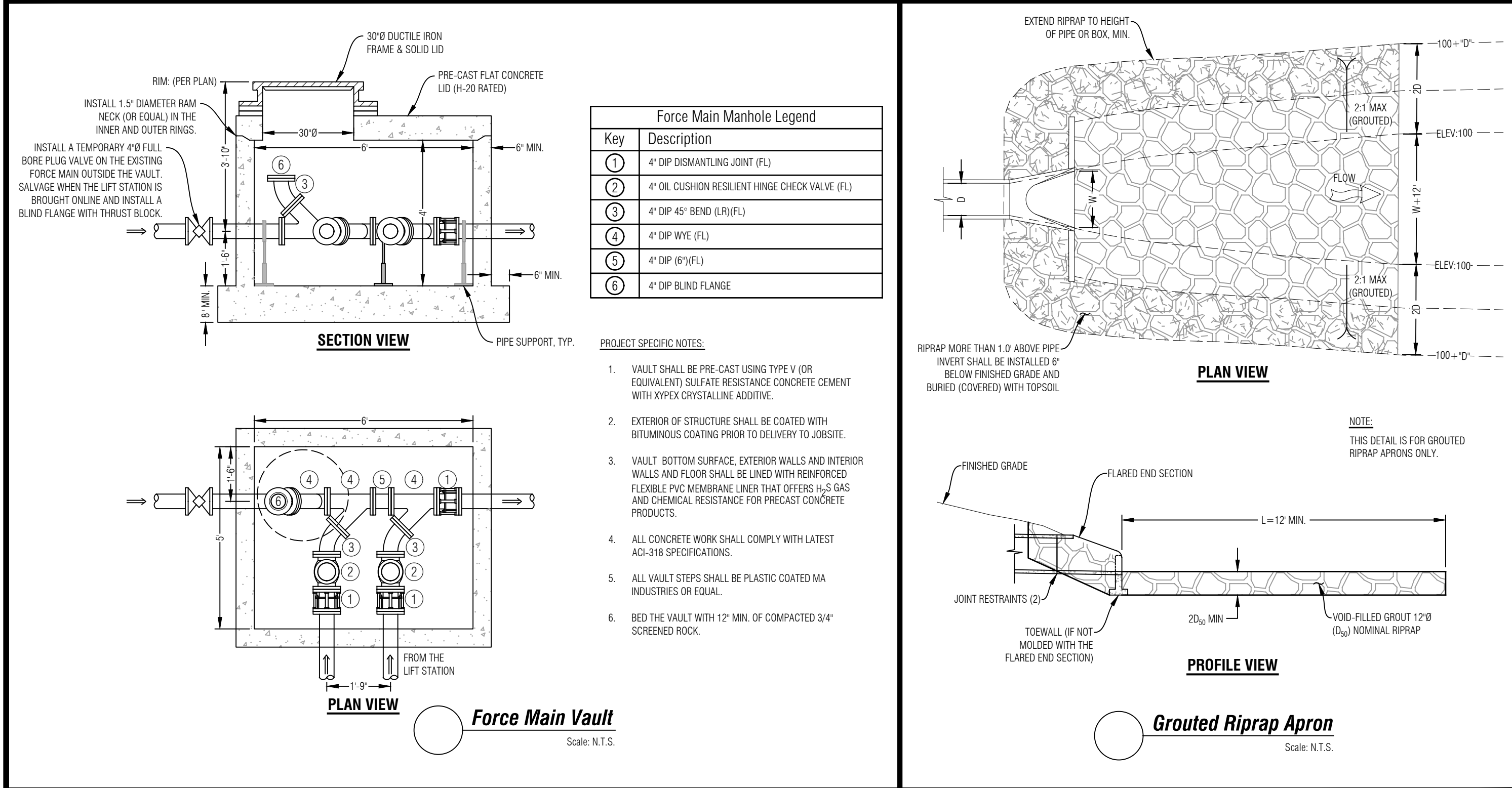
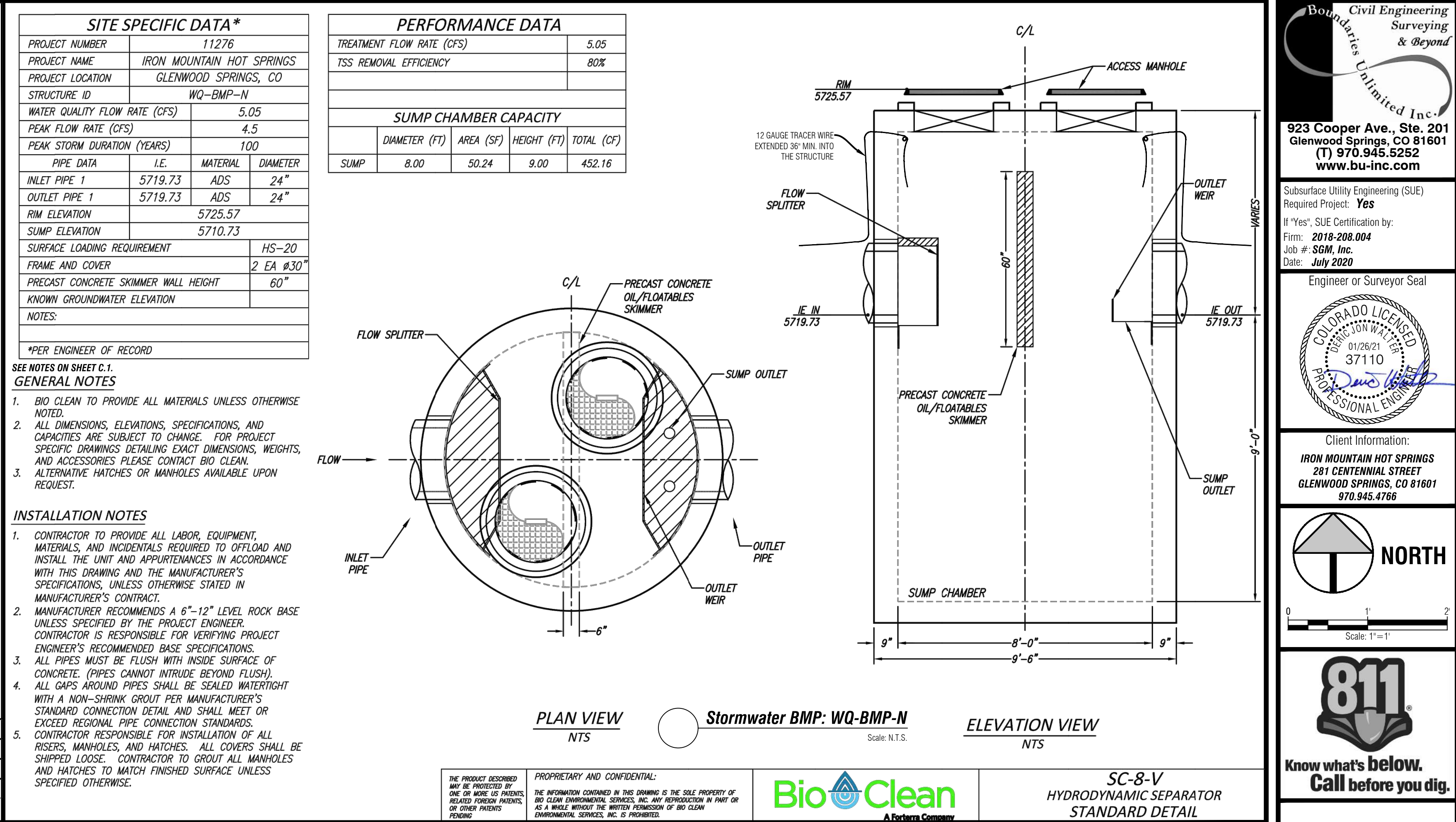
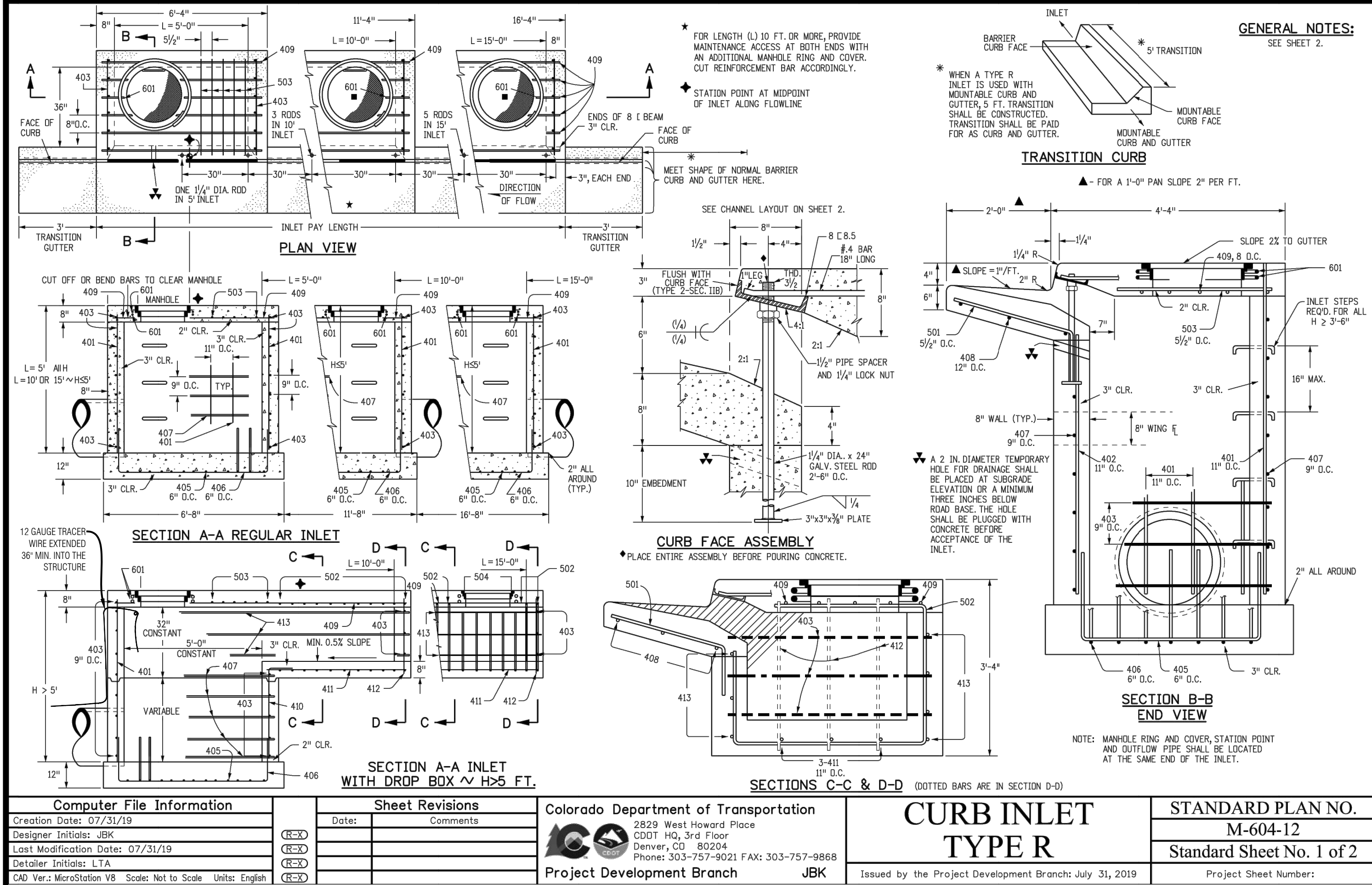
PROJECT NO.
17015-02
Designer
DJW
Checker
BUI
Date
1/26/21

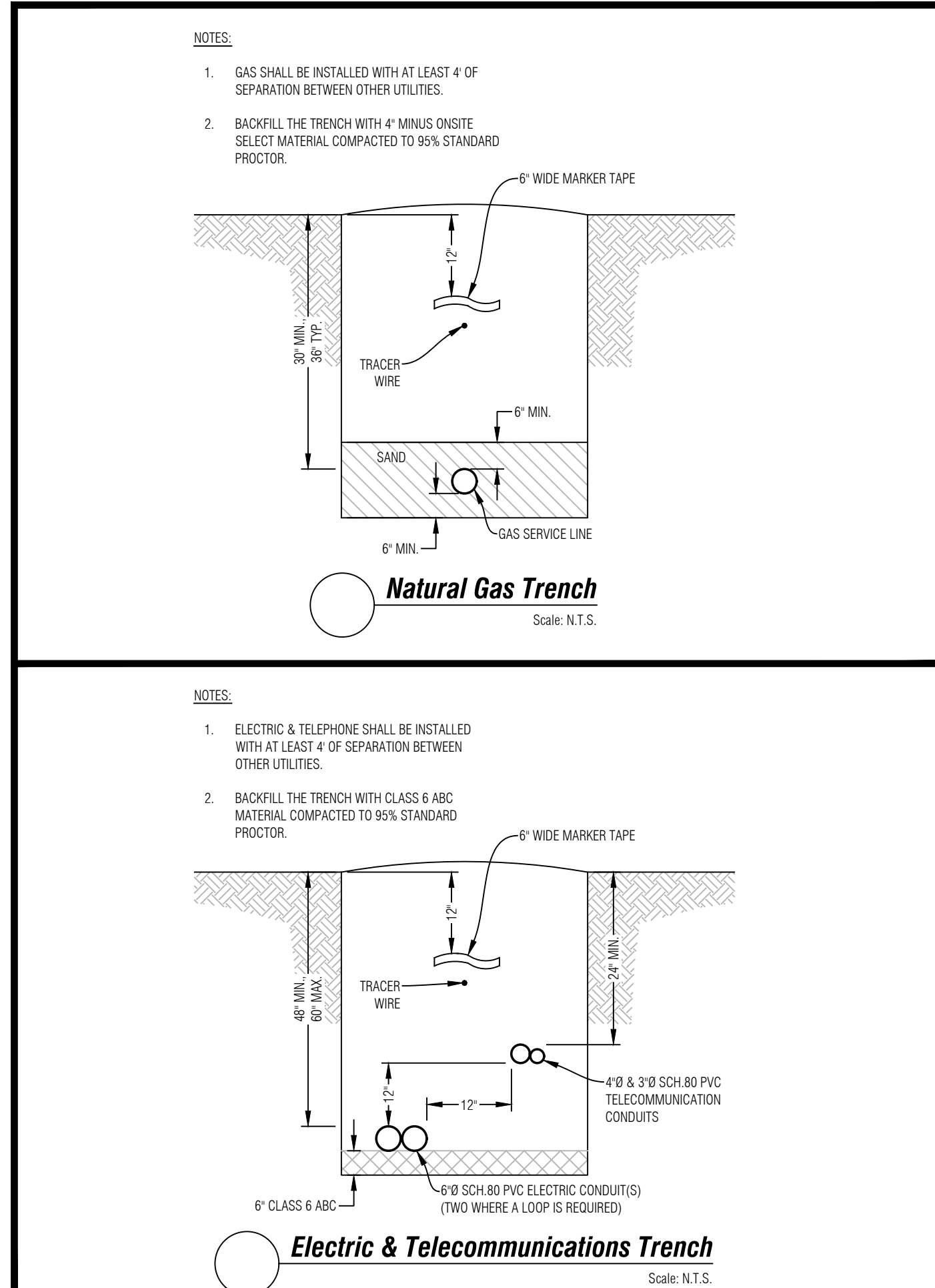
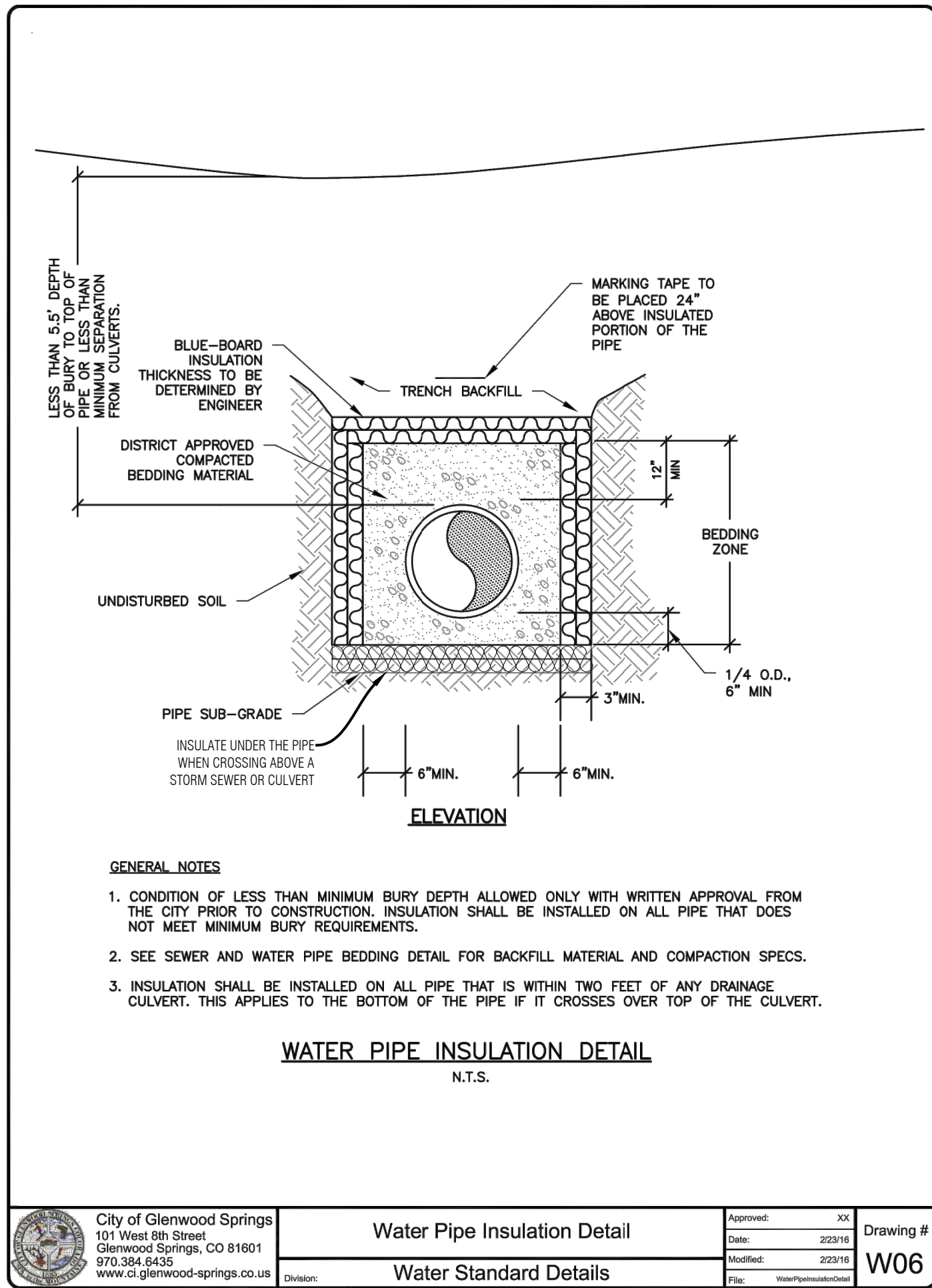
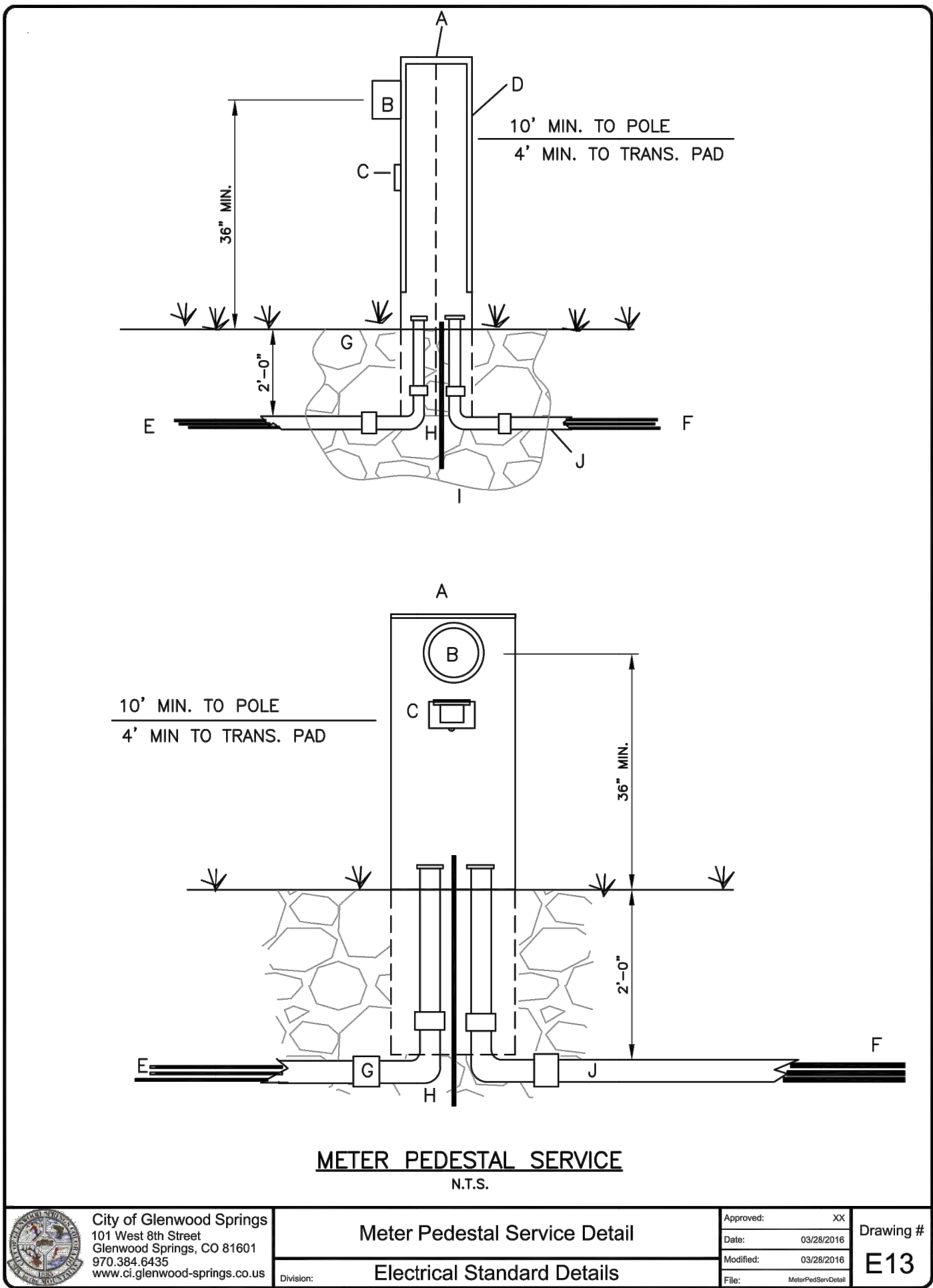
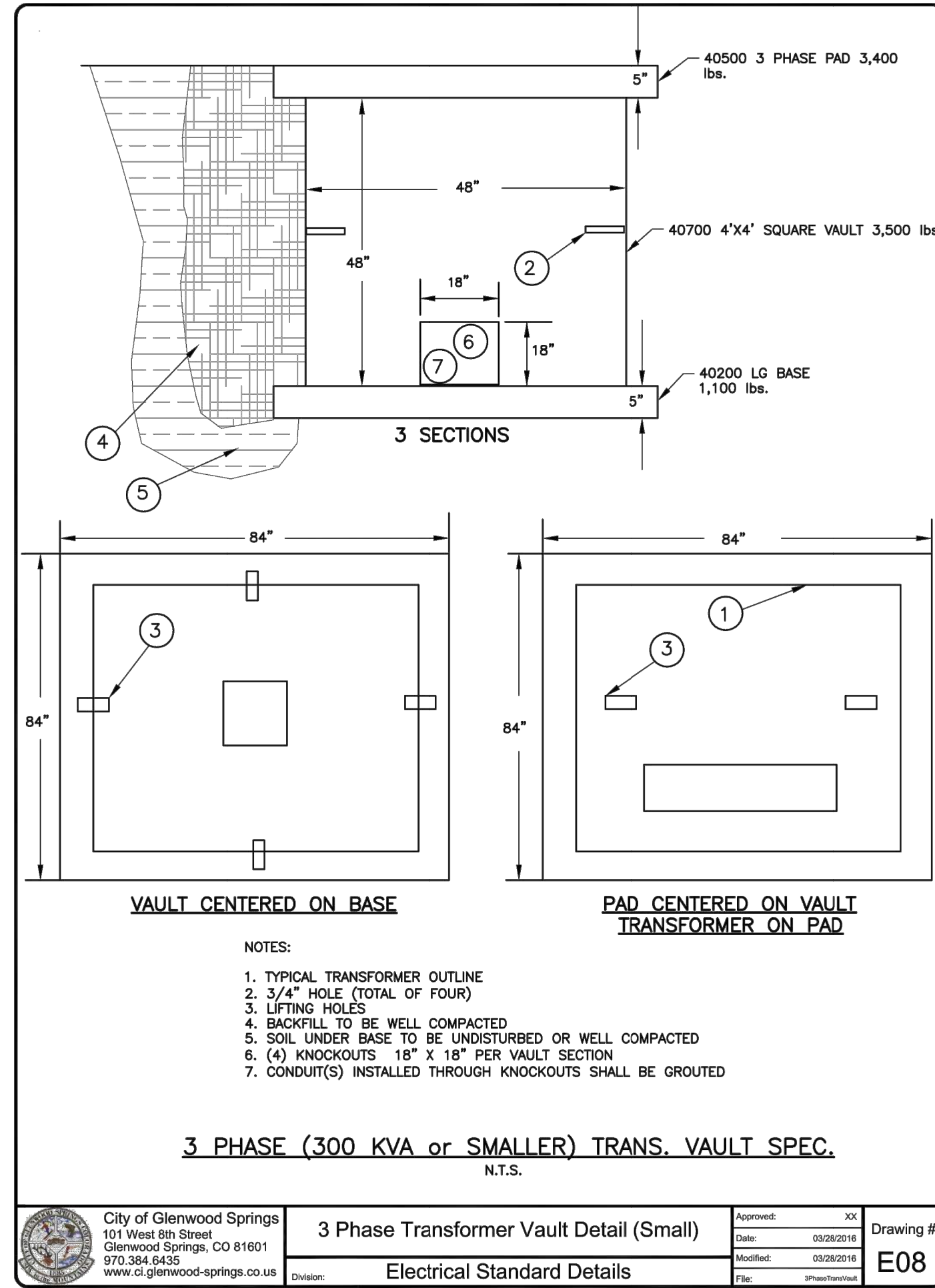
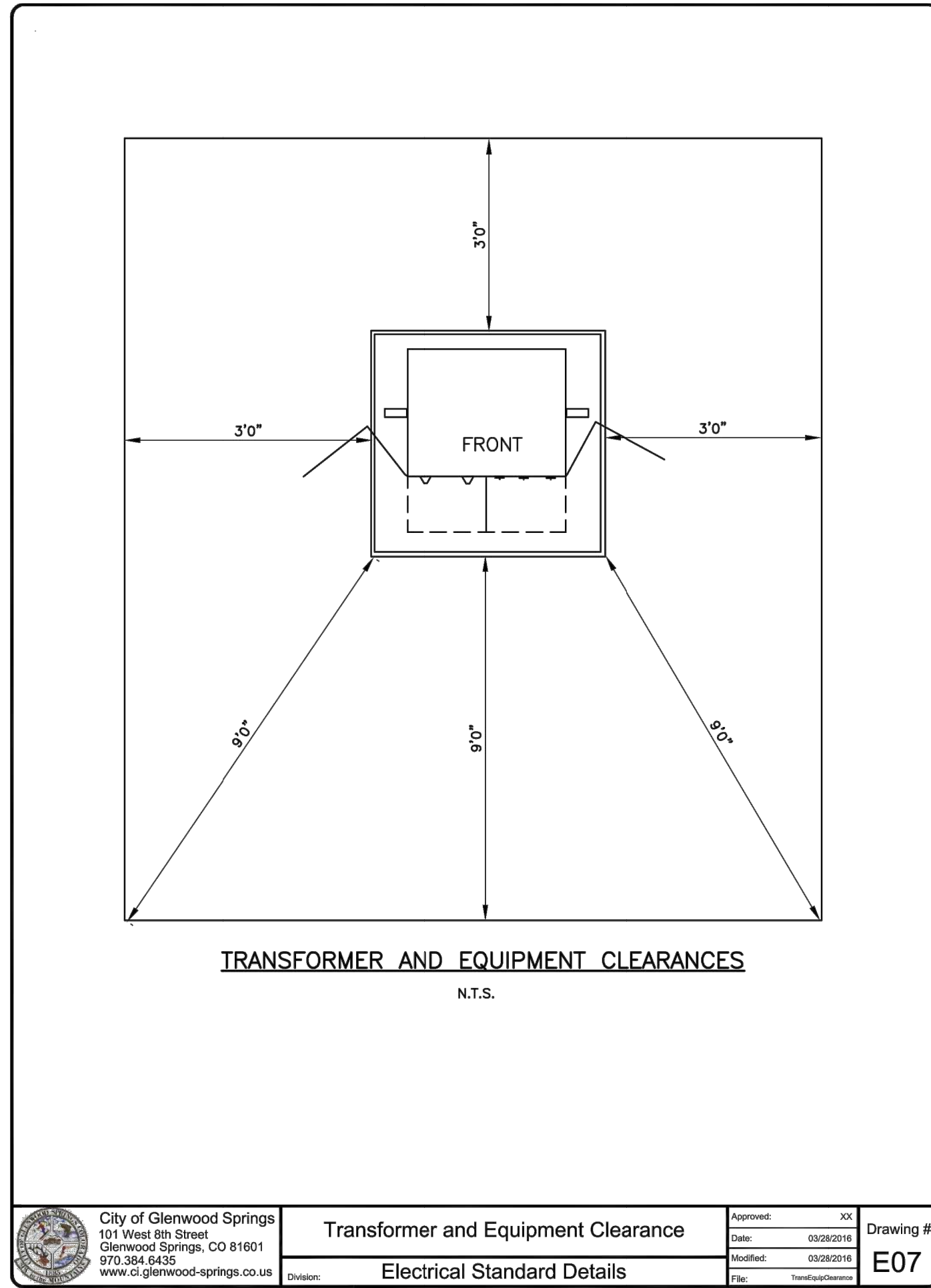
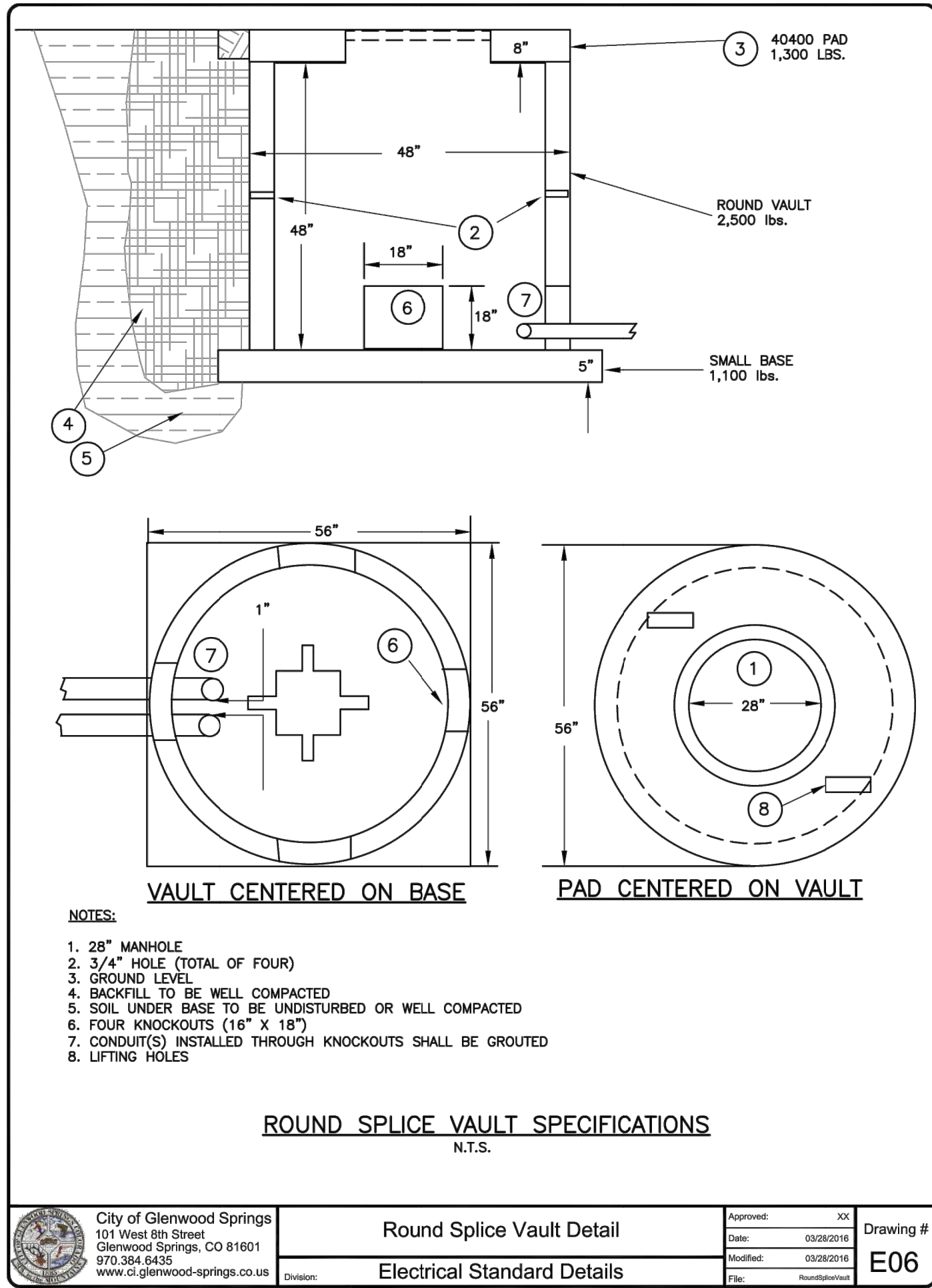
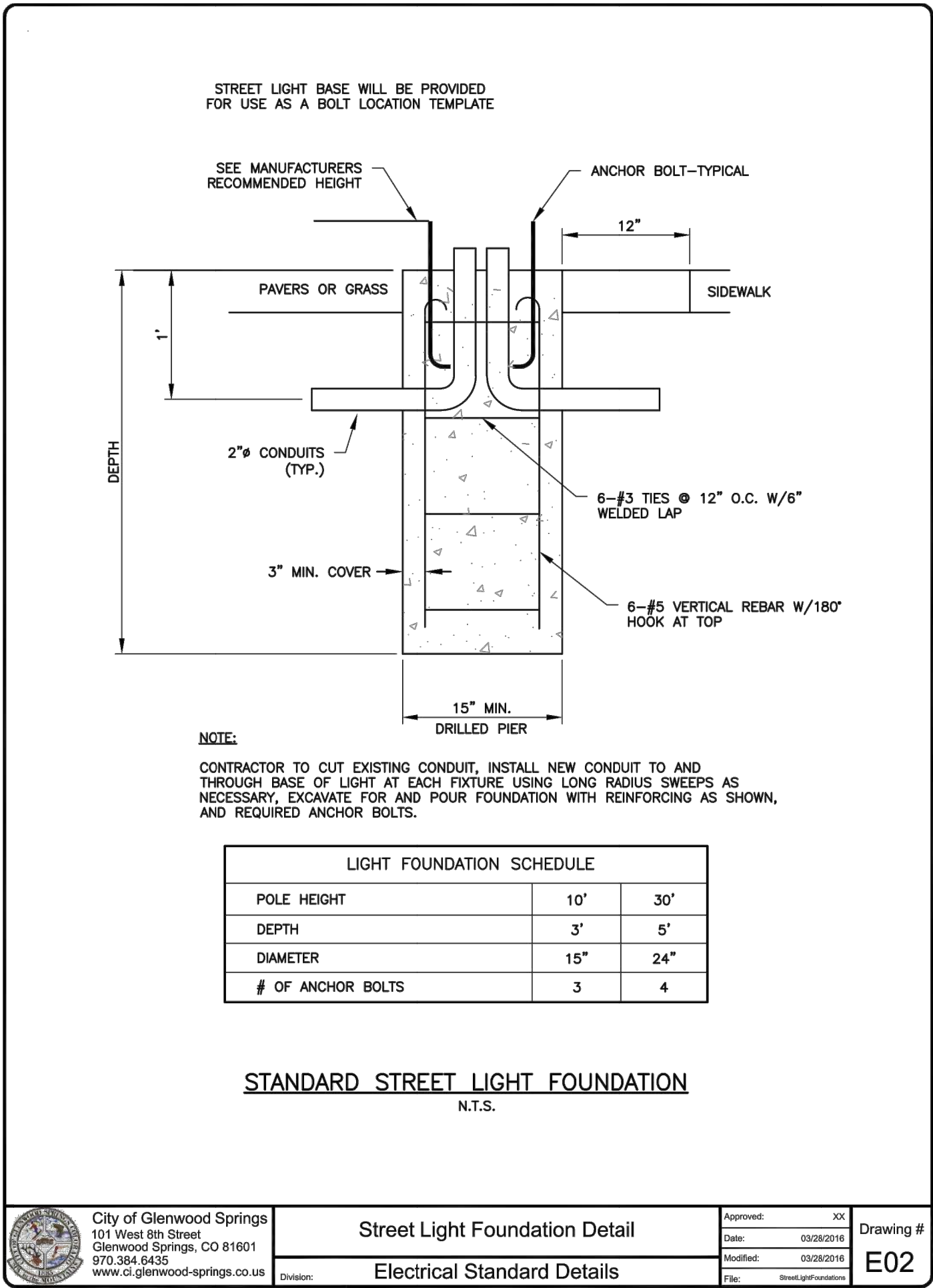
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Boudaries Civil Engineering Surveying & Beyond Unlimited Inc.
923 Cooper Ave., Ste. 201
Glenwood Springs, CO 81601
(T) 970.945.5252
www.bu-inc.com

Subsurface Utility Engineering (SUE)
Required Project: Yes
If "Yes", SUE Certification by:
Firm: 2018-208-004
Job #: SGM, Inc.
Date: July 2020

Engineer or Surveyor Seal
COLORADO LICENSED
01/26/21
37110
Professional Engineer

Client Information:
IRON MOUNTAIN HOT SPRINGS
281 CENTENNIAL STREET
GLENWOOD SPRINGS, CO 81601
970.945.4766

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

Centennial Street Lift Station (LS16000)
Civil-Details (2)
Construction Set

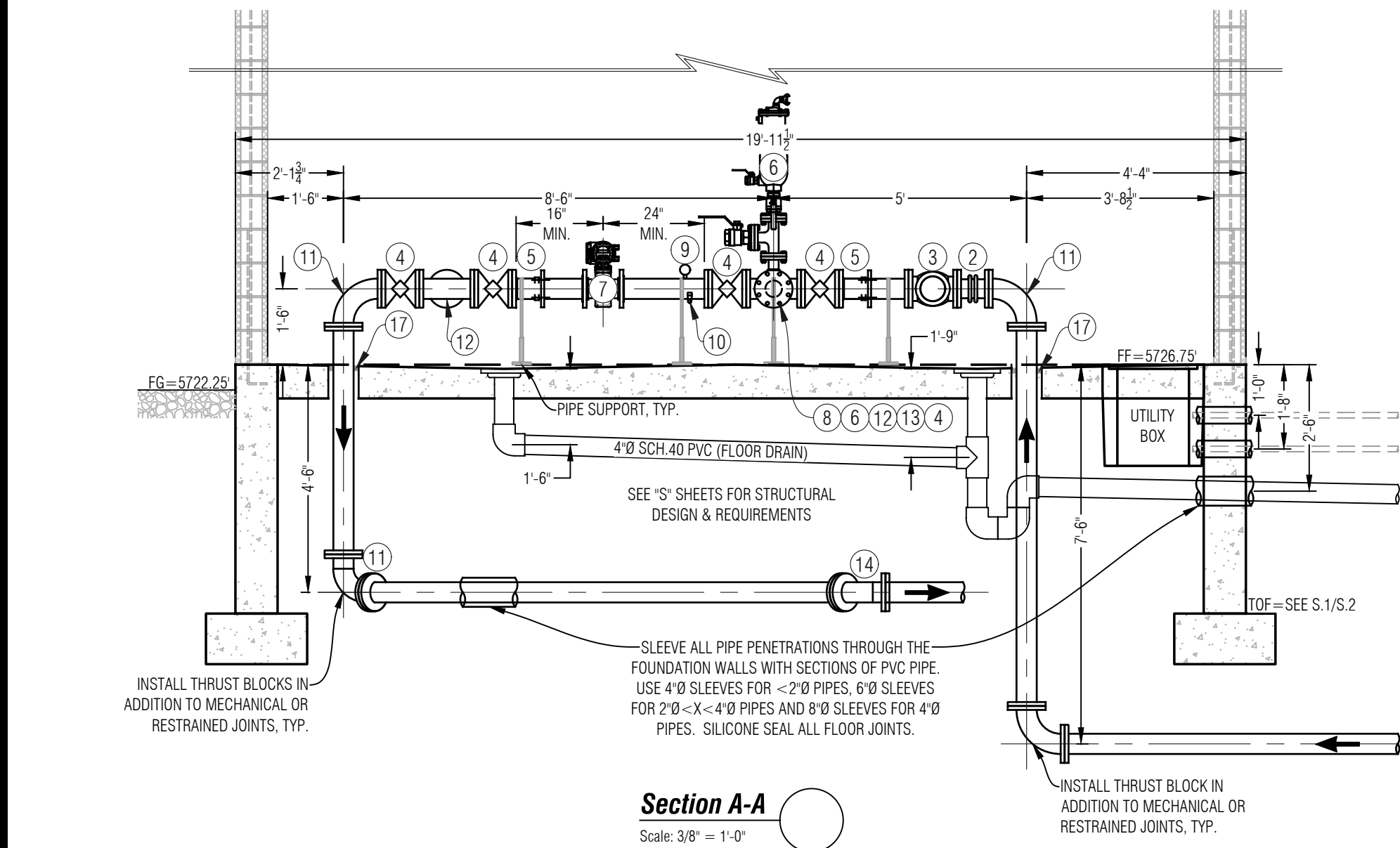
GLENWOOD SPRINGS, CO

By: [Signature]
Revision: [Signature]
Date: [Signature]
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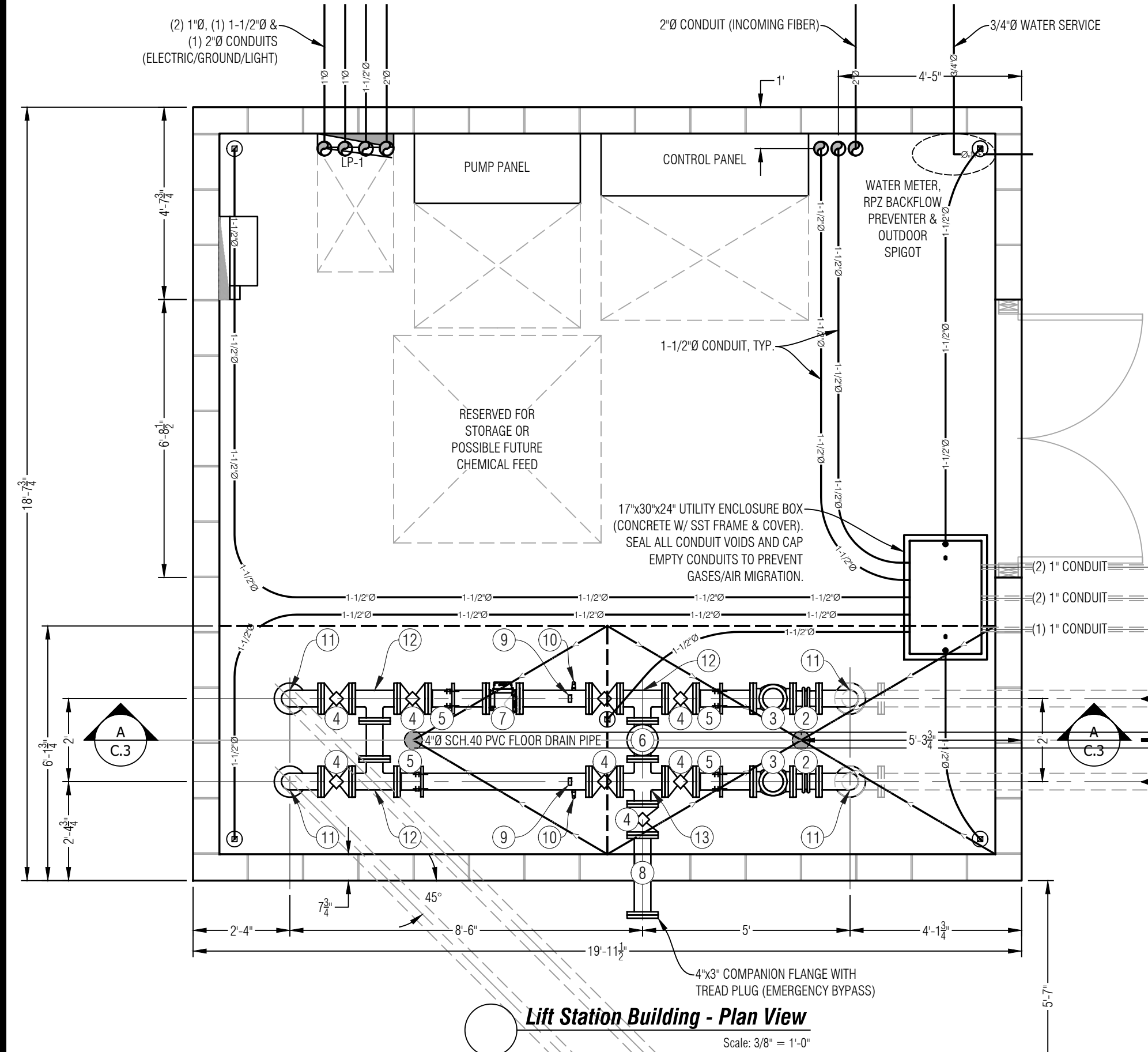
PROJECT NO.
17015-02
Designer:
DJW
Checker:
BUI
Date:
1/26/21

Sheet
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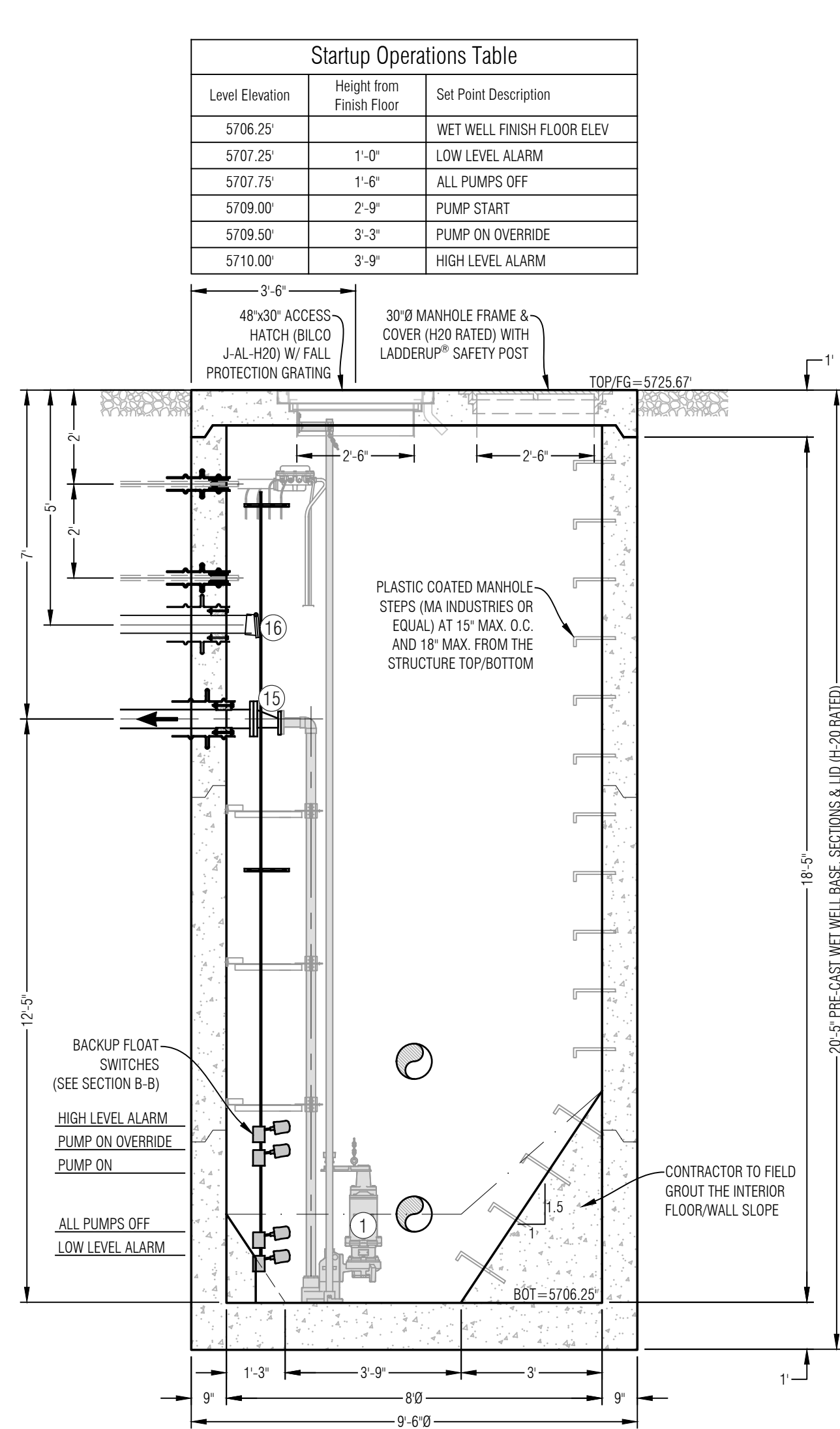
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Section A-A
Scale: 3/8" = 1'-0"



Lift Station Building - Plan View
Scale: 3/8" = 1'-0"

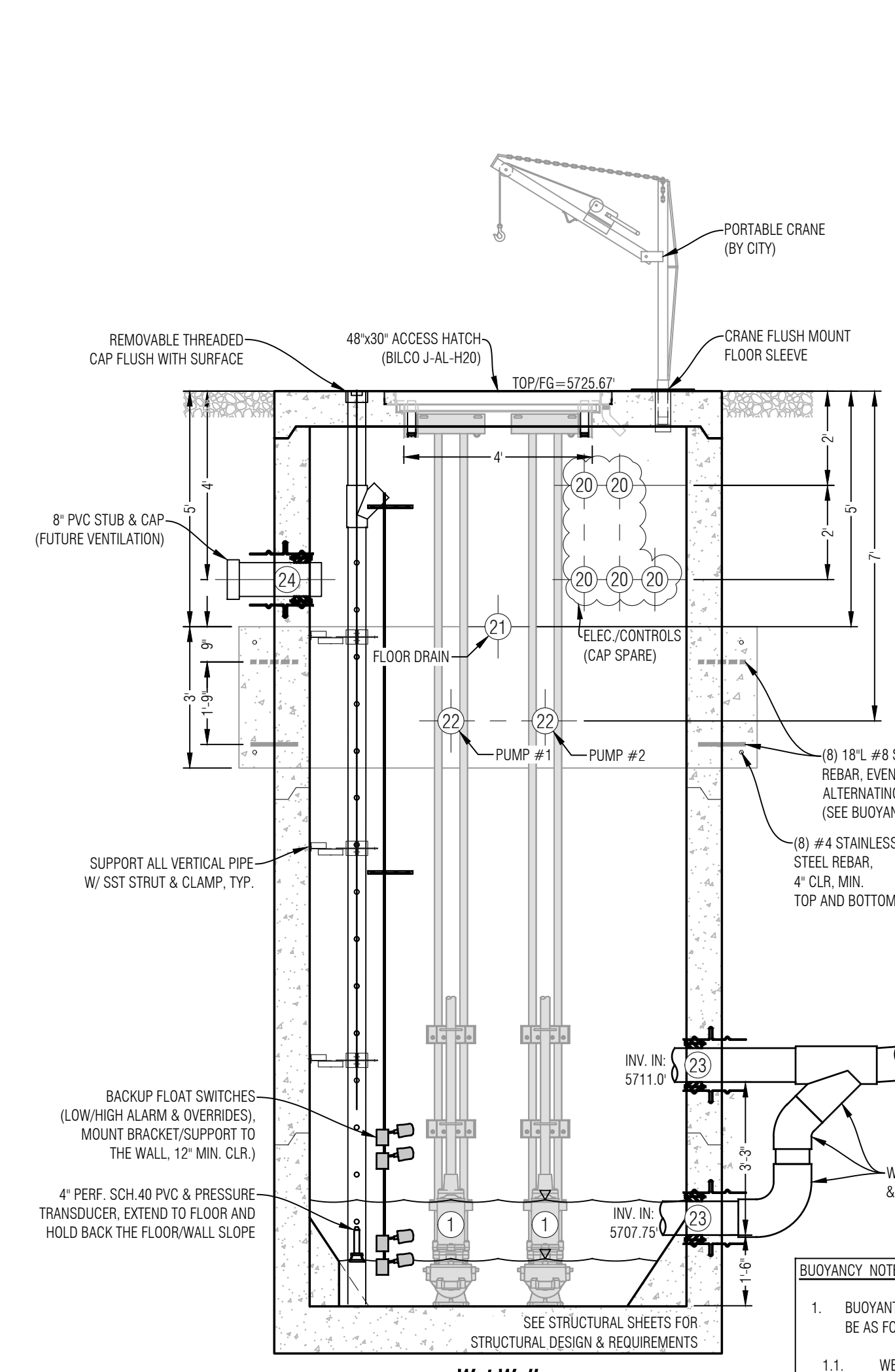


Wet Well
Section C-C
Scale: 3/8" = 1'-0"

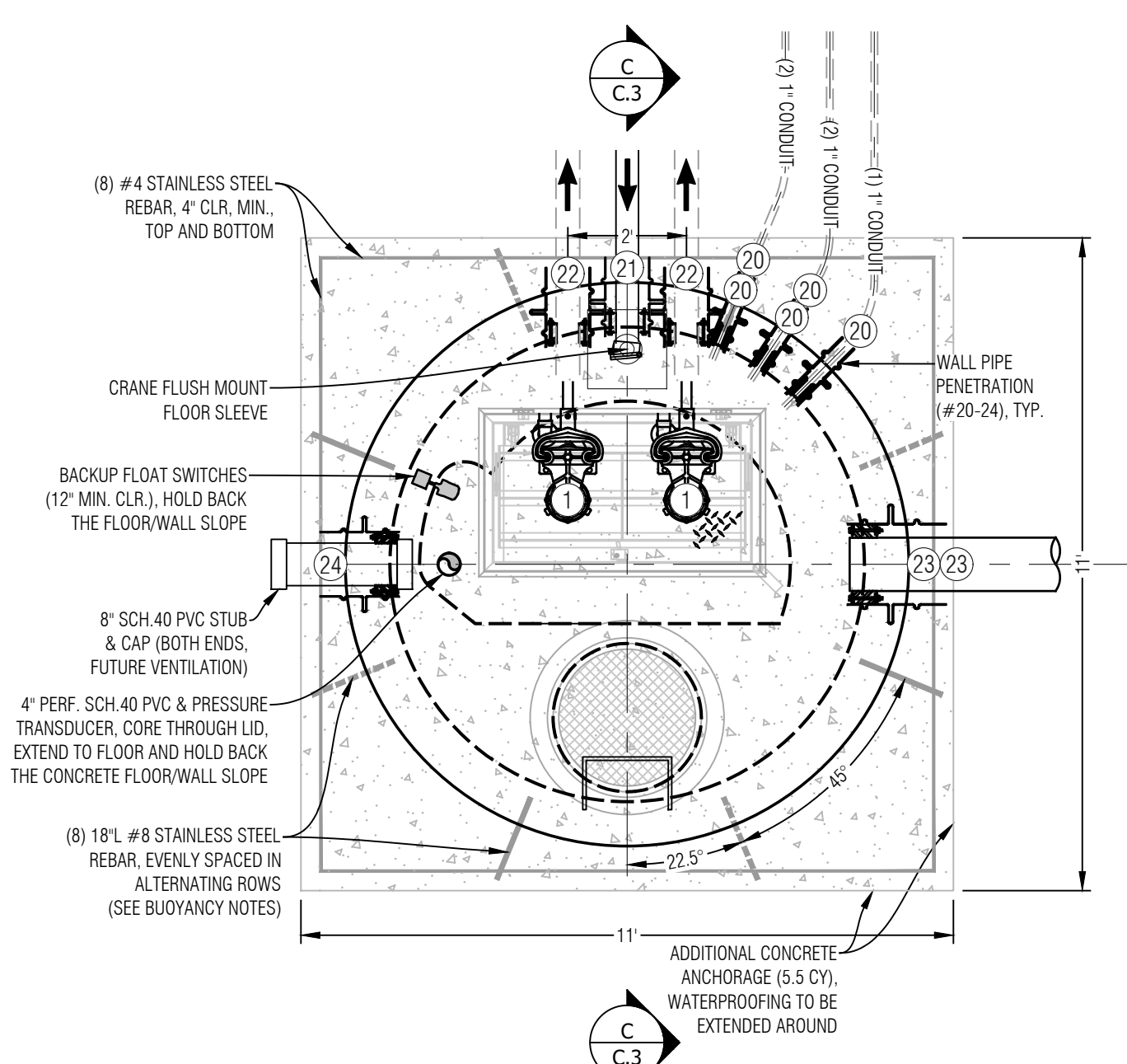
Pump System Legend	
Key	Description
①	SUBMERSIBLE WASTEWATER PUMP/MOTOR, QUICK REMOVAL SYSTEM & SLIDE RAIL (GRINDER PUMP, HAZARDOUS LOCATION)
②	4" EXPANSION JOINT (FL)
③	4" FLEXIBLE DISC CHECK VALVE (FL)
④	4" PLUG VALVE W/ WORM GEAR & HANDWHEEL (FL)
⑤	4" FCA
⑥	4"x1" TEE, 1" TEE, (2) 1" BLIND FLANGES W/ 1" THREADED TAPS, (2) 1" THREADED BRONZE FULL FLOW VALVES & 1" WASTEWATER COMBINATION AIR VALVE ASSEMBLY
⑦	4" MAGNETIC METER (FL)
⑧	4" EMERGENCY BYPASS STUB (FL)
⑨	PRESSURE GAGE
⑩	SAMPLE TAP
⑪	4" DIP 90° BEND (LR/FL)
⑫	4" DIP TEE (FL)
⑬	4" DIP CROSS (FL)
⑭	4" DIP 45° BEND (LR/ML)
⑮	4" x 3" ECCENTRIC REDUCER (FL)
⑯	4" PVC FLAP VALVE
⑰	MODULAR PIPE SEALS (SEE PIPELINE NOTE #5)
⑱	SLEEVE & MODULAR SEAL - 1" SCH. 80 PVC Century-Line (CS-3-16.0) W/ Link-Seal (LS-300-S-316-4) (Supplier to confirm sizing)
⑲	SLEEVE & MODULAR SEAL - 4" SCH. 40 PVC Century-Line (CS-8-16.0) W/ Link-Seal (LS-475-S-316-8) (Supplier to confirm sizing)
⑳	SLEEVE & MODULAR SEAL - 4" DIP Century-Line (CS-8-16.0) W/ Link-Seal (LS-475-S-316-8) (Supplier to confirm sizing)
㉑	SLEEVE & MODULAR SEAL - 10" SCH. 40 PVC Century-Line (CS-14-16.0) W/ Link-Seal (LS-400-S-316-11) (Supplier to confirm sizing)
㉒	SLEEVE & MODULAR SEAL - 8" SCH. 40 PVC Century-Line (CS-12-16.0) W/ Link-Seal (LS-475-S-316-12) (Supplier to confirm sizing)
NOTES:	
MODULAR SEAL SIZING/UNITS ARE AS PROVIDED BY TEN POINT SALES AND MARKETING, LLC. (303)-233-3883.	
SEE TECHNICAL SPECIFICATIONS FOR ALL PRODUCT AND MATERIAL REQUIREMENTS.	

- PIPELINE NOTES:
- ALL WASTEWATER PIPE AND FITTINGS FROM THE PUMPS TO THE EXISTING FORCE MAIN SHALL BE FLANGE DUCTILE IRON OR C900 PVC (CL305/DR-14) INSTALLED PER PROJECT/CITY SPECIFICATIONS AND MANUFACTURER RECOMMENDATIONS FOR WASTEWATER TRANSPORT UNDER PRESSURE.
 - FLOOR DRAIN SHALL BE EQUIPPED WITH A WATER SENSOR ALARM.
 - MECHANICAL AND ELECTRICAL CONDUIT AND FITTINGS SHALL BE ELECTRIC GRADE SCH. 80 PVC. ALL BENDS SHALL BE LONG RADIUS OR SWEEP BENDS.
 - NOT ALL PIPE SUPPORTS ARE SHOWN. SEE SPECIFICATIONS. FLOOR PIPE SUPPORT SHALL BE TWO PIECE FULL CIRCLE SADDLE CLAMP MATCHING THE PIPE DIAMETER AND HAVE A 1/2" NEOPRENE GASKET GLUED TO THE SADDLE. THREADED STUD, STANCHION AND BASE PLATE SIZING SHALL BE. SHALL BE BASED PLATE SHALL BE 10"x10" MINIMUM AND ANCHORED TO THE FLOOR WITH (4) 5/8" SS316 EXPANSION ANCHORS. EMBED ANCHORS 5" MIN AND EPOXY GROUT IN PLACE. COMPONENTS SHALL BE PAINTED TO MATCH THE PIPING.
 - PIPE SEALS SHALL BE USED FOR ALL WASTEWATER PIPE FLOOR PENETRATIONS.

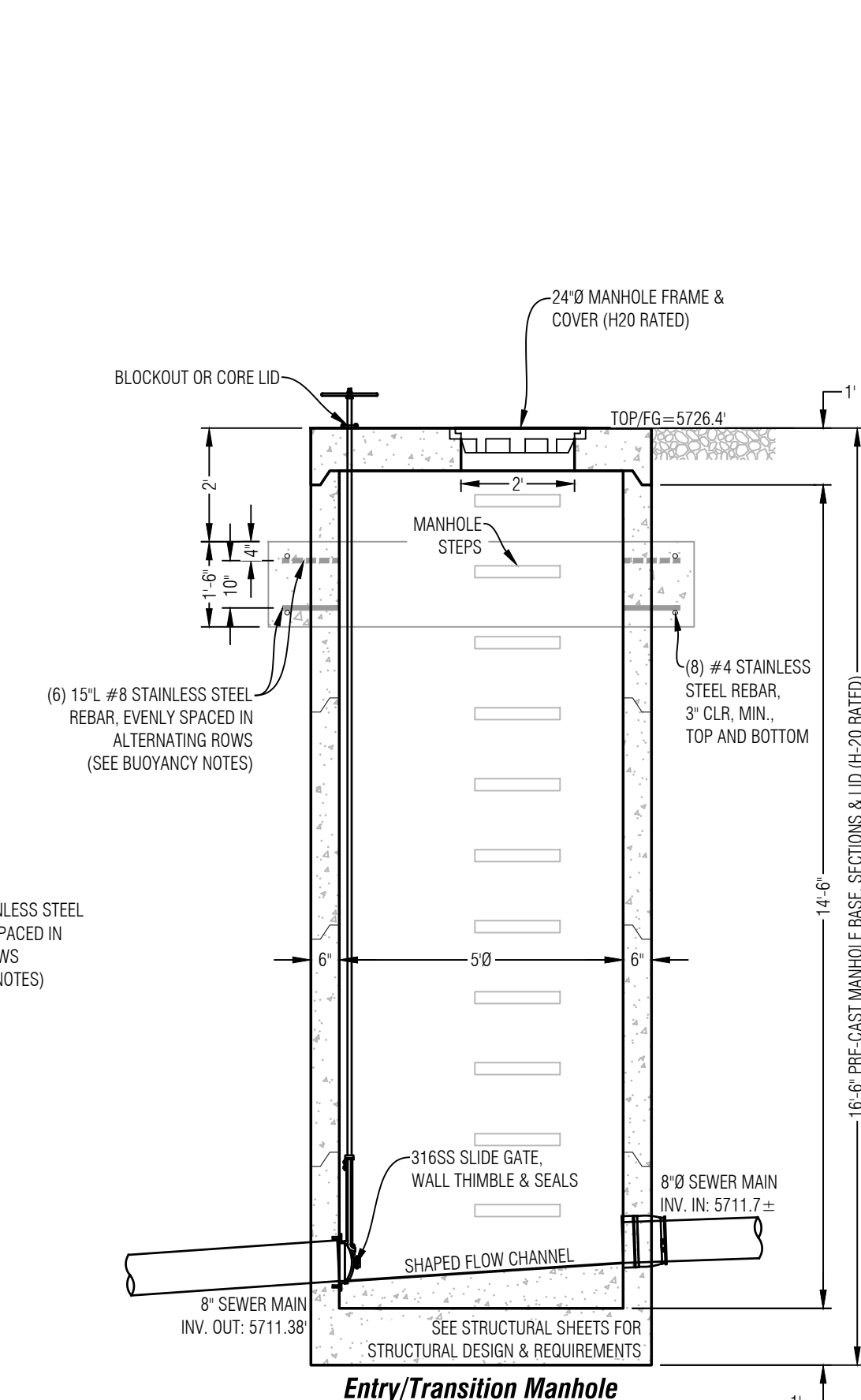
- MANHOLE/WET WELL NOTES:
- MANHOLE AND WET WELL SHALL BE PRE-CAST CONCRETE AS DIMENSIONED OR AS APPROVED BY THE ENGINEER OF RECORD.
 - CONCRETE MANHOLES, INLETS AND OTHER STRUCTURES SHALL BE PRE-CAST USING TYPE V (OR EQUIVALENT) SULFATE RESISTANCE CONCRETE CEMENT WITH XYPEX CRYSTALLINE ADDITIVE. ALL CONCRETE WORK SHALL COMPLY WITH THE LATEST ACI-318 SPECIFICATIONS.
 - SANITARY SEWER MANHOLE BOTTOM SURFACE, EXTERIOR WALLS AND INTERIOR WALLS AND FLOOR SHALL BE LINED WITH REINFORCED FLEXIBLE PVC MEMBRANE LINER THAT OFFERS H₂S GAS AND CHEMICAL RESISTANCE FOR PRECAST CONCRETE PRODUCTS.
 - MANHOLE STEPS SHALL BE PLASTIC COATED MA INDUSTRIES OR ENGINEER APPROVED EQUAL.
 - MANHOLE AND WET WELL BEDDING AND BACKFILL SHALL BE IN CONFORMANCE WITH CITY STANDARDS FOR MANHOLE INSTALLATION.



Wet Well
Section B-B
Scale: 3/8" = 1'-0"



8'0" Concrete Wet Well - Plan View
Scale: 3/8" = 1'-0"



Section B-B
Scale: 3/8" = 1'-0"

- BUOYANCY NOTES:
- BUOYANT FORCES FOR EACH STRUCTURE SHALL BE AS FOLLOWS:
 - WET WELL: 108,436 LBS. MIN.
 - TRANSITION MANHOLE: 34,935 LBS. MIN.
 - ADDITIONAL ANCHORAGE WEIGHT SHALL BE SECURED WHERE SHOWN USING 12"L x 1"x1" 316SS REBAR DRILLED AND GROUTED INTO THE EXISTING STRUCTURE. RIBBED REBAR ARE REQUIRED. DO NOT USE SMOOTH BARS.
 - CONCRETE USED FOR ANCHORAGE WEIGHT SHALL BE FORMED AND BE TYPE V (OR EQUIVALENT) SULFATE RESISTANCE CONCRETE CEMENT WITH XYPEX CRYSTALLINE ADDITIVE.

Civil Engineering
Surveying
& Beyond

Boundaries Unlimited Inc.

923 Cooper Ave., Ste. 201
Glenwood Springs, CO 81601
(770) 945.5252
www.bu-inc.com

Subsurface Utility Engineering (SUE)
Required Project: Yes
If Yes: SUE Certification by:
Firm: 2018-208-004
Job #: SGM, Inc.
Date: July 2020
Engineer or Surveyor Seal
Colorado Licensed
Professional Engineer
01/26/21
37110
Client Information:
IRON MOUNTAIN HOT SPRINGS
281 CENTENNIAL STREET
GLENWOOD SPRINGS, CO 81601
970.945.4766

NORTH

0 1' 2'

Scale: See Plan

811

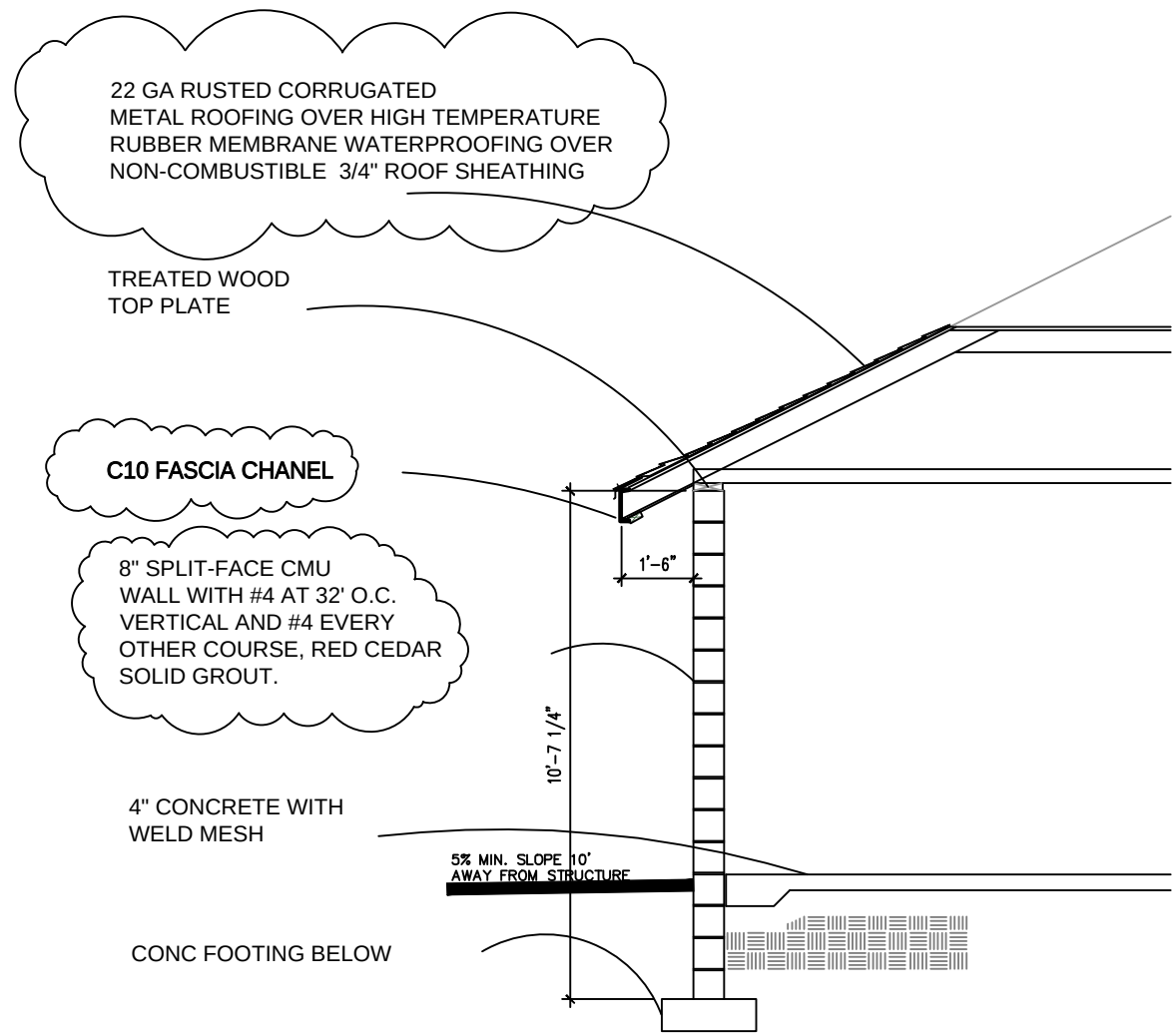
Know what's below.
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Centennial Street Lift Station (LS16000)
Civil-Facility Piping Plan
Construction Set

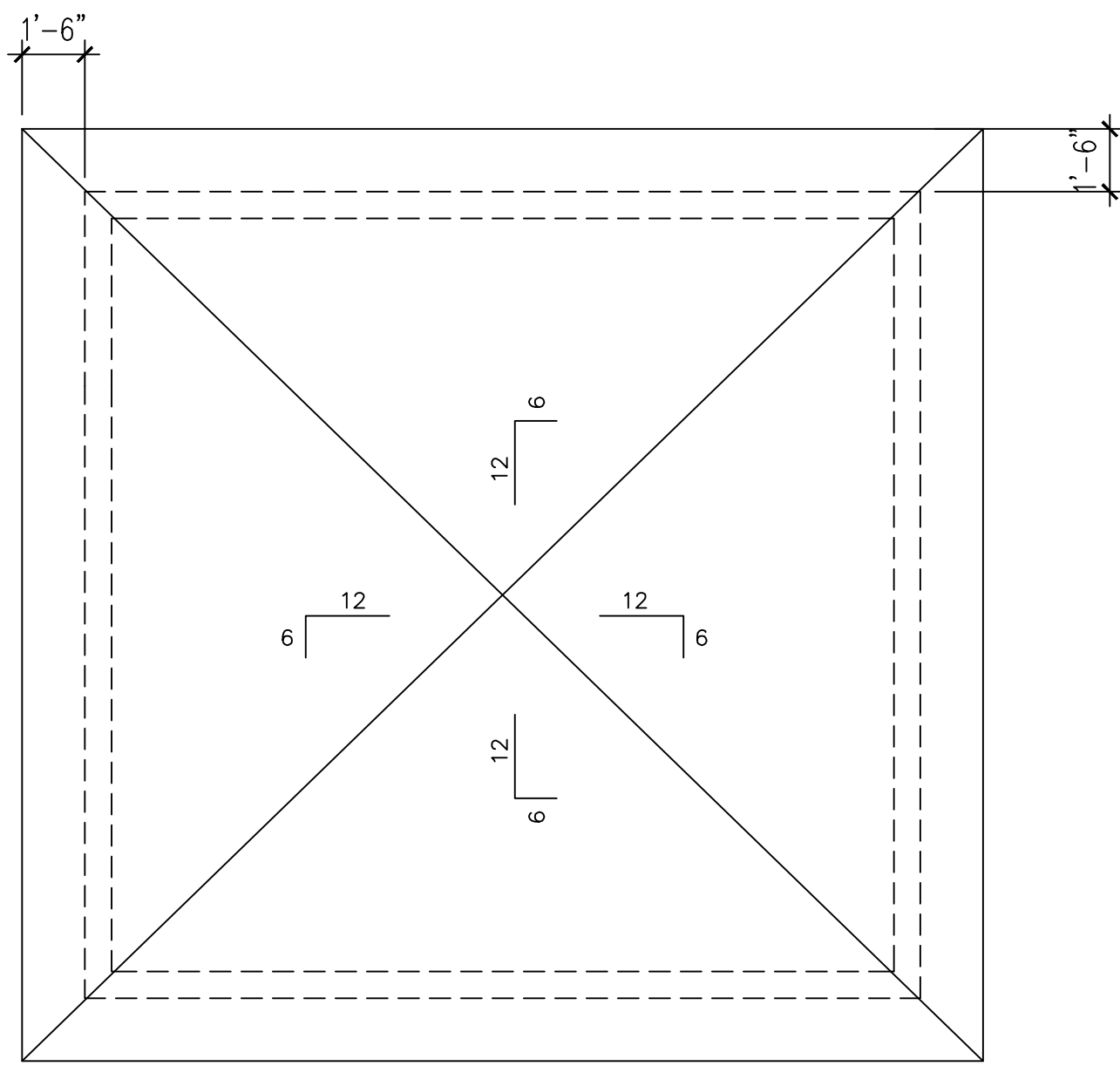
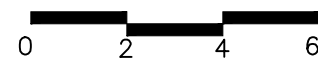
By: Revision: Date: No. 1 2 3 4 5 6 7 8 9

PROJECT NO.
17015-02
Designer:
DJW
Checker:
BUI
Date:
1/26/21
Sheet
C.8
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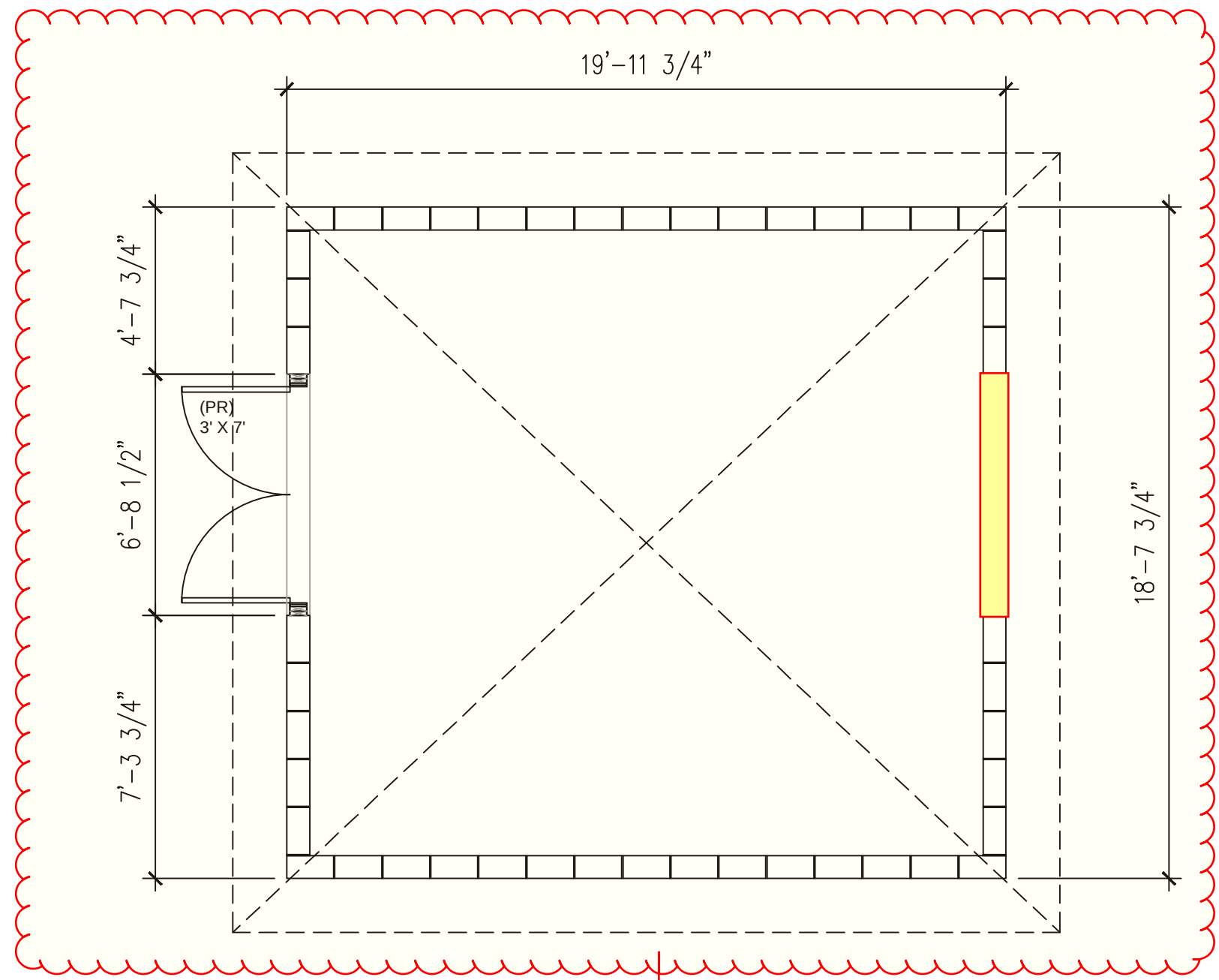
Packet Page 78



LIFT STATION WALL SECTION



LIFT STATION - ROOF PLAN

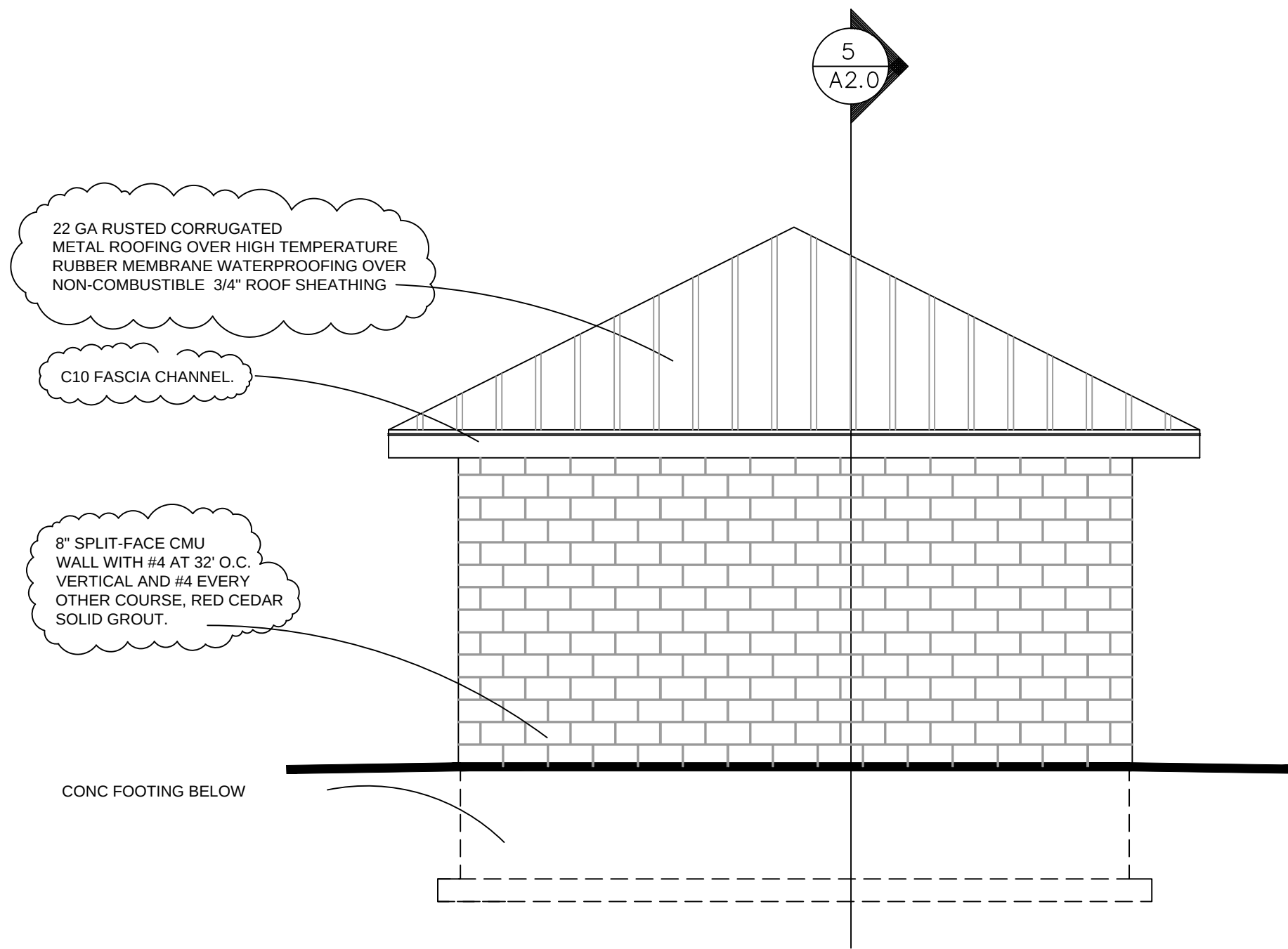


LIFT STATION - FLOOR PLAN

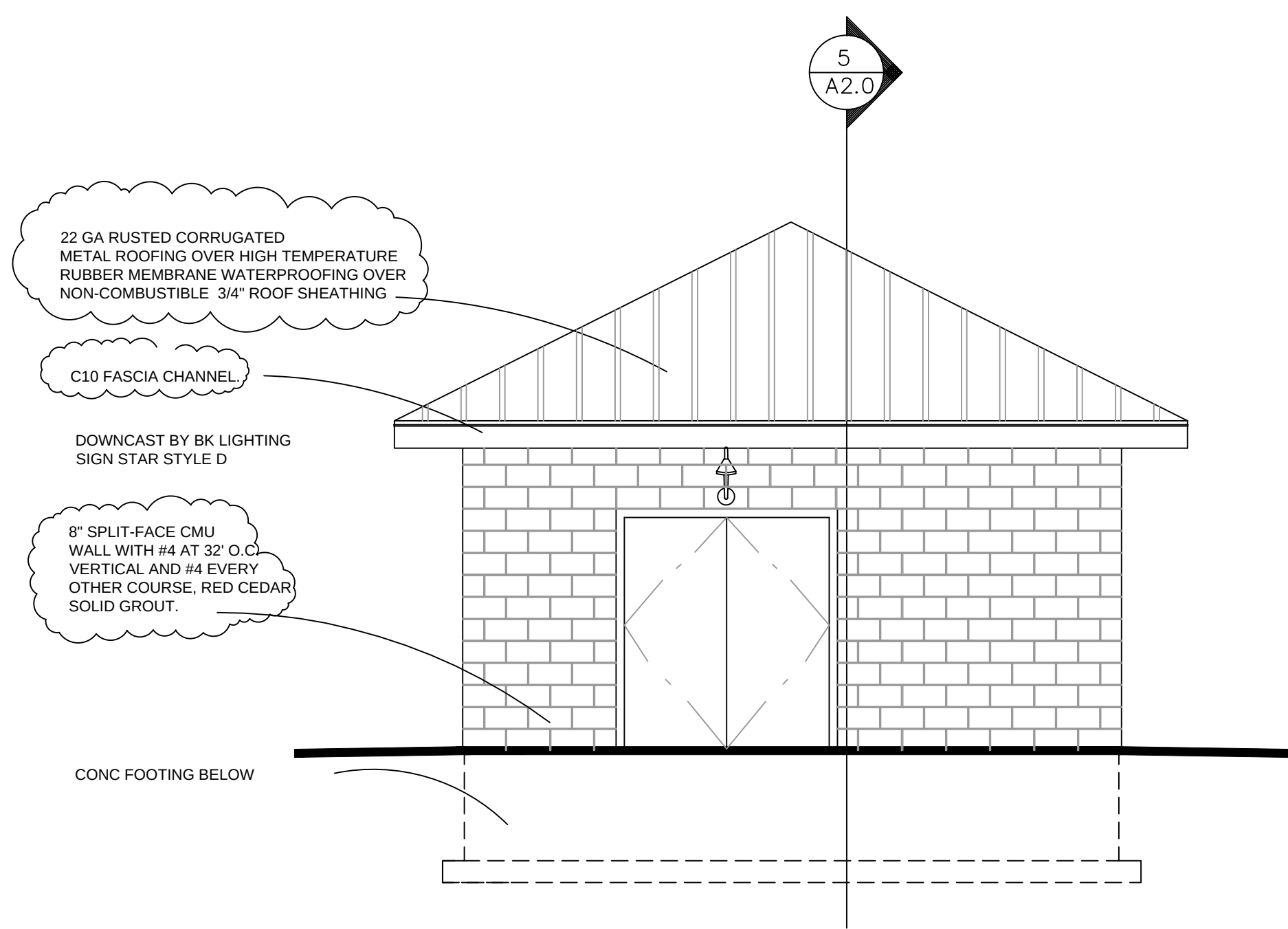


Note:
This Plan was modified by
Boundaries Unlimited Inc.
on 12/30/20 as follows:
Building mirrored.

Building is to be mirrored so
that the doorway is on the
east side of the building



LIFT STATION - ELEVATION



LIFT STATION - ELEVATION



©2016 TRIUMPH

Sheet

Date: 8/08/2019

Project No:

Drawn by: MEF

Checked by: MEF

A2.0

Sheet title
LIFT STATION
NEW PLANS

Revisions:
RED LINES
9-27-19

IRON MOUNTAIN HOT SPRINGS
281 CENTENNIAL STREET

GLENWOOD SPRINGS, CO 81601

TRIUMPH

Vail Office
12 Vail Road,
suite 700
Vail, CO 81657
Tel: 970.478.9990
www.triumphdev.com

GENERAL STRUCTURAL NOTES

GENERAL REQUIREMENTS

1. Design is based on the 2015 edition of the International Building Code (IBC).
2. Design Live Loads:
 - a. Roof (Snow)..... 40PSF
 - b. Residential Floors..... 40PSF
 - c. Wind..... 90 MPH Basic Wind Speed, 3 second gust 115 MPH Ultimate Wind Speed
3. All dimensions, elevations and details on structural documents shall be verified against the architectural documents prior to construction or fabrication.
4. The contract structural documents and specifications represent the completed structure. The contractor shall provide all measures necessary to protect the structure and existing adjacent structures and utilities.
5. Coordinate all openings through floors, walls and roofs with Mechanical and Electrical Contractors. Notify Engineer of any openings to be cut in structural systems.

FOUNDATIONS

1. Foundation Design is based on Soils Report #GS-05875-145 by H-P Kumar Geotechnical, Inc., dated June 24, 2014. Maximum design soil bearing capacity: 1000 PSF. The Contractor shall review the Soils Report and follow all recommendations therein, including, but not limited to excavation, site conditions, drainage, backfill and compaction, slab-on-grade construction, drainage systems, and site inspection requirements.
2. All footings shall be on undisturbed natural bearing materials or compacted structural fill. Compactive effort for structural fill shall be in accordance with the Soils Engineer's recommendations. Bearing soils (natural and compacted) shall be inspected and approved by the Soils Engineer prior to placement of footings.
3. Avoid excessive wetting or drying of the excavation, keeping the excavation reasonably free of water during placement of concrete for footings.
4. General Requirements:
 - a. Foundation walls with backfill on only one wall face shall have all supporting framing systems or temporary bracing in place prior to placing backfill (unless noted otherwise on plan).
 - b. Backfill on walls with fill on both sides to be compacted in equal lifts each side of wall.

- a. Foundation walls with backfill on only one wall face shall have all supporting framing systems or temporary bracing in place prior to placing backfill (unless noted otherwise on plan).
- b. Backfill on walls with fill on both sides to be compacted in equal lifts each side of wall.

CONCRETE AND REINFORCING STEEL

1. All concrete shall attain 3500 PSI compressive strength within 28 days except as follows:
Concrete for exterior flatwork and interior flatwork shall attain 4000 PSI compressive strength within 28 days.
2. Use Type V Portland Cement (ASTM C150) with CDOT Class 3 sulfate resistance and 4-6% air entrainment. Concrete aggregate to be normal weight (stone). (Building foundation/floor excluded).
3. All concrete shall have a water/cement ratio = 0.40 (by weight), maximum. All concrete shall have "Xypex Admix C-Series" (Mfr = Xypex Chemical Corp.).
4. Submit concrete mix designs for review and approval prior to construction.
5. Perform all cast-in-place concrete work in accordance with "Specifications for Structural Concrete for Buildings," ACI 301-84, unless noted otherwise. Provide hot or cold weather protection per ACI 305 or 306.
6. Reinforcing steel shall conform to ASTM A615:
#4 and smaller... Grade 40; #5 and larger... Grade 60
7. Horizontal reinforcing steel shall be made continuous by lapping bars a minimum of 32 bar diameters at all splices and providing corner bars. Fabrication and installation of reinforcing steel shall conform to ACI 315.
8. Provide accessories necessary to properly support reinforcing at the positions shown on the documents.
9. Calcium chloride or admixtures containing more than 0.05% chloride ions or thiocyanates are not permitted.
10. Do not place pipes, ducts or chases in structural concrete without prior approval of the Structural Engineer.

STRUCTURAL WOOD FRAMING

- A. DIMENSIONAL LUMBER
1. All timber construction (light and heavy) shall conform to American Institute of Timber Construction (AITC) and National Design Specification (NDS) standards.
2. Structural framing lumber shall be Hem-lok Fir, with the following minimum grades:

Plates and Studs:	#2
Joists and Rafter:	#2
3. All sill plates in contact with concrete or masonry foundation shall be Foundation Grade Redwood or Pressure Treated Hem-Fir #2 or better, designated for "Above Ground" usage as defined by the American Wood Preserver's Institute.

B. FASTENERS AND CONNECTORS

1. All timber nailing and connections shall conform to IBC and AITC. Reference IBC Table No. 2304.4.1; Fastening Schedule.
2. Metal connectors for wood framing are manufactured by the Simpson Strong-Tie Company; connectors with nails shorter than common as follows:
8d x 1 1/4"; 10d x 1 1/2"; 16d x 2 1/2", unless noted otherwise.
3. Alternate connections and fasteners to those listed above, which have I.C.C. approval, may be used upon approval by the Engineer.
4. Lag screw connections, including lead holes, pilot holes, and screw installation, shall conform to NDS.
5. Bolts for wood member connections shall be ASTM A307 with minimum 1/2" diameter washer each end, unless noted otherwise. Do not countersink bolts unless noted otherwise.

WOOD ROOF TRUSSES

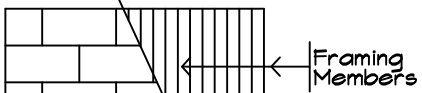
1. Provide open web trusses as profiled on the documents to safely support the indicated dead and live loads.
2. Truss manufacturer shall be a member of the Truss Plate Institute (TPI) and Component Manufacturer's Council. Trusses shall be designed by a Professional Engineer employed by the manufacturer.
3. Lumber for trusses shall be of the species and grade as required by the Engineer's design. Grade stamp each piece.
4. Manufacture and install press-fit metal plates complying with TPI-T4.
5. Manufacturer shall submit shop drawings to Architect for review and approval. Shop drawing shall indicate truss pitch, span, and spacing; gage, size and location of connectors; bearing and anchorage details, truss-to-truss connections, bridging and permanent bracing details; and all related items.
6. Submit shop drawings to the engineer for review and approval.
7. Submit design calculations, bearing the seal of the Manufacturer's Engineer, with the shop drawings, indicating species and grade of lumber, design loadings, and force analysis of each member and design of each connection.
8. Fabricate trusses according to approved shop drawings. Provide trusses and all related items required for erection, to include blocking, bridging and permanent bracing.
9. Snow load duration factor..... 1.0
a. Truss top chord dead load..... 12.0 PSF
b. Truss bottom chord dead load..... 10.0 PSF

REINFORCED UNIT MASONRY

1. Masonry unit design, manufacture and installation shall conform to standards set by the Masonry Institute of America.
2. Assembled masonry to develop 1500 PSI ultimate compressive strength (Fm) in 28 days. Special inspection not required.
3. Concrete masonry units shall conform to ASTM C90, Grade 'N', Type I, lightweight block.
4. Mortar shall be Type 'N' or 'S'. Mortar shall attain 1800 PSI compressive strength within 28 days.
5. Grout shall attain 2000 PSI compressive strength within 28 days.
6. Reinforcing bars to be deformed bars, minimum yield strength = 40 KSI. Lap reinforcing bar splices 40 bar diameters unless otherwise noted.
7. Reinforce all bond beams with 2- #4 continuous, unless otherwise noted.
8. Provide continuous horizontal ladder type Dur-O-Wall reinforcing at 16' on center, unless otherwise noted. Lap joints minimum 8".
9. Grout all reinforced cells and bond beams solid. Grout all cells below grade solid, unless otherwise noted.

SHEATHING NOTES

1. Sheathings shall be American Plywood Association (APA). Exposure I, C-D plywoods or oriented strand board (O.S.B.) as follows:
Roofs..... 5/32" thick, APA rated sheathing, 32/16. Provide Plyclips midway between rafters at unsupported sheet edges.
Walls..... 7/16" thick, APA rated sheathing, 24/0, all edges blocked.
2. Sheath exterior face of all exterior frame walls with APA sheathing unless noted otherwise on structural drawings.
3. Do not block floor and roof sheathing edges unless noted.
4. Roof sheathing layout:

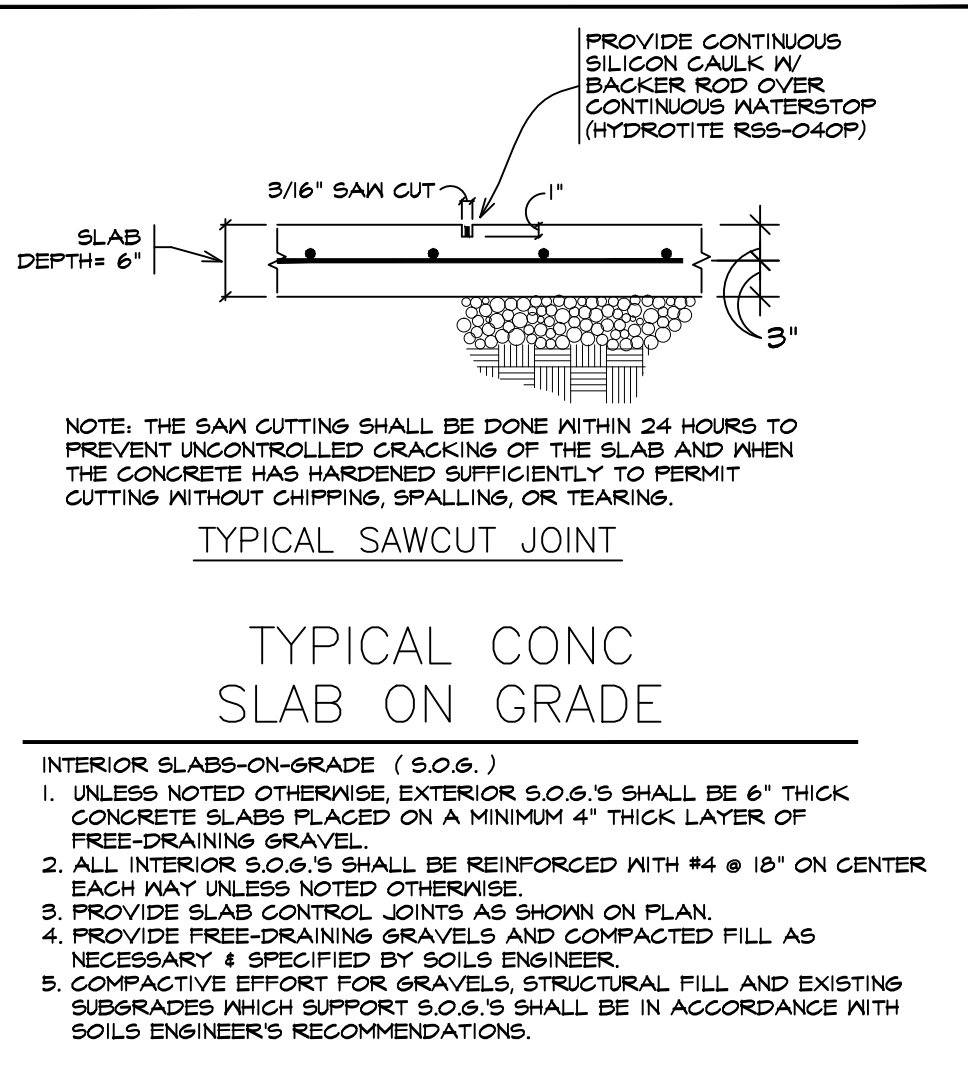


5. NAILING

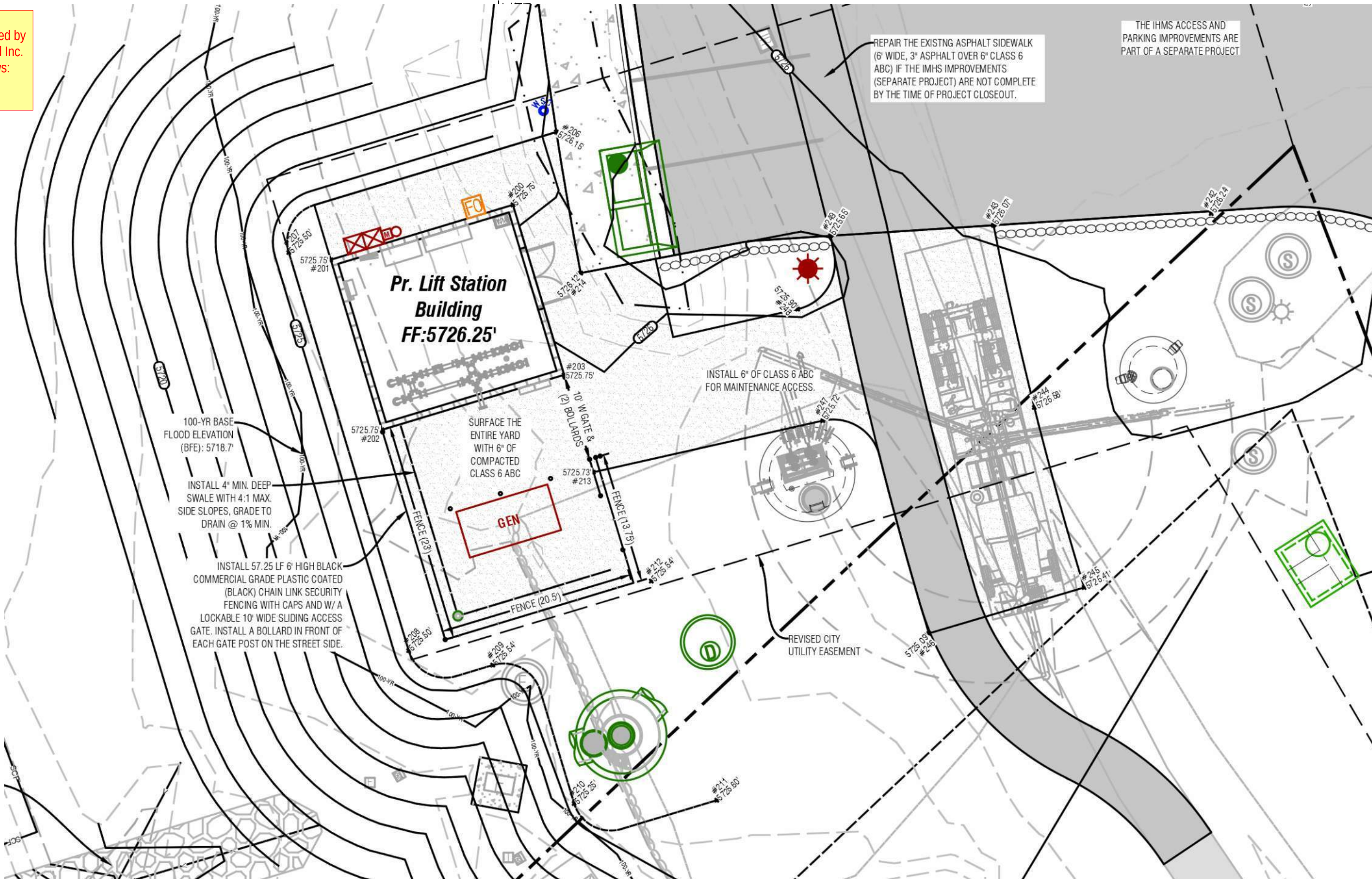
USE	NAILS (Deformed shank)	NAIL SPACING @ Interm. Supports	@ Sheet Edges	COMMENTS
Roof	2d (131" Ø)	12"	6"	
Wall	2d (131" Ø)	12"	6"	

Note:

1. Nail diameter of .131" is equivalent to 2d common or 12d sinker nails. Mechanically driven nails of equal or greater diameter which penetrate the framing members at least 1 3/4" may be used.

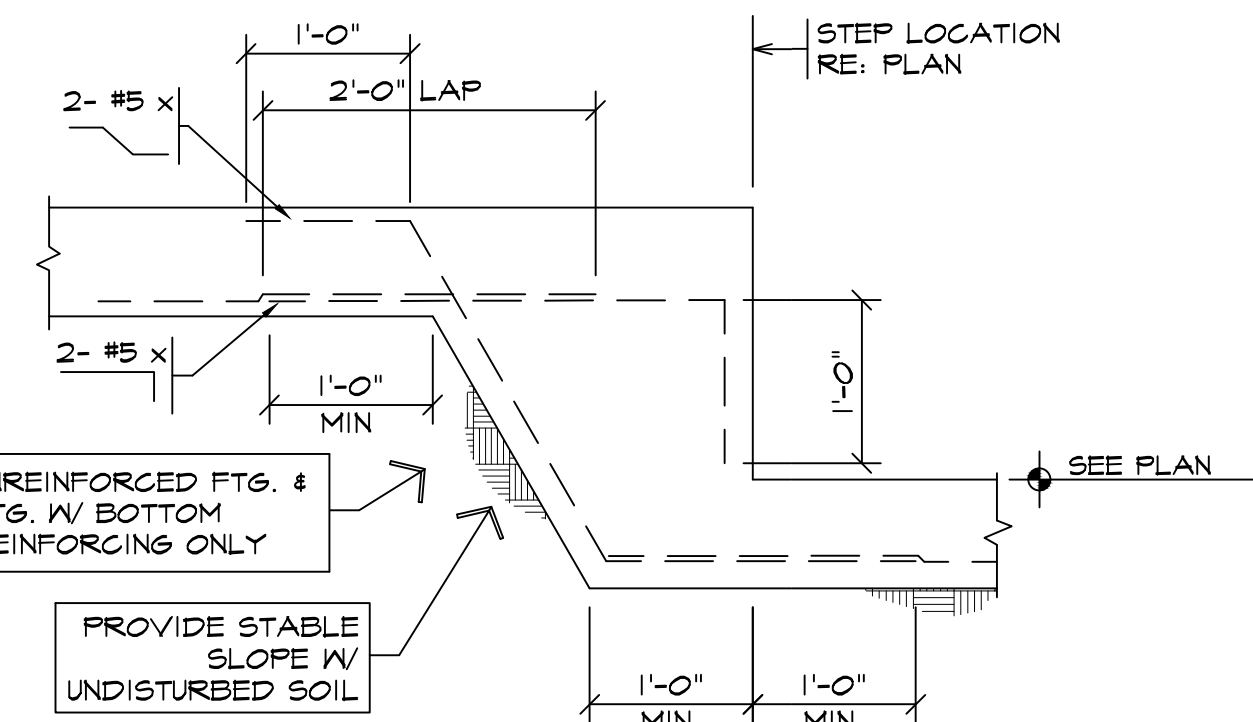
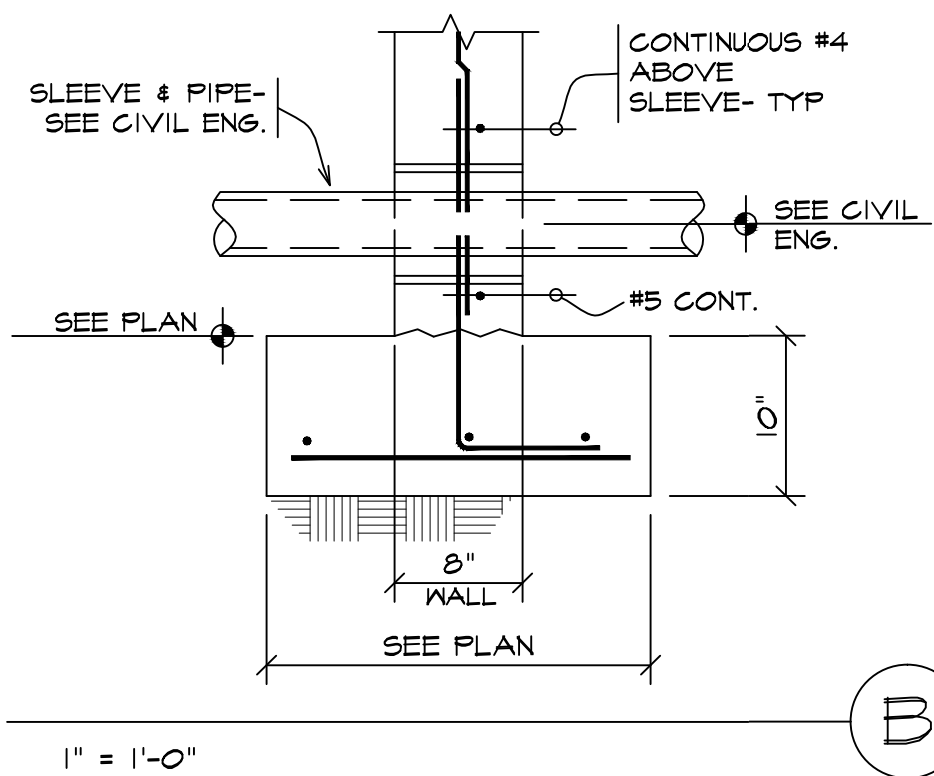
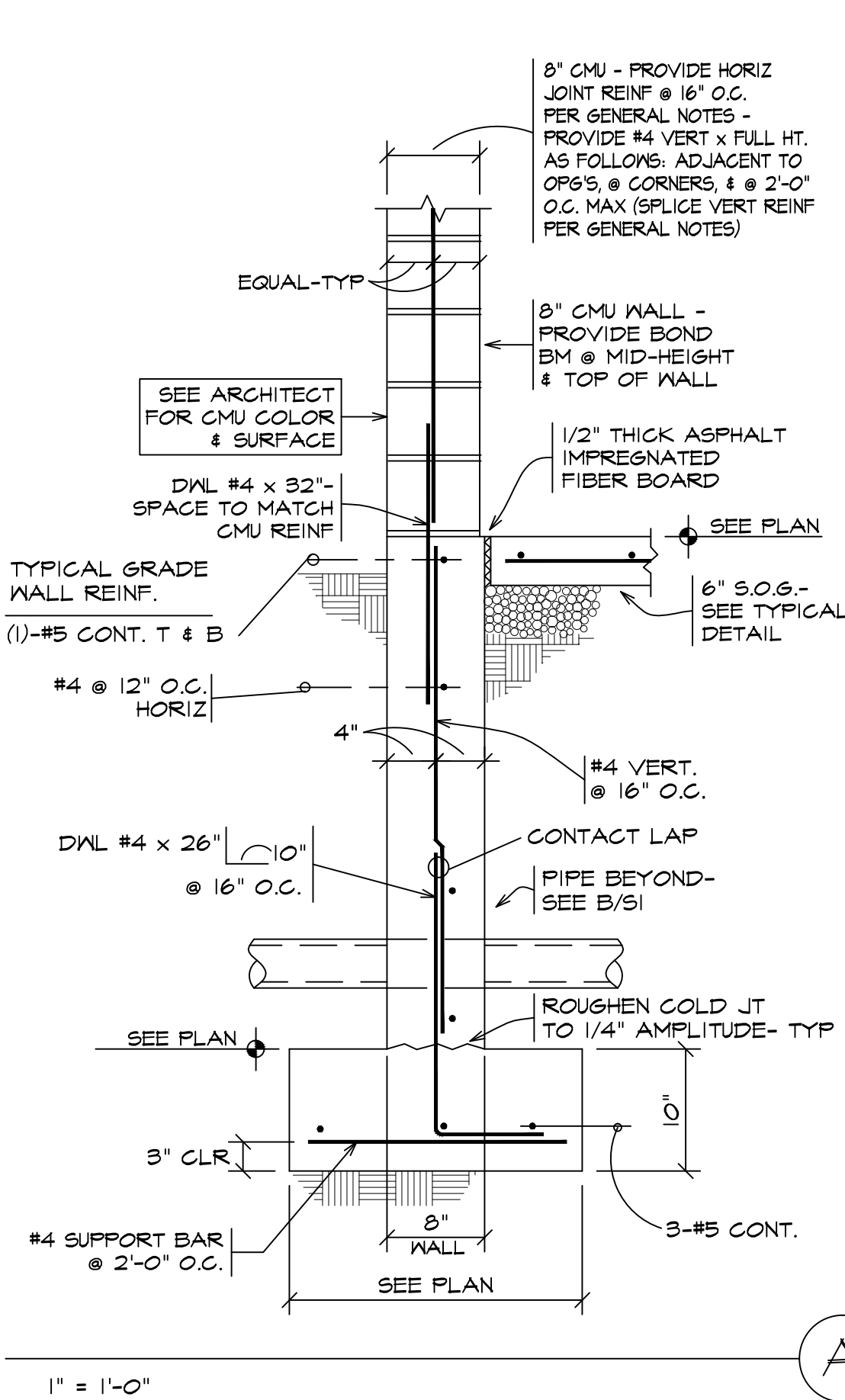


Note:
This Plan was modified by
Boundaries Unlimited Inc.
on 12/30/20 as follows:
Key Plan replaced



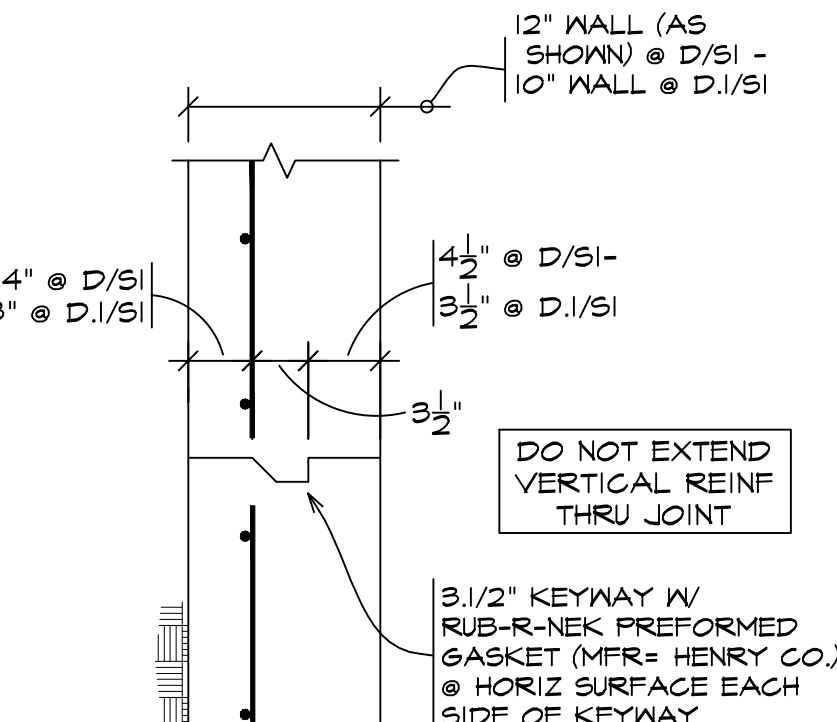
KEY PLAN

1" = 10'-0"



TYPICAL FTG. STEP DETAIL
TRANSVERSE REINFORCING NOT SHOWN

NO SCALE



HORIZ CONTROL JOINT

1" = 1'-0"



KURTZ &
ASSOCIATES,
INC.

5012 COUNTY RD. 154
GLENWOOD SPRINGS,
COLORADO
(970) 945-6805

IRON MOUNTAIN
HOT SPRINGS
LIFT STATION

281 CENTENNIAL ST.
GLENWOOD SPRINGS,
COLORADO

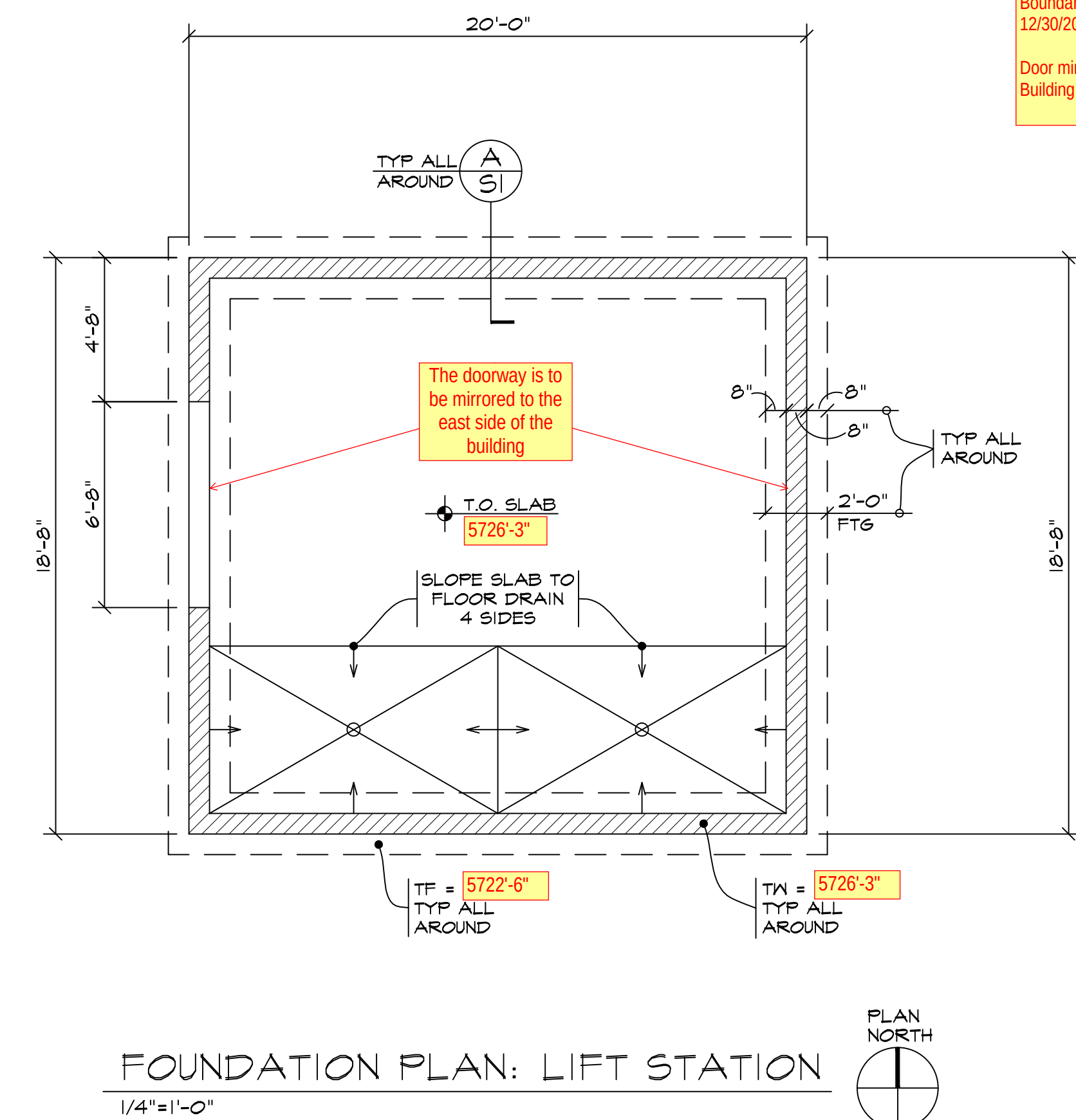
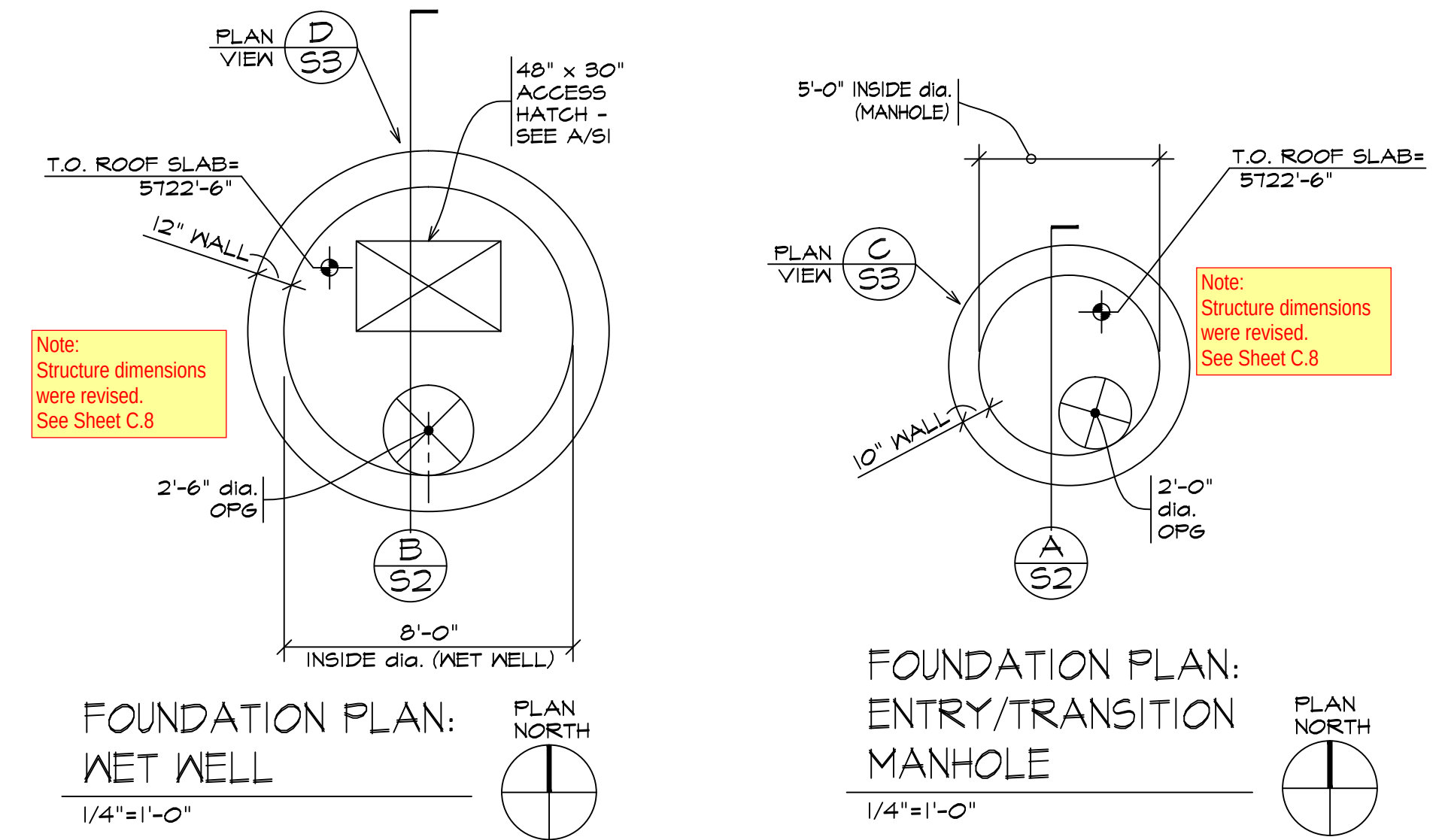
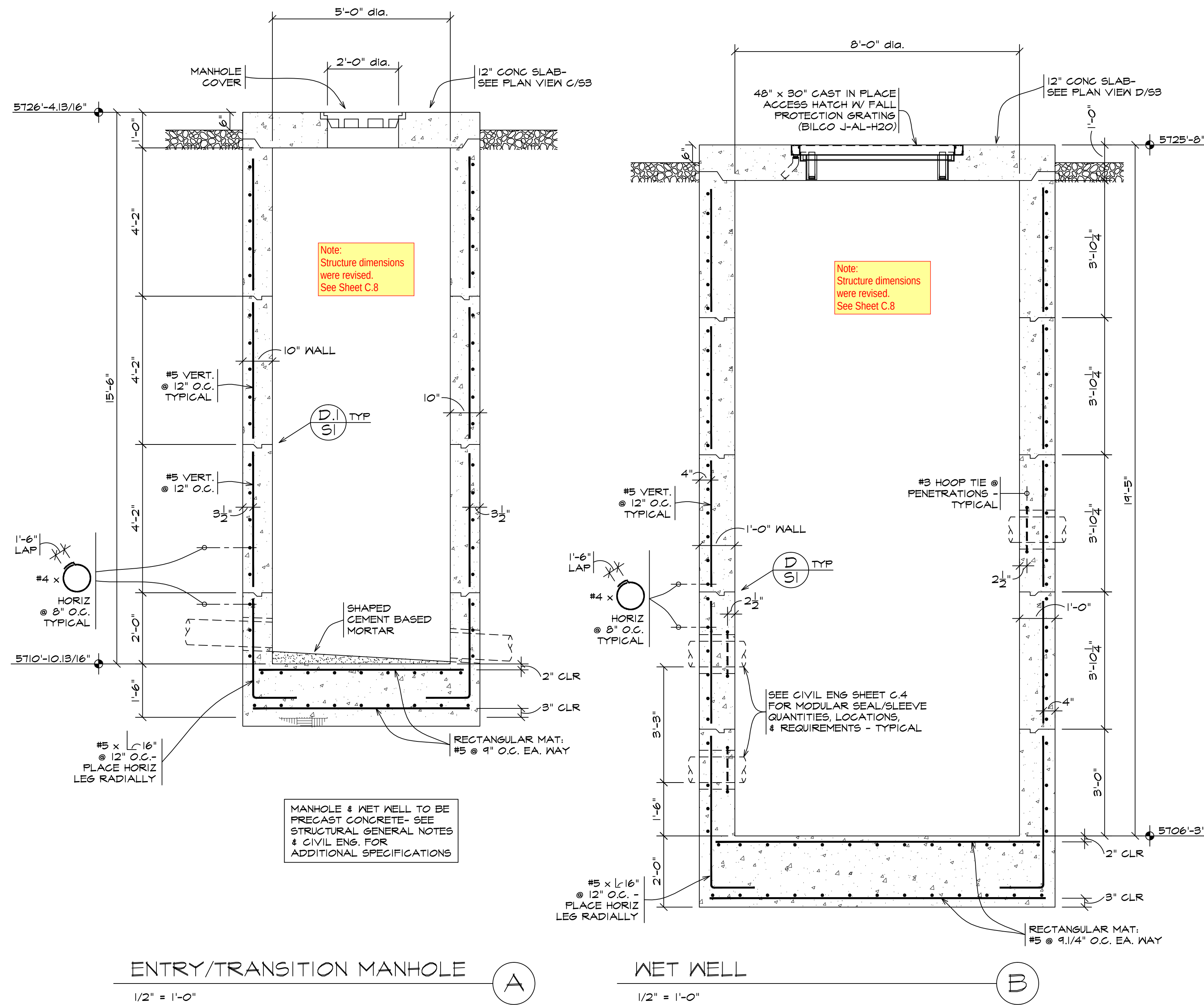
DRAWN BY: M.C.E.K.
CHECKED BY: B.J.K.
SCALE: AS SHOWN
PROJECT NO.: 17-48.03

DATE:
COORDINATION SET:
08/17/2020
CONSTRUCTION SET:
09/14/2020

SHEET TITLE:
GENERAL NOTES
& DETAILS

SHEET:

S=1



- FOUNDATION PLAN NOTES:
- Concrete foundation walls to be 8" thick unless noted otherwise (U.N.O.).
 - Dimensions this sheet are to face of concrete U.N.O.
 - TX = top of concrete wall.
 - TF = top of concrete footing.
 - SF = Step in top of concrete footing. See typical detail C/51.
 - Footings are to bear on undisturbed natural bearing soils or compacted structural fill.
 - Finish grades are to provide 36" minimum cover for exterior footings.
 - designates 8" Concrete Masonry Unit (CMU) wall bearing on 8" concrete wall.



KURTZ &
ASSOCIATES,
INC.
5012 COUNTY RD. 154
GLENWOOD SPRINGS,
COLORADO
(970) 945-6305

IRON MOUNTAIN
HOT SPRINGS
LIFT STATION
281 CENTENNIAL ST.
GLENWOOD SPRINGS,
COLORADO

DRAWN BY: M.C.E.K.
CHECKED BY: B.J.K.
SCALE: AS SHOWN
PROJECT NO.: 17-48.03

DATE:
COORDINATION SET:
08/17/2020
CONSTRUCTION SET:
09/14/2020

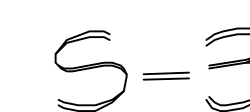
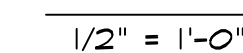
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FOUNDATION
PLAN

SHEET:
S-2

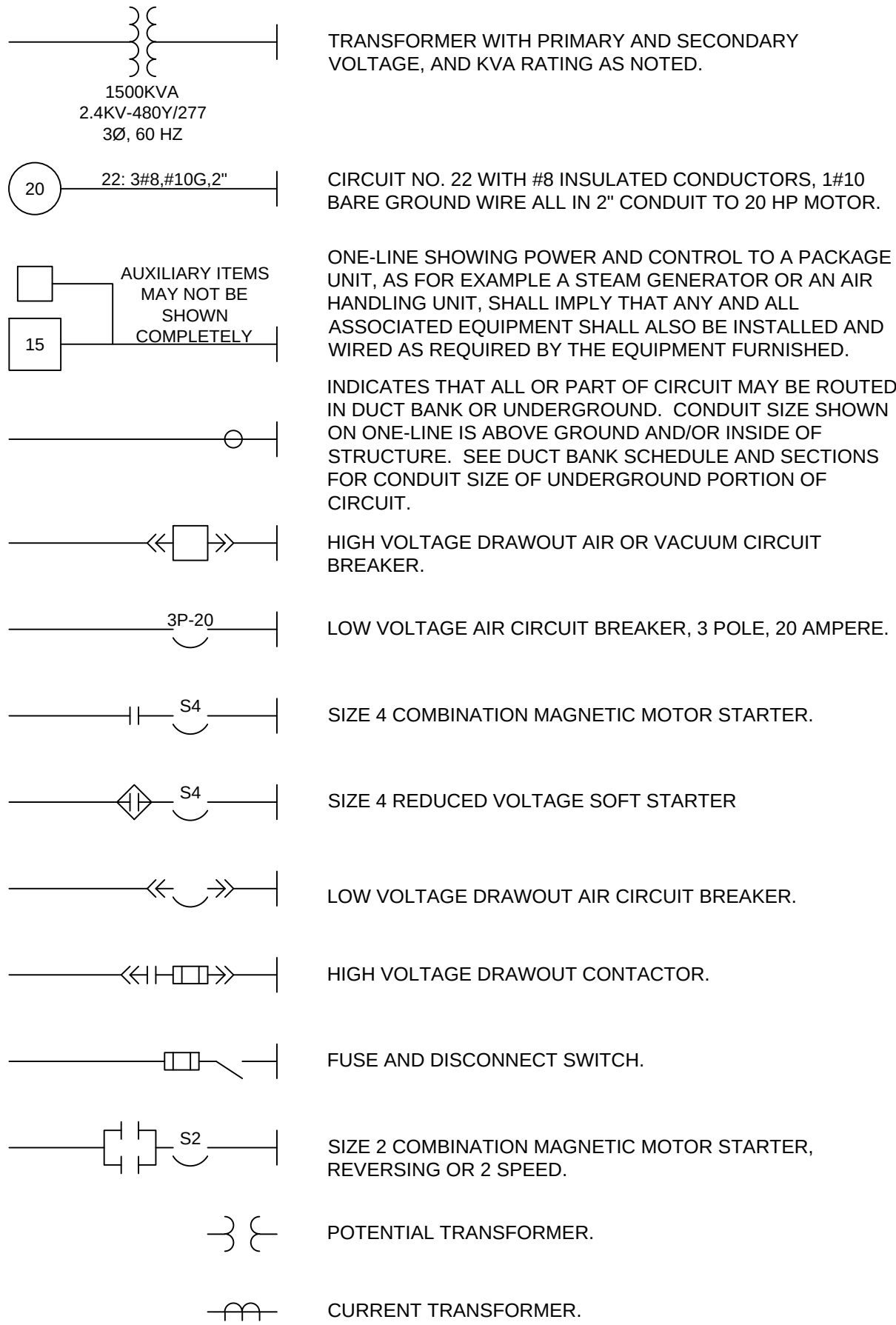


ROOF FRAMING PLAN NOTES

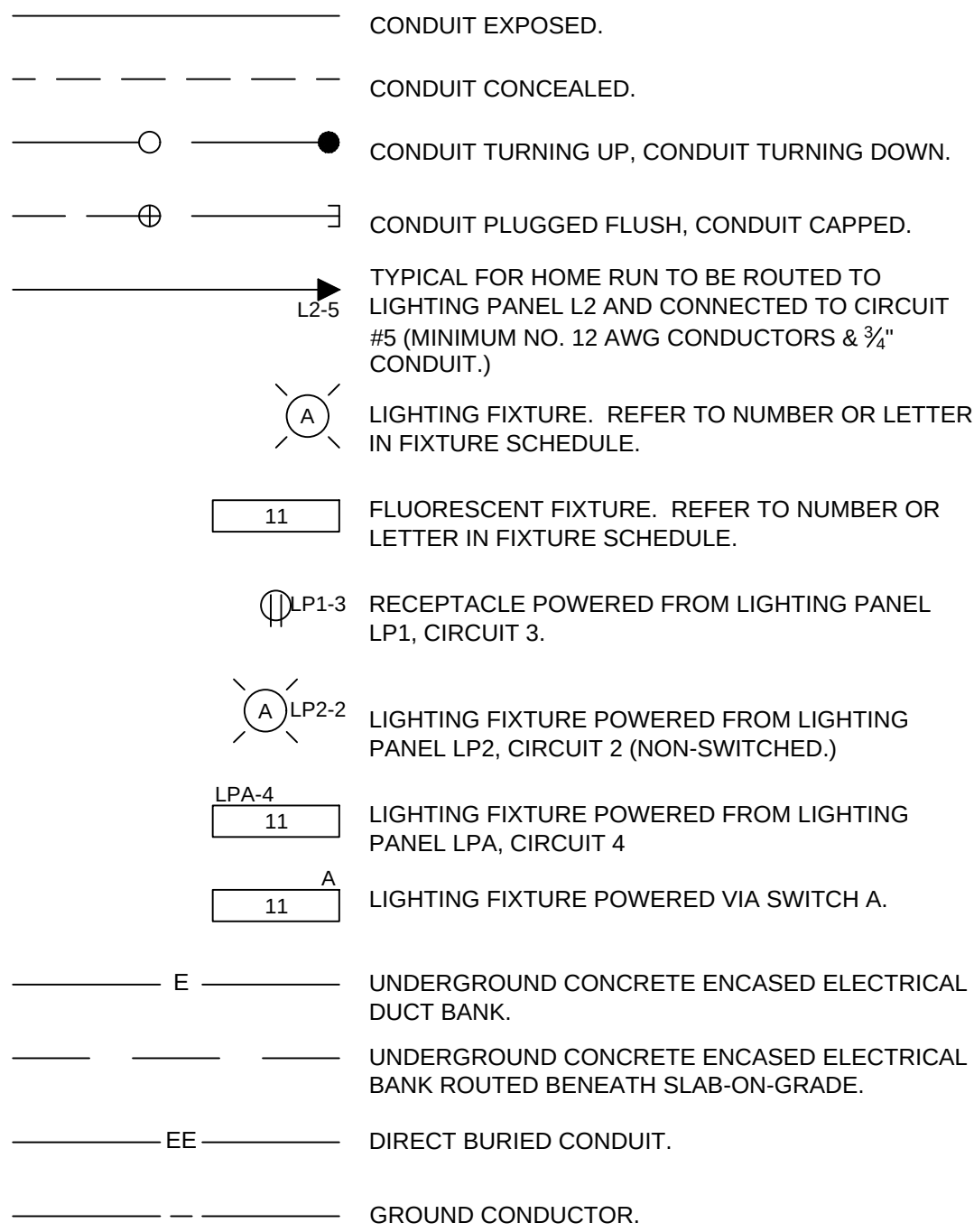
1.  Designates premanufactured roof truss, showing span direction.
2.  Joist hanger or beam to beam connection.
3. CMU= Concrete Masonry Unit
4.  Designates CMU wall which supports roof framing.



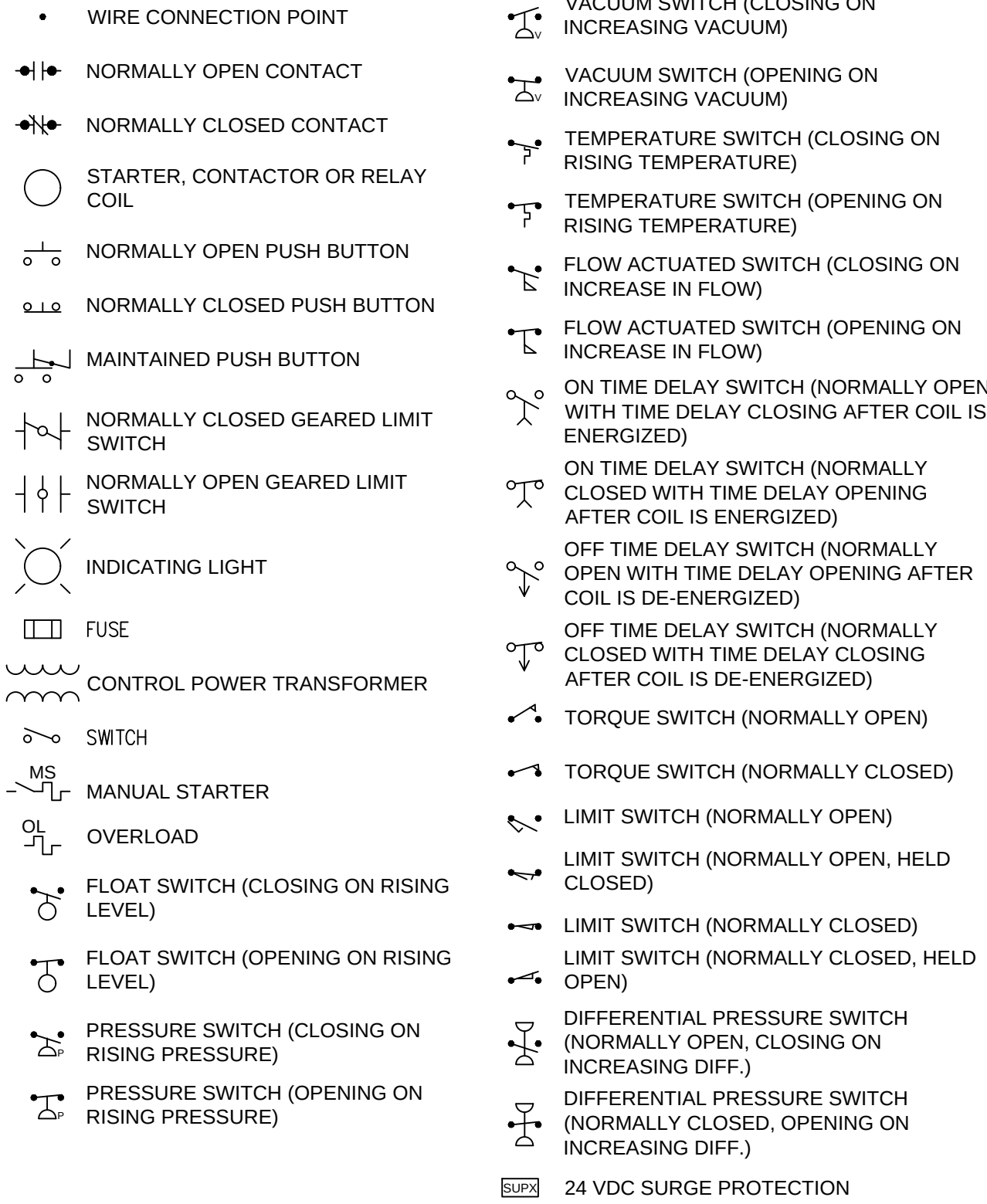
ONE LINE DIAGRAM LEGEND



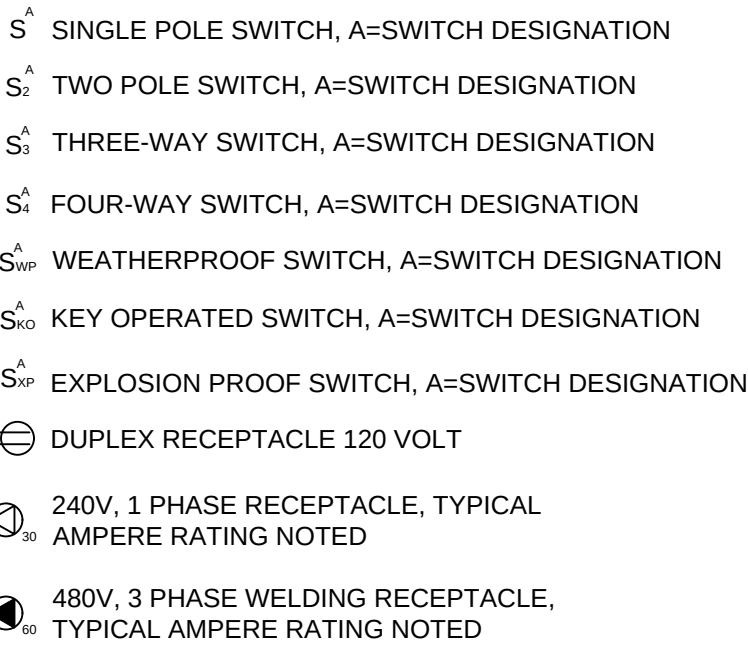
CONDUIT & WIRING INSTALLATION LEGEND



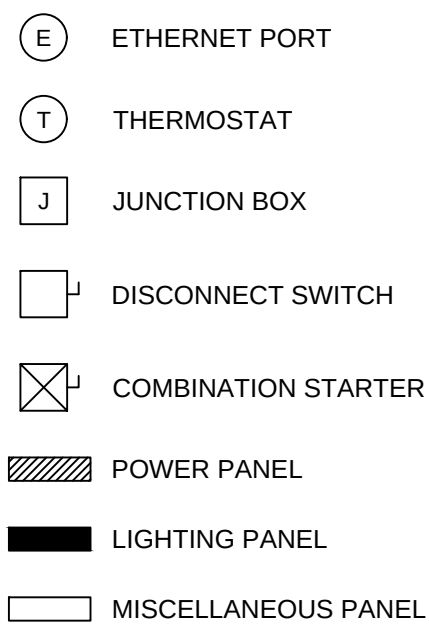
SCHEMATIC SYMBOLS



SWITCH & OUTLET SYMBOLS



MISCELLANEOUS SYMBOLS



ABBREVIATIONS

A	AMBER, AMPERE, ALARM	RECP	RECEPTACLE
AC	ALTERNATING CURRENT	RGS	RIGID GALVANIZED STEEL
AFD	ADJUSTABLE FREQUENCY DRIVE	RTD	RESISTANCE TYPE TEMP DETECTOR
AFF	ABOVE FINISHED FLOOR	RTU	REMOTE TERMINAL UNIT
AM	AMMETER	RVSS	REDUCED VOLTAGE SOLID STATE STARTER
ATO	AUTOMATIC THROWOVER	S2	SIZE 2 STARTER
AWG	AMERICAN WIRE GAUGE	SCADA	SUPERVISORY CONTROL AND DATA ACQUISITION
C	CLOSE, COUNTER, CONTACTOR	SP	SINGLE POLE
CAP	CAPACITOR	SPDT	SINGLE POLE DOUBLE THROW
CB	CIRCUIT BREAKER	SPST	SINGLE POLE SINGLE THROW
CD	CONTROL DAMPER	SS	SELECTOR SWITCH
CKT	CIRCUIT	SV	SOLENOID VALVE
CL2	CHLORINE	SWB	SWITCHBOARD
CP	CONTROL PANEL	SWGR	SWITCHGEAR
CPT	CONTROL POWER TRANSFORMER	T	THERMOSTAT, TIMER, TOTALIZER
CS	CONTROL STATION	TACH	TACHOMETER
CT	CYCLE TIMER, CURRENT TRANSFORMER	TB	TERMINAL BLOCK
CTM	CYCLE TIMER MOTOR	TD	TIME DELAY RELAY
2/C	2 CONDUCTOR	TEMP	TEMPERATURE
4"C	4" CONDUIT	TQ	TORQUE
DC	DIRECT CURRENT	TS	TEMPERATURE SWITCH
DM	DAMPER MOTOR, DEMAND METER	UG	UNDERGROUND
DPDT	DOUBLE POLE DOUBLE THROW	UPS	UNINTERRUPTIBLE POWER SUPPLY
DPST	DOUBLE POLE SINGLE THROW	V	VOLTS
DPS	DIFFERENTIAL PRESSURE SWITCH	VA	VOLT AMPERE
DS	DISCONNECT SWITCH	VLS	VALVE LIMIT SWITCH
E	ELECTRIC OPERATOR FOR CONTROL DAMPER OR VALVE	VM	VOLTMETER
EMH	ELECTRICAL MANHOLE	W	WHITE, WATTS
EX	EXISTING	WH	WATT HOUR METER
F	FORWARD	WM	WATT METER
FS	FLOW SWITCH	WP	WEATHERPROOF
G	GREEN, GROUND	XFMR	TRANSFORMER
GFI	GROUND FAULT INTERRUPTER	XP	EXPLOSION PROOF
GLS	GEARED LIMIT SWITCH	Y	YELLOW
#G	#8 GROUND WIRE	Z	AUXILIARY RELAY
H	HIGH, HUMIDISTAT	ZS	POSITION SWITCH
HH	HANDHOLE		
HMT	HIGH MOTOR TEMPERATURE		
HOA	HAND-OFF-AUTO		
HOR	HAND-OFF-REMOTE		
HP	HORSEPOWER		
HWCO	HIGH WATER CUTOFF		
HZ	HERTZ (CYCLE)		
I/O	INPUT/OUTPUT		
J	JUNCTION BOX		
KV	KILOVOLT		
KVA	KILOVOLT AMPERE		
KVAR	KILOVAR		
KW	KILOWATT		
KWH	KILOWATT HOUR		
L	LOW, LEVEL		
LA	LIGHTNING ARRESTOR		
LAN	LOCAL AREA NETWORK		
LP	LIGHTING PANEL		
LS	LIMIT SWITCH, LEVEL SWITCH		
LWCO	LOW WATER CUTOFF		
M	MAGNETIC MOTOR STARTER		
MA	MILLIAMPERE		
MCB	MAIN CIRCUIT BREAKER		
MCC	MOTOR CONTROL CENTER		
MCM	THOUSAND CIRCULAR MIL		
MD	MOISTURE DETECTOR		
MH	MANHOLE, MOUNTING HEIGHT		
MOV	MOTOR OPERATED VALVE		
MS	MANUAL MOTOR STARTER		
MSH	MOTOR SPACE HEATER		
N	NEUTRAL		
NC	NORMALLY CLOSED		
NO	NORMALLY OPEN, NUMBER		
O	OPEN		
OL	OVERLOAD		
PB	PUSH BUTTON, PULL BOX		
PF	POWER FACTOR METER		
PH	PHASE (CHEMICAL TERM)		
PLC	PROGRAMMABLE LOGIC CONTROLLER		
PP	POWER PANEL		
PS	PRESSURE SWITCH		
PT	POTENTIAL TRANSFORMER, PROGRAM TIMER		
2P	2 POLE		
R	RED, RAISE, RELAY, REVERSE		

AREA DESIGNATIONS

THE SPECIAL AREA DESIGNATION BOXES, AS DEFINED BELOW, ARE LOCATED ON THE PLAN DRAWINGS TO DEFINE ELECTRICAL INSTALLATION REQUIREMENTS. DESIGNATION BOXES ARE LOCATED WITHIN ROOM OR BELOW ROOM NUMBER. ALL INDOOR AREAS NOT INDICATED OTHERWISE ARE AREA TYPE 1 AND MINIMUM NEMA TYPE 1 ENCLOSURES.

AREA TYPE 1 INDOOR AND DRY AREA. REQUIRES MINIMUM NEMA TYP 1 ENCLOSURES FOR ALL EQUIPMENT AND GASKETED FITINGS IN CONDUIT SYSTEMS.

AREA TYPE 1A CORROSIVE CHEMICAL FEED AND STORAGE ROOMS. CONDUIT SYSTEM SHALL BE EXPOSED PVC COATED CONDUIT WITH FITTINGS, AND ACCESSORIES.

AREA TYPE 4 INDOOR WET LOCATIONS SUCH AS VAULTS, HOSEDOWN AREAS, BASEMENTS, ETC. MINIMUM NEMA TYPE 4 ENCLOSURE FOR EQUIPMENT AND GASKETED FITTINGS IN A CONDUIT SYSTEM.

AREA TYPE 7A CLASS 1, DIVISION 1 AREA AS DEFINED BY NEC. ALL EQUIPMENT AND CONDUIT SYSTEMS SHALL BE RATED FOR USE IN THIS AREA.

AREA TYPE 7B CLASS 1, DIVISION 2, GROUP C AND D (METHANE, GASOLINE) AS DEFINED BY NEC. EQUIPMENT AND CONDUIT SYSTEMS SHALL BE RATED FOR USE IN THIS AREA.

AREA TYPE 12 INDOOR, DRY, DIRTY AREA. REQUIRES MINIMUM NEMA TYPE 12 GASKETED ENCLOSURES FOR ALL EQUIPMENT AND GASKETED FITTINGS IN CONDUIT SYSTEMS.

AREA TYPE 4X OUTDOOR AND INDOOR WET LOCATIONS SUBJECT TO CORROSION. CONDUIT SYSTEM SHOULD BE PVC COATED RIGID GALVANIZED STEEL WITH PVC COATED FITTINGS, BOXES, AND STAINLESS STEEL HARDWARE.

GENERAL REQUIREMENTS

- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ROUTING ALL CONDUITS NOT SHOWN ON THE PLANS. THIS SHALL INCLUDE ALL CONDUITS SHOWN ON THE ONE-LINES AND HOME-RUNS SHOWN ON THE PLAN DRAWINGS. CONDUITS SHALL BE ROUTED AS DEFINED IN THE SPECIFICATIONS.
- SPARE WIRES SHALL BE TAPED AND COILED.
- IF EQUIPMENT SUPPLIED BY MANUFACTURER HAS A LARGER LOAD THAN VALUE SHOWN, THE CABLE CONDUIT AND ELECTRICAL EQUIPMENT SHALL BE ENLARGED, AS REQUIRED, TO ACCOMMODATE THE HIGHER VALUE.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING PROPERLY SIZED STARTER OVERLOADS FOR EQUIPMENT FURNISHED.
- LIGHTING AND RECEPTACLE CIRCUITS DESIGNATED ON THE FLOOR PLANS ARE NOT SHOWN ON THE ONE-LINES. CONDUCTORS FOR LIGHTING, RECEPTACLES, AND MISCELLANEOUS 120VAC CIRCUITS SHALL BE MINIMUM NO. 12 AWG. CONDUIT FOR LIGHTING, RECEPTACLES, AND MISCELLANEOUS 120VAC CIRCUITS SHALL BE MINIMUM ¾".
- IN AREAS WHERE THERE ARE OVERHEAD BRIDGE CRANES, HOISTS, ETC., NO CONDUITS SHALL BE RUN OVERHEAD THAT WILL INTERFERE WITH THE OPERATION OF THE EQUIPMENT.

GENERAL NOTES

- SOLID LINES ——— INDICATE NEW WORK OR EQUIPMENT.
- DOTTED LINES - - - INDICATE EXISTING WORK OR EQUIPMENT.
- DASHED LINES ——— INDICATE FUTURE WORK OR EQUIPMENT.
- THIS IS A GENERAL LEGEND SHEET. SOME SYMBOLS AND ABBREVIATIONS MAY NOT BE UTILIZED ON THIS SPECIFIC PROJECT.
- INFORMATION RELATED TO CIRCUIT IDENTIFICATION, WIRE & CONDUIT SIZES, AND ROUTING, IS ON THE FOLLOWING DRAWING TYPES.
 - ONE-LINE DIAGRAMS SHOW CIRCUIT IDENTIFICATION, WIRE QUANTITY AND SIZES, AND CONDUIT SIZE WITHIN STRUCTURES. ONE-LINE DIAGRAMS ALSO INDICATE ORIGIN AND DESTINATION OF CIRCUITS, AND IDENTIFY CIRCUITS ROUTED UNDERGROUND.
 - FOR CIRCUITS WITHOUT UNDERGROUND PORTIONS, BUILDING FLOOR PLANS SHOW LOCATION OF EQUIPMENT FOR DETERMINING CIRCUIT LENGTH WITHIN THE STRUCTURE. FOR CIRCUITS WITH UNDERGROUND PORTIONS, ANTICIPATED PENETRATION OF UNDERGROUND CONDUITS ARE SHOWN ON STRUCTURE PLANS FOR DETERMINING THE LENGTH OF IN-STRUCTURE PORTIONS OF CIRCUITS. BUILDING FLOOR PLANS MAY ALSO SHOW HOME RUNS FOR LIGHTING, RECEPTACLE, AND OTHER MISCELLANEOUS EQUIPMENT CIRCUITS.
 - SITE PLANS INDICATE THE GENERAL ROUTING OF UNDERGROUND CONDUITS AND DUCT BANKS. CIRCUITS ROUTED IN UNDERGROUND CONDUITS OR DUCT BANKS ARE INDICATED IN DUCT BANK SECTIONS REFERENCED ON THE SITE PLAN.
 - DUCT BANK SECTIONS AND SCHEDULES IDENTIFY CONDUIT SIZE, CONDUIT MATERIAL, ARRANGEMENT OF THE UNDERGROUND CONDUITS, AND CIRCUITS ROUTED IN EACH UNDERGROUND CONDUIT.
- CLOUDED MARKINGS INDICATE WORK IN EXISTING AREAS THAT IS NEW OR NEW WORK ON AN EXISTING PIECE OF EQUIPMENT.

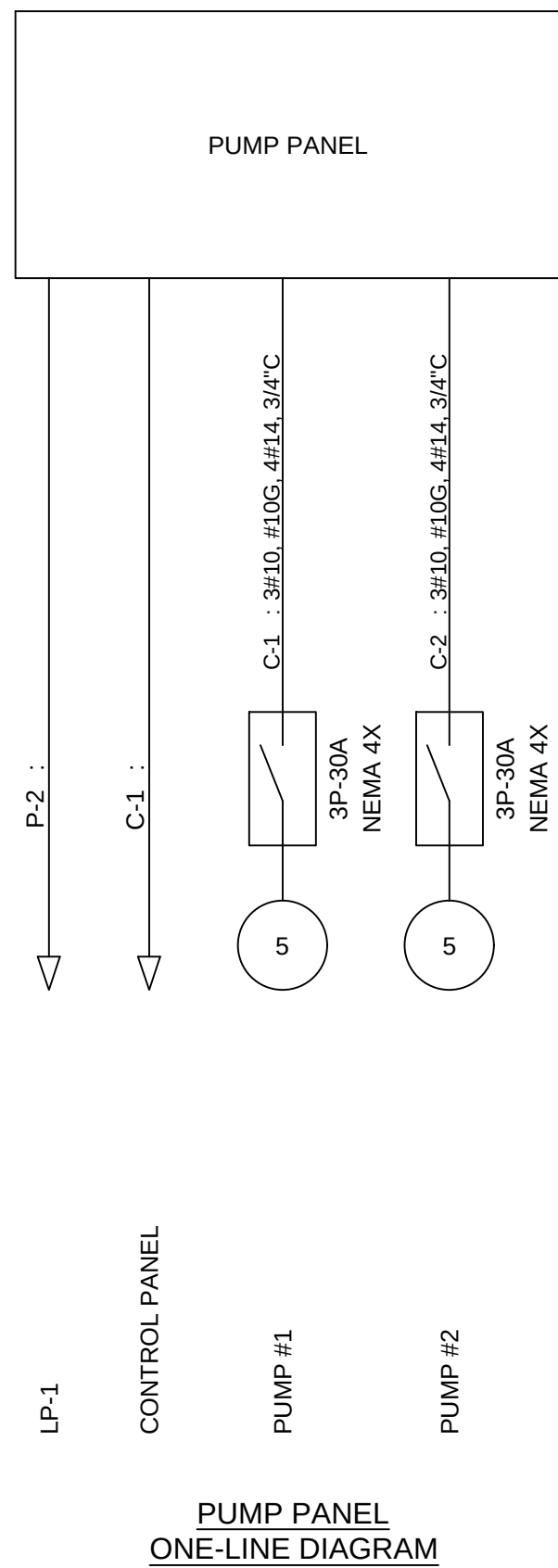
Browns Hill Engineering
and Controls
8119 Shaffer Parkway Suite # C
Littleton, Colorado 80127
720.344.7771 720.344.7460 fax

GLENWOOD SPRINGS, COLORADO
HOT SPRINGS LIFT STATION

LEGEND
ELECTRICAL

DESIGN BY: TFW
DRAWN BY: TFW
APP BY: TFW
JOB ID:19-588 E01
DATE: 6-2019

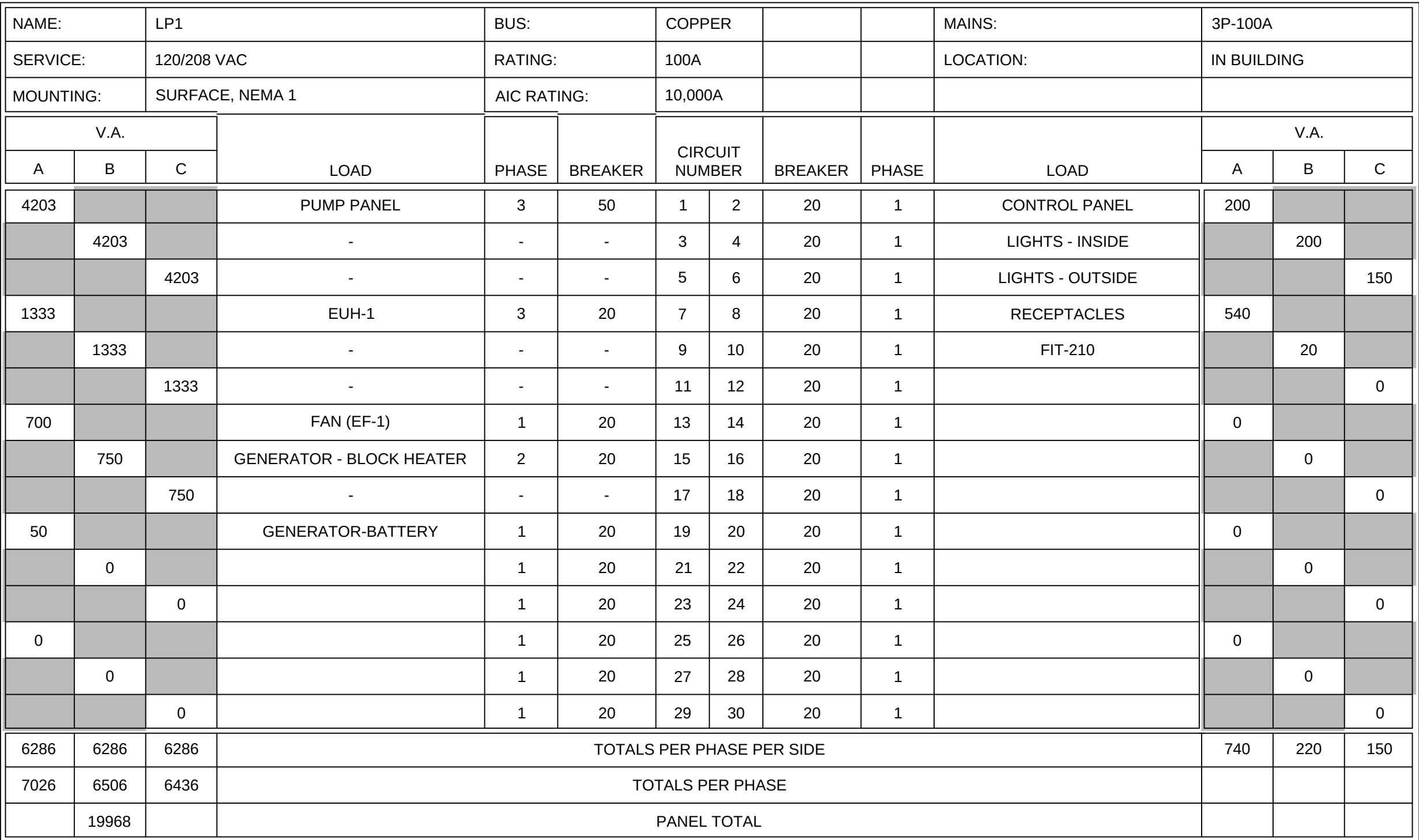
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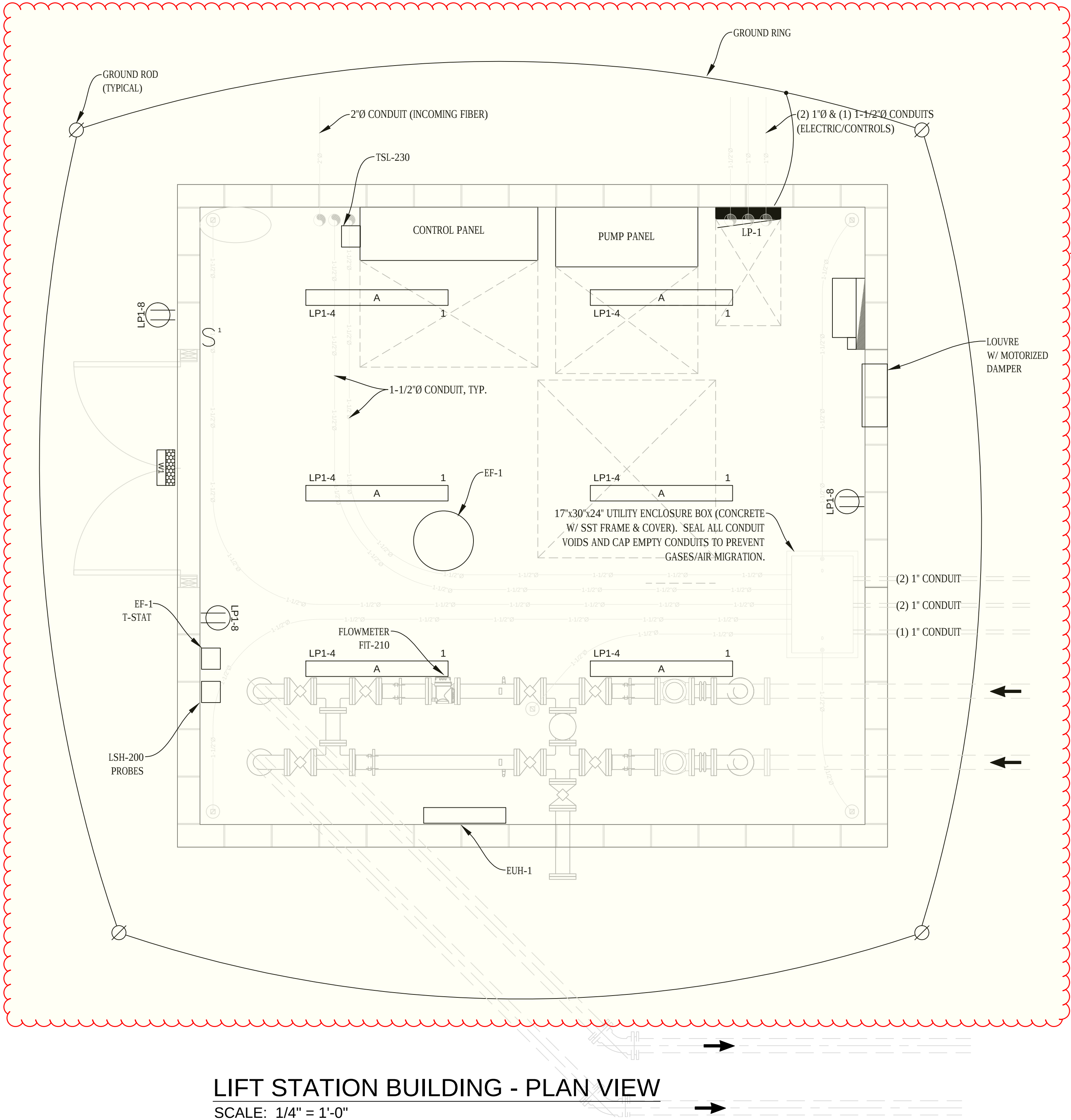
FAULT CURRENT	
UTILITY	7,700
F1	5,549

NOTES:

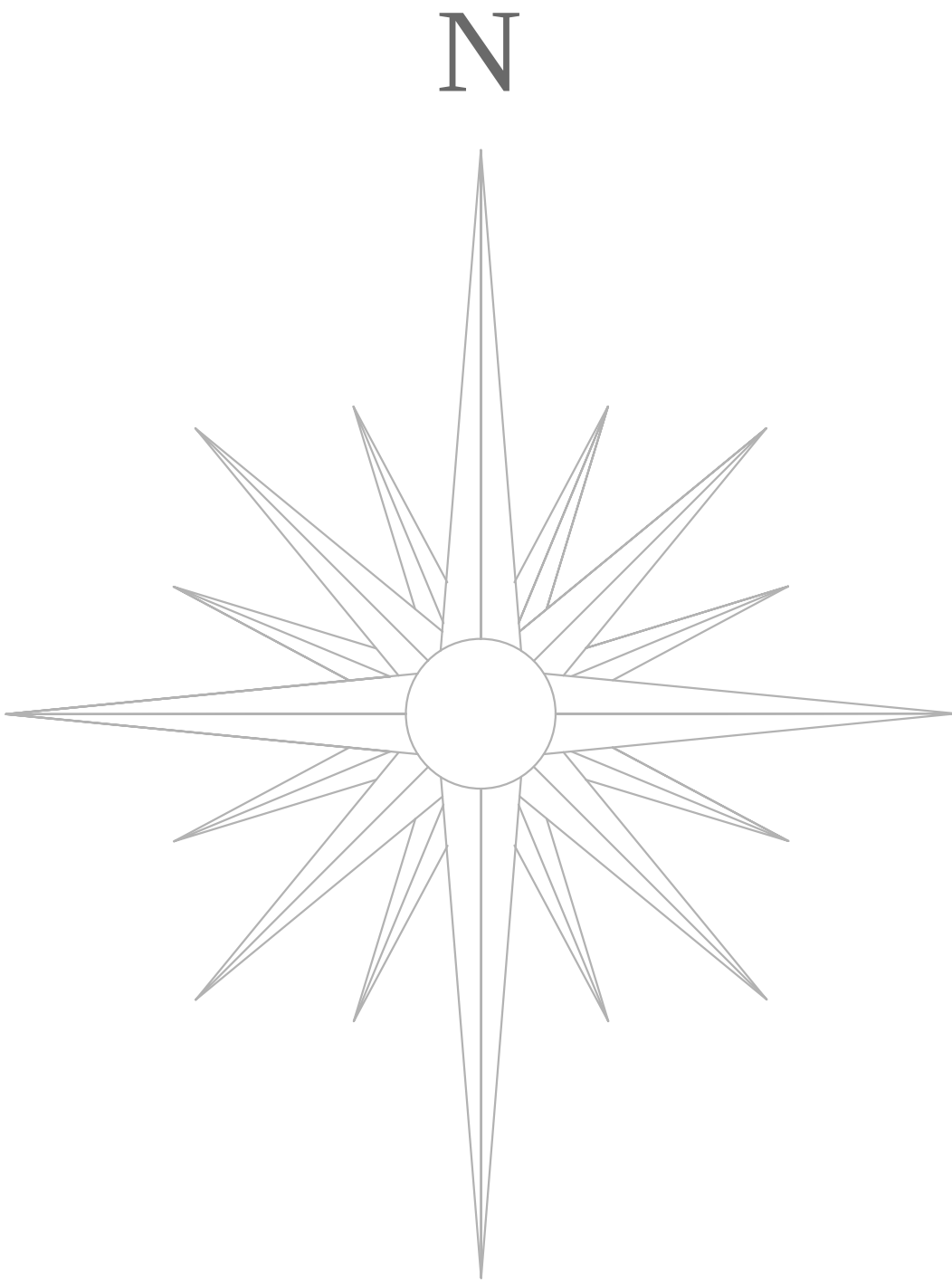
1. BONDING AND GROUNDING SHALL INCLUDE BUILDING STEEL AND PROCESS PIPE AS PER N.E.C.
2. ALL 120VAC CONDUCTORS WITH 20 AMP BREAKER SHALL BE 3#12, 3/4" C. ALL OTHER CONDUCTORS SHALL BE SIZED TO OVER CURRENT PROTECTION.
3. THE CITY SHALL PROVIDE FIBER OPTIC CABLE TO THE SITE. CONTRACTOR SHALL ROUTE THIS FIBER OPTIC CABLE TO THE BUILDING AND INTO THE CONTROL PANEL.
4. ** - EQUIPMENT PROVIDED BY THE CITY.



LIGHTING FIXTURE SCHEDULE				
SYMBOL	LAMP	MTG HEIGHT	DESCRIPTION	MANUFACTURER
A	LED, 120V	MOUNT AT 10' AFF OR ON CEILING	4 FOOT FIXTURE-HEAVY DUTY AND MOUNTING HARDWARE SUITABLE FOR WET LOCATIONS	DIALIGHT: LPK44-2C3DIF
W1	LED, 120V	1 FT ABOVE DOOR	WALL LIGHT FIXTURE TO POINT IN THE DOWN POSITION. OUTDOOR RATED, LED WITH PHOTOELECTRIC CONTROL	HI-LITE MFG. CO., INC: H-15312-B-119/9WILED2/27/ WBCM-MOPVCL/BCM-R, OR EQUAL



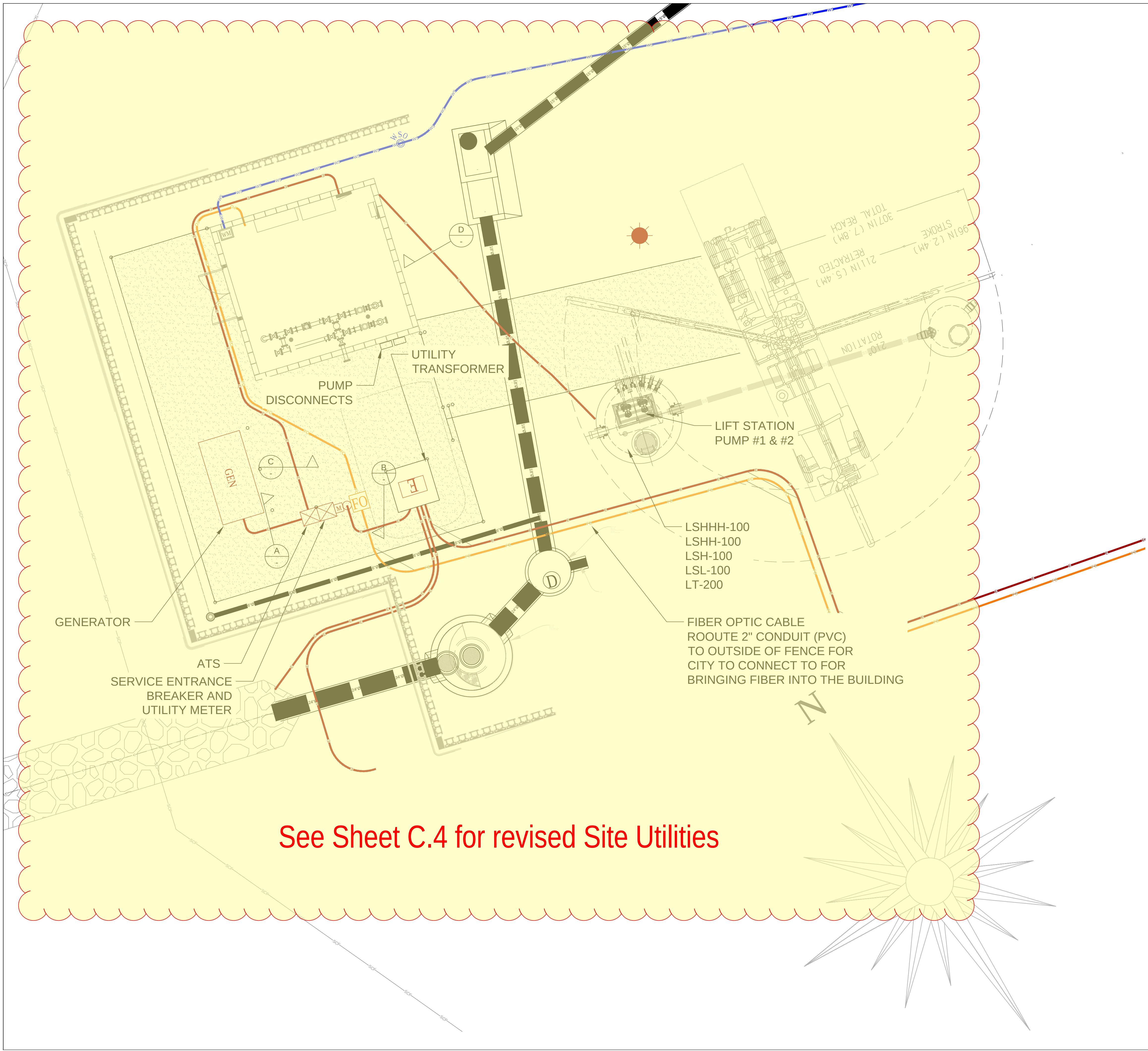
The doorway, mechanical, water, controls and electric are to be mirrored to match Sheet C.8 "Civil-Facility Piping Plan"



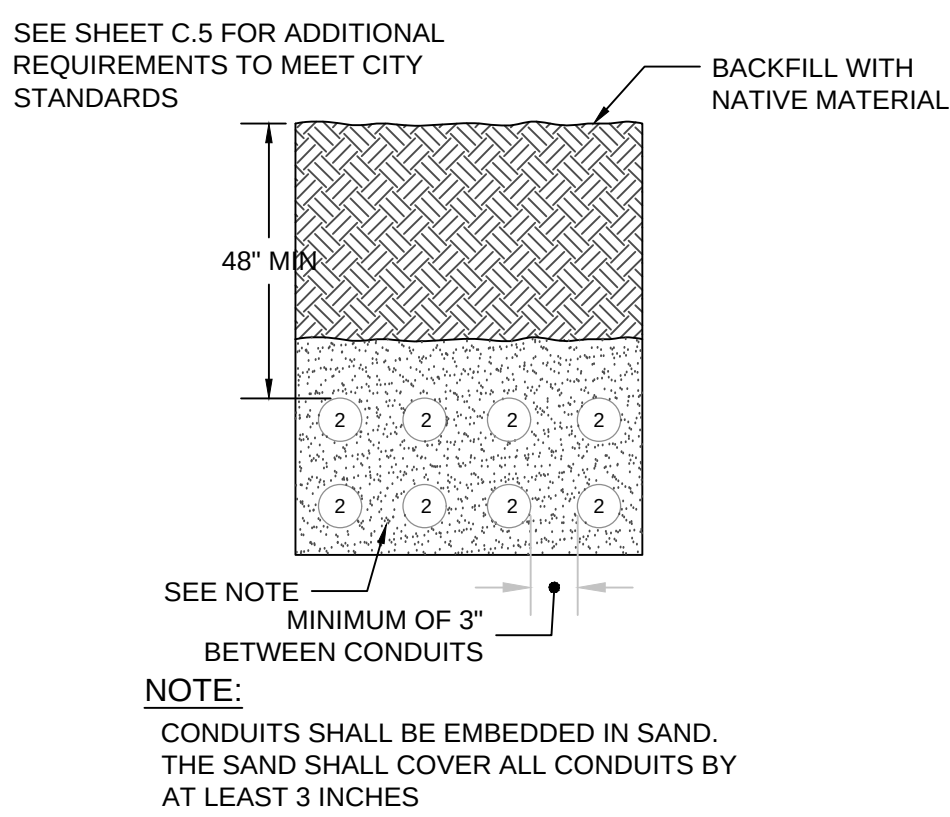
Note:
This Plan was modified by
Boundaries Unlimited Inc.
on 12/30/20 as follows:

Components mirrored
west to east (right to left).

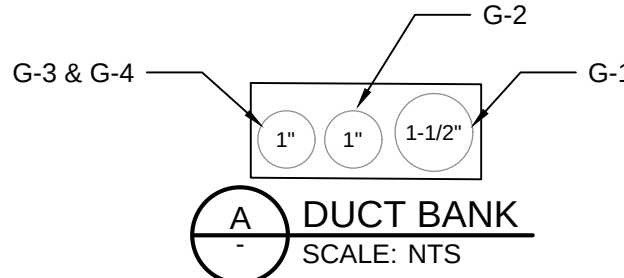
E3	DESIGN BY: TFW	GLENWOOD SPRINGS, COLORADO HOT SPRINGS LIFT STATION	Browns Hill Engineering and Controls 8119 Shaffer Parkway Suite #C Littleton, Colorado 80127 720.344.7771 720.344.7460 fax		F					
	DRAWN BY: TFW				E					
	APP BY: TFW				D					
	JOB ID: 19-588 E01				C					
	DATE: 6-2019				B					
4					A	9-29-19	REV	DATE	DESCRIPTION	APP
									REVISED PER CITY COMMENTS	



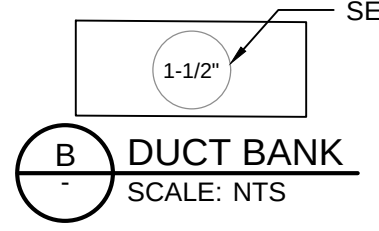
See Sheet C.4 for revised Site Utilities



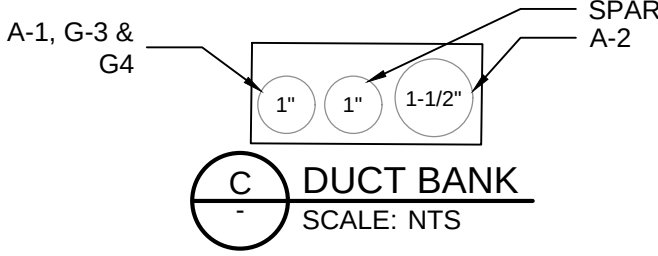
1 ELECTRICAL DUCT BANK DETAIL
SCALE: NTS



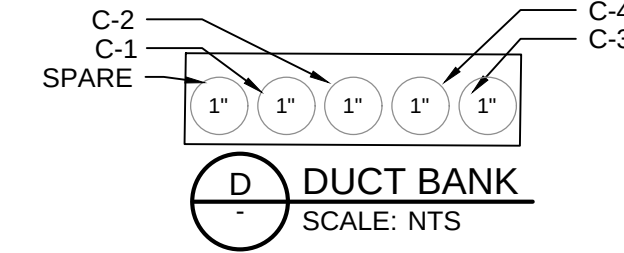
A DUCT BANK
SCALE: NTS



B DUCT BANK
SCALE: NTS



C DUCT BANK
SCALE: NTS



D DUCT BANK
SCALE: NTS

DESIGN BY: TFW	DRAWN BY: TFW	APP. BY: TFW	JOB ID: 19-588 E01	DATE: 6-2019	E4	4	GLENWOOD SPRINGS, COLORADO HOT SPRINGS LIFT STATION SITE PLAN ELECTRICAL	Browns Hill Engineering and Controls 8119 Shaffer Parkway Suite # C Littleton, Colorado 80127 720.344.7771 720.344.7460 fax				
									REV	DATE	DESCRIPTION	APP
									A	6-2019	REVISED PER CITY COMMENTS	TFW
									B			
									C			
									D			
									E			
									F			

Control System Plans

GLENWOOD SPRINGS, COLORADO

HOT SPRINGS

LIFT STATION

1. DRAWING INDEX
2. DRAWING LEGEND
3. CONTROL PANEL - POWER DISTRIBUTION
4. CONTROL PANEL - POWER DISTRIBUTION CONT.
5. BASE DI & DO
6. DI SLOT 1 & SLOT 2
7. AI SLOT 3
8. PANEL LAYOUT
9. PUMP PANEL
10. PUMP PANEL
11. PUMP PANEL LAYOUT

1"

IF THIS LINE IS NOT EQUAL TO ONE INCH
ADJUST SCALES ACCORDINGLY

REVISIONS				
REV.	DESCRIPTION	BY	DATE	APP.
F				
E				
D				
C				
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PROJECT NUMBER:
19-588 E01



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GLENWOOD SPRINGS,, COLORADO
HOT SPRINGS LIFT STATION

CONTROL PANEL
INDEX

DRAWN BY: TFW
REVIEWED BY: TFW
APPROVED BY: TFW
DATE: 6/2019

E.2.1
11

WIRE COLOR CODING	
DC CONTROL CIRCUITS	
+12 V	BLUE
-12 V	BLUE W/ WHITE STRIPE
+24 V	BLUE
- 24 V	VIOLET
AC CONTROL CIRCUITS	
24 V (L)	ORANGE
24 V (N)	GRAY
120 V (L)	BLACK (UNPROTECTED)
120 V (L)	RED (PROTECTED)
120 V (N)	WHITE
FOREIGN POWER	YELLOW
DC POWER	
+12 V	BLUE
-12 V	BLUE W/ WHITE STRIPE
+24 V	BLUE
-24 V	VIOLET
AC POWER 480V/277V	
PHASE A	BROWN
PHASE B	ORANGE
PHASE C	YELLOW
GROUND	GREEN
240V/120V, 208V/120V	
PHASE A	BLACK
PHASE B	RED
PHASE C	BLUE
GROUND	GREEN

WIRE SIZE CODE IN CONTROL PANELS	
WIRE TYPE	WIRE SIZE
PLC DISCRETE INPUT/OUTPUT	#16 AWG
AC & DC CONTROL WIRING	#16 AWG
120 VAC GENERAL PURPOSE	#16 AWG
DC ANALOG SIGNALS	#18 TSP

FIELD TERMINATIONS TORQUE TABLE			
EQUIPMENT TYPE	TORQUE RATING	EQUIPMENT TYPE	TORQUE RATING
PHOENIX CONTACT TERMINAL BLOCKS	5 - 7 LB*IN	EATON PILOT DEVICES	12 LB*IN
PHOENIX CONTACT QUINT DEVICES	4.4 - 5.3 LB*IN	EATON FAZ CIRCUIT BREAKERS	25 LB*IN
EATON COMMS MODULES	4.5 LB*IN	EATON MOTOR INSIGHT	5.3 LB*IN
IDEC RELAYS	9-11 LB*IN	ALLEN BRADLEY DIGITAL DISPLAYS	6-8 LB*IN
IDEC POWER SUPPLIES	7 LB*IN	ALLEN BRADLEY PILOT DEVICES	5-8 LB*IN
SQUARE D QOU CIRCUIT BREAKER	45 LB*IN	ALLEN BRADLEY MICROLOGIX	5 LB*IN
MERLIN GERLIN CIRCUIT BREAKER	22 LB*IN	ALLEN BRADLEY COMPACTLOGIX	6 LB*IN
SQUARE D PILOT DEVICES	5-8 LB*IN	ALLEN BRADLEY CONTROLOGIX	7-9 LB*IN
SCHNEIDER ELECTRIC - QUANTUM	10 LB*IN	SCHNEIDER ELECTRIC - MOMENTUM	4.9 LB*IN
SCHNEIDER ELECTRIC - ADVANTYS	2.2 LB*IN	SCHNEIDER ELECTRIC - M340, MAGELIS, PREMIUM	4.3 LB*IN
PEPPERL+FUCHS SEGMENT PROTECTORS	3.5 - 4.42 LB*IN	TURCK BL20 SCREW CONNECTIONS	3.5 - 5.3 LB*IN
GROUND BAR	20 LB*IN	RED LION DISPLAY	4.5 LB*IN
USE COPPER WIRE ONLY 90° C			

GENERAL NOTES
ALL TERMINALS WITH THE SAME LABEL ARE JUMPERED TOGETHER.
WIRES WITHOUT A LABEL SHALL BE LABELED WITH THE SAME LEGEND AS THE TERMINAL BLOCK.
ALL FIELD WIRE SHALL BE COPPER WIRE, AND TORQUED PER MANUFACTURER RECOMMENDATIONS.
CONDUIT FITTINGS, HUBS OR ANY OTHER PENETRATIONS SHALL BE UL LISTED TO MAINTAIN THE ENVIROMENTAL RATING OF THE ENCLOSURE PROVIDED.
DANGER, MULTIPLE POWER SUPPLIES RISK OF ELECTRIC SHOCK, BURN OR EXPLOSION. MORE THAN ONE DISCONNECT SWITCH MAY BE REQUIRED TO DE-ENERGIZE THE EQUIPMENT BEFORE SERVICING.

INTRINSICALLY SAFE TABLE	
A	INSTALL IN ACCORDANCE WITH ARTICLE 504 OF NEC, FOR CONNECTING ONLY TO PURELY RESISTIVE NON-ENERGY STORING DEVICES.
B	NOT TO EXCEED MAXIMUM CABLE LENGTH OF 3,500 FT (PER TURCK)
C	THE INTRINSICALLY FIELD WIRING SHALL ENTER THE CONTROL PANEL THROUGH A DEDICATED CONDUIT THAT CONTAINS NO NON-INTRINSICALLY SAFE WIRING.
THIS ENCLOSURE/PANEL PROVIDES INTRINSICALLY SAFE CIRCUIT EXTENSIONS FOR USE IN CLASS 1, GROUP D, HAZARDOUS LOCATIONS WHEN CONNECTED PER MANUFACTURER INSTALLATION INSTRUCTIONS AND DRAWING 18-864 03 OF 12	

OVERCURRENT PROTECTION TABLE CONTROL PANEL				
	RATING	VOLTAGE	MFR.	PART #
CB-1	10 A	120 VAC	SQUARE D	QOU110
F1 , F3, F10	5 A	120 VAC	BUSSMANN	GMA-5A
F2, F5 - F9, F11- F12	1 A	120 VAC	BUSSMANN	GMA-1A
F4, F13	2 A	120VAC	BUSSMANN	GMA-2A
F14 - F21	1 A	24 VDC	BUSSMANN	GMA-1A
X-YF+	250 MA	24 VDC	BUSSMANN	GMA-250MA
TO REDUCE THE RISK OF FIRE REPLACE OVERCURRENT PROTECTION ONLY WITH FUSES / CIRCUIT BREAKERS OF THE SAME TYPE AND RATING				
ENVIRONMENTAL RATING FOR INDUSTRIAL CONTROL PANEL IS TYPE "12"				

OVERCURRENT PROTECTION TABLE VFD'S				
	RATING	VOLTAGE	MFR.	PART #
CB	35 A	208 VAC	EATON	FDB3035L
FL1 - FL3	30A	208VAC	BUSSMANN	FRN-R-30
F1, F2	1/2A	208VAC	BUSSMANN	FRN-R-1/2
F3	1-1/4A	120VAC	BUSSMANN	FRN-R-1-1/4
F4	1A	120VAC	BUSSMANN	GMA-1A
TO REDUCE THE RISK OF FIRE REPLACE OVERCURRENT PROTECTION ONLY WITH FUSES / CIRCUIT BREAKERS OF THE SAME TYPE AND RATING				
ENVIRONMENTAL RATING FOR INDUSTRIAL CONTROL PANEL IS TYPE "12"				

1"
IF THIS LINE IS NOT EQUAL TO ONE INCH
ADJUST SCALES ACCORDINGLY

PROJECT NUMBER:
19-588 E01

REVISIONS				
REV.	DESCRIPTION	BY	DATE	APP.
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D				
C				
B				
A				



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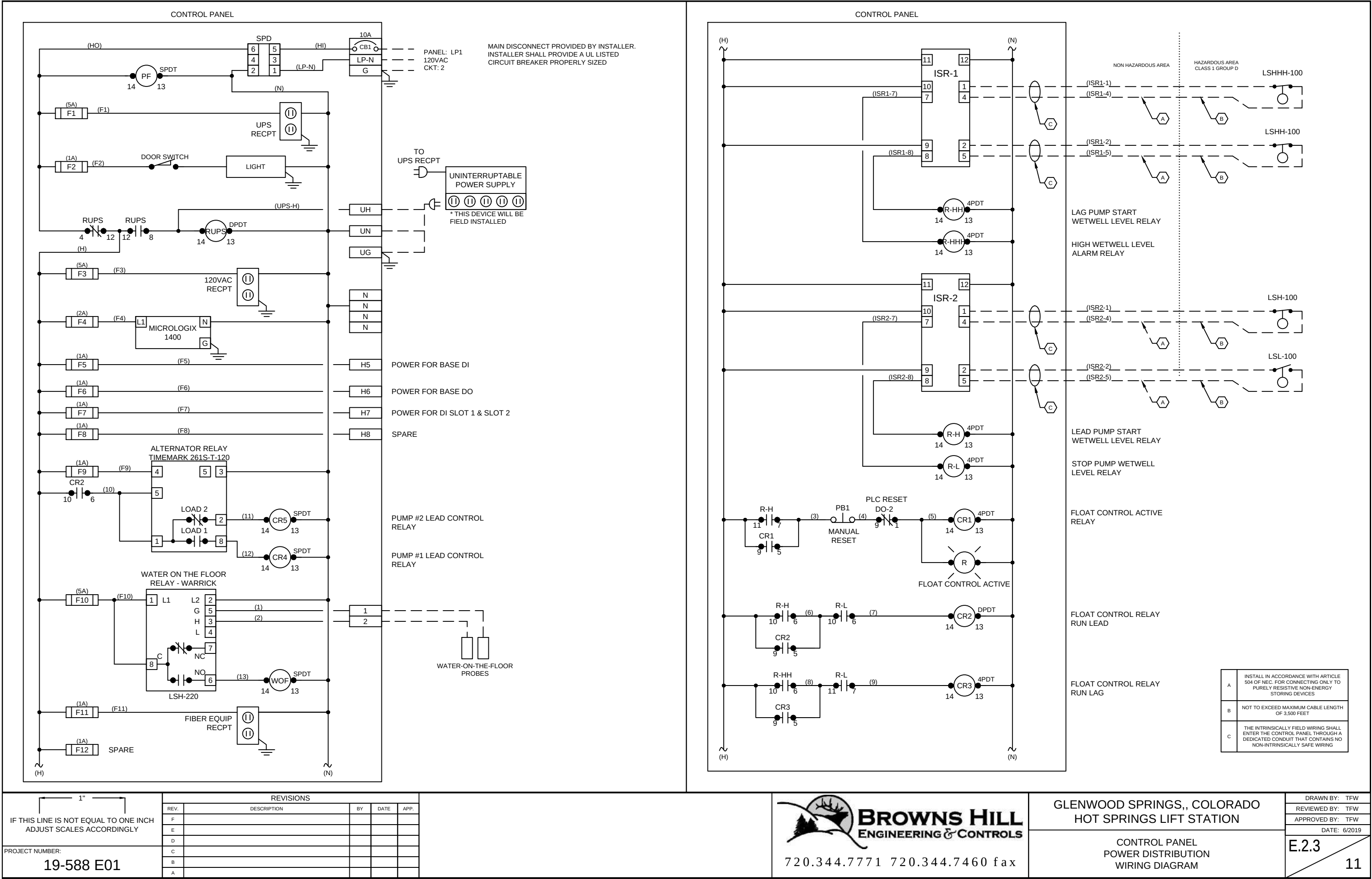
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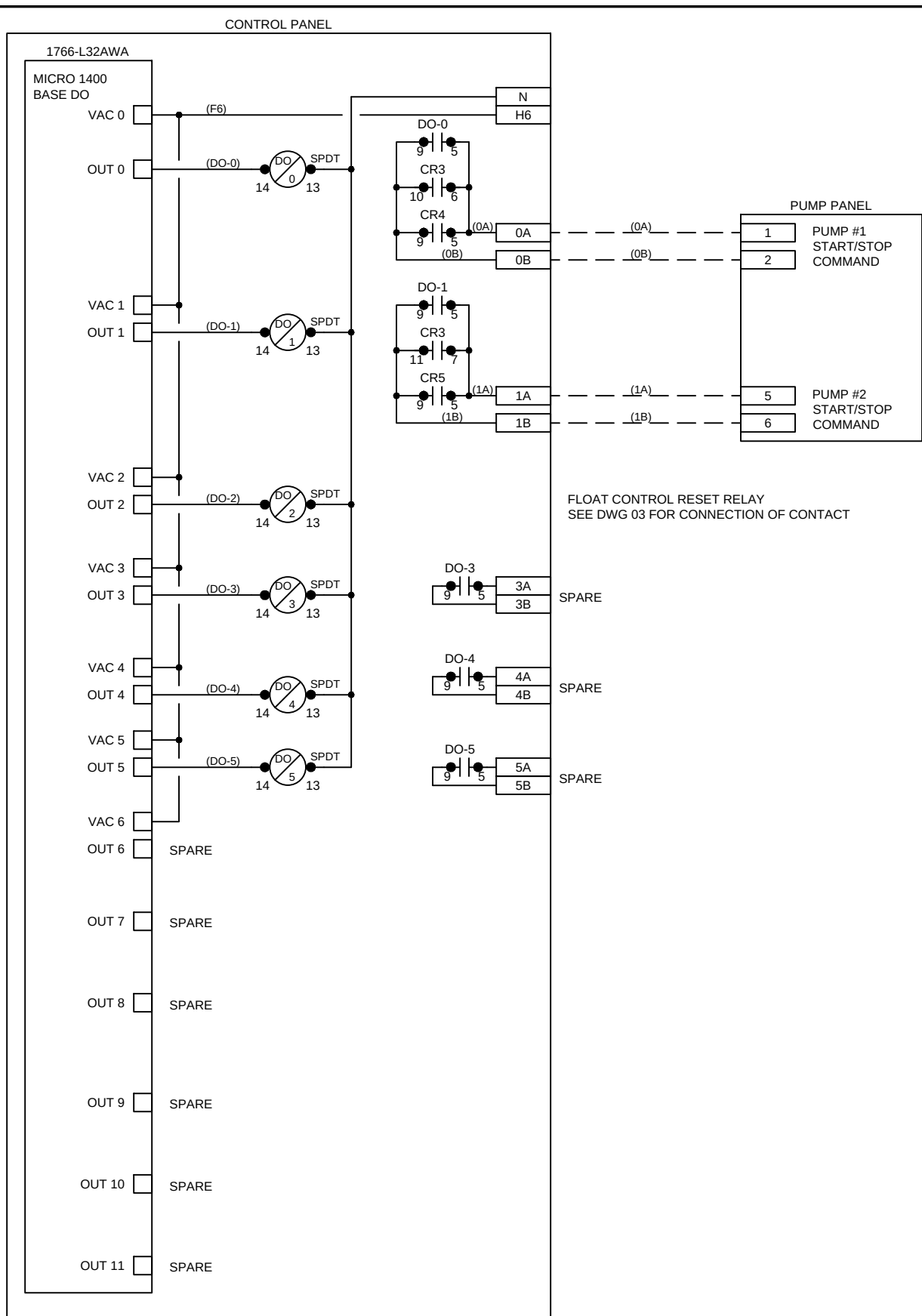
GLENWOOD SPRINGS,, COLORADO
HOT SPRINGS LIFT STATION

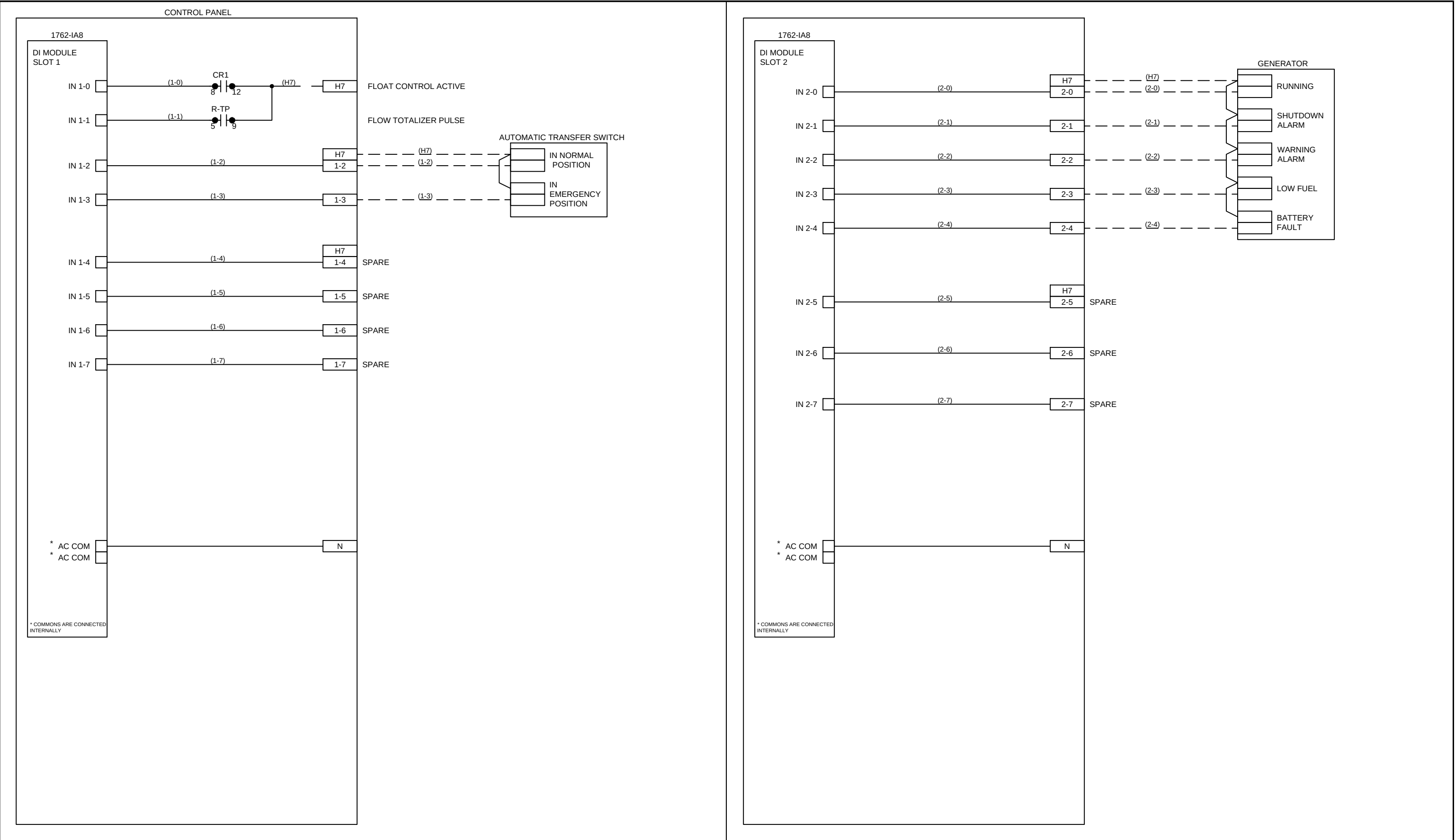
CONTROL PANEL
LEGEND

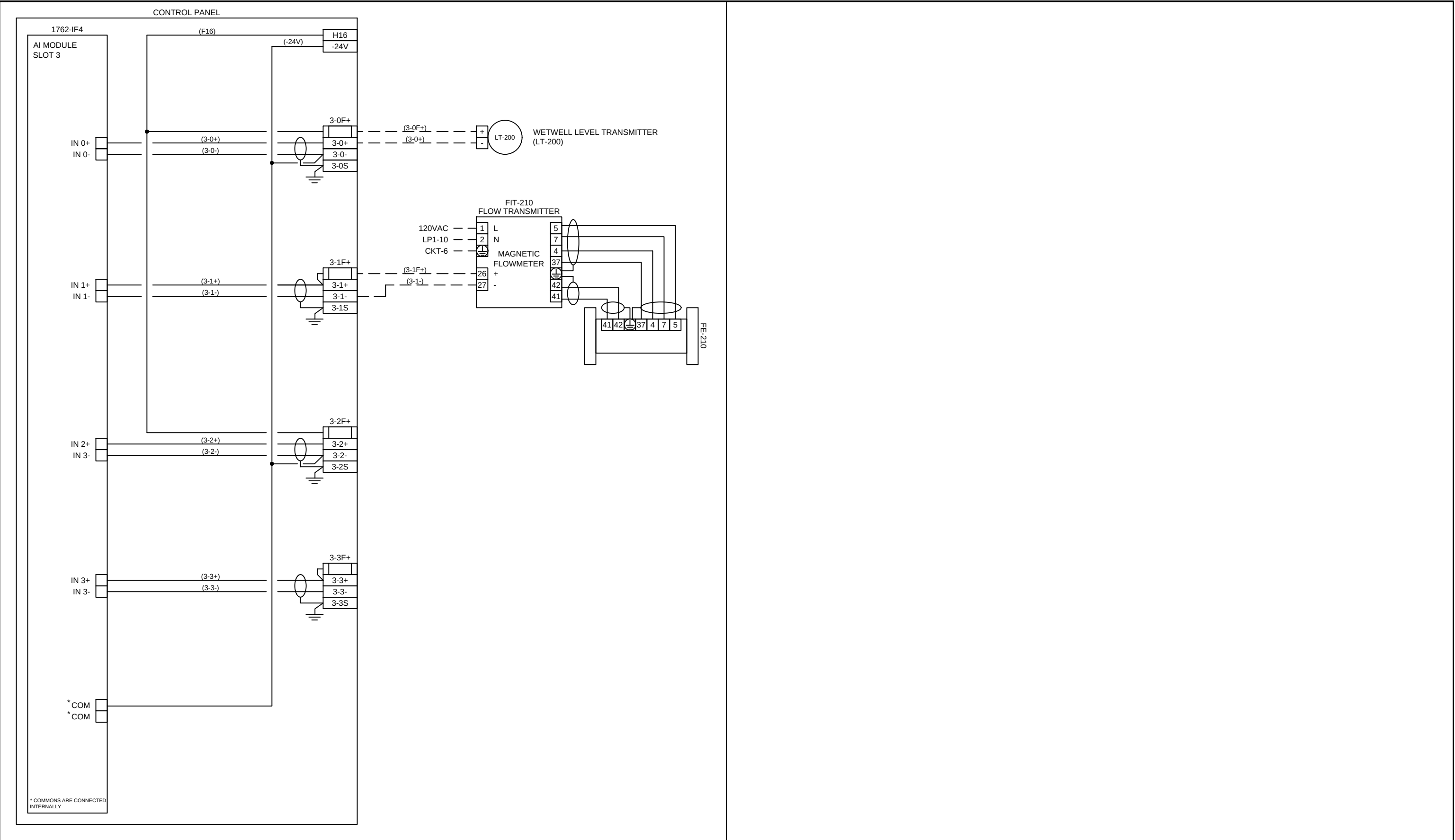
DRAWN BY: TFW
REVIEWED BY: TFW
APPROVED BY: TFW
DATE: 6/2019

E.2.2









1"

IF THIS LINE IS NOT EQUAL TO ONE INCH
ADJUST SCALES ACCORDINGLY

PROJECT NUMBER:
19-588 E01

REVISIONS				
REV.	DESCRIPTION	BY	DATE	APP.
F				
E				
D				
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B				
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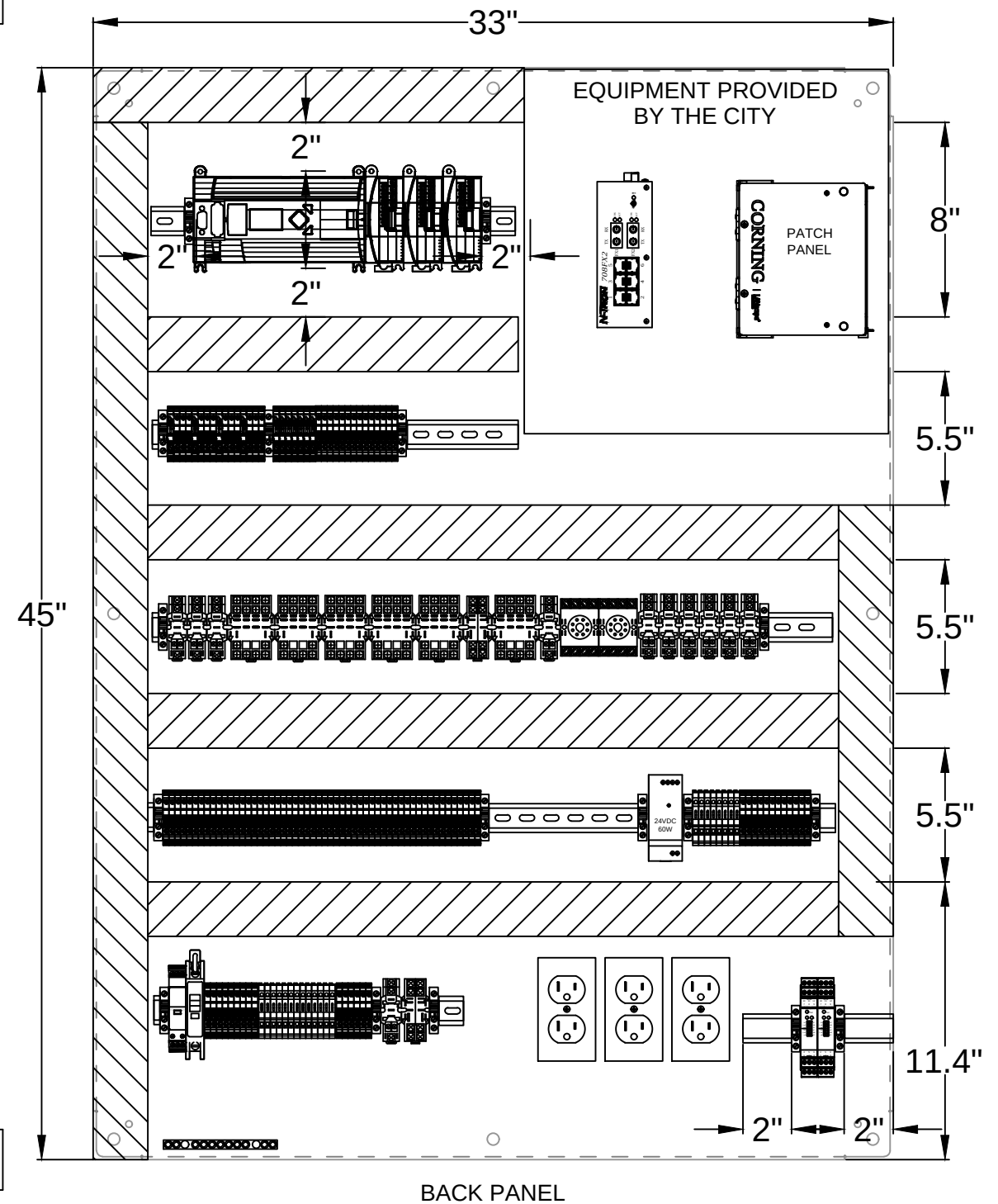
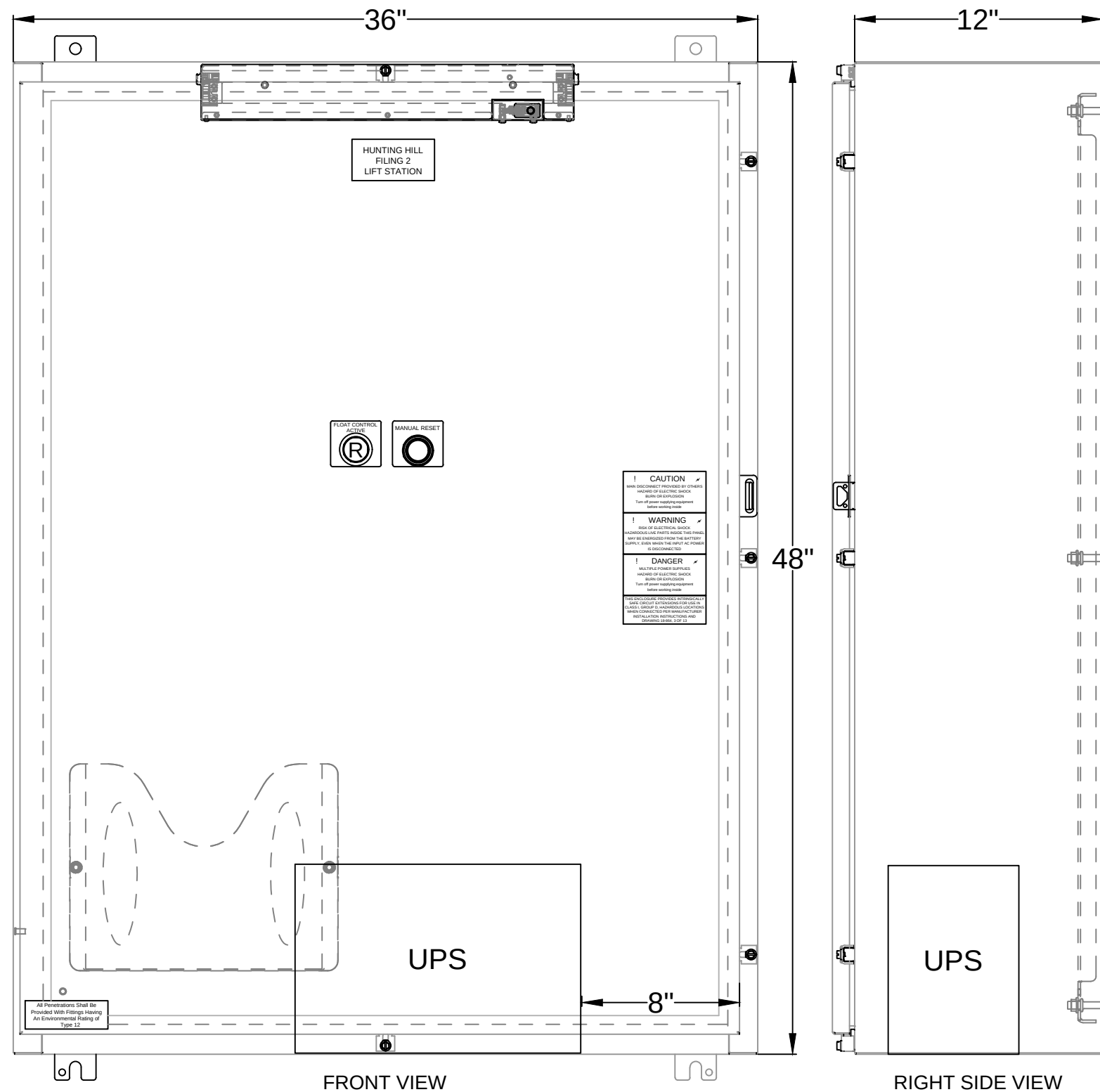
GLENWOOD SPRINGS,, COLORADO
HOT SPRINGS LIFT STATION

CONTROL PANEL
AI SLOT 3
WIRING DIAGRAM

DRAWN BY: TFW
REVIEWED BY: TFW
APPROVED BY: TFW
DATE: 6/2019

E.2.7

11



REVISIONS					
REV.	DESCRIPTION	BY	DATE	APP.	
F					
E					
D					
C					
B					
A					

1"

IF THIS LINE IS NOT EQUAL TO ONE INCH
ADJUST SCALES ACCORDINGLY

PROJECT NUMBER:
19-588 E01

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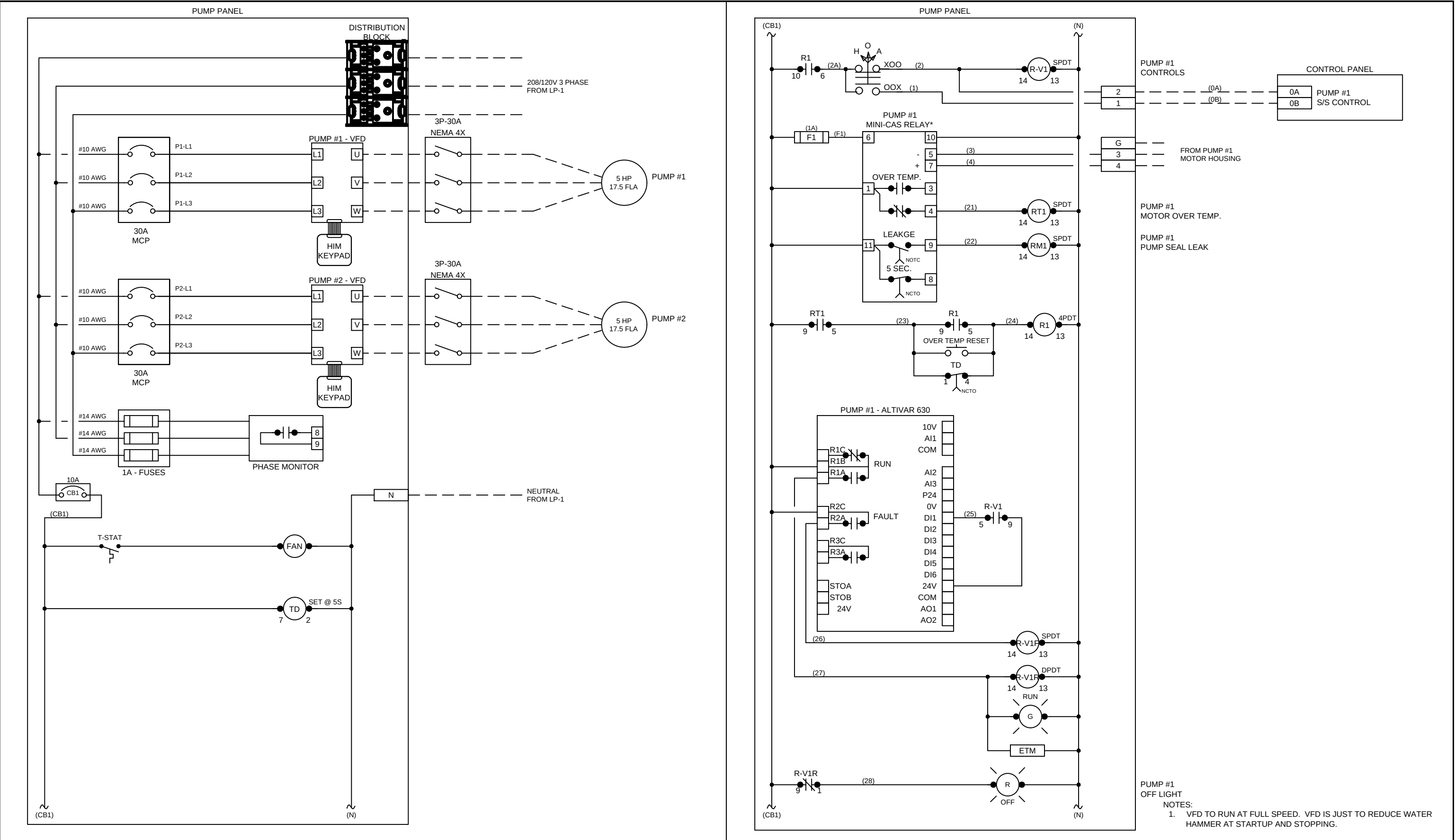
GLENWOOD SPRINGS,, COLORADO
HOT SPRINGS LIFT STATION

CONTROL PANEL
LAYOUT

DRAWN BY: TFW
REVIEWED BY: TFW
APPROVED BY: TFW
DATE: 6/2019

E.2.8

11



1"

IF THIS LINE IS NOT EQUAL TO ONE INCH
ADJUST SCALES ACCORDINGLY

PROJECT NUMBER:
19-588 E01

REVISIONS				
REV.	DESCRIPTION	BY	DATE	APP.
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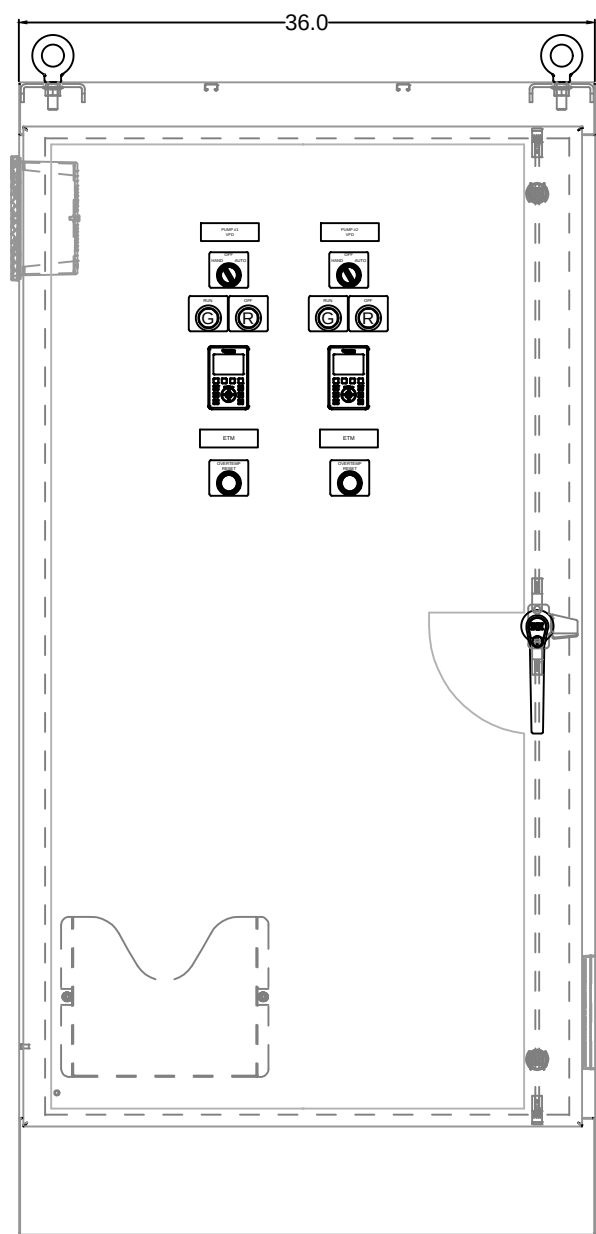
BROWNS HILL
ENGINEERING & CONTROLS

720.344.7771 720.344.7460 fax

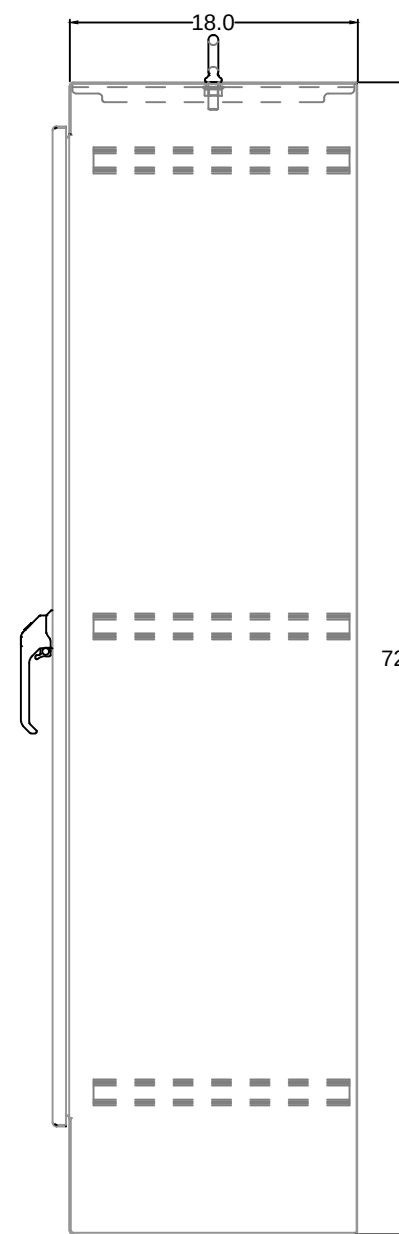
GLENWOOD SPRINGS,, COLORADO
HOT SPRINGS LIFT STATION

PUMP PANEL
WIRING DIAGRAM

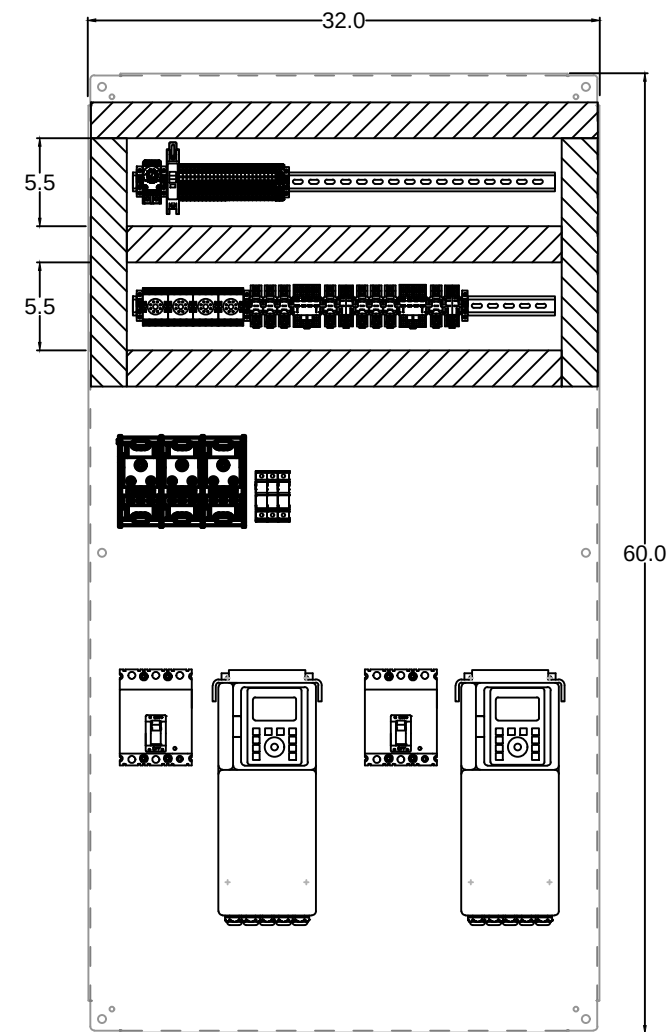
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REVIEWED BY: TFW
APPROVED BY: TFW
DATE: 6/2019
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11



FRONT VIEW



RIGHT SIDE VIEW



FULL PANEL FRONT VIEW

IF THIS LINE IS NOT EQUAL TO ONE INCH ADJUST SCALES ACCORDINGLY PROJECT NUMBER: 19-588 E01	REVISIONS <table border="1"> <thead> <tr> <th>REV.</th> <th>DESCRIPTION</th> <th>BY</th> <th>DATE</th> <th>APP.</th> </tr> </thead> <tbody> <tr> <td>F</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>E</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>D</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>B</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>A</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>					REV.	DESCRIPTION	BY	DATE	APP.	F					E					D					C					B					A					BROWNS HILL ENGINEERING & CONTROLS 720.344.7771 720.344.7460 fax	GLENWOOD SPRINGS,, COLORADO HOT SPRINGS LIFT STATION		DRAWN BY: TFW
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MECHANICAL PROVISIONS

1. SCOPE OF WORK
- A. THE CONTRACTOR IS RESPONSIBLE FOR ALL WORK, MATERIALS, AND LABOR TO SATISFY A COMPLETE WORKING SYSTEM WHETHER SPECIFIED OR IMPLIED.
- B. ALL WORK IS TO BE PERFORMED IN STRICT COMPLIANCE WITH ALL LOCAL CODES AND ALL OTHER REGULATION GOVERNING WORK OF THIS NATURE.
- C. THE CONTRACTOR SHALL, BEFORE SUBMITTING ANY PROPOSAL, EXAMINE THE PROPOSED SITE AND SHALL DETERMINE FOR HIMSELF THE CONDITIONS THAT MAY EFFECT THE WORK. NO ALLOWANCE SHALL BE MADE IF THE CONTRACTOR FAILS TO MAKE SUCH EXAMINATIONS.
- D. ALL EQUIPMENT AND MATERIALS SHALL BE AS SPECIFIED OR "APPROVED EQUAL" BY THE ENGINEER OR ARCHITECT.
2. PERMITS
- A. THE CONTRACTOR SHALL SECURE ALL PERMITS OR APPLICATIONS AND PAY ANY AND ALL FEES.
3. SHOP DRAWINGS
- A. SUBMIT MATERIAL LIST AND SHOP DRAWINGS FOR MAJOR EQUIPMENT TO THE ARCHITECT/ENGINEER FOR APPROVAL. THE CONTRACTOR SHALL SUBMIT FIVE SETS OF SHOP DRAWINGS AND THEY SHALL BE CLEARLY LABELED.
4. FLEXIBLE DUCT WORK
- A. FLEXIBLE TYPE DUCT SHALL BE OF TWO ELEMENT SPIRAL CONSTRUCTION COMPOSED OF A CORROSION RESISTANT METAL SUPPORTING SPIRAL AND COATED FABRIC WITH A MINERAL BASE. FLEXIBLE DUCT CONNECTORS SHALL BE LISTED BY U.L., CLASS 1 DUCTS, AND SHALL HAVE A FLAME SPREAD RATING NOT EXCEEDING 25 AND A SMOKE DEVELOPED RATING NOT EXCEEDING 50.
- B. USE OF FLEXIBLE DUCTWORK SHALL BE LIMITED TO NO MORE THAN 6 LINEAR FEET PER RUN.
- C. CONTRACTOR SHALL BE CAREFUL SO AS NOT TO KINK OR COLLAPSE FLEXIBLE DUCT.
5. REFRIGERENT
- A. PIPING CONTRACTOR SHALL PROVIDE AND INSTALL REFRIGERANT PIPING IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND IN SUCH A WAY AS TO BE INCONSPICUOUS AND FREE FROM ANY POSSIBLE CONDENSATION.
- B. INSULATE REFRIGERANT LINES WITH ARMOUR-FLEX TYPE INSULATION, SHALL BE TYPE "K" COPPER TUBING, WITH WROUGHT COPPER SOLDER TYPE FITTINGS SUITABLE FOR CONNECTION WITH SILVER SOLDER.
6. DUCTWORK
- A. THE DUCTWORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE "SMACNA" APPLICABLE MANUALS.
- B. ALL DUCTWORK SHALL BE THE LOW VELOCITY TYPE, UNLESS SPECIFIED OTHERWISE.
- C. CONTRACTOR SHALL PROVIDE AND INSTALL APPROVED FIRE DAMPERS AND ACCESS PANELS IN ANY AND ALL DUCTWORK WHICH PENETRATES A HORIZONTAL OR VERTICAL FIRE PARTITION, OR AS OTHERWISE SHOWN ON DRAWINGS.
- D. ALL BRANCH DUCTS TO HAVE VOLUME DAMPERS, SMOOTH TURN RADIUS DUCTWORK OR TURNING VANES SHALL BE USED THROUGHOUT WHERE FLOW EXCEEDS 150 CFM.
- E. ALL DUCT JOINTS TO BE SEALED IN ACCORDANCE WITH "SMACNA" STANDARDS AND ACCEPTED GOOD PRACTICE.
- F. ALL DUCT DIMENSIONS SHOWN ARE NET INSIDE VALUES. DIMENSIONS MAY BE CHANGED SO LONG AS THE NET FREE FACE AREA IS MAINTAINED.
- G. ALL CONCEALED DUCTWORK SHALL BE INSULATED WITH 1-1/2" FIBERGLASS INSULATING BLANKET WITH ALUMINUM FOIL FACING.
- H. ALL SUPPLY AND RETURN DUCTWORK 15 FEET DOWNSTREAM OF THE HVAC UNIT SHALL BE INTERNALLY LINED WITH A 1/2" ACOUSTICAL DUCT LINER UNLESS OTHERWISE NOTED ON THE DRAWINGS.
7. DRAINAGE PIPING
- A. (CONDENSATE) SHALL BE SCHEDULE 40 PVC PIPE WITH SOLVENT JOINTS. PITCH HORIZONTAL LINES 1" IN 10'-0". CONDENSATE DRAINS SHALL BE ROUTED TO FLOOR DRAIN, ROOF DRAIN OR INDIRECT WASTE DRAIN.
8. HVAC CONTROLS
- A. CONTRACTOR TO SUPPLY AND INSTALL ALL CONTROL WIRING AND THERMOSTATS AS REQUIRED.
9. ELECTRICAL
- A. CONTRACTOR TO COORDINATE WITH ELECTRICAL CONTRACTOR FOR LOCATION OF WIRING FOR EACH HVAC UNIT.
10. PIPE SUPPORTS
- A. ALL PIPE SHALL BE SUPPORTED FROM THE BUILDING STRUCTURE IN A NEAT AND WORKMANLIKE MANNER. THE USE OF WIRE OR METAL STRAP TO SUPPORT PIPES WILL NOT BE PERMITTED. SPACING OF PIPE SUPPORTS SHALL NOT EXCEED 8 FEET FOR ALL PIPING. PLASTIC PIPING TO BE SUPPORTED EVERY 4 FEET.
11. GAS PIPING
- A. PIPING SHALL BE SCHEDULE 40 BLACK STEEL PIPE WITH MALLEABLE IRON FITTINGS.
- WHERE GAS PIPE CONNECTS TO EQUIPMENT, IT SHALL BE PROVIDED WITH A DRIP LEG THE FULL SIZE OF THE RUNOUT, A 100% SHUT-OFF VALVE AND A UNION. GAS PIPING CONTAINING PRESSURE GREATER THAN 9" W.G. SHALL BE SCHEDULE 40 BLACK STEEL PIPE WITH WELDED JOINTS.
12. MISCELLANEOUS
- A. ALL EXTERIOR OPENINGS TO BE PROPERLY CAULKED AND SEALED WITH A SEALANT OF HIGH QUALITY AND LONG LIFE, TO PREVENT INFILTRATION OF OUTSIDE AIR INTO CONDITIONED SPACE.
- B. COORDINATE INSTALLATION OF ALL ROOF FLASHING AT ROOF PENETRATION.
- C. DO NOT SCALE THIS DRAWING FOR EXACT DIMENSIONS.
- D. VERIFY ALL FIGURES, CONDITIONS, AND DIMENSIONS AT THE JOB SITE.
- E. THE MECHANICAL PLANS ARE INTENDED TO BE DIAGRAMMATIC AND ARE BASED ON ONE MANUFACTURE'S EQUIPMENT. THEY ARE NOT INTENDED TO SHOW EVERY ITEM IN ITS EXACT LOCATION, THE EXACT DIMENSIONS, OR ALL THE DETAILS OF THE EQUIPMENT.
- F. THE CONTRACTOR SHALL VERIFY THE ACTUAL DIMENSIONS OF THE EQUIPMENT PROPOSED TO ENSURE THAT THE EQUIPMENT WILL FIT IN THE AVAILABLE SPACE.
- G. PEX TUBING, IF PEX TUBING IS USED AS AN APPROVED ALTERNATE FOR APPLICATIONS WHERE METALLIC PIPING IS THE BASIS OF DESIGN, THE PEX MANUFACTURER SHALL SUBMIT SHOP DRAWINGS CLEARLY INDICATING THAT THE DESIGN HAS BEEN ANALYZED AND MODIFIED, AS REQUIRED TO MAINTAIN SCHEDULED HYDROIC SYSTEM PARAMETERS. ANY DESIGN RESULTING IN INCREASED SYSTEM PRESSURE DROP AS A RESULT OF IMPROPER PEX SIZING OR DESIGN SHALL NOT BE PERMITTED.
13. TESTING AND BALANCING
- A. THE HVAC SYSTEM SHALL BE TESTED AND BALANCED BY AN INDEPENDENT AGENCY, UNDER THE SUPERVISION OF A LICENSED PROFESSIONAL ENGINEER. A SEALED TYPE WRITTEN REPORT SHALL BE SUBMITTED TO THE ARCHITECT/ENGINEER FOR REVIEW AND APPROVAL.
14. GUARANTEE
- A. MATERIALS, EQUIPMENT AND INSTALLATION SHALL BE GUARANTEED FOR A PERIOD OF TWO (2) YEAR FROM DATE OF ACCEPTANCE. DEFECTS WHICH APPEAR DURING THAT PERIOD SHALL BE CORRECTED AT THIS CONTRACTOR'S EXPENSE.
- B. FOR THE SAME PERIOD, THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO PREMISES CAUSED BY DEFECTS IN WORKMANSHIP OR IN THE WORK OR EQUIPMENT FURNISHED AND/OR INSTALLED BY HIM.

GENERAL NOTES:

DRAWING IS DIAGRAMMATIC IN NATURE. LOCATION AND SIZES MAY VARY DURING FIELD COORDINATION AND INSTALLATION OF MECHANICAL EQUIPMENT. DRAWINGS DO NOT NECESSARILY INDICATE EVERY REQUIRED OFFSET, FITTING, ETC. DRAWINGS ARE NOT TO BE SCALED FOR DIMENSIONS. TAKE ALL DIMENSIONS FROM ARCHITECTURAL DRAWINGS, CERTIFIED EQUIPMENT DRAWINGS, AND FROM THE STRUCTURE ITSELF BEFORE FABRICATING ANY WORK. VERIFY ALL SPACE REQUIREMENTS COORDINATING WITH OTHER TRADES, AND INSTALL THE SYSTEMS IN THE SPACE PROVIDED WITHOUT EXTRA CHARGES TO THE OWNER.

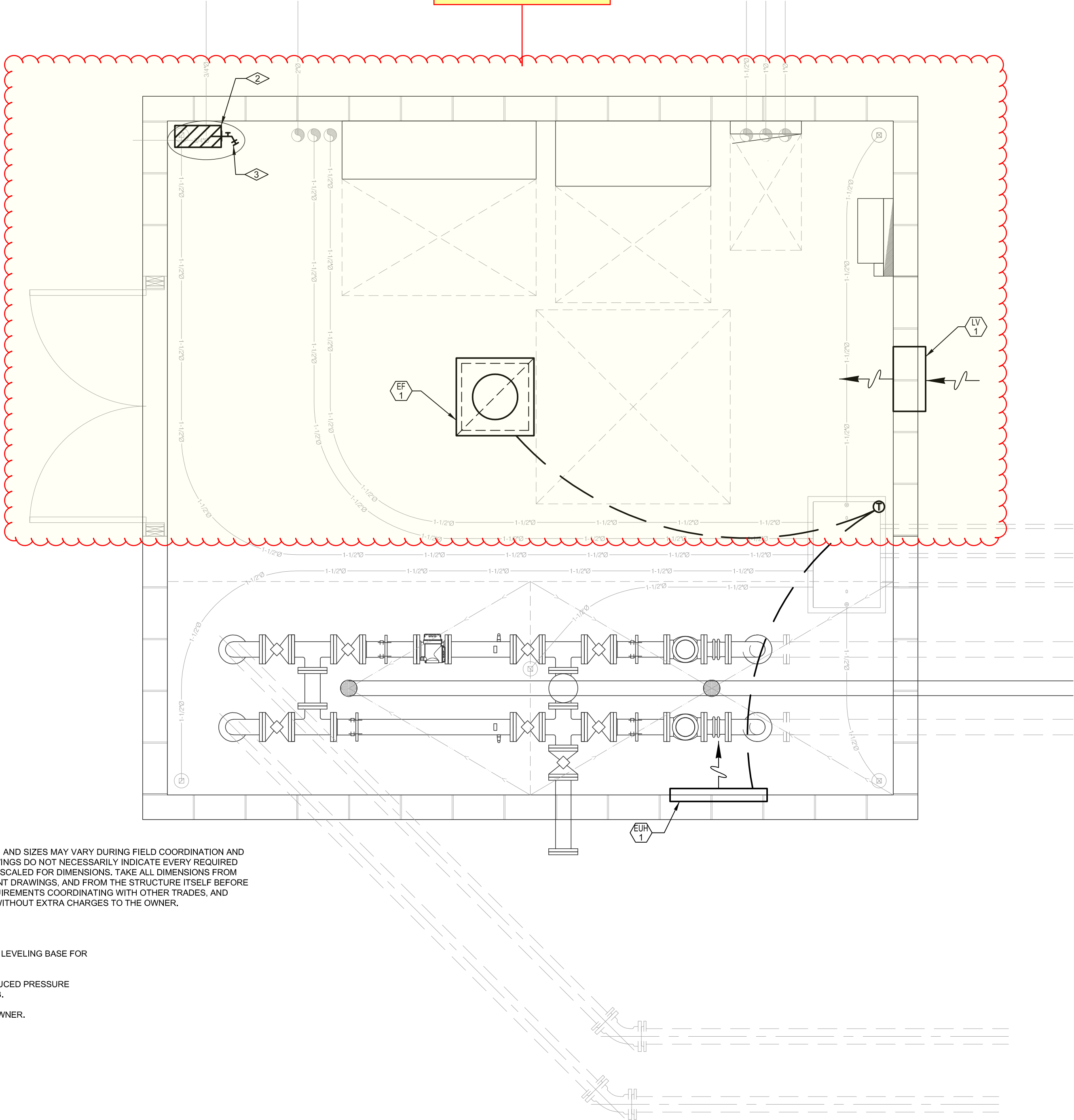
FLAG NOTES:

1. EXHAUST FAN MOUNTED ON ROOF, PROVIDE LEVELING BASE FOR ROOF PITCH AND CURB. ROOF IS 6:12 PITCH.
2. DOMESTIC WATER ENTRY WITH METER, REDUCED PRESSURE BACKFLOW PREVENTER, PRV AND HOSE BIBB.
3. HOSE BIBB. COORDINATE LOCATION WITH OWNER.

Note:
This Plan was modified by
Boundaries Unlimited Inc.
on 12/30/20 as follows:

Components mirrored
west to east (right to left).

The doorway, controls and mechanical
are to be mirrored to match Sheet C.8
"Civil-Facility Piping Plan"



MECHANICAL - LIFT STATION BUILDING - PLAN VIEW

SCALE: 1/2"=1'-0"

EXHAUST FAN SCHEDULE						
TIC PRESS (IN. 3.)	ELECTRICAL			MANUFACTURER & MODEL	OPTIONS/ACCESSORIES	
	HP	RPM	VOLT/PH/HZ			
5	1/4	1500	120/1/60	GREENHECK GB-101	NOTE 1	

DAMPER, AND BELT DRIVEN VFD MOTOR.

ELECTRIC UNIT HEATER SCHEDULE										
EQUIPMENT NO.	SERVICE	CFM	RPM	BTU/HR	KW	AIR TEMP. RISE (F)	FULL LOAD AMPS (FLA)	V/PH/HZ	MANUFACTURER & MODEL	OPTIONS/ACCESSORIES
EUH-1	LIFT STATION	245	1,400	13,652	4	105	11.1	208/3/60	RAYWALL AFC8340T	NOTE 1

NOTES:
1. WALL MOUNTED, PROVIDE WITH POWER DISCONNECT AND 4" SURFACE MOUNTING FRAME.

LOUVER SCHEDULE						
EQUIPMENT NO.	SERVICE	WIDTH (IN)	HEIGHT (IN)	THICKNESS OF WALL (IN)	MANUFACTURER & MODEL	OPTIONS/ACCESSORIES
LV-1	EF-1	22	22	10	GREENHECK ECD-401-22X22	NOTE 1

NOTES:
1. PROVIDE MOTORIZED DAMPER TO OPERATE WITH EF-1, HOUSING AND BIRD SCREEN.

PLUMBING SPECIFICATION

1. SCOPE OF WORK
- A. THE CONTRACTOR IS RESPONSIBLE FOR ALL WORK, MATERIALS, AND LABOR TO SATISFY A COMPLETE WORKING SYSTEM WHETHER SPECIFIED OR IMPLIED.
- B. ALL WORK IS TO BE PERFORMED IN STRICT COMPLIANCE WITH THE INTERNATIONAL PLUMBING CODE (LATEST EDITION), ALL LOCAL CODES AND ALL OTHER REGULATION GOVERNING WORK OF THIS NATURE.
- C. THE CONTRACTOR SHALL, BEFORE SUBMITTING ANY PROPOSAL, EXAMINE THE PROPOSED SITE AND SHALL DETERMINE FOR HIMSELF THE CONDITIONS THAT MAY AFFECT THE WORK. NO ALLOWANCE SHALL BE MADE IF THE CONTRACTOR FAILS TO MAKE SUCH EXAMINATIONS.
- D. ALL EQUIPMENT AND MATERIALS SHALL BE AS SPECIFIED OR "APPROVED AS EQUAL" BY THE ENGINEER OR ARCHITECT.
2. PERMITS
- A. THE CONTRACTOR SHALL SECURE ALL PERMITS OR APPLICATIONS AND PAY ANY AND ALL FEES.
3. SHOP DRAWINGS
- A. SUBMIT MATERIAL LIST AND SHOP DRAWINGS FOR MAJOR EQUIPMENT TO THE ARCHITECT/ENGINEER FOR APPROVAL. THE CONTRACTOR SHALL SUBMIT FIVE SETS OF SHOP DRAWINGS AND THEY SHALL BE CLEARLY LABELED.
4. DOMESTIC WATER SUPPLY PIPING
- A. UNDERGROUND: PROVIDE HDPE WITH FUSION WELDED JOINTS.
- B. ABOVE GROUND: PROVIDE TYPE "L" HARD DRAWN COPPER TUBING WITH 125 PSI SOLDER JOINTS, COPPER OR BRASS FITTINGS. ALL SOLDER TO BE "NO LEAD" TYPE.
- C. ALL HOT WATER PIPING TO BE INSULATED WITH 1" FIBERGLASS INSULATION.
- D. ALL COLD WATER PIPING TO BE INSULATED WITH 1/2" FOAM INSULATION.
5. SANITARY/STORM DRAINAGE AND VENT PIPING
- A. ABOVE GRADE:
- 2" BELOW: SCHEDULE 40 GALV. STEEL PIPE WITH SCREWED ENDS OR SCHEDULE 40 PVC WITH SOLVENT JOINTS OR DWV COPPER WITH SOLDER JOINTS. ALL SOLDER TO BE "NO LEAD" TYPE.
- 3" AND ABOVE: SERVICE WT. CAST IRON WITH NO-HUB OR BELL AND SPIGOT JOINTS; OR SCHEDULE 40 PVC WITH SOLVENT JOINTS.
- B. BELOW GRAD: SERVICE WT. CAST IRON WITH NO-HUB OR BELL AND SPIGOT JOINTS; OR SCHEDULE 40 PVC WITH SOLVENT JOINTS.
- C. PVC PIPING SHALL NOT BE USED IN AIR PLENUM CEILINGS AND SHALL NOT CROSS FIRE RATED WALLS, CEILINGS, OR FLOORS.
- D. DRAINAGE PIPING SHALL BE RUN AS STRAIGHT AS POSSIBLE AND SHALL HAVE LONG TURN FITTINGS.
- E. DRAINAGE PIPING 3" SIZE AND SMALLER SHALL RUN AT A UNIFORM GRADE OF AT LEAST 1/8" PER FOOT, AND PIPING LARGER THAN 3" SHALL BE RUN AT A GRADE OF NO LESS THAN 1/8" PER FOOT.
- F. ALL VENT PIPING SHALL BE SLOPED TO DRAIN BACK TO FIXTURES.
- G. CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER FLASHING OF THE VENT PIPING RUN THROUGH THE ROOF.
7. PIPE SUPPORTS
- A. ABOVE GRADE: ALL PIPE SHALL BE SUPPORTED FROM THE BUILDING STRUCTURE IN A NEAT AND WORKMANLIKE MANNER. THE USE OF WIRE AND PERFORATED METAL TO SUPPORT PIPES WILL NOT BE PERMITTED. SPACING OF PIPE SUPPORTS SHALL BE AS SPECIFIED IN INTERNATIONAL PLUMBING CODE (LATEST EDITION).
- B. BELOW GRADE: EARTH SHALL BE EXCAVATED TO A MINIMUM DEPTH WITH AN EVEN SURFACE TO INSURE SOLID BEARING OF PIPE FOR ITS ENTIRE LENGTH.

-INTERIOR: THE PIPE SHALL BE INSTALLED (UNLESS OTHERWISE SPECIFIED) A MINIMUM OF 4 INCHES BELOW THE BOTTOM OF THE SLAB AND SHALL NOT BE IN ANY DIRECT CONTACT WITH THE CONCRETE AT ANY POINT.

-EXTERIOR: THE WATER PIPE SHALL HAVE A MINIMUM OF 60" OF COVER AND THE SANITARY WASTE PIPE SHALL HAVE A MINIMUM OF 24" OF COVER.

8. MISCELLANEOUS
- A. COORDINATE INSTALLATION OF ALL ROOFS FLASHING AT ROOF PENETRATIONS.
- B. DO NOT SCALE THIS DRAWING FOR EXACT DIMENSIONS. VERIFY ALL FIGURES, CONDITIONS AND DIMENSIONS AT THE JOB SITE.
- C. THE PLUMBING PLANS ARE INTENDED TO BE DIAGRAMMATIC AND ARE BASED ON ONE MANUFACTURER'S EQUIPMENT. THEY ARE NOT INTENDED TO SHOW EVERY ITEM IN ITS EXACT LOCATION, THE EXACT DIMENSIONS OR ALL THE DETAILS OF THE EQUIPMENT. THE CONTRACTOR SHALL VERIFY THE ACTUAL DIMENSIONS OF THE EQUIPMENT PROPOSED TO ENSURE THAT THE EQUIPMENT WILL FIT THE AVAILABLE SPACE.
9. TESTING
- A. PLUMBING SYSTEM SHALL BE FLOW AND PRESSURE TESTED IN ACCORDANCE WITH THE INTERNATIONAL PLUMBING CODE (LATEST EDITION).
10. GUARANTEE
- A. MATERIALS, EQUIPMENT AND INSTALLATION SHALL BE GUARANTEED FOR A PERIOD OF TWO (2) YEAR FROM DATE OF ACCEPTANCE. DEFECTS WHICH APPEAR DURING THAT PERIOD SHALL BE CORRECTED AT THIS CONTRACTOR'S EXPENSE.
- B. FOR THE SAME PERIOD THE PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO PREMISES CAUSED BY DEFECTS IN WORKMANSHIP OR IN THE WORK OR EQUIPMENT FURNISHED AND/OR INSTALLED BY HIM.

DO NOT REPRODUCE THESE DRAWINGS AND SPECIFICATIONS WITHOUT THE EXPRESSED WRITTEN PERMISSION OF THE DESIGNER. THE DRAWINGS AND SPECIFICATIONS ARE INSTRUMENTS OF THE SERVICE AND SHALL REMAIN THE PROPERTY OF THE DESIGNER. WHETHER THE PROJECT FOR WHICH THEY ARE MADE IS EXECUTED OR NOT, THESE DRAWINGS AND SPECIFICATIONS SHALL NOT BE USED BY ANYONE ON ANY OTHER PROJECTS FOR ACCORDING TO THE PROJECT BY OTHERS EXCEPT BY THE EXPRESSED WRITTEN PERMISSION OF THE DESIGNER.



Bighorn Consulting Engineers, Inc.
Mechanical & Electrical Engineers
386 Indian Road
Grand Junction, CO 81501
Phone: 970-241-8709

**GLENWOOD SPRINGS
HOT SPRINGS LIFT STATION**

GLENWOOD SPRINGS, COLORADO

DATE:	ISSUED FOR:
10/09/20	CONSTRUCTION

DATE:	10/09/2020
JOB NO:	19-128
DRAWN BY:	BCE
CHECKED BY:	BCE
SCALE:	AS SHOWN
SHEET NUMBER:	

M1-1



TECHNICAL SPECIFICATIONS

Centennial Street Lift Station (LS1600)

Glenwood Springs, Colorado

SPECIFICATION LIST:

SECTION 01300 – SUBMITTALS
SECTION 01450 – EMERGENCY RESPONSE PLAN
SECTION 01510 – TEMPORARY FACILITIES
SECTION 02100 – SITE PREPARATION
SECTION 02200 – EARTHWORK
SECTION 02315 – EXCAVATION AND BACKFILL FOR BURIED PIPES
SECTION 02370 – EROSION AND SEDIMENT CONTROL
SECTION 02520 – INSTALLATION OF GRAVITY SANITARY SEWER PIPELINES
SECTION 02575 – MANHOLES
SECTION 02614 – SANITARY SEWER FORCE MAINS
SECTION 02676 – WATERTIGHTNESS TESTING
SECTION 02925 – REVEGETATION
SECTION 03100 – FORMWORK
SECTION 03200 – REINFORCEMENT
SECTION 03253 – WATERSTOPS
SECTION 03300 – CAST-IN-PLACE CONCRETE
SECTION 04200 – MASONRY
SECTION 04810 – KEYSTONE CONCRETE RETAINING WALLS
SECTION 05050 – MISCELLANEOUS METALS
SECTION 06300 – CARPENTRY, MILLWORK AND MISC. WOODWORK
SECTION 07050 – SEALANTS AND CAULKING
SECTION 07610 – METAL ROOFING SYSTEM
SECTION 08100 – DOORS
SECTION 09900 – PAINTING AND COATINGS
SECTION 11005 – GENERAL EQUIPMENT
SECTION 11125 – SUBMERSIBLE GRINDER PUMPS
SECTION 15200 – INTERIOR PROCESS PIPING
SECTION 15215 – VALVES, METERS AND ACCESSORIES
SECTION 15700 – HEATING AND VENTILATION
SECTION 16010 – GENERAL PROVISIONS
SECTION 16015 – SHORT-CIRCUIT/COORDINATION STUDY/ARC-FLASH ANALYSIS
SECTION 16050 – BASIC ELECTRICAL MATERIALS AND METHODS
SECTION 16150 – VARIABLE FREQUENCY DRIVES AND CONTROL EQUIPMENT
SECTION 16250 – ENGINE GENERATORS: DIESEL
SECTION 16280 – AUTOMATIC TRANSFER SWITCH
SECTION 16900 – INSTRUMENTATION AND CONTROLS
SECTION 16950 – PROGRAMMABLE LOGIC CONTROLLERS & SCADA SYSTEMS
SECTION 16951 – CONTROLS DESCRIPTIONS
SECTION 16960 – ELECTRICAL COMPLETION

January 26, 2021

SECTION 01300 – SUBMITTALS**PART 1 -- DESCRIPTION**

The Contractor shall submit submittal information to the Engineer as stated in the Technical Specification sections. The information must be thorough (drawings, descriptions, samples, manufacturer catalog sheets, etc.) enough for the Engineer to conclusively determine compliance with Specification requirements of Contractor proposed equipment, materials and methods of work. Contractor shall not proceed with manufacture, fabrication, delivery, or installation of items prior to obtaining the Engineer's favorable review of product submittals.

PART 2 -- PROCEDURE

The Contractor shall submit to the Engineer three copies (which will be retained by the Engineer), plus however many copies that are to be returned to the Contractor, of each submittal item. The Contractor must allow three weeks for approval, and one additional week if a Subconsultant is needed for approval. Submittals of related items shall be delivered as a package for a coordinated review. Related items not included in a single package for coordinated review may be cause for return without review for amendment and resubmittal. The Engineer reserves the right to require submittals in addition to those required in the Specifications.

The submittals shall be submitted with a transmittal form for each separate item listed for review. The submittal shall be marked with the appropriate title and Section reference for filing. A sequential numbering system shall be assigned to the submittals with a position for marking resubmittals.

Prior to sending to the Engineer, the Contractor must review all submittal materials and shall mark his approvals and recommendations. All O&M information must be submitted separately from the original submittal and shall be so marked.

Submittals that are not reviewed and coordinated by the Contractor prior to submittal to the Engineer, including ensuring that all necessary information is included for complete review of a single Section, packaging of items for coordinated review, marking of proposed items and providing recommendations, and crossing out of extraneous items, may be cause for return without review and may delay the review schedule. The Contractor shall not be entitled to a contract time extension due to submittal review delays associated with poorly coordinated submittals.

PART 3 -- REVIEW REQUIREMENTS

The Contractor is responsible for ensuring compliance with the methods and materials required in the Technical Specifications. Approval of a submittal by the Engineer does not alleviate the responsibility of the Contractor. The Contractor shall maintain responsibility of any errors or omissions, and review by the Owner or the Engineer does not remove any liability or risk of the Contractor. The Contractor can make no claim of failure of the work, material or equipment against any item reviewed.

Submittals shall include all items and materials within a single Technical Specification section, unless allowed otherwise by the Engineer. Verify that the physical characteristics of items submitted, such as size, configuration, clearances, mounting locations, utility connection points, and access points, are compatible with the space provided and with interconnecting or interrelated items which have been or are yet to be submitted. When catalog sheets are submitted, the items proposed for use must be clearly marked, and extraneous items shall be crossed out.

If a submittal represents equipment or methods that are different from those specified, the Contractor is responsible for demonstrating the relevance to the specifications. All variations must be shown in writing for review, and must be approved by the Engineer. If the variation creates a change in the Contract Price, a Change Order modification will be generated.

PART 4 -- OPERATION AND MAINTENANCE MANUALS

The Contractor shall furnish three copies of Operation and Maintenance information for the equipment stated in the specifications. The information shall be labeled as an O&M Manual and be bound in a three-ring binder. The sections shall be clearly labeled and tabbed with permanent covers. They shall include information on required maintenance, installation, operations, electrical and hydraulic systems, lubrication and spare or necessary parts.

PART 5 -- CERTIFICATES

When certification of an item or an individual performing the work is required, three copies of the certificates shall be supplied demonstrating that the material and work are being provided in accordance with the Specifications.

PART 6 -- PRODUCT SAMPLES

Where required, three samples shall be supplied to the Engineer for review of proposed material, colors, textures or patterns.

- END OF SECTION -

SECTION 01450 – EMERGENCY RESPONSE PLAN

PART 1 -- GENERAL

1.01 SCOPE:

Development of a Wastewater Discharge Emergency Response Plan by Contractor, to be implemented in the event of a wastewater discharge.

1.02 SUBMITTALS:

Submit detailed plan in accordance with Specification 01300.

1.03 EMERGENCY RESPONSE PLAN DEVELOPMENT:

- A. The Contractor shall develop and submit to Engineer at least 14 working days prior to the start of construction, a written Emergency Response Plan (ERP). The ERP shall be developed to respond to any flood occurrence which presents the risk of impacting the temporary bypass piping and the risk of a construction related wastewater discharge. Contractor's ERP shall not rely on Owner's personnel for emergency response, but they may be dispatched, at the Owner's discretion, to provide additional assistance. If Owner's personnel are utilized, Contractor shall be responsible for all associated costs.
- B. The ERP shall include at minimum, the following:
 - 1. Identification of nearby environmentally-sensitive areas such as waterways, channels, catch basins and entrances to existing storm drains or drainage conveyances.
 - 2. Development of an emergency notification procedure. Contractor shall designate primary and secondary representatives, their respective phone numbers and mobile phone numbers. Owner and Engineer contacts shall also be listed.
 - 3. Identify personnel and equipment/tools that will be utilized in the event of a wastewater discharge, a flood in excess of the 100-year occurrence, or any other flood related issues which pose a risk to the project. Include an emergency response team with arrangements for backup personnel and equipment. The emergency response team shall be able to dispatch to the site 24 hours a day, 7 days a week, including weekends and holidays to respond immediately to any wastewater discharge related to the Work or as required to prevent damage as a result of flooding.
 - 4. Identify any property owners who may be affected by a spill of any nature. Identify local and state agencies requiring notification upon a discharge.
 - 5. Identify step-by-step procedures to follow to contain, control, and minimize wastewater discharge.
- C. At the preconstruction meeting, Contractor will be provided with a list of Owner's representatives to contact in case of a wastewater discharge. These contacts shall be added to the ERP.
- D. Contractor shall not begin work until Engineer and Owner have approved the ERP. An approved copy of the ERP shall be available on the job site at all times.
- E. It shall be the Contractor's responsibility to ensure that all employees, including

subcontractors, know and obey all emergency procedures included in the Emergency Response Plan (ERP).

1.04 WASTEWATER DISCHARGE EVENT

- A. In the event of a wastewater discharge Contractor shall immediately:
 - 1. Implement the ERP without direction from Engineer or Owner, to control and contain the discharge.
 - 2. Contact Owner's personnel as outlined at the pre-construction meeting. Contact to include at a minimum, the following:
 - a. Location of discharge
 - b. Estimated volume
 - c. Time discharge began
 - d. Duration (if already controlled)
 - e. Cause (if known)
 - f. Control measures implemented
 - g. Type of remedial measures and/or cleanup measures taken
 - 3. Based on this information, Contractor, Engineer, and Owner's Project Manager will determine if the discharge is contained, and whether or not the Owner's personnel should be dispatched to the site.
 - 4. Contact the local and state agencies requiring notification of a discharge.
- B. Contractor shall, within three working days of the wastewater discharge, submit to Engineer and Owner a written Wastewater Discharge Incident Report.
- C. Engineer and Owner will evaluate the suggested procedural changes to avoid further discharges and will instruct Contractor on changes. Engineer and Owner may institute further corrective actions, as deemed necessary.
- D. Contractor shall be fully responsible for preventing wastewater discharges, containing the sewage, recovery and legal disposal of sewage, any fines, penalties, claims and liability arising from negligent or willful discharge of wastewater; and any violation of any law, ordinance, code, order, or regulation as a result of the emergency. Contractor shall be responsible for replacement or repair of damaged or failed equipment as a direct result of the emergency. Contractor shall be responsible for payment of any fines assessed against Owner and Engineer.

1.05 FLOOD EVENT:

- A. Placement of the temporary bypass piping shall be above the elevation of the 100-year floodplain. At the crossing of tributaries to a river, the temporary bypass piping shall be supported above the 100-year flood water elevation and anchored in place.
- B. Contractor shall monitor NOAA weather forecasts to anticipate flood events affecting the project and place remedial resources on standby.
- C. In the event that the water level should reach an elevation approaching the 100-year flood level, Contractor shall cease bypass pumping and mobilize resources

EMERGENCY RESPONSE PLAN – SECTION 01450

necessary to remove bypass piping from drainage crossings or otherwise act as necessary to protect against backup of flood waters caused by the bypass piping or damage to the piping resulting from flood water.

PART 2 -- PRODUCTS (Not used)

PART 3 -- EXECUTION (Not used)

- END OF SECTION -

SECTION 01510 – TEMPORARY FACILITIES**PART 1 -- GENERAL****1.01 OFFICE AT THE WORK SITE:**

During the performance of this Contract, Contractor shall maintain a suitable office at or near the site of the Work which shall be the headquarters of his representative authorized to receive drawings, instructions, or other communication or articles. Any communication given to the Contractor's representative or delivered at Contractor's office at the site of the Work in his absence shall be deemed to have been delivered to the Contractor. The field office shall be in place prior to the Contractor receiving payment for more than 5 percent of the work and shall remain in place until the final inspection. The location of the office shall be approved by the Owner. Contractor shall be responsible for providing utility services to the office.

1.02 WATER:

Water for construction, maintenance, testing, or for any other reasonable use by Contractor will be furnished and paid for by the Contractor. Contractor shall furnish necessary equipment and connections and shall perform all necessary labor.

1.03 POWER:

Power for heating, lighting, operation of Contractor's plant or equipment, or for any other reasonable use by Contractor will be furnished and paid for by the Contractor. Contractor shall furnish necessary cable and connections and shall perform all necessary labor. Temporary heat and lighting shall be maintained until the Work is accepted.

1.04 TELEPHONE SERVICE:

Contractor shall make all necessary arrangements and pay all installation and use charges for telephone lines if needed at their field office, and shall provide all telephone instruments. Alternatively, cell phones are acceptable in lieu of land lines.

1.05 SANITARY FACILITIES:

Contractor shall furnish temporary sanitary facilities at the site for the needs of all construction workers and others performing work or furnishing services on the Project.

Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, at least one toilet will be furnished for each 20 personnel. Contractor shall enforce the use of such sanitary facilities by all personnel at the site.

1.06 SECURITY:

Contractor shall be responsible for protection of the site, and all work, materials, equipment, and existing facilities thereon, against theft, vandalism and unauthorized persons.

No claim shall be made against the Owner by reason of any act of an employee or trespasser, and Contractor shall make good all damage to the Owner's property resulting from failure to provide adequate security measures.

Security measures shall be at least equal to those usually provided by the Owner to protect its existing facilities during normal operation, but shall also include such additional security

TEMPORARY FACILITIES – SECTION 01510

fencing, barricades, lighting, and other measures as required to protect the work site and associated storage and parking areas.

PART 2 -- PRODUCTS (Not used)

PART 3 -- EXECUTION (Not used)

- END OF SECTION -

SECTION 02100 – SITE PREPARATION**PART 1 -- GENERAL**

The scope of the work for this section includes the clearing of vegetation and topsoil; removal of roots, fences, and debris; disposal of unutilized materials; and related incidentals required, including salvaging of materials and backfilling of resulting trenches, holes and pits, to prepare the site for the contract work for the entire project.

1.01 THE REQUIREMENT:

The Work of this SECTION includes procedures required during the Contractor's initial move onto the Site to protect existing fences, trees and vegetation, houses and associated improvements, streets, and utilities downslope of construction areas from damage due to boulders, trees or other objects dislodged during the construction process; clearing, grubbing and/or stripping; and regrading of certain areas to receive embankment fill. It shall be the Contractor's responsibility to both maintain safe working conditions and to protect the entire project area and adjacent properties that could be damaged storms, floods, caving of trenches and embankments, and sloughing of material, until final acceptance by the Owner. The Contractor must maintain the entire site until each portion of the project area has reached completion within the job specifications.

1.02 SITE INSPECTION:

Prior to moving onto the site, the Contractor shall inspect the site conditions and review maps of the existing site. The Contractor shall satisfy themselves as to the nature and location of the work, site conditions, the terrain and nature of the existing ground surface, and the type of equipment needed to perform the work. Any discrepancies between the Drawings and the actual site conditions must be brought to the attention of the Engineer in writing immediately for clarification. The Contractor must also video tape the entire site as a record of existing conditions. A copy of the video must be submitted to the Engineer prior to mobilization.

1.03 SOILS INVESTIGATION REPORT:

A Soils Investigation Report has been completed for this project and is located following the Special Construction Provisions.

PART 2 -- PRODUCTS (Not Used)**PART 3 -- EXECUTION****3.01 PRIMARY SITE ACCESS:**

The Contractor shall develop any necessary access to the Site, including access barriers to prohibit entry of unauthorized persons. Work shall be limited to the specific areas noted on the drawings.

3.02 UTILITY INTERFERENCE:

Where existing utilities interfere with the Work, notify the utility owner and the Contracting Officer or Engineer before proceeding in accordance with the General Conditions. Unless noted otherwise, all utility lines and structures, regardless of whether shown on the Drawings or not, shall remain in service and shall be protected by the Contractor from any damage as a result of construction operations. Utilities shown on the drawings are based on information available to the Design Engineer at the time of design, and there is no

guarantee that all utilities are shown. If utilities are encountered that are not shown on the Drawings, the Contractor must report them to the Owner and the Engineer before proceeding with the work. The Contractor shall repair or replace any utility damaged by their operations in coordination with and to the satisfaction of the utility owner, at no additional cost to the Owner.

3.03 CLEARING AND GRUBBING:

Construction areas shall be cleared of grass, weeds and incidental vegetation, and cleared of structures identified to be demolished, concrete or masonry debris, trees, logs, upturned stumps, loose boulders, and any other objectionable material of any kind which would interfere with the performance or completion of the Work, create a hazard to safety, or impair the subsequent usefulness of the Work, or obstruct its operation. Loose rocks and boulders within 10 feet of the top of cut lines shall be stockpiled for use or removed from the Site. Trees and other natural vegetation outside the actual lines of construction shall be protected from damage during construction, as directed by the Engineer and in accordance with the referenced erosion and sedimentation control best management practices. Violation of this provision may require the Contractor to replace trees at their expense.

3.04 STRIPPING:

Strip the upper six (6) inches of soil containing topsoil, vegetation and root matter from all areas to receive fill and to be excavated. Stockpile the stripped material for later use in restoration of the site.

3.05 OVEREXCAVATION AND REGRADING OF AREAS TO RECEIVE FILL:

As directed by the Engineer, after the areas to receive fill have been cleared, grubbed, and stripped, the areas shall be over-excavated to remove undesirable soils, the underlying competent soil scarified and compacted, and then filled as specified in the Earthwork Specification SECTION. The overexcavated ground surface shall be recontoured for keying the fill and removing severe or abrupt changes in the topography. Remove undesirable soils from the site; do not incorporate them within the Work.

3.06 SOILS INSPECTION AND TESTING:

The Owner will provide a qualified Soils Engineer to inspect excavations, subgrades, and backfill. The testing of prepared subgrade and any or all lifts of compacted fill or backfill will be at the discretion of the Engineer. The Contractor shall give the Engineer twenty-four hours' notice before beginning or between lifts of embankment fills, backfilling or subgrade preparation to provide adequate notification to the testing personnel. The Contractor shall not proceed with the work until favorable conditions are confirmed by the test results.

The Owner will engage an independent testing laboratory or otherwise provide for earthwork testing. Costs for all such testing will be paid by the Owner, except the Contractor shall bear the cost of retesting and reinspection of faulty work that does not pass requirements of the Specifications. When the tests indicate that the density of any layer of fill or portion thereof is below the specified density, the particular layer or portion shall be reworked until the specified density is obtained.

- END OF SECTION -

SECTION 02200 – EARTHWORK**PART 1 -- GENERAL****1.01 THE REQUIREMENT:**

The Contractor shall perform all earthwork indicated and required for construction of the Work, complete and in place, in accordance with the Contract Documents to include, but not limited to, excavation and embankment construction, structural excavation and backfill, compaction, disposal of extra or unsuitable materials, dust and drainage control, and cleanup.

All work shall be executed in accordance with the recommendations contained in the Geotechnical Report prepared for this project (follows the Special Construction Provisions).

1.02 CONTRACTOR SUBMITTALS:

Submit in accordance with Specification 01300. Submit the following:

- A. Certified laboratory test results demonstrating that imported materials meet the requirements of this SECTION, including gradation, optimum moisture content, and maximum density. Particle size analysis of soils and aggregates shall be determined in accordance with ASTM D422. Test results shall be dated within 12 months of the date of the submittal.
- B. Mix design for Controlled Low Strength Material (CLSM).
- C. The Contractor shall acquire all required permits by each relevant governmental entity and provide copies to the Engineer prior to commencing with work.

1.03 DEFINITIONS:

FILL: Fill is defined as earthen material excavated from the channel and used in the construction of the embankment.

BACKFILL: Earthen materials collected onsite, remixed to a specific gradation and used in the reconstruction of the channel bottom.

EMBANKMENT: The placement of fill material systematically to the grades and elevations shown on the plans.

1.04 DUST CONTROL:

The Contractor shall take every step possible to prevent and reduce dust arising from the construction activity. He shall have adequate water trucks or sources on the site at all times and shall water, as necessary, the areas where dust may arise. He shall cooperate fully with the Owner and water immediately, when asked to do so.

PART 2 -- PRODUCTS**2.01 SUITABILITY REQUIREMENTS:**

- A. General: Fill, backfill, and embankment Materials shall be selected or processed clean, fine earth, rock, or sand, free from grass, roots, brush, or other vegetation. Only topsoil at the backfill surface may include organic matter.
- B. Suitable Materials: Materials not defined as suitable or unsuitable below are classified as undefined and they need to be accepted for use by the Engineer.

Material defined as suitable may be used for backfilling and constructing fills, and embankments. In addition, when acceptable to the Engineer, some of the material listed as unsuitable may be used when thoroughly mixed with suitable material to form a stable composite.

- C. Suitable materials may be obtained from on-site excavations, may be processed on-site materials, or may be imported. If imported materials are required by this SECTION or to meet the quantity requirements of the project, the Contractor shall provide the imported materials at no additional expense.

Unless approved by the Engineer, backfill in the upper 2-feet or within 2-feet of a structure shall contain no rocks larger than 6 inches in greatest dimension.

Rock greater than 8 inches but less than 24 inches in greatest dimension may be placed in non-structural backfills deeper than 2-feet below finish grade, and greater than 5-feet (vertically and horizontally) from structures and utilities. Disperse the large rock throughout the fill and compact soil in 12-inch max lifts around the rocks as necessary to prevent voids and nesting.

Rocks larger than 24-inch shall be segregated and used for other appropriate portions of the project if applicable, or removed from the site.

2.02 UNSUITABLE MATERIAL:

- A. Unsuitable materials include the materials listed below.
1. Soils which, when classified under ASTM D 2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System), fall in the classifications of Pt, OH, CH, MH, or OL.
 2. Soils which cannot be compacted sufficiently to achieve the density specified for the intended use.
 3. Materials that contain hazardous or designated waste materials including petroleum hydrocarbons, pesticides, heavy metals, and any material which may be classified as hazardous or toxic according to applicable regulations.
 4. Topsoil, except as allowed below.

2.03 USE OF FILL, BACKFILL, AND EMBANKMENT MATERIAL TYPES:

- A. The Contractor shall use the types of materials as designated herein for all required fill, backfill, and embankment construction hereunder.
- B. Fill and backfill types shall be used in accordance with the following provisions:
1. Fill and backfill types may be sourced from materials excavated on site. Fill and Backfill shall be classified as granular soil. The soil shall contain less than 15% passing the No. 200 sieve, and no rocks greater than 8 inches in largest dimension. It shall be noted that the geotechnical investigation found that native soils have percentages passing the No. 200 sieve greater than 20%. The Contractor shall provide screening of native soils to remove excess fines such that the resulting fill and backfill material contains less than 15% passing the No. 200 sieve. Remove excess fines from the site.

PART 3 -- EXECUTION**3.01 EXCAVATION – GENERAL:**

- A. General: Except when specifically provided to the contrary, excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the Work. The removal of said materials shall conform to the lines and grades indicated or ordered.
- B. Site preparation: Prior to excavation or fill activities, complete requirements specified in Specification 02100 "Site Preparation".
- C. Excavation stability: The Contractor shall be solely responsible for the stability and safety of all temporary slopes, including, but not limited to furnishing, placing, and maintaining all supports and shoring that may be required for the sides of the excavations. Excavation shall be sloped or otherwise supported in a safe manner in accordance with all applicable Federal, State and local safety requirements and the requirements of OSHA Safety and Health Standards for Construction.
- D. Removal and Exclusion of Water: The Contractor shall remove and exclude water, including stormwater, groundwater, irrigation water, and wastewater from all excavations, regardless of quantity and rate of flow. Dewatering wells, well points, sump pumps, or other means shall be used to remove water and continuously maintain groundwater at a level of at least two feet below the bottom of excavations before the excavation work begins at each location. Water shall be removed and excluded until backfilling is complete and all field soils testing have been completed. Unless the water table is kept well below the base of the excavation, the soils may become "quick" and unsuitable for foundation material. Any sumps, drain trenches, or other overexcavation for dewatering facilities shall be removed and backfilled as required. *The Contractor is responsible for all permitting and equipment required for proper disposal and silt removal to meet the quality requirements of the pumped water prior to discharge as required by the State.*
- E. Structural Excavation. Except where prohibited by existing structures or specifically by design of the foundation or structure, provide 18-inches of minimum clear working space between exterior lines of structure foundations or walls and the face of the excavation shoring. In all cases, extend structural excavations to solid bearing and below frost line. Excavated materials approved for reuse as structural backfill or for embankments shall be stockpiled by the Contractor. The bottom of the excavation shall be the bottom of the foundation or slab, or bottom of the crushed rock base layer, as shown on the drawings. When excavation and water control operations have been completed for a structure, the Contractor shall notify the Engineer, who will contact the Soils Engineer to inspect the excavation to verify the condition and bearing capacity of undisturbed soil or bedrock. No backfill, concrete or forms, shall be placed until the excavation is approved. If it is determined by the Soils Engineer that the natural soils are not suitable, the Contractor shall over-excavate and re-compact with rock stabilization materials to the limits directed by the Soils Engineer. Payment for authorized over-excavated and replacement materials shall be at a price agreed upon prior to commencement of the work.

3.02 OVER-EXCAVATION NOT ORDERED OR INDICATED:

Any excavation carried below the grade ordered or indicated, shall be backfilled and compacted to the required grade with the indicated material by the Contractor at the Contractor's expense. The backfill shall be placed and compacted in accordance with this SECTION.

3.03 ROCK EXCAVATION QUALIFICATION:

- A. It is anticipated that nearly all or all excavation can be accomplished using conventional equipment.
 - 1. For general excavation, a D-9N Caterpillar tractor with a single shank ripper, or equivalent equipment, is considered conventional equipment.
 - 2. For trench excavation a 235C Caterpillar excavator with a medium stick and a rock ripping bucket, or equivalent equipment, is considered conventional equipment.

3.04 ROCK EXCAVATION:

- A. If material is encountered which the Contractor believes cannot be excavated by conventional equipment, the Engineer shall be immediately notified. The Contractor shall provide performance tests of the specified conventional or equivalent equipment. If the Engineer confirms in writing that the specified conventional equipment cannot perform at the production rates specified, the excavation shall be considered rock excavation.
- B. Rock excavation shall include removal, stockpiling and/or placing of all rock material from ledges, bedding deposits, and un-stratified masses which cannot be removed without systematic drilling and blasting; concrete or masonry structures which have been abandoned; and conglomerate deposits which are so firmly cemented that they possess the characteristics of solid rock and which cannot be removed without systematic drilling and blasting. Rock material obtained from the blasting process shall be segregated and disposed of at the Contractor's expense.
- C. Explosives and Blasting
 - 1. General
 - a. Blasting will only be allowed with prior approval of the Owner and City.
 - b. The Contractor shall obtain all necessary permits and furnish copies to the Engineer before explosives are transported to the site. The Contractor shall pay for permits at no additional cost to the Owner.
 - c. Blasting shall be done only by skilled operators under the direction of a licensed foreman.
 - d. The Contractor shall identify all property, structures, and persons which may be affected by blasting and shall take all safety precautions and protective measures to prevent damage or injury to same. All personal injury or damage to persons or property of any nature, whether in the Work or appurtenant to it, shall be the responsibility of the Contractor.

- e. The Contractor agrees by submission of a bid to indemnify and hold the Owner and Engineer harmless from any and all liability claims, costs, and expenses including expenses of investigation and defending against same in regard thereto.
 - f. Blasting shall only be permitted between 9:00 AM and 4:00 PM, Monday through Friday, unless otherwise approved by the Engineer and regulatory agencies having jurisdiction. Blasting will not be permitted on legal holidays.
2. Pre-Blasting
- a. Contractor shall determine area of influence of blast and make inspections of private residences, appurtenance, or other improvements within the area of influence.
 - b. Waiver of inspection shall be in writing, signed by structure owner.
 - c. Complete inspection reports listing findings with photographs or waivers shall be signed by the Contractor's inspector. One copy of inspection reports and waivers shall be submitted to the Engineer before blasting commences.
3. Blasting
- a. The Contractor shall submit a conceptual Blasting Plan with individual shot plans to the Engineer.
 - b. Fly rock from blasting shall be contained by any means necessary within the project site and shall not represent a hazard to persons, vehicles, existing improvements, or vegetation.
 - c. No blasting shall be done within 100-feet or sufficiently close enough to cause damage to concrete which has been placed less than 7 days.
 - d. Contractor shall take necessary measures to maintain slope stability in the project area.
4. Post-Blasting
- a. The Contractor shall investigate each complaint of property damage and a written report shall be furnished to the Engineer and Owner within 30 days of receipt of the complaint.

3.05 BACKFILL – GENERAL:

Backfill shall be placed after all water is removed and maintained 2-feet below the excavation, and the trench sidewalls and bottom have been prepared for compaction per these specifications and approved by the Engineer. Sloping sides of the excavated space shall be stepped to prevent wedging action of the backfill against the structure.

No backfill shall be placed around or upon any structure until it is proven that the concrete has attained satisfactory strength and that the structure as a whole is adequate to receive backfill.

Water leakage tests on tanks shall be completed, submitted and favorably reviewed before backfill.

3.06 PLACING AND SPREADING OF FILL MATERIALS:

- A. Fill materials shall be placed and spread evenly in horizontal layers. When compaction is achieved using mechanical equipment, the layers shall be evenly spread so that each compacted layer does not exceed 6 inches in thickness.
- B. During spreading, each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer.
- C. Where the fill material moisture content is below the optimum moisture content, water shall be added before or during spreading until the uniform moisture content is within 2% of optimum.
- D. Where the backfill material moisture content is greater than 2% above optimum the material shall be dried until the moisture content is within 2% of optimum.

3.07 COMPACTION OF FILL, BACKFILL, AND EMBANKMENT MATERIALS:

- A. Each layer of fill material shall be mechanically compacted. Equipment that is consistently capable of achieving the required degree of compaction shall be used and each layer shall be compacted over its entire area while the material is at the required moisture content. Contractor's equipment or means and methods for compaction shall not damage adjacent ground, existing improvements, or improvements installed under the Contract. Flooding, jetting, or ponding will not be allowed for the compaction of any structure backfill.
- B. Compaction Requirements: The following compaction test requirements shall be in accordance with ASTM D698 - Test Method for Laboratory Compaction Characteristics of Soils Using Standard Proctor Effort and in accordance with ASTM D 4253 - Standard Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table. Where agency requirements govern, the highest compaction standards shall apply.

<u>Location or Use of Fill</u>	<u>Percentage of Maximum Density</u>	<u>Percentage of Relative Density</u>
Subgrade, Embankments and Fills. (Adjacent to and above, Not Under Structures)	95	70
Subgrade, Embankments and Fills (Under Structures)	100	70
Channel Bottom Reconstruction, Subgrade and fills	95	70
Topsoil	85	N/A

{Refer to Paragraph 3.10C for compaction requirements for rocky fill material containing more than 30 percent retained on a 3/4-inch sieve.}

3.08 GRADES:

Rough graded surfaces ready to receive top soil, sod, or seed, crushed rock, or aggregate base shall be graded to ± 0.2 feet of the plan elevation (minus the thickness of the topsoil, sod, crushed rock, or aggregate base), except where meeting curbs, walks, or building entrances, grade to ± 0.1 feet of plan. However, the acceptance of such irregularities shall not be constructed to reduce the thickness of topsoil, sod, or pavement specified.

Natural areas that are to be seeded shall be surface-roughened in accordance with Specification 02370, which may include immediate troughs and valleys that exceed the specified grading tolerance; however, the general overall grade of the area shall meet tolerance. The top 6-inches of the backfill shall consist of stockpiled Topsoil. Seed and provide prescribed revegetation and erosion and sedimentation control measures as specified elsewhere or on the Drawings, and in accordance with the referenced erosion and sediment control best management practices.

Permanent surface water courses shall be constructed to average plan grades and shall drain completely throughout their length. Finish surfaces shall be ± 0.1 feet of the plan elevation and all areas shall be finished so as to drain readily.

3.09 CLEAN-UP:

Stockpiled topsoil shall be spread uniformly across all disturbed areas except roads, and the estimated quantity of topsoil available shall be considered by the Contractor to set elevations for rough grading of the disturbed areas prior to placing the topsoil.

Prior to final inspection and acceptance, remove all rubbish and excess materials and leave area in a neat, satisfactory condition.

3.10 MAINTENANCE OF BACKFILL:

All backfill shall be maintained in a satisfactory condition and all places showing signs of settlement shall be filled and maintained during the life of the Contract and for a period of two (2) years following the date of final acceptance of all work performed under the Contract. When the Contractor discovers or is notified by the Engineer or the Owner that any backfill is not in compliance with the provision of this Contract, the Contractor shall correct such conditions at once at no additional cost to the Owner. Any utilities and road surfacing damaged by such settlement shall be repaired by the Contractor to the satisfaction of the Owner and Engineer or agency having jurisdiction. In addition, the Contractor shall be responsible for the cost to the Owner of all claims for damages filed with the Court, actions brought against the said Owner for, and on account of, such damage.

- END OF SECTION -

SECTION 02315 – EXCAVATION AND BACKFILL FOR BURIED PIPES

PART 1 -- GENERAL

1.01 SCOPE:

The work to be performed under this Specification shall include all labor, materials, equipment, plant and services as are necessary for the excavating and backfilling of all pipeline trenches and utility boxes. Any modifications or additions to this Specification are set forth in the "Special Construction Provisions". Excavation and Backfill within no less than 5 feet of structures shall be completed in accordance with SECTION 00200 "Earthwork".

The work shall include the excavation of whatever substances are encountered to the depths shown on the Drawings or modified in the field by the Engineer and installation of compacted bedding, backfill and surface restoration as described herein.

Wherever in this Specification a Standard is quoted or used, such as, but not limited to, ASTM, AWWA and ACI, this shall be interpreted to be the latest revision of that Standard.

All work within the rights-of-way of the Federal Government of the Colorado Division of Highways, County Governments or Municipal Governments shall be done in compliance with requirements issued by those agencies. All such requirements shall take precedence over these Specifications. It shall be the Contractor's responsibility to secure all required excavation permits and pay all costs thereof. Contractor will be required to obtain necessary road cut permits.

1.02 REFERENCES:

The Contractor must conform to the amended Rules and Regulations of Construction Standards for Excavations, CFR 29, PART 1926, Sub-part P of Title 29 including appendices of the Occupational Safety and Health Administration, Labor, including revisions thereto. The Contractor is solely responsible for excavation safety.

1.03 CONTRACTOR SUBMITTALS:

Submit in accordance with Specification 01300. Submit the following:

- A. Certified laboratory test results demonstrating that imported materials meet the requirements of this SECTION, including gradation, optimum moisture content, and maximum density. Particle size analysis of soils and aggregates shall be determined in accordance with ASTM D422. Test results shall be dated within 12 months of the date of the submittal.
- B. Mix design for Controlled Low Strength Material (CLSM).

1.04 QUALITY ASSURANCE:

- A. All soils testing will be done by a testing laboratory of the Owner's choice at the Owner's expense except under the following condition:

In the instance that tests of fill or backfill show non-compliance with the required density, gradation, or other physical properties, the Contractor shall complete the requirements to accomplish compliance. Subsequent testing to demonstrate compliance shall be by a testing laboratory selected by the Owner and shall be at the Contractor's expense.
- B. Where soil material is required to be compacted to a percentage of maximum dry

density, the maximum density at optimum moisture content will be determined in accordance with ASTM D698, Standard Proctor. Where granular, cohesionless material is required to be compacted to a percentage of relative density, the calculation of relative density will be determined in accordance with ASTM D4253 and D4254. Field density tests will be performed in accordance with ASTM D1556, ASTM D2922, or by other means acceptable to the Engineer.

1.05 GENERAL REQUIREMENTS:

Except as shown otherwise on the Drawings, all excavation shall be made by open cut. Permission may be granted to tunnel under driveways, crosswalks, curbing, walkways and utility installations, but such tunnels shall not exceed 10 feet in length.

The length of trench permitted to be open at any one time may be limited when, in the opinion of the Engineer, such limitation is necessary for protection of the work or the convenience of the public.

When excavations are through turf lawns, cultivated fields, pastureland, or areas having natural grass cover, the Contractor shall stockpile separately all stripped topsoil (as specified in the Site Preparation SECTION), which shall be replaced to at least the same depth on top of the trench backfill. All surfaces that have natural grass cover shall be reseeded by the Contractor as specified elsewhere and in accordance with the referenced erosion control best management practices. Removed turf lawns shall be replaced with sod of the same species. All lawns and other grass-covered areas, not excavated, on which excavated material is placed, shall be protected from damage by placing burlap over the grass.

It is the general intent and requirement that the Contractor leaves the work area in a similar and equal condition as it was preceding the Contract work.

1.06 PROTECTION OF EXISTING FACILITIES:

A. General: Existing power lines, telephone lines, 6-inch and greater diameter trees, six feet or more from the pipe centerline, shrubbery, fences, water mains, gas mains, sewers, cables, conduits, ditches, embankments and other structures in the vicinity of the work not authorized to be removed, shall be supported and protected from injury by the Contractor during the construction and until completion of the work affecting them. The Contractor shall be liable for all damages done to such existing facilities and structures, as herein provided and he shall save the Owner from any liability or expense for injuries, damages, or repairs to such facilities.

B. Underground Facilities: This project does not require Subsurface Utility Engineering. The type, size, location and number of known underground facilities have been shown on the Drawings based on information provided to the Engineer at the time of design; however, no guarantee is made as to the true type, size, location, or number of such facilities, or that all facilities are shown. It shall be the sole responsibility of the Contractor to verify the existence and location of all underground utilities along the route of the work. The omission from, or the inclusion of, utility locations on the Drawings is not to be considered as the nonexistence of, or a definite location of, existing underground utilities.

The Contractor shall notify the owner or owners of the existing utilities, whether aboveground or underground, 48 hours prior to proceeding with trench excavation whenever such trenching operations are within ten feet of the

possible location of any existing utility. The notification shall also include a request for field staking any such underground facility that may be in the area of influence by the construction.

Should any such utility be damaged in the trenching operations, the Contractor shall immediately notify the owner of such utility and, unless authorized in writing by the owner of utility, the Contractor shall not attempt to make repairs except to prevent further damage to property. Duplicate copies of any written authorization given to the Contractor to make repairs shall be filed with the Engineer and shall be so worded as to save the Owner from any responsibility whatsoever relative to the sufficiency of the repairs.

If a conflict that is not shown on the Drawings develops between an existing utility and the work required by this Contract, the Contractor shall notify the owner of the utility and the Engineer immediately in writing. Such conflict may be considered, by the Engineer, to be a change in the work. The Contractor may request a change in the Contract amount for such change in the work, subject to the General Conditions.

If during construction any underground utility conduit, including sewers, water mains, gas mains and drainage structures, or any aboveground utility facilities are required to be relocated, the Contractor shall notify the utility owner well in advance of approaching the utility so that arrangements can be made with the owner or owners for its relocation without delay to the work.

The cost of relocating both underground and aboveground utilities, exclusive of water and sewer service connections, will be borne by the Owner.

1.07 SUBSURFACE INFORMATION:

Except as may be shown on the Drawings or set forth in the "Special Construction Provisions," no additional subsurface exploration has been made along the pipeline alignment as a part of this project.

1.08 EXCAVATION:

Excavation shall be categorized as either classified or unclassified. Unclassified excavation shall include the removal and subsequent handling of any and all materials and substances encountered (including rock) in performance of the work, regardless of the type, character, composition, or condition thereof. For unclassified excavation, the cost for all excavation is to be included in the unit price for pipeline installation.

Under this contract, all excavation shall be categorized as unclassified.

1.09 CONSTRUCTION IN STREETS

- A. When construction operations are located within streets make provisions at cross streets and walks for free passage of vehicles and pedestrians. Do not block streets or walks without prior approval.

1.10 EXISTING SURFACES:

- A. Asphalt Pavement: The excavation in streets with asphalt paving must be confined to a minimum width as required to maintain a safe trench condition. The pavement shall be sawcut vertically to the full depth of the pavement, and on a straight line.

Regardless of the amount of pavement damaged by construction equipment or

activities or removed during installation of the pipelines, the maximum width of pavement replacement that will be paid for will be up to 36 inches on either side of the pipe centerline and a maximum total width of 72 inches if pavement is excavated on both sides of the pipe centerline and shall include all base course, cleaning, prime coat, tack coats, and asphalt pavement. Replacement of asphalt shall be in accordance with Paragraph “Surface Restoration” in PART 3 herein or the included asphalt specification whichever is more stringent.

- B. Road Gravel Surfacing: The gravel surfacing that is removed, disturbed, and/or contaminated during trench excavation shall be replaced to not less than 6 inches compacted depth. Replacement of road gravel surfacing shall be in accordance with Paragraph “Surface Restoration” in PART 3 herein.

PART 2 -- PRODUCTS

2.01 GENERAL:

All backfill material shall be approved before use. Material from project excavations may be used for backfill. The backfill material shall be free from rubbish, large stones, clods, roots, brush, debris, frozen lumps of earth, or other objectionable material, and shall be moisture conditioned (dried or moistened) prior to placement and compaction as specified.

The Contractor is solely responsible for the stability of slopes during construction. Excavation and fill operations shall be coordinated with water control and stabilization measures to prevent unstable conditions.

- A. Water shall be clean and free from harmful substances. The amount of water used in compaction shall be sufficient to obtain the percent of compaction required.
- B. Topsoil is defined as the existing material nominally within a 6-inch depth beneath the existing ground surface. The Engineer shall verify the suitability of this material as topsoil for use in restoration of the site following construction prior to stockpiling.

2.02 PIPELINE BEDDING AND BACKFILL:

- A. Trench Zones: For the purposes of this Specification, the terms “Bedding Zone,” “Pipe Zone” and “Backfill Zone” shall refer to the trench zones as identified following:
 - 1. Bedding Zone. The Bedding Zone shall consist of all material placed below the pipe invert or, when permitted, the native materials graded and prepared for direct placement of the pipe.
 - 2. Pipe Zone. The Pipe Zone shall consist of all material placed above the pipe invert to an elevation 12-inches above the top of the pipe.
 - 3. Backfill Zone. The Backfill Zone shall consist of all material above the Pipe Zone.
- B. Materials: All bedding and backfill material shall have the approval of the Engineer and shall be included in the unit price for the pipe unless otherwise specified and indicated in the Proposal. All bedding and backfill material shall be free of frozen material, organic material and debris. All imported materials shall be and native materials may be subject to gradation tests and compaction tests prior to approval of the use of that material. Test results shall be certified by a

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qualified testing laboratory, and submitted to the Engineer for approval and verified as to their accuracy. The cost of these tests shall be borne by the Contractor.

1. Sand Bedding or Sand Backfill Material. This material shall be imported; a clean, well-graded sand conforming to the following limits when tested by means of laboratory sieves:

Well-Graded Sand

<u>Sieve Size</u>	<u>Total Percent Passing by Weight</u>
3/8 inch	100
No. 4	70 - 100
No. 8	36 - 93
No. 16	20 - 80
No. 30	8 - 65
No. 50	2 - 30
No. 100	1 - 10
No. 200	0 - 3

2. Roadbase Bedding Material, Roadbase Backfill, or Roadbase Material. This material shall be imported conforming to Class 6 aggregate base course as specified by the State of Colorado Department of Transportation; and shall meet the following gradation:

<u>Sieve Size</u>	<u>Total Percent Passing by Weight</u>
3/4-inch	100
No. 4	30 - 65
No. 8	20 - 55
No. 200	3 - 12

3. Granular Bedding or Granular Backfill Material. This material shall be imported crushed rock or angular surfaced gravel and meet the following gradation (ASTM D448, No. 67):

<u>Sieve Size</u>	<u>Total Percent Passing by Weight</u>
3/4-inch	100
3/8-inch	20-55
No. 4	0-10
No. 8	0-5

4. Select Material. Select Material shall not be permitted unless authorized by the Engineer. This material shall consist of suitable material screened from the excavated earth having no rocks or stones greater in size than 2-inches for DIP or RCP and 3/4-inch for all other pipe.

When specified and acceptable Select Material (suitable for placement

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within 12 inches of the pipe barrel) is not available at any particular location, the Contractor shall screen out rocks and stones larger than permitted or shall provide acceptable screened material from excavations at other locations of the work under this Contract. No extra cost will be paid for moving and handling of Select Material. If sufficient material is not reasonably available, the Contractor shall notify the Engineer. If the Engineer agrees, the Contractor will locate a source of suitable material.

5. Trench Stabilization Material. This material shall be crushed rock, concrete aggregate. When approved by the Engineer, crushed recycled concrete rubble meeting the same gradation may be used.
6. Backfill Material. Backfill Material shall consist of suitable material from the native excavated earth, after clearing, grubbing, and stripping activities have been completed as specified in SECTION "Site Preparation". Material shall be processed or screened to remove organic matter, deleterious material, and all rock larger than 8 inches in any dimension.
7. Controlled Low Strength Material (CLSM) Backfill. This material, also known as flowfill, flash fill, or equivalent shall be placed in the trench where designated on the drawings or as directed by the Engineer. The Contractor may elect to utilize CLSM in lieu of Backfill Material in the Backfill Zone to reduce duration of open trenching in roadways, subject to the approval of the Engineer, or when dictated by the agency having jurisdiction over the roadway or right-of-way. Mix design shall be submitted to the Engineer for approval.

CLSM shall have a 28-day strength of 60-100 psi, and a maximum slump of 7-10 inches.

- C. Special Cutoff Zones: Where designated to prevent flow of water along pipeline trenches use all clay soil (CL per unified classification system). Prepare material to allow good bedding conditions and backfill for pipe.

PART 3 -- EXECUTION

3.01 PREPARATION:

- A. Ground Surface Preparation: Prior to excavating, complete all clearing and grubbing and demolition operations as specified in SECTION "Site Preparation" and herein.
- B. Topsoil: In natural areas where excavation will occur, strip all topsoil, or in the absence of topsoil, strip the top surface material and store separately from other excavated materials as specified in SECTION "Site Preparation" and herein.
- C. Concrete Walks, Paved Roadways, Parking Areas, and Road Crossings: Cut existing pavement full depth to a true line before excavation. Cutting of concrete shall occur along the lines of existing joints, unless noted otherwise.
- D. The Contractor is to field-verify by excavation the location of all utility crossings, service connections, and connections to existing lines before proceeding with trenching operations.

3.02 TRENCH EXCAVATION:

- A. **TRENCH WIDTH:** The minimum clear trench width measured at the top of the pipe barrel shall be not less than the outside pipe diameter, plus 16-inches.

For all pipe, the maximum clear trench width measured at a point 12-inches above the top of the pipe barrel shall be not greater than the trench width shown on the following table.

<u>MAXIMUM TRENCH WIDTH TABLE</u>			
Pipe Diameter	Maximum Trench	Pipe Diameter	Maximum Trench
<u>(inches)</u>	<u>(inches)</u>	<u>(inches)</u>	<u>(inches)</u>
4	24	24	48
6	26	27	52
8	28	30	56
10	30	33	60
12	33	36	68
14	35	39	72
15	36	42	75
16	37	48	82
18	40	54	89
20	42	72	110
21	44		

If the above-stated maximum trench widths are exceeded, either through accident or otherwise, and if the Engineer determines that the combined dead and live loads will exceed the design loadings on the pipe, the Contractor shall either cradle the pipe in concrete, or use a pipe of a stronger class, as required by the Engineer. The cost of such remedial measures shall be entirely at the Contractor's expense.

- B. **TRENCH WALLS:** The Contractor may slope or bench the trench side walls. Such sloping or benching shall terminate at a depth not lower than one foot above the top of the pipe barrel, and from that point down, the trench wall shall be vertical and conforming to the specified maximum trench width. The trenching operation, including the spoil bank and sloping of the trench sidewalls shall be confined to the width of the permanent and temporary rights-of-way or easements, if any.

A clear area shall be maintained a sufficient distance back from the top edge of the excavation to avoid overloading which may cause slides or caving of the trench walls. The excavated material shall be kept trimmed in such a manner as to be of as little inconvenience as possible to the public and adjoining property owners. Unless otherwise authorized by the agency having jurisdiction, all public thoroughfares and crossroads shall be kept open to traffic. Bridging (trench plating) shall be used when required by the agency having jurisdiction at street crossings, sidewalks and other points where necessary, to prevent serious interruption of travel and to provide access to fire hydrants and public and private premises.

- C. **TRENCH DEPTH:** The trenches shall be excavated to such depths that the pipeline can be laid at the elevation of the grade lines shown on the Drawings, or at depths or covers specified on the Drawings, and backfilled with the specified Bedding Zone material.

- D. **TRENCH PREPARATION:** The trench shall be excavated only so far in advance of pipe laying as permitted by the Engineer, as dictated by public safety, or by the agency having jurisdiction over the public right-of-way or easement. The trench wall shall be so braced that the work may be executed safely and efficiently. All trenches shall be drained so that pipe laying may take place in un-watered conditions. Trench preparation shall also conform to the details shown on the Drawings.

Trenches above a point 12-inches above the top of the pipe shall be of such extra width, when required, as will permit the convenient placing of timber supports, sheeting and bracing, and the handling of special units as necessary.

Bell holes in the trench bottom shall be provided at each joint to permit the jointing to be made properly and to prevent the pipe from bearing on the bells.

After excavation, the trench bottom shall be uniformly graded and hand-shaped so that the pipe barrel (exclusive of the joint) will have uniform and continuous bearing on firm, undisturbed trench bottom (when permitted), or thoroughly compacted granular bedding or sand material, throughout the length of the pipe. The trench grade shall permit the pipe spigot to be accurately centered in the preceding laid pipe joint, without lifting the pipe above the grade and without exceeding the permissible joint deflection. If it is necessary to raise the pipe subgrade, approved, compacted granular bedding material shall be used at the Contractor's cost.

If unstable foundation is encountered, the Contractor shall notify the Engineer immediately, prior to excavating the unstable material and backfill the over excavation with 12-inch uniformly-graded, specified Trench Stabilization Material. If larger material is needed, it must be approved by the Engineer prior to placement. Payment for over excavation for unstable bedding and supplying and installing of Trench Stabilization Material that has been authorized by the Engineer will be negotiated by Change Order.

3.03 SHORING:

- A. As needed, all trench sidewalls shall be properly sheeted and braced to meet Federal, State and local laws in regard to safe working conditions. The Contractor shall be solely responsible for providing adequate excavation safety. The shoring shall be arranged so as not to place any stress on portions of the completed work until the general construction thereof has proceeded far enough to provide ample strength. Any damage to pipes or structures resulting from settlements, heaving, water or earth pressures, slides, caving, or other causes, due to lack of shoring, sheeting, or bracing, or due to failure of shoring, or due to improper shoring, or due to any other negligence on the part of the Contractor, shall be repaired by the Contractor at their own expense.
- B. Shoring shall be removed as the work progresses, unless left in place by written order of the Engineer. The Contractor will be paid for shoring so ordered left in place on the basis of invoiced material cost only.
- C. If the Engineer is of the opinion that at any point the trench walls are not properly supported to protect the work, the Engineer may order the placement of additional supports by, and at the expense of, the Contractor. Compliance with such order shall not relieve or release the Contractor from their sole responsibility for safety and the protection of the work.

3.04 OVEREXCAVATION OF UNSUITABLE MATERIAL:

In areas where unsuitable or unstable material is encountered, the Contractor shall over-excavate and remove the unsuitable material and backfill and compact with material approved by the Engineer. Overexcavation and replacement of unsuitable material will be done only upon authorization by the Engineer. Payment for authorized work will be negotiated by Change Order.

3.05 WATER CONTROL AND DEWATERING:

Construction dewatering is anticipated for this project. For all excavations, the Contractor shall provide suitable equipment to divert and/or remove surface, rain, and groundwater. The excavation shall be continuously maintained in an un-watered condition so that pipeline construction and backfill operations can be executed at all times under dewatered conditions. Refer to the Geotechnical Report for anticipated levels of groundwater and dewatering recommendations.

The Contractor shall obtain all local and State permits and authorizations to discharge from dewatering activities.

3.06 STORAGE OF EXCAVATED MATERIALS:

- A. Generally excavated material will be stockpiled near the immediate construction area so as not to interfere with other work.
- B. In natural areas, place excavated materials close to the excavation and in as confined a configuration as possible. Where adjacent slopes are too steep to stockpile, transport materials to special stockpile locations in nearby areas. All transportation to and from stockpiles (including loading and unloading) shall be included in the work.

3.07 TRENCH BACKFILL:

- A. **GENERAL:** Use mechanical compaction equipment appropriate for the use and material to achieve the specified level of compaction. Compaction by means of flooding or jetting with water shall not be acceptable.

When required by the Engineer the Contractor shall excavate backfilled trenches for purposes to perform compaction tests at locations and depths required by the Engineer. The Contractor shall be responsible to reinstall and compact the test excavations at no additional cost to the Owner.
- B. **COMPACTION STANDARD:** Unless accurate results cannot be obtained, the compaction requirements shall conform to maximum dry density according to ASTM D698, Moisture-Density Relations of Soils (Standard Proctor). When the ASTM D698 test is not applicable for a given material, the percentage compaction requirements shall conform to ASTM D4253 Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
- C. **MOISTURE CONDITIONING:** All imported and native earthwork materials shall be properly moisture conditioned (wetted or dried as necessary) to obtain a moisture content within two percent (2%) of optimum prior to placement and compaction. Employ such means as may be necessary to secure a uniform moisture content throughout the material of each lift being compacted.
- D. **BEDDING ZONE:** Bedding material shall be placed to the required elevation of the bottom of the pipe barrel. Bedding Zone installation shall comply with the

following:

1. Material: Granular Bedding.
 2. Compaction: Tamping equipment shall be used to thoroughly tamp the bedding material to a minimum of 95 percent of maximum dry density.
- E. PIPE ZONE: After the Bedding Zone has been placed and has been approved and, after the pipe has been installed and approved, the Pipe Zone material shall be installed to an elevation 12-inches above the top of the pipe. Pipe Zone installation shall comply with the following:
1. Material: Granular Backfill Material.
 2. Compaction: Minimum of 95 percent of maximum dry density utilizing T-bars or mechanical tamping equipment.
 3. Installation Requirements: Place and compact in distinct, separate lifts not to exceed 6-inches of loose depth; except that the first loose lift shall not be higher than the pipe centerline (springline).
- F. BACKFILL ZONE: All backfill above the Pipe Zone shall be carefully placed and compacted. The Backfill Zone installation shall comply with the following:
1. Material: Backfill Material.
 2. Compaction:
 - a. Outside of roadway limits: Minimum of 95 percent of maximum dry density.
 - b. Within roadway limits: Minimum of 95 percent of maximum dry density.
 3. Installation Requirements:
 - a. Compaction shall be by mechanical tamping in 12-inch maximum loose lifts using mechanical or hand tampers, weighing not less than 20 pounds, or vibratory rollers. All other means must be approved in writing by the Engineer. The Contractor may request approval of alternate means of compaction. Such request must be submitted to the Engineer in writing. Approval of the compaction method will be made by the Engineer only in writing. Use of specified or approved compaction methods does not relieve the Contractor from providing a complete project meeting the intent and requirements of this Specification.
 - b. In turf or natural grass areas, the top 8 inches of the Backfill Zone shall consist of organically amended soil, compacted to no greater than 85% of maximum dry density. Roughen the surface of the underlying compacted trench backfill material to afford good adhesion between the two soil types.
 - c.
- G. WARNING TAPE AND TRACER WIRE: Install warning tape and/or tracer wire in coordination with the trench backfilling operation as specified in the Specification SECTION(S) for pipeline materials and as shown on the Drawings.

3.08 SURFACE RESTORATION:

- A. GENERAL: Unless indicated otherwise in the Proposal, the cost of surface restoration shall be included in the cost of the pipeline installation.
- B. IMPROVED ROADWAYS: Unless noted otherwise or required by the agency having jurisdiction, all paving, curb and gutter, sidewalks and other street improvements removed or damaged during construction shall be replaced with the same type and dimensions of items removed or damaged to the same line and grade, and shall be equal to, and consistent with, the undisturbed portions of the improvements existing prior to the trench excavation.
 - 1. Concrete curb, gutter, and sidewalk. All concrete used in the restoration work shall conform to the requirements of the Street or Highway Department having jurisdiction. Comply with the standard details shown on the drawings for such items, or if not shown, with the applicable local standards in effect. Pedestrian sidewalk ramps shall comply with the latest ADA standards. Subgrade shall be thoroughly compacted as specified. Provide compacted Roadbase Material beneath concrete work to the thicknesses shown on the Drawings or to match existing thicknesses.
 - 2. Asphalt Pavement: After the Backfill Zone has been approved by the Engineer, and the Highway or Street Department having jurisdiction has approved the pavement subgrade, place and compact a layer of Roadbase Material. The thickness of the material shall be as shown on the Drawings or match existing – whichever is greater. Compact the material to a minimum of 95% maximum dry density, or greater if required by the agency having jurisdiction.

Asphalt shall be hot mix in accordance with the standards of the Highway Department having jurisdiction, or in another SECTION of the Project Specifications if more stringent. The thickness of the asphalt shall be as shown on the Drawings, or match the existing paving thickness, whichever is greater. In no case shall the asphalt be less than 3-inches in thickness.

Preparation for paving shall include: cutting the pavement with a vertical face 12-inches beyond the trench wall or limit of damaged pavement; milling a 2-inch deep, 12-inch wide sheer step along the top edge of existing pavement edge; cleaning; prime coat; and tack coat. After placing the material, the pavement shall be compacted with a smooth roller. All methods shall meet the requirements of the Highway Department having jurisdiction. The final paved surface shall be uniform so that if tested with a 10-foot straight edge, the variation shall not exceed one-quarter inch. Areas not complying with these tolerances shall be reworked to obtain conformity at no additional cost to the Owner.
- C. ROAD GRAVEL SURFACING: After the backfill has been approved by the Engineer, the gravel shall be placed to a 6-inch minimum thickness. The gravel shall be compacted by a vibratory roller to the elevation of the undisturbed surface. The gravel shall conform to the requirements of the Highway or Street Department having jurisdiction. If no requirements apply, the material shall be Roadbase Material.

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- D. TURF: The top 8-inches of the Backfill Zone shall consist of organically amended soil, compacted to no greater than 85% of maximum dry density. Amend, seed, and mulch as specified on the Drawings and specification for Revegetation.
- E. NATURAL AREAS: The top 8-inches of the Backfill Zone shall consist of organically amended soil, compacted to no greater than 85% of maximum dry density. Seed and provide prescribed revegetation and erosion and sedimentation control measures as specified elsewhere or on the Drawings, and in accordance with the referenced erosion and sediment control best management practices.
- F. OTHER ITEMS: The Engineer will clarify restoration of other minor items as construction proceeds. Such items must be restored to equal or exceed existing conditions.

3.09 CLEANUP:

Prior to final inspection and acceptance, remove all rubbish and excess materials and leave area in a neat, satisfactory condition.

3.10 INSPECTION AND TESTING

- A. Inspection and testing to be performed at the direction of the City. Contractor to cooperate fully with all persons engaged in testing. Contractor to excavate as required to allow testing. Contractor to backfill all test excavations in accordance with these Specifications.

3.11 DENSITY TESTING AND CONTROL

- A. Reference Standards. Density/moisture relationships to be developed for all soil types encountered according to ASTM D698 or AASHTO T99.
- B. Field Testing. Testing for density during compaction operations to be done in accordance with ASTM D2922 using nuclear density methods.
- C. Frequency of Testing. Minimum of one (1) test every 100' trench per lift or as directed by City. Contractor to excavate to depths required by Engineer for testing and backfill test holes to density specified. Testing to be paid for by the Owner.

3.12 MAINTENANCE OF BACKFILL:

All backfill shall be maintained in a satisfactory condition and all places showing signs of settlement shall be filled and maintained during the life of the Contract and for a period of two (2) years following the date of final acceptance of all work performed under the Contract. When the Contractor discovers or is notified by the Engineer or the Owner that any backfill is not in compliance with the provision of this Contract, the Contractor shall correct such conditions at once at no additional cost to the Owner. Any utilities and road surfacing damaged by such settlement shall be repaired by the Contractor to the satisfaction of the Owner and Engineer or agency having jurisdiction. In addition, the Contractor shall be responsible for the cost to the Owner of all claims for damages filed with the Court, actions brought against the said Owner for, and on account of, such damage.

- END OF SECTION -

SECTION 02370 – EROSION AND SEDIMENT CONTROL

PART 1 -- GENERAL

1.01 DESCRIPTION:

The work of this section consists of temporary measures for the control of erosion, sedimentation and other pollutants during construction. Work includes installation of such measures in accordance with the Drawings and any permits for the project, maintenance during the contract period to assure proper function, and removal of temporary measures in coordination with installation of permanent erosion control measures.

The Contractor shall provide and maintain adequate erosion control measures during all phases of construction to protect surface waters from run-off transporting eroded materials. The erosion control measures shall be inspected during and after each run-off event, with repairs being made and excess sediment removed as needed. The Contractor is responsible for preventing sediment from traveling off-site or to nearby water sources.

The Contractor shall be responsible for developing the necessary sedimentation and erosion control plans and securing associated permits necessary to execute the work from the agencies having jurisdiction. Provide all needed coordination and payment of fees associated therewith.

1.02 SUBMITTALS:

Samples of all materials specified in this section and submittals demonstrating these materials meet the Specification requirements shall be submitted in accordance with SECTION 01300.

1.03 REFERENCE STANDARDS:

Erosion control details and practices may be obtained from the Urban Drainage and Flood Control District "Urban Storm Drainage Criteria Manual Volume 3 - Best Management Practices", or the "Erosion Control Manual" by the Colorado Department of Transportation. In addition, the Contractor may submit details, sketches and descriptions of other soil erosion and sediment control measures he wishes to utilize during construction (or modifications to the specified practices).

PART 2 -- PRODUCTS

2.01 CHANNEL SLOPES AND OTHER DISTURBED AREAS:

Materials for use as temporary measures include straw bales, loose mulch, mulch blankets, silt fence, sod buffer strips and other stabilization materials.

2.02 ACTIVE FLOWING STREAM OR DIVERSION:

Material for use as temporary measures to stabilize the invert or toe of slope zone of a live stream or diversion channel include pipe, concrete rubble, riprap, plastic sheeting, synthetic erosion control matting or other functional material that is not hazardous to water quality.

2.03 STORM SEWER OUTFALLS/POINT DISCHARGES:

Materials for temporary erosion control on slopes downstream of storm sewer or swale outfalls may be pipe, concrete rubble, riprap, cast-in-place concrete, plastic sheeting, synthetic erosion control matting or other functional material that is not hazardous to water

quality.

PART 3 -- EXECUTION

3.01 GENERAL:

Procedures for installation, maintenance and removal of temporary erosion control measures shall generally conform to the guidelines contained in the criteria manual referenced in PART 1 herein. The specific practices and measures to be implemented depend on the contractor's construction procedures, sequencing, and general approach to the project.

3.02 CONSTRUCTION IN WATERWAYS:

To the extent possible, movement of construction equipment within the flowing portion of channels or waterways shall be minimized. Frequent fording of the stream shall be avoided. Isolate or divert stream flows so construction equipment, materials and earthwork are not exposed (vulnerable) to flow.

3.03 TEMPORARY CONTROLS DURING SITE WORK:

- A. All dewatering flows that carry sediment or other deleterious material shall not be directly introduced to the stream. Such flows shall be routed to a sediment basin(s) or trap(s) for treatment prior to discharge to the stream. The intent is to trap material disturbed by construction activities and prevent the discharge of this material into the stream. Sediment basins or traps shall be monitored and maintained no less than weekly (including removal of sediment and/or repair of basin dike or filter material) or whenever the basin fills with sediment to 50-percent of capacity.
- B. Properties and roadways adjacent to the site shall be protected from sediment deposition. This may be accomplished by leaving a sod buffer strip around the lower perimeter of the land disturbance, by installing perimeter controls such as sediment barriers, filters or dikes, or by a combination of such measures. Construction ingress and egress routes shall be stabilized by gravel or other means to prevent tracking sediment, mud or debris onto adjacent thoroughfares. Promptly remove soil, sediment, or debris from paved roadways and keep them clean throughout the construction period.
- C. Sediment basins and traps, perimeter dikes, sediment barriers (such as straw bale barriers or silt fencing), and other measures intended to trap sediment on-site, must be constructed as a first step in grading and be made functional before upslope land disturbance takes place.
- D. Diversion channels must be stabilized against erosion by use of riprap, or other measures.
- E. Roughened soil surfaces are preferred to smooth surfaces on slopes during initial grading operations. Diversion dikes or ditches shall be constructed at the top of long or steep slopes which have significant drainage areas above the slope. Diversions or terraces may also be used to reduce slope length.
- F. Concentrated storm water shall not be allowed to flow down cut or fill slopes unless contained within a stabilized temporary or permanent channel, flume or slope drain structure.
- G. Wherever a slope face crosses a water seepage plane which endangers the

stability of the slope, adequate drainage or other protection shall be provided.

- H. All storm drain inlets within or near the site that are operable during construction shall be protected with filter fabric or a similar approach to remove sediment from stormwater runoff prior to entering the storm drain system.

3.04 DUST ABATEMENT:

During the performance of the work required by these Specifications or of any operation appurtenant thereto, the Contractor shall furnish all the labor, equipment, materials and means required, and shall carry out proper and efficient measures whenever and as often as necessary to reduce the dust nuisance and to prevent dust which has originated from their operations from damaging dwellings or causing a nuisance to persons. The Contractor shall be liable for any damage resulting from dust originating from their operations under these Specifications. The cost of sprinkling or of other methods for dust control shall be included in the cost for erosion and sediment control.

3.05 DISPOSITION OF TEMPORARY MEASURES:

All temporary erosion and sediment control measures shall be removed and disposed of as permanent measures are being installed. Both operations shall be coordinated to prevent erosion or other damage to the channel or finished grading. Trapped sediment or other disturbed soil areas shall be permanently stabilized to prevent further erosion and sedimentation.

- END OF SECTION -

SECTION 02520 – INSTALLATION OF GRAVITY SANITARY SEWER PIPELINES

PART 1 -- GENERAL

1.01 SCOPE:

The work of this section includes providing and installing gravity sewer pipe and fittings for sanitary sewer service. All materials shall be new and the best available. All material used shall be manufactured and supplied according to the latest revised standards of the American Water Works Association, the American National Standards Institute, and the American Society for Testing and Materials, or as mentioned hereinafter. Miscellaneous valves and fittings shall be as called out on the Drawings.

1.02 REFERENCES:

- A. American Society for Testing and Materials (ASTM)
- B. American National Standards Institute (ANSI)
- C. American Water Works Association (AWWA)
- D. Federal Specifications (FS)

1.03 CONTRACTOR SUBMITTALS:

In accordance with SECTION 01300, submit:

- A. Certificate of compliance.
- B. Manufacturer's literature and product data sufficient to demonstrate compliance with the specified requirements.
- C. Manufacturer's installation instructions and recommendations.
- D. Test results.

1.04 PRODUCT HANDLING:

- A. Pipe, fittings, and all other accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage to them. Under no circumstances shall any materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground. Skidding which damages protective coatings will not be permitted.

In distributing the material at the site of the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench to minimize moving more than once.

All pipe and fittings shall be so handled that the coating and lining will not be damaged. If, however, any part of the coating or lining is damaged, the repair shall be by the Contractor at their expense in a manner satisfactory to the Engineer. Any area damage beyond repair must be cut off and discarded.

- B. All pipes will be field inspected at the job site and checked for conformance to these specifications. Pipe and fittings will be checked for out-of-round or damaged joints, interior and exterior surface damage, gasket damage and the other requirements listed herein. Any pipeline or appurtenant material found defective will be rejected. Any material rejected at the job site shall be marked "Rejected," and the Contractor shall remove it immediately from the job site.

INSTALLATION OF GRAVITY SANITARY SEWER PIPELINES – SECTION 02520

The Contractor shall provide results of tests required by the various standard specifications listed herein. The Contractor will not be reimbursed for the pipe tested, the testing, or for the reports submitted to the Engineer.

The Contractor shall provide the Engineer with 2 copies of the standard specifications covering the manufacture and testing procedures of the pipelines and other materials. The submittal shall be made prior to delivery of the materials.

- C. Do not store materials directly on the ground. Polyvinyl chloride (PVC) pipe shall be stored under opaque cover that does not transmit UV light.
- D. Precaution shall be taken to prevent foreign matter from entering the pipe and fittings prior to and during installation. Place no debris, tools, clothing or other materials in the pipe during installation.
- E. At such time as pipe installation is suspended, either temporarily or overnight, the open end of the pipe shall be sealed with a watertight plug to prevent entrance of trench water, debris or foreign matter. A mechanical-type fitting shall be used for this seal. At no time shall duct tape or any other tape be used for this seal.
- F. Under no circumstances shall trench water be allowed to enter the pipeline. When water is present in the trench, the seal shall remain in place until such time the trench is pumped dry. Whenever trench water becomes evident, adequate measures shall be taken to prevent pipe flotation. Contractor shall bear all costs associated with keeping trench free of liquids.
- G. If, in the opinion of the City, the Contractor is incapable of keeping the pipe free of foreign matter during installation, the City shall require the Contractor to cover the pipe ends with close woven bags until the start of the jointing operation.

PART 2 -- PRODUCTS

2.01 PIPELINE MATERIALS:

- A. General: The Contractor shall furnish pipeline materials meeting applicable requirements of this Specification. The internal diameter of the pipe shall not be less than the diameter shown on the drawings.
- B. Polyvinyl Chloride Pipe: The pipe shall be Pressure Class 235, DR18, and shall conform to AWWA C900. The pipe material shall be of virgin source, conform to ASTM D1784 Cell Classification 12454, and be integrally pigmented green in color

Provisions must be made for contraction and expansion at each joint with a rubber ring and integral thickened bell as part of each joint. Gaskets shall conform to ASTM F477. Pipe shall be supplied in nominal laying lengths of 20 feet. All pipe and fittings shall be assembled with a non-toxic lubricant. Each length of pipe and all fittings shall have marked on the exterior the following:

- 1. Manufacturer's Name or Trademark
- 2. Nominal Pipe Size
- 3. PVC Cell Classification (e.g. 12454-B)
- 4. Legend – Type C900 Pressure Pipe

5. "Sewer Force Main" or "Not for Potable Use"

All fittings to be used with the PVC pipe shall be those manufactured by the manufacturer of the pipe. Each special fitting shall be a completely manufactured unit with either bells or spigots on each connection that are an exact duplication of the bells and spigots on the pipeline. Fittings with any other type of connections will not be accepted.

2.02 FITTINGS

- A. Type - PVC push-joint.
- B. Materials - ASTM D1784.
- C. Reference Standard - ASTM D3034 or ASTM F679.

2.03 BURIED UTILITY WARNING TAPE:

- A. Detectable marking tape shall consist of a minimum of 5 mil (0.0005") overall thickness; five-ply composition; ultra-high molecular weight 100% virgin polyethylene; acid alkaline and corrosion resistant.
- B. Elongation properties shall be in accordance with ASTM D882-80A and shall be less than 150% at break. The tape shall have a 20-gauge (0.0020") solid aluminum foil core, encapsulated within 2.55 mil (0.00255") polyethylene backing.
- C. Tape color and legend combination shall be in accordance with APWA or local requirements. The color shall be green. The legend shall read "CAUTION - SEWERLINE BELOW".
 - 1. The tape tensile strength shall be in accordance with ASTM D882-80A and be not less than 7800 psi.
 - 2. Tape width shall be 3/4 of the diameter of the pipeline being protected

Tape Width:	2"	3"	6" or wider
Tape Bury Depth:	6"- 18"	6"- 28"	6"- 36"
 - 3. The tape shall be as manufactured by T. Christy Enterprises, or equal.
 - 4. Magnetic tape is required for all pipes and shall be 2-feet above the top of pipe.

2.04 TRACER WIRE

Tracer wire is required for all pipes and services. Wire shall be No. 12 gauge insulated, stranded copper. All splices to be watertight, underground type.

2.05 REPAIR COUPLINGS

Manufacturer Reference – Smith Blair Quantum with Type 316 stainless-steel hardware with fluoropolymer coated nuts and protected EPDM gaskets. Pipe stiffeners are required when used with PVC pipe.

2.06 CONCRETE:

Concrete for encasing the sewer pipeline, securing clean-out access castings, and other similar items shall be Type V Portland Cement (ASTM C150) and have a 28-day compressive strength of not less than 3,500 psi. All reinforcement required shall be

standard deformed reinforcement conforming to the requirements set forth in ASTM A615, Grade 60.

2.07 MISCELLANEOUS:

- A. Plugs: Plugs shall be specifically manufactured for the pipelines in which they are to be installed. The plug shall be constructed of a material approved by the Engineer and shall provide a permanent water-tight installation without permanently sealing the joint.
- B. Couplings: Couplings shall be used only where shown on the drawings or where approved in writing by the Engineer. The Contractor shall provide a description of and exact location of any couplings used.

Flexible couplings shall consist of a rubber gasket or boot, stainless-steel shear ring, and 300 series stainless-steel tightening bands. The coupling shall conform to requirements of ASTM C425 and shall be "Mission" ARC or approved equal.

- C. Fittings: Fittings shall be of the same material and to the same requirements, including coatings and linings, as the pipeline in which they are installed.

The fittings shall be standard manufactured form with the same type of joint as the pipe.

- D. Grout: Grout shall be a non-shrink type with aluminum filings; grouts with iron filings are not acceptable. Grout shall be "Five Star Grout," "Embeco Grout" or equal. The Contractor may substitute a 2-component, 100% solids epoxy resin (Sikadur Hi-Mod LV) for the specified grout.

Grout used for sealing service connections shall be a 2-component, waterproof epoxy grout specifically manufactured for this application. The grout shall adhere to any of the dissimilar materials.

- E. Sealants: Sealants used on manholes or pipe connections shall be equal to SIKAFLEX-la, a one component polyurethane base, elastomeric sealant. When required due to moisture or immersion, provide SIKAFLEX 429 primer for application onto the substrate according to manufacturer's recommendation.

PART 3 -- EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS:

Each pipe length and fitting interior, interior surface of bells, and exterior surface of spigots shall be cleaned of all foreign material before placing it in the trench and shall be kept clean all times thereafter. Each item must also be examined for cracks and other defects before installation.

Pipe shall be cut, only whenever necessary, to conform to locations of manholes or connections. All cuts shall be straight, true, and at right angles to the axis of the pipe unless otherwise noted or directed by the Engineer. The cutting process shall leave a smooth end without damaging the pipe. All burrs shall be removed from the ends of cut pipe, and the end lightly rasped or filed. All tools used in cutting pipe shall be subject to the Engineer's approval.

All sanitary sewer pipes must be installed with a laser. If bending of the beam due to air temperature variations becomes apparent with "in pipe" units, a fan shall be provided to circulate air in the pipe. Air velocity shall not be so excessive as to cause pulsating or

vibrating of the beam. If, in the opinion of the City, the beam cannot be accurately controlled, this method of setting line and grade shall be abandoned.

Pipe laying shall proceed upgrade with the spigot ends of pipe pointing in the direction of the flow, unless otherwise approved by the Engineer. Each pipe length shall be laid true to line and grade in such manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets to the flow line. Pipe shall be laid in a dry (dewatered) trench and shall not be used for draining water from the trench.

Whenever the pipe is left unattended or pipe laying is not in progress, temporary plugs shall be installed at all openings. Temporary plugs shall be watertight and of such design as to prevent debris and animals from entering the pipe. All temporary plugs shall be subject to approval of the Engineer.

The Contractor shall obtain from each pipe manufacturer complete installation instructions. The Contractor shall provide the Engineer with 2 copies of those instructions and shall have additional copies at the site of the work. The Contractor shall install the materials in accordance with the manufacturer's recommendations. If there is a conflict between the Contract Documents and the manufacturer's instructions, the Contractor shall obtain resolution from the Engineer before proceeding with the work.

Install buried utility warning tape as shown on the trench detail shown on the Drawings, or centered 24-inches above the pipe within the trench backfill if not shown. Tape shall be laid continuously between manholes or structures. Provide for all sewer and sewer service pipelines.

3.02 INSTALLATION OF PVC PLASTIC PIPE:

- A. Pipe Laying: No deflection in the joints shall be allowed. All pipes shall be fully supported by the full length of pipe barrel without support by the bell mounding.
- B. Jointing the Pipe: The outside of the spigot and the inside of the bell shall be thoroughly wiped clean. Set the rubber ring in the bell with the marked edge facing toward the end of the bell. Lubricate the spigot end using a thin film of the manufacturer-supplied lubricant. Push the pipe spigot into the bell. Position the completed joint so that the mark on the pipe end is in line with the end of the bell.

Bevel the end of the pipe with a beveling tool after the pipe is field cut. Place a clearly visible position mark at the correct distance from the end of the field-cut pipe.

- C. Connection of PVC Pipe to Concrete Manhole Base: The PVC pipe shall be encased in the concrete of the manhole base as detailed on the Drawings, and provisions shall be made for watertightness of the connection as follows:

The exterior circumference of the PVC pipe where encased in concrete for watertightness shall be uniformly roughened or scarified by sanding with coarse sandpaper or emery cloth for the encased length.

Additionally, a gasket or O-ring shall be stretched onto the PVC pipe to form a weep ring where encased in concrete. The gasket shall be specifically manufactured for this purpose, and shall have a stainless-steel ring to hold it securely around the pipe. The gasket shall be supplied by the pipe manufacturer.

Any proposed alternative to the above-specified methods for PVC pipe connection to concrete shall be submitted to the Engineer for approval prior to

use.

- D. Manhole Stubs. Pipe stubs shall be a full stick of pipe and extend approximately 20' from the outside face of the manhole and shall be capped or plugged with manufactured fittings to form a watertight installation.

3.03 PIPE EMBEDMENT

- A. Placing embedment material - Refer to SECTION Excavation and Backfill for Buried Pipes for placement methods.
- B. Embedment Classes - Refer to SECTION Excavation and Backfill for Buried Pipes and Construction Drawings for embedment materials for each class listed below:
1. Pipe shall be embedded according to applicable details within the specifications and on the Construction Drawings.

3.04 FLUSHING AND TESTING SEWER PIPELINES:

- A. Pipeline Flushing: The Contractor shall flush the pipelines, as the work progresses, by means that are in accordance with good practice, to ensure that earth, sand, rocks or other foreign materials are removed from the interior of the pipeline.
- B. Alignment and Grade: Sewer pipelines will be checked by the Engineer to determine whether any displacement of the pipe has occurred after the trench has been bedded to an elevation 6-inches above the pipe and tamped as specified. The test will be as follows:

A light will be flashed between manholes, or if the manholes have not as yet been constructed, between the locations of the manholes, by means of a flashlight or by reflecting sunlight with a mirror. If the illuminated interior of the pipeline shows poor alignment, displaced pipe, earth, or other debris in the pipe, or any other kinds of defects, the defects, determined by the Engineer, shall be remedied by the Contractor at their own expense. The test will be repeated following completion of backfilling and any poor alignment, displaced pipe, or other defects, determined by the Engineer, shall be corrected at the Contractor's expense.

- C. Leakage: Tests for watertightness shall be made by the Contractor in the presence of the Engineer. The Contractor shall provide assistance to the Engineer in development of a detailed record of the testing program. The sewer and connections shall not leak in excess of the following rate for a 24-hour test period:

MAXIMUM ALLOWABLE SEWER LEAKAGE

<u>Pipe Size</u> <u>Inches</u>	<u>Leakage</u> <u>Gal/Foot/24 Hours</u>
15	0.57
12	0.45
10	0.38
8	0.30
6	0.23

INSTALLATION OF GRAVITY SANITARY SEWER PIPELINES – SECTION 02520

Each reach of pipeline between manholes shall be tested individually. Any individual reach that leaks in excess of the amount allowed in the previous paragraph shall be considered as failing, and shall be repaired and retested.

At the discretion of the Engineer, the time for leakage rate test may be shortened to four (4) hours.

The tests and measurement of infiltration or exfiltration shall be conducted in a manner as approved by the Engineer. The Contractor shall repair the sewer in a manner that is satisfactory to the Engineer and re-test until satisfactory tightness is obtained.

Infiltration tests will be used if the groundwater table is 1-foot or more above the finished sewer; otherwise, exfiltration tests will be used. The minimum head for the exfiltration tests shall be 2-feet above the top of the pipe at its highest point in the test section. Sections shall be bulk-headed so that during any test the head on the sewer at its lowest elevation will not be more than 10-feet. This restriction does not apply to ductile-iron pipe. In any section of the pipeline if the head at the lowest point in the section exceeds 10-feet, then the Engineer will set forth the special method of testing to meet the field conditions.

Air tests for sewer lines may be substituted for leakage tests at the option of the Contractor. The air tests will be conducted in the presence of the engineer, or his authorized representative, in accordance with the guidelines and standards set by Uni-Bell Plastic Pipe Association.

The Contractor will use equipment specifically designed for air testing sewers. The air test shall be made when the sewer is clean and lateral services properly plugged. The line shall be plugged at each manhole with pneumatic balls and low-pressure air may be introduced through either end. The air shall fill the plugged line until the internal pressure is 3.5 psig greater than the average back pressure of any groundwater pressure that may submerge the pipe. (This pressure to be determined in the field by the Engineer, but not to exceed 9.0 psig). At least two (2) minutes shall be allowed for the air temperature to stabilize, and then the internal pressure shall be allowed to drop to the test pressure. At this point the internal line pressure is monitored. The line pressure shall not drop more than 0.5 psig in less time than specified in the table or the pipe fails the test and shall be repaired and retested. The Contractor is responsible for locating the leaks, repairing them, and re-testing the line.

AIR TEST C MINIMUM TIME PRESSURE LOSS

Pipe Diam.	Minimum Time	Length Pipe	Time Longer
<u>In.</u>	<u>(Min:Sec)</u>	<u>(Ft)</u>	<u>Length (Sec)</u>
8	3:47	298	0.760 L
10	4:43	239	1.187 L
12	5:40	199	1.709 L
15	7:05	159	2.671 L

- D. Deflection: All PVC sewer pipelines shall be tested for vertical deflection after placement and compaction of backfill unless testing is specifically accepted by the Engineer. Method of testing shall be by deflectometer of the rigid GO/No-GO type device. An alternative method will be permitted only by written permission of the Engineer or as defined in the Special Construction Provisions of these

Specifications. Maximum allowable deflection shall be five percent (5%) of the pipe diameter. Any and all pipe with vertical deflection greater than the allowable shall be excavated, removed from the pipeline, replaced, backfilled and compacted as specified, and retested at the Contractor's expense.

3.05 TELEVISION MAIN

- A. All sewer connection lines eight inches (8") or larger shall be televised.
- B. The Contractor shall televise the entire line as soon as the leakage and manhole tests are satisfactorily completed. Any defects noted shall be repaired immediately. The entire line(s) shall be re-videotaped immediately prior to the warranty period expiring. The City retains the right to televise the line anytime during the warranty period, if conditions warrant such inspection. If defects are present, the developer or contractor shall complete the repair work immediately. The developer or contractor shall pay to have that section of line re-televised following any required repairs.
- C. Immediately prior to a television inspection, enough water shall be run down the line so it comes out the lower manhole.
- D. The televising system camera shall include pan, tilt, and radial viewing. The full color camera system shall be fully controllable remotely from the operator's vehicle. The pan shall be plus or minus 275 degrees, and rotate 360 degrees. The camera equipment shall include an accurate footage counter, which displays the footage distance from the centerline of the starting manhole on the operators monitor and is recorded on the videotape or CD. The camera shall be equipped with a camera height adjustment to allow the camera lens to always be centered at one-half the inside pipe diameter, or higher, in the pipe being televised. A lighting system for the camera is required to clearly illuminate the features and conditions of the pipe being inspected. A reflector in front of the camera may be required to enhance lighting in large diameter pipes. High quality copies of the videotape or CD, along with a complete log of the operator's observations, shall be provide to the City within one week of the completion of the televising activity. The videotape or CD, as well as the operators log, shall clearly show the location in relation from the starting manhole, each item of interest. These shall include, but are not limited to each infiltration point, offset joints, separated joints, service taps, roots, broken pipe and other discernible conditions of interest.

- END OF SECTION -

SECTION 02575 – MANHOLES**PART 1 -- GENERAL****1.01 SCOPE:**

The work of this section consists of furnishing, installing and testing cast-in-place bases with reinforcement, precast concrete bases and risers, frames, covers, and installation materials, and appurtenances.

1.02 REFERENCES:

- A. American Society for Testing and Materials (ASTM).
 - 1. A48 Gray Iron Castings
 - 2. A615 Deformed Carbon Steel Bars for Concrete Reinforcement
 - 3. C150 Portland Cement
 - 4. C478 Precast Reinforced Concrete Manhole Sections
- B. American Association of State Highway and Transportation Officials (AASHTO), Standard Specifications for Highway Bridges.
- C. Federal Specification: SS-S-210: Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints.

1.03 CONTRACTOR SUBMITTALS:

In accordance with SECTION 01300, furnish:

- A. Manufacturer's literature on manholes, joint material, frame and cover, steps, and pipe inserts, connectors, and stubs sufficient to demonstrate compliance with the Specification and Drawing requirements.
- B. Shop drawings showing design criteria, reinforcing steel location and embedment, layout of inserts, attachments and openings, and location and details of joints.
- C. Test results.

PART 2 -- PRODUCTS**2.01 GENERAL:**

Manholes shall be constructed of pre-cast concrete riser sections, in accordance with the details shown on the Drawings. The concrete sections shall conform to ASTM C478. The top section required for change of diameter shall be eccentric cone or flat slab if permitted by the Engineer. Dry cast concrete structures are not permitted.

To bring the manhole cover to the correct elevation, the adjustment section of each manhole shall be pre-cast concrete. These rings shall not be less than 6 inches wide and furnished in heights to allow for 1-inch adjustment. Maximum adjustment height shall not exceed 12 inches.

Manholes and castings shall be rated for AASHTO H-20 loading.

Stubs shall be provided at manholes when shown on the Drawings. Stubs shall be sealed with a removable watertight plug.

Gaskets for connecting PVC pipe to manhole sections shall be specifically manufactured for that purpose. The gasket shall be provided by the pipe manufacturer.

2.02 JOINTS:

Precast manhole joints shall be made watertight with Ram-Nek gasket material or equal. Provide and use primer as recommended by the manufacturer. Diameter of gasket shall be as recommended by the manufacturer. Meet or exceed Federal Specification SS-S-210.

2.03 FRAME AND COVER:

Frames and covers shall be as specified on the Drawings, but no less than 24-inch diameter, bolt down and gasketed, watertight, as manufactured by D and L Supply (Number E1924), or equal. Cast iron shall be per ASTM A48, Class 30B or better.

Cover shall have the word "SEWER" clearly cast on its surface.

2.04 MANHOLE STEPS:

- A. Manhole steps shall conform to ASTM C-478-94 and shall be steel reinforced copolymer polypropylene with materials conforming to the following:
 - 1. The deformed steel reinforcing bar shall be 1/2-inch conforming to ASTM A615 Grade 60.
 - 2. The copolymer polypropylene shall conform to ASTM D4101-92b PP0344B33534Z02.
 - 3. Manufacturer's Reference: M.A. Industries PS2-PFDF, or approved equal.

2.05 GROUT:

Grout shall be non-shrink type with aluminum filings; grout with iron filings is not acceptable. Grout shall be "Five Star Grout," "Embeco Grout" or equal.

2.06 CONCRETE:

- A. Concrete requirements for precast and cast-in-place manhole bases and sections are:
 - 1. All concrete shall attain 3,500 psi compressive strength within 28 days;
 - 2. All concrete shall use Type V Portland cement (ASTM C150) with 4-6% air entrainment.
 - 3. All concrete shall have a water/cement ratio = 0.45 (by weight), maximum.
 - 4. All concrete shall have the additive "Xypex Admix C-Series" (Mfr-Xypex Chemical Corporation)
 - 5. All reinforcement shall be standard deformed reinforcement conforming to the requirements set forth in ASTM, A615, Grade 60.

2.07 COATING:

Manhole bottom surface, exterior walls and interior walls and floor shall be lined with reinforced flexible PVC membrane liner that offers H₂S gas and chemical resistance for precast concrete products.

PART 3 -- EXECUTION**3.01 GENERAL:**

Manholes shall be constructed to conform to the details shown on the Drawings. The invert channels shall be smooth, semi-circular in shape, and tangent to pipe openings at each end, conforming to the inside of the incoming and outgoing sewer pipelines. Changes in direction of flow shall be made with a smooth curve of as large a radius as the size of the manhole will permit. Changes in size and grade of the channels shall be made gradually and evenly. Where differences in invert elevations exist, sloped flow channels shall be formed so the sewage does not undergo a sharp vertical drop. Where an inlet invert is above the crown of the outlet, provide a smooth "beaver slide" shaped transition channel, with the channel invert tangent to the pipe invert slope at the inlet and outlet. The invert channels may be formed directly in the concrete of the manhole base. The floor of the manhole outside of the channel shall be smooth and shall slope toward the channels at not less than 1-inch per foot and not more than 2-inches per foot.

In graded areas, manhole frames and covers shall be set with their tops at the ground line, unless shown otherwise on the Drawings. Compacted backfill shall be placed around the exposed section as shown on the Drawings. The site shall be graded so that drainage is away from the manhole. In paved areas, accurately locate and place the frames no more than 1/4-inch vertical elevation below the finished paved surface at any location along its circumference. Coordinate the activities of all trades so that this tolerance is achieved.

Outside each manhole where the pipe enters/exits, within 12-inches of the manhole base, the Contractor shall install a bell section of pipe or a certified and accepted coupling as indicated on the Drawings.

Each joint of the precast manhole barrel shall have at least one continuous gasket placed on the lower ledge before the barrel immediately above is lowered into place.

3.02 MATERIAL INSPECTION:

All pre-cast structures shall be inspected and approved by the Project Engineer and City prior to installation. Any structures deemed unacceptable shall be replaced or repaired by the Contractor at the discretion of the Project Engineer and City.

3.03 GROUTING:

Any opening between manhole walls and pipe made by the Contractor, and lifting holes or as designated elsewhere shall be closed watertight with non-shrink grout. The opening shall be of sufficient size to accommodate the pipe, "O"-rings, and grout. The grout shall extend no less than the full width of the manhole barrel. Use grout to make a watertight seal in and around existing pipes which are removed from service.

Channels that have been cut into existing concrete bases shall be smoothed to the specified contour with grout.

3.04 FINISH GRADE AND ADJUSTMENT:

To bring the manhole cover to the correct elevation, the top section of each manhole shall be constructed of pre-cast concrete grade adjustment rings. These rings shall be not less than 6-inches wide and furnished in heights to allow for two (2) 2-inch adjustments. Grade adjustment with rings shall be 8-inches maximum and 2-inches minimum. All rings shall be grouted in place.

3.05 TESTING MANHOLES:

During the construction of the manholes, the Contractor shall, in accordance with good practice, ensure that no earth, sand, rocks or other foreign material exists on the joint surfaces during assembly of the sections. The Engineer shall check each manhole to determine whether the manhole fulfills the requirements of the Drawings and Specifications. The Visual Examination and either the Leakage Test or Vacuum Test are required.

- A. Visual Examination: The Engineer shall visually check each manhole, both exterior and interior, for flaws, cracks, holes, or other inadequacies which might affect the operation or watertight integrity of the manhole. Should any inadequacies be found, the Contractor shall make any repairs deemed necessary by the Engineer.
- B. Leakage Test: All manholes shall be tested for leakage and all tests shall be witnessed by the Engineer. The leakage test shall be conducted prior to backfilling around the manhole and shall be carried out in the following manner:
 - 1. All lines leading into or out of the manhole shall be tightly plugged.
 - 2. The manhole shall be filled with water to a level at least 2-inches above the uppermost step. The water shall be allowed to stand for two hours to allow for normal water absorption into the manhole material. At the end of the two-hour stabilization period, if the water level in the manhole has dropped below the top step, additional water will be added to bring the level above the step as before. Any visible external leakage or drop in water level noted within the one-hour test period shall constitute failure, and the Contractor, at their own expense, shall repair the manhole and re-test until satisfactory watertightness is obtained.
- C. Vacuum Testing: All pipes entering and exiting the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.

The test head shall be placed at the top of the manhole and the seal inflated in accordance with the manufacturer's recommendations.

A vacuum of 10-inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head shall be closed, and the vacuum pump shut-off. The time shall be measured for the vacuum to drop to 9-inches of mercury.

The manhole will be declared unacceptable if the time to drop from 10-inches of mercury to 9-inches of mercury is less than the time shown in the following table:

DEPTH (FEET) (Vertical Length of Manhole)	TIME (seconds)		
	48" Diameter	60" Diameter	72" Diameter
8	20	26	33
10	25	33	41
12	30	39	49
14	35	46	57
16	40	52	67
18	45	59	73
20	50	65	81
22	55	72	89
24	59	78	97
26	64	85	105
28	69	91	113
30	74	98	121

The minimum test time shall be one minute. If the manhole fails the initial tests, the manhole shall be repaired and re-tested until a satisfactory test is obtained.

3.06 EXISTING SANITARY MANHOLES ABANDONED IN PLACE:

Existing manholes to be abandoned in place shall be backfilled with squeegee material, grout plugs of abandoned inflow and outflow pipes are not required. The top cone section, grade rings, and frame and cover of the manhole shall be removed and disposed of.

- END OF SECTION -

SECTION 02614 – SANITARY SEWER FORCE MAINS**PART 1 -- GENERAL****1.01 DESCRIPTION:**

The work of this section consists of furnishing and installing buried sewage force main pipe and appurtenances. The Contractor shall follow normal good construction practice in accordance with materials manufacturer's printed instructions. All material used shall be manufactured and supplied according to the latest revised standards of the American Water Works Association, the American National Standards Institute, and the American Society for Testing and Materials, or as mentioned hereinafter.

1.02 REFERENCES:

American Society for Testing and Materials (ASTM), American Water Works Association (AWWA).

Ductile Iron Pipe Research Association (DIPRA)

American Water Works Association (AWWA)

1.03 SUBMITTALS:

In accordance with SECTION 01300, submit:

- A. Certificates of compliance
- B. Manufacturer's installation instructions and recommendations
- C. Manufacturer's literature and product data sufficient to demonstrate compliance with the specified requirements.
- D. Test results.

1.04 PRODUCT HANDLING:

- A. Delivery: Handle pipe and fittings to ensure delivery in a sound, undamaged condition. Under no circumstances shall any materials be dropped.
- B. All pipes will be field inspected at the job site and checked for conformance to these specifications. Pipe and fittings will be checked for out-of-round or damaged joints, interior and exterior surface damage, gasket damage and the other requirements listed herein. Any pipeline or appurtenant material found defective will be rejected. Any material rejected at the job site shall be marked "Rejected," and the Contractor shall remove it immediately from the job site.
- C. Storage: Do not store materials on the ground. Use opaque covers to protect materials from direct sunlight (UV light).

PART 2 -- MATERIALS

The Contractor shall furnish pipeline materials meeting applicable requirements of this Specification. The internal diameter of the pipe shall not be less than the diameter shown on the drawings.

2.01 POLYVINYL CHLORIDE (PVC) PIPE:

The pipe shall be green internal restrained joint Pressure Class 305, DR14, and shall conform to AWWA C900 "Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal

Diameters 4-inch through 12-inch.” The pipe material shall be of virgin source, conform to ASTM D1784 Cell Classification 12454.

Provisions shall be made for contraction and expansion at each joint with a rubber ring, and integral thickened bell as part of each joint. Integral joints shall conform to ASTM D3139. Gaskets shall conform to ASTM F477. Pipe shall be supplied in nominal laying lengths of 20 feet. All pipe and fittings shall be assembled with a non-toxic lubricant. Each length of pipe shall have marked on the exterior the following:

- A. Manufacturer's Name or Trademark
- B. Nominal Pipe Size/Dimension Ratio
- C. PVC Cell Classification (e.g. 12454-B)
- D. Legend – Type C900 Pressure Pipe
- E. Sewer Force Main” or “Not for Potable Use”

Fittings and plugs to be used with the PVC pipe shall be ductile or cast iron in accordance with AWWA C110, with mechanical joint end connections in accordance with AWWA C111. Fittings shall be ceramic-epoxy lined (Protecto 401 as manufactured by U.S. Pipe, or equal). Fusion epoxy lining in accordance with AWWA C116 may be substituted only if approved in writing by the Engineer.

2.02 DUCTILE IRON PIPE, FITTINGS, AND APPURTENANCES:

In accordance with Specification 15200.

2.03 THRUST RESTRAINT:

Thrust restraint shall be made through the installation of concrete thrust blocks as shown on the Drawings. Concrete for thrust blocks shall be a minimum of 3,000 psi, 28-day strength.

All pipe to pipe joints shall be internal restrained joint. All pipe to fitting joints shall also be mechanically restrained in addition to concrete thrust blocks.

Mechanical restraints for mechanical joint fittings shall be split ring with continuous serrations around the full circumference of the pipe. EBBA Iron Series 15MJ00 for C900 pipe, or approved equal.

2.04 BURIED UTILITY WARNING TAPE:

- A. Detectable marking tape shall consist of a minimum of 5 mil (0.0005") overall thickness; five-ply composition; ultra-high molecular weight 100% virgin polyethylene; acid alkaline and corrosion resistant.
- B. Elongation properties shall be in accordance with ASTM D882-80A and shall be less than 150% at break. The tape shall have a 20-gauge (0.0020") solid aluminum foil core, encapsulated within 2.55 mil (0.00255") polyethylene backing.
- C. Tape color and legend combination shall be in accordance with APWA or local requirements. The color shall be green. The legend shall read "CAUTION - SEWERLINE BELOW".
 - 1. The tape tensile strength shall be in accordance with ASTM D882-80A and be not less than 7800 psi.

2. Tape width shall be 3/4 of the diameter of the pipeline being protected.
 - a. Tape Width: 2" 3" 6" or wider
 - b. Tape Bury Depth: 6"- 18" 6"- 28" 6"- 36"
3. The tape shall be as manufactured by T. Christy Enterprises, or equal.
4. Magnetic tape is required for all pipes and shall be 2-feet above the top of pipe.

2.05 TRACER WIRE

Tracer wire is required for all pipes and services. Wire shall be No. 12 gauge insulated, stranded copper. All splices to be watertight, underground type.

2.06 HARDWARE:

All hardware used for assembly of buried joints, fittings, restraints, and the like shall be in accordance with Specification 15200.

2.07 PLUG VALVES AND VALVE BOXES:

In accordance with Specification 15215.

2.08 POLYETHYLENE ENCASEMENT

All polyethylene encasement film shall be a multi-layer system infused with a corrosion inhibitor and an anti-microbial additive and meet standard ANSI/AWWA C105/21.5.

Approved Product: V-Bio Enhanced Polyethylene Encasement by DIPRA or Engineer approved equal.

PART 3 -- EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS:

Do not lay pipe when trenches or weather conditions are unsuitable for such work.

Each pipe length and fitting interior, interior surface of bells, and exterior surface of spigots shall be cleaned of all foreign material before placing it in the trench and shall be kept clean all times thereafter. Each item shall also be examined for cracks and other defects before installation.

Field cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe, and so as to leave a smooth end at right angles to the axis of the pipe.

Each pipe length shall be laid true to line and grade, without intermediate high or low points not shown on the Drawings. If field conditions are encountered that preclude installation per the Drawings, immediately notify the Engineer for resolution. Pipe shall be laid in a dry (dewatered) trench and shall not be used for draining water from the trench.

Whenever the pipe is left unattended or pipe laying is not in progress, temporary plugs shall be installed at all openings. Temporary plugs shall be watertight and of such design as to prevent debris and animals from entering the pipe. All temporary plugs shall be subject to review by the Engineer.

Warning Tape: Install buried utility warning tape as shown on the trench detail shown on the Drawings, or centered 24-inches above the pipe within the trench backfill if not shown. Tape shall be laid continuously along the length of the pipeline. Connect ends together

with continuity connectors.

The Contractor shall install the materials in accordance with the manufacturer's recommendations. If there is a conflict between the Contract Documents and the manufacturer's instructions, the Contractor shall obtain resolution from the Engineer before proceeding with the work.

3.02 INSTALLATION OF POLYVINYL CHLORIDE (PVC) PIPE:

- A. Pipe Laying: Pipe laying shall proceed with the spigot ends of pipe pointing in the direction of the flow. All pipes shall be fully supported by the full length of pipe barrel without support by the bell.

When curved lines are indicated on the drawings, or if needed to deflect the pipe vertically, the curve shall be accomplished by installing the pipes on uniform curves by deflecting the pipe barrel. The entire pipe segment to be curved shall first be assembled straight, prior to curving. Deflection at joints shall not be acceptable. The minimum curves are shown below:

Pipe Diameter <u>Inches</u>	Minimum Radius <u>Feet</u>	Offset in 20' <u>Length</u> <u>Inches</u>
4	150	16
6	200	12
8	250	10
10	300	8
12	350	7
14	400	6

- B. Jointing the Pipe (Bell and Spigot Pipe): The outside of the spigot and the inside of the bell shall be thoroughly wiped clean. Set the rubber ring in the bell with the marked edge facing toward the end of the bell. Lubricate the spigot end using a thin film of the manufacturer-supplies lubricant. Push the pipe spigot into the bell. Position the completed joint so that the mark on the pipe end is in line with the end of the bell.

Bevel the end of the pipe with a beveling tool after the pipe is field cut. Place a clearly visible position mark at the correct distance from the end of the field cut pipe to facilitate proper bell joint insertion.

3.03 INSTALLATION OF DUCTILE IRON PIPE, FITTINGS, AND APPURTENANCES:

In accordance with Specification 15200 and the following:

- A. Pipe Laying:
1. Inspection: Fittings shall be carefully inspected by the Engineer for defects before installation. Such inspection shall include light tapping with a hammer while the pipe is suspended in the air. No fittings which are cracked or which show defects excluded by the Specifications for such pipe or fittings shall be used. Any injuries to the protective coating of the pipe or fittings shall be carefully repaired by the Contractor. Injuries to the protective ceramic-epoxy lining shall be rejected and new fittings provided at no additional cost.

2. Cleanliness of Material: Fittings shall be carefully cleaned before installation. Every open end shall be carefully plugged or capped before leaving the work.
 3. Positioning: Bells and spigots must be thoroughly cleaned and free from oil, grease, blisters, and excess coating before spigots are inserted into bells. The spigot end of the pipe shall be brought to true line and grade and be inserted to the full depth of the socket before the joints are made. The inner surface of the pipe shall conform at the joints, and the annular space for the jointing material shall be of uniform width and depth. If any pipe does not allow sufficient space or jointing material, it shall be replaced by one of proper dimensions.
 4. Deflection: The maximum deflection in bell and spigot cast or ductile iron joints shall be no more than that specified by the manufacturer.
- B. Push-on or Mechanical Joints: Joints shall conform to AWWA C111. Installation shall be in accordance with the manufacturer's printed recommendations. Gasket seats and rubber gaskets shall be thoroughly cleaned before assembly. The completed joint shall have a uniform contact by the gasket between the outer surface of the spigot and the gasket seat of the bell.

3.04 INSTALLATION OF THRUST RESTRAINT:

The movement of fittings and pipe joints shall be restrained by use of concrete thrust blocks. Thrust blocks shall be installed in accordance with the Drawings. The thrust blocks shall be poured between undisturbed solid ground and the fitting to be anchored; the area of bearing on the undisturbed trench wall shall be that shown on the thrust block detail or directed by the Engineer. The concrete shall be so placed that the pipe or fitting joints will be accessible for repair. Thrust blocks or other thrust restraint where thrust blocks cannot be used shall be required at all fittings unless otherwise shown on the Drawings. A bond breaker shall be placed over the fitting before placing concrete.

If mechanical restraints are used, install in strict conformance with the manufacturer's written instructions and recommendations.

3.05 CONNECTION TO EXISTING SYSTEM:

The existing system must at all times remain under the control of the Owner. The Contractor shall operate no valves or pumps on the existing system without permission of the Owner.

All points at which the existing force main and gravity main are to be disconnected and connected to the new mains are shown on the Drawings. Connections to the existing system shall be completed after new pipeline, valves, thrust blocks and other appurtenances are installed, tested, and accepted. Connections shall be completed in accordance with the details given for each point of disconnection or reconnection. The Contractor shall install temporary thrust-restraint systems needed to restrain piping, fittings, and appurtenances at connections until all required materials are installed as designed to complete a fully intact system. At each point of connection of new pipes to existing pipes, the Contractor shall expose the existing pipe and locate a good sound point at which has been designed and manufactured explicitly for the purpose of joining together two types and sizes of pipe which he must connect. The use of poured concrete collar connectors around two dissimilar sizes or types of pipes without the use of the proper transition couplings will not be permitted.

The Contractor shall coordinate service interruptions with the Owner or affected party(ies). No interruption of service shall be permitted without prior approval. Give at least two (2) days notice and make appropriate arrangements with the Owner or affected party(ies) prior to shutdown. Schedule shutdowns for periods of minimum use and at the Owner's or affected party(ies) convenience. Have all material, equipment, and personnel on hand prior to beginning any work involving a potential shutdown. Perform work in a manner that reduces the shutdown time to the minimum. In some cases, an increased number of personnel or night or weekend work may be necessary.

3.06 PIPELINE FLUSHING:

The Contractor shall flush the pipelines as the work progresses by a means in accordance with good practice to ensure that sand, rocks or other foreign material are not left in any of the pipelines. If possible, the flushing shall be made through an open pipe end.

3.07 PRESSURE TESTING OF PVC FORCE MAINS:

After each section of pipeline has been laid and partially backfilled (except for the joints or when the Engineer directs the trench to be backfilled for reasons of public safety, or if the Contractor elects to backfill prior to testing, as permitted), the pipe shall be pressure tested. The Contractor shall furnish the pump, pipe, connections, meters, water, and all other necessary apparatus, and shall furnish all necessary assistance to conduct the test. The duration of each leakage test shall be two hours, and, during the test, the main shall be subjected to a hydrostatic pressure of 150 pounds per square inch as measured at the location of the lowest elevation of the segment of pipeline being tested.

No pipeline installation will be acceptable until the leakage is less than the amount computed by the following formula:

$$L = \frac{SD(P)^{0.5}}{133,200}$$

L = Allowable leakage in gallons (per hour)

S = Tested length of pipe (feet)

D = Nominal diameter of pipe (inches)

P = Average test pressure during the test (psi)

Should any test of pipe laid disclose leakage greater than that specified above, the Contractor shall, at their own expense, locate and repair the points of leakage, and retest until the leakage is within the specified allowance.

The pipe may be subjected to hydrostatic pressure, inspected, and tested for leakage at any convenient time after the trench has been partially backfilled, except at the joints, or backfilled as permitted by the Engineer. Where any section is provided with concrete thrust blocks, the pressure test shall not be made until at least two days have elapsed after the concrete was installed.

The Engineer shall be notified at least 48-hours before the pipes are to be tested so they may be present during the test.

- END OF SECTION -

SECTION 02676 – WATERTIGHTNESS TESTING

PART 1 -- GENERAL

1.01 DESCRIPTION:

Furnish all labor, equipment, and materials necessary to test the wet well and valve/meter pit for watertightness.

PART 2 -- PRODUCTS

2.01 MATERIALS:

Water, clean and free of deleterious substances.

PART 3 -- EXECUTION

3.01 PREPARATION:

After construction of the tank has been completed, but prior to application of protective coating systems, the floor and inside of the walls shall be broom- cleaned. The floor shall be squeegeed and washed with clean water. After the sweeping and the removal of all debris, completely hose down the interior surfaces of the tank with water under pressure.

3.02 TESTING:

Watertightness testing shall be performed prior to backfill. Two tests are required. The first test shall be made on the overall watertightness of the tank. The second test shall be made on the visible surfaces of the tank.

- A. Fill to the “emergency high water level” and allow the tank to stand full for at least 24 hours. During the first 24 hours, the surface of the water may drop, and shall be refilled.
- B. The water level elevation shall be determined by using a surveyor's level and level rod or other acceptable means. Measure the drop in water level over the next 5 days to determine the water volume loss for comparison with the acceptance criteria. Floating “evaporation and precipitation pans” shall be used to remove these effects from the test. The liquid loss for each period of 24 hours shall not exceed 0.0005 of the tank capacity (or height), which shall be translated to the nearest 1/16 inch in the 5-day period.
- C. Visible wet spots on the exterior wall surface or flowing water on the wall base shall not be permitted. Wet spots are defined as spots where moisture can be picked up on a dry hand. Wet spots shall be repaired as required by the Engineer.
- D. If the watertightness testing fails to meet the above requirements, the Engineer may require the tank to be drained, repaired and again tested for watertightness. For the second test, and any other tests thereafter, the Contractor shall pay for all water used at no additional cost to the Owner.

- END OF SECTION -

SECTION 02925 – REVEGETATION**PART 1 -- GENERAL****1.01 DESCRIPTION:**

The work under this section consists of revegetation with seeded grasses. The Contractor shall furnish all labor, materials, equipment, tools, and transportation required to complete the work, and shall perform all operations in connection with and reasonably incidental to establishing, maintaining, and warranting the reseeded areas.

All work shall be completed in accordance with these specifications, the Drawings and Contract Documents, and in a manner consistent with accepted horticultural practices. All permits, licenses, and fees associated with any work under this Contract are the responsibility of the Contractor, unless otherwise noted.

1.02 PROJECT MONITORING:

The Contractor shall notify the Owner prior to the commencement of any work under this section. The Owner will monitor the progress of the work throughout the Contract period. The Owner may also collect samples of the seed used on the project, and may collect samples of fertilizers, water, or other materials as necessary to assure the project Specifications are met.

1.03 SUBMITTALS:

General – The Contractor shall be required to submit statements of guarantee and/or certifications from vendors who supply seed, mulches, tackifiers, and fertilizers.

1.04 TIMING OF THE WORK:

Seeding shall be completed as soon as practical after the completion of final grading. The Contractor shall coordinate the actual start of the seeding operation with the Owner.

1.05 CONTRACTOR'S SITE RESPONSIBILITIES:

It shall be the responsibility of the Contractor to locate and protect all utilities, structures, roadways, parking areas, fences, survey markers, existing vegetation (e.g. trees), etc. on all work sites. Any damage caused by the Contractor or their subcontractors shall be immediately repaired or corrected by the Contractor at no expense to the Owner.

1.06 CLEANING:

The work site shall be kept clean and free from all debris. At the conclusion of work, the Contractor shall remove and haul from the site all excess materials, debris, and equipment. Any damage (e.g. damaged fencing, damaged road surfaces, excessive tire furrows, mud tracked onto pavement, etc.) resulting from the Contractor's activities shall be repaired by the Contractor to the Owner's satisfaction at no expense to the Owner.

1.07 FINAL ACCEPTANCE:

When work has been completed for the project, the Contractor and the Owner shall inspect the site together and determine the total area of the work, and whether or not the work is complete and has been performed in accordance with the Contract Documents and Specifications. If mutual agreement cannot be reached on these issues, the determinations made by the Owner shall be final. Deficiencies in the work, if any, shall be noted and a checklist of these deficiencies given to the Contractor by the Owner. The Contractor shall immediately correct any deficiencies listed on the checklist at no cost to

the Owner.

When all checklist items are completed to the satisfaction of the Owner, the Contractor shall then submit these items for payment to the Owner.

1.08 GUARANTEE AND REPLACEMENT:

The purpose of this guarantee is to ensure that the Owner receives seed of prime quality, installed and maintained in a thorough and careful manner throughout the warranty period.

- A. Warranty Period: For a period of two (2) years after the date of “Final Acceptance,” the Contractor shall maintain and guarantee all seeded areas to be in a vigorous, healthy growing condition. The Contractor shall re-seed any areas that are dead, diseased, sparse, or in the opinion of the Owner in an unhealthy condition at no additional cost to the Owner. Reseeding operations shall be performed by the Contractor within ten days of notification from the Owner
- B. Seed Establishment Period:
 - 1. Seed establishment period shall begin upon notice of “Final Acceptance” given by the Owner in writing.
 - 2. Areas seeded shall be inspected for required coverage approximately five (5) months after “Final Completion of the Contract” unless that time occurs in the dormant season (November 15th through April 15th). In those cases, inspections shall be completed before or after the dormant season as determined by the Owner. Required performance for seeded areas shall be a healthy, well-rooted, even-colored, viable grass stand that is established, free of weeds, open joints, bare areas and surface irregularities.
 - 3. After the inspections, it is the Contractor’s responsibility to perform any required maintenance within one week to insure a healthy established seeded condition.
- C. Maintenance: Maintain seeded areas to two years from the date of “Final Completion of the Contract.”
- D. Maintenance Requirements:
 - 1. Weed Control: Apply appropriate herbicide(s) in accordance with manufacturer’s suggested rate(s) to control weeds. Herbicide application must comply with all requirements of herbicide/pesticide applicator license, including suitable warning/signing following application.
 - 2. Disease and Insect Control: Apply fungicides and insecticides as required to control diseases and insects by a licensed applicator in accordance with state law requirements.
 - 3. Watering: The Contractor shall be responsible for watering of seeded areas if he deems necessary to insure performance under this SECTION. Apply only the amount of water necessary to maintain seeded areas in a healthy condition until the end of the warranty period. Reduce amount of water after seed is established. Avoid standing water, surface wash, or erosion from over-watering.
 - 4. Protection:
 - a. Provide sufficient barriers and signage notifying the public to keep

- off newly seeded area.
 - b. Repair reseeded areas that have washed out or are eroded with new soil, seed, and appropriate erosion and sedimentation control measures.
5. Inspection:
- a. The Contractor shall notify the Owner prior to watering, fertilizing and spraying operations.
 - b. At the time of the first inspection, the Owner and the Contractor shall evaluate the seeded area with the Contractor to determine that maintenance is sufficient to insure a healthy condition of the seeding work.
 - c. At this time, a second inspection will be agreed upon between the Owner and the Contractor, if deemed necessary.

PART 2 -- PRODUCTS

2.01 GENERAL:

All materials used shall be new and without flaws or defects of any type, and shall be the best of their class and kind.

All materials furnished shall be free of noxious weeds including, but not limited to, Knapweeds, Canada Thistle, Field Bindweed, Johnsongrass, Leafy Spurge, and Kochia.

All materials shall be stored in a manner that will prevent them from coming into contact with precipitation, surface water, or any other contaminating substance.

Seed mix shall be consistent with an appropriate native grass mix suitable for restoration and erosion control.

2.02 FERTILIZER:

Fertilizer shall be as recommended by the seed provider. All fertilizer shall be a standard commercial product of uniform composition, free flowing and conforming to applicable State and Federal laws. It shall be delivered in original, unopened containers, unless provisions are made and approved by the Owner for bulk deliveries to the site of the work.

No cyanamide compounds will be permitted in fertilizers.

The Contractor shall submit to the Owner the manufacturers guaranteed chemical analysis, name, trade name, trademark, and conformance to state law of all fertilizers.

2.03 HYDRAULIC MULCH

- A. Hydraulic mulch material shall consist of at least ninety (90%) percent virgin wood cellulose fiber and be free of any substance or factor that might inhibit germination or growth of grass seed. The wood cellulose fibers shall have the property of becoming evenly dispersed and suspended when agitated in water.
- B. Hydraulic mulch shall be clean and shall not contain the seeds of noxious weeds or unspecified grasses. It shall be dyed a color to allow visual metering of its application. When sprayed uniformly on the surface of the soil, the fibers shall form a blotter-like ground cover that readily absorbs water and allows infiltration to the underlying soil

- C. Weight specifications for hydraulic mulch from suppliers and for all applications shall refer only to air-dry weight of the fiber, a standard equivalent to ten (10%) percent moisture. The hydraulic mulch material shall be supplied in packages having a gross weight not in excess of one hundred (100) pounds and shall be marked by the manufacturer to show the air dry weight content.

2.04 WATER:

All water used on projects under this Contract shall be free of any substances harmful to plant germination and growth or to the environment in general. The Contractor shall be responsible for furnishing and applying water that meets these requirements. The Owner may submit samples of water used on any project for laboratory analysis (of a reasonable number and kind) to ensure the acceptable quality of water.

2.05 SEED:

- A. All seed shall be obtained from Rivendell Distribution and Sod Farm, 3961 County Road 114, Glenwood Springs, CO 81601, (970) 945-2568. Mix shall be:
 - 1. Rivendell's Native Low Grow Mix: Attractive species mix with a lower growing habit. Tough, drought tolerant mix preferred by landscape architects and designers.
 - a. 19% Blue Fescue
 - b. 12% Blue Grama
 - c. 14% Rocky Mountain Fescue
 - d. 14% Canby Bluegrass
 - e. 9% Indian Ricegrass
 - f. 18% Sandberg Blue
 - g. 10% Sideoats Grama
 - h. 2% Alpine Bluegrass
 - i. 2% Bottlebrush Squirreltail
- B. Application Rate: 1/2 lb. per 1,000 SF

2.06 EROSION BLANKETS:

Where indicated on the Drawings, or where slopes to be seeded are steeper than 3:1, erosion blankets will be required after seeding and hydraulic mulching. Blankets shall be biodegradable with single-sided netting. SFB1 100% straw erosion control blanket by CONTECH, or Engineer approved equal.

PART 3 -- EXECUTION

3.01 GENERAL:

- A. Notice to Proceed: The Contractor shall inform the Owner when they are ready to commence permanent revegetation. Upon agreement with the Contractor's preparation for this work the Owner shall provide the Contractor with a Notice to Proceed. The Contractor shall begin and complete the work as specified in this section.

- B. Performance of the Work: All work is to be performed by personnel thoroughly familiar with proper and accepted methods for soil preparation, herbicide applications, fertilizing, sodding, etc. All work is to be performed under the direct supervision of the Contractor's superintendent, who shall be thoroughly familiar with the provisions of this Contract.

3.02 SEEDED AREAS PREPARATION:

- A. General: Limit subgrade preparation to areas that will be planted in the immediate future.

All surfaces to be seeded shall be mechanically roughened immediately prior to seeding in a manner consistent with the referenced erosion control best management practices and described below. Roughened surfaces will better retain water for adsorption and resist erosion until the grass becomes established. All ripping and tilling operations shall be done in a direction that follows the natural contour of the land on slopes 3:1 or flatter. Soils on slopes steeper than 3:1 will be roughened by tracked vehicles with indentations following the natural contours, or in a manner otherwise submitted by the Contractor and approved by the Engineer. Any gross irregularities in the ground surface resulting from soil preparation operations shall be corrected to comply with finished grade requirements and sloped to drain.

Thoroughly till or rip all areas, which are to be seeded that previously supported vehicular traffic to a depth of 12-inches. Till all remaining areas to a depth of 6-inches. The soils shall be worked until no clods greater than 2-inches in diameter remain, unless directed otherwise by the Owner. Remove rocks and other objects 2-inches or greater in diameter.

Moisten prepared areas to be seeded prior to planting when soils are dry. Water thoroughly and allow surface to adsorb free standing water before seeding. Do not create muddy conditions. Restore prepared areas if eroded or disturbed after fine grading and before planting.

3.03 FERTILIZATION:

Any fertilizers specified by the Owner shall be applied and mixed with the soil as specified. In some instances, as directed by the Owner, fertilizers will be spread evenly on the surface of the soil rather than tilled into the top four (4) inches. All fertilizers shall be applied using standard application equipment at rates indicated by soils tests, or in some cases as specified by the Owner.

3.04 HERBICIDE/CHEMICAL APPLICATIONS:

Herbicides or other chemicals, if required, shall be applied using well-maintained spraying equipment by individuals working for the Contractor who are appropriately licensed by any State and/or Federal agency having jurisdiction over such applications. It shall be the responsibility of the Contractor to be knowledgeable of any and all current laws and regulations pertaining to herbicide and other chemical applications, and to advise the Owner immediately if any requests for these applications made by the Owner are inappropriate as they pertain to these laws and regulations.

Herbicides and other chemicals shall not be applied during periods when wind or other physical conditions cause the herbicides or chemical to be transported a distance of more than five (5) feet from the immediate area where they are being placed. It shall be the responsibility of the Contractor to stop work immediately and to notify the Owner if any

weather or other physical condition exists that would make the application of herbicides or other chemical inappropriate.

All herbicides or other chemicals used (except solid fertilizers) shall be applied at a rate and strength, and by the method recommended by the manufacturer of the product being used.

3.05 MULCHING:

Immediately after seeding has been completed, hydraulic mulch shall be applied as homogeneous slurry of water, cellulose fiber mulch and tackifier at the rate of two thousand (2,000) pounds per acre. Mulch mixture shall be applied uniformly over all seeded areas with equipment capable of operating at one hundred (100) gallons per minute at one hundred (100) pounds per square inch.

3.06 EROSION BLANKETS:

When required on slopes, deploy and stake erosion control blankets on top of the completed seeded and mulched surface in accordance with the Drawings or referenced best management practices.

- END OF SECTION -

SECTION 03100 – FORMWORK**PART 1 -- GENERAL****1.01 DESCRIPTION:**

This section covers furnishing, erecting and removing of forms for cast-in-place concrete.

1.02 QUALITY ASSURANCE:**A. Reference Standards:**

1. American Concrete Institute Standards (ACI)
 - a. 301 Specifications for Structural Concrete
 - b. 347 Guide to Formwork
 - c. As modified herein.

B. Design Criteria:

1. The Contractor shall design the formwork for the loads, lateral pressures and allowable stresses outlined in Chapter 1 of ACI 347.

C. Maximum Allowable Tolerances:

1. Variation from Plumb:
 - a. Lines and surfaces of columns, piers and walls
 - 1) In any 10 feet of length: $\frac{1}{4}$ inch
 - 2) Entire length: 1 inch
 - b. Control-joint grooves, and other conspicuous lines
 - 1) In any 20 feet of length: $\frac{1}{4}$ inch
 - 2) In 40 feet or more: $\frac{3}{4}$ inch
2. Variation from level or specified grade:
 - a. Slabs, beams and roof:
 - 1) In any 10 feet of length: $\frac{1}{4}$ inch
 - 2) In any 20 feet of length: $\frac{3}{8}$ inch
 - 3) Entire length: $\frac{3}{4}$ inch
3. The maximum deflection of facing materials reflected in concrete surfaces exposed to view shall be 1/240 of the span between supporting members.
4. Refer to ACI 301 for additional requirements.

PART 2 -- PRODUCTS**2.01 FORM MATERIALS:**

- A. General: Where "Smooth Form Finish" or "Grout Cleaned Finish" is specified, use prefabricated plywood panel forms, job-built plywood forms, forms lined with plywood or fiberboard, or steel forms. Where "Rough Form Finish" is specified, unlined wooden forms may be used.

- B. Steel Forms: Symons “Steel Ply,” Simplex “Industrial Steel Frame Forms,” Universal “Uniform” or equivalent.
- C. Plywood Forms: Product Standard PS-1, - waterproof, resin-bonded exterior type Douglas fir.
- D. Fiberboard Forms: Federal Spec LLL-B-810 – Type II tempered, waterproof, screenback, concrete form hardboard.
- E. Lumber (Including Board and Batten Forms): Straight, uniform width and thickness, free from knots, offsets, holes, dents, and other surface defects. Lumber must be sufficiently sealed to prevent the absorption of water, form release agent, etc.
- F. Chamfer strips: Clear white pine, surface against concrete planed.
- G. Form ties:
 - 1. Removable end, permanently embedded body type with waterstop.
 - 2. Sufficient strength and rigidity to support and maintain the form in proper position and alignment without the use of auxiliary spreaders.
 - 3. When cones are provided on the outer ends the permanently embedded portion shall be back a minimum of one inch from concrete surface.
 - 4. Permanently embedded type without threaded ends shall be so constructed so that removable ends are readily broken off (one inch back from concrete surface) without damage to the concrete.
 - 5. Form ties in exposed surfaces shall be uniformly spaced and aligned in horizontal and vertical rows.
- H. Joints: Joints shall be flat, not keyed, with adhesive waterstops, unless otherwise shown on Drawings.
- I. Polyethylene Film: Product Standard PS17; 6 mil.
- J. Form Coating:
 - 1. Non-staining chemical release agent that will not damage the concrete surfaces and appropriate for use in potable water structures.
 - 2. For all exposed surfaces not in contact with earth backfill use Symons Corp. “Magic Kote”, L & M “Debond” or equivalent.

PART 3 -- EXECUTION

3.01 ERECTION:

- A. General:
 - 1. Erect forms substantial and sufficiently tight to prevent leakage of mortar and braced or tied to maintain the desired position, shape and alignment before, during and after concrete placement. At vertical wall joints where forms overlay existing concrete, a mortar tight joint shall be required. Use a bead of silicone caulking or foam joint filler against concrete before placing form. Alternate methods shall be acceptable to the Engineer.
 - 2. Use adequate walers, stiffeners and braces to ensure proper alignment and stability until the wall construction is completed.

3. Provide temporary openings at the bottom of column and wall forms and at other locations where necessary to facilitate cleaning and inspection.
4. Temporary openings in wall or column forms used to limit the free fall of concrete to a maximum of 4-feet shall be located to facilitate placing and consolidation of the concrete. Such openings in walls shall not exceed 8 feet laterally to avoid moving concrete laterally more than 4-feet.
5. If tremies of proper length are used for depositing concrete in walls or columns, temporary openings for concrete placement will not be required.
6. Whenever the top of a wall will be exposed to weathering, do not extend the forms on one side above the top of the wall; bring to true line and grade.
7. At other locations, bring forms to a true line and grade, or provide a wooden guide strip at the proper location on the forms so that the top surface can be finished with a screed or template for concrete which is to have a specified elevation, slope or contour.
8. At horizontal construction joints in walls, do not extend the forms on one side more than 2-feet above the joint. Horizontal construction joints shall not be used in walls of water retaining structures or exposed walls, unless reviewed and accepted by the Engineer.
9. Where concrete is placed against rock, remove all loose pieces of rock and clean the exposed surface with a high-pressure hose.

B. Embedded Items:

1. Anchor bolts, castings, steel shapes, conduits, sleeves, waterstops, masonry anchorage and other materials that are to be embedded in the concrete shall be accurately positioned in the forms and securely anchored.
2. Install conduits in walls or slabs with reinforcement in both faces between the two faces of reinforcing steel.
3. In walls or slabs which have only a single mat of reinforcing steel, place conduits near the center of the wall or slab.
4. Unless installed in pipe sleeves, provide anchor bolts with sufficient threads to permit a nut to be installed on the concrete side of the form or template.
5. Install a second nut on the other side of the form or template and adjust the two nuts so the bolt will be held rigidly in proper position.
6. Assure embedments are clean when installed.
7. After concrete placement, clean surfaces not in contact with concrete of concrete mortar and other foreign substances.

C. Preparation of Form Surfaces:

1. Remove mortar, grout, and other foreign material from form surfaces.
2. Coat form surfaces with form coating material before either the reinforcing steel or concrete is placed. Ensure that dimension lumber board and batten forms are properly sealed so that they do not absorb form coating

or water.

3. Do not allow form coating to:
 - a. Stand in puddles in the forms.
 - b. Come in contact with the reinforcing steel.
 - c. Come in contact with adjacent hardened concrete against which fresh concrete is to be placed.

D. Edges and Corners:

1. Place chamfer strips in forms to bevel exposed edges and projecting corners. Tool the top edges of walls and slabs not indicated on the Drawings to be beveled.
2. Form beveled edges for all vertical and horizontal corners of equipment bases unless indicated otherwise on the Drawings.
3. Chamfer strip shall be $\frac{3}{4}$ inch unless indicated otherwise on the Drawings.

E. Removal:

1. Do not remove or disturb forms until the concrete has attained sufficient strength to safely support all dead and live loads.
2. For beams, slabs and similar sections, the shores and supports shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted by the Engineer. Determine strength from pullout tests in accordance with ASTM C 900 or job cured cylinder breaks. Cylinders shall be job cured in same manner as the formed concrete.
3. Retain shoring in place and reinforce as necessary to carry out construction equipment, materials or other loads in excess of cured strength. Brace walls and columns after removal of forms to resist wind and construction loads.
4. Use care in form removal to avoid surface gouging, corner, or edge breakage, and other damage to the concrete.
5. Do not commence form removal for concrete not yet supporting loads, earlier than the following schedule:
 - a. Walls and columns: 16 hours
 - b. Vertical sides of beams and girders: 24 hours
 - c. Bottom forms and shoring for post-tensioned
 - d. slabs, upon completion of the post-tensioning
 - e. of the tendons, whichever comes last: 7 days
 - f. Bottom forms and shoring for non-prestressed
 - g. slabs, beams and girders under 10 feet
 - h. clear span between permanent supports: 7 days
 - i. Bottom forms and shoring for non-prestressed

- j. slabs, beams and girders between 10 and
- k. 20 feet clear span between permanent supports: 14 days
- l. Bottom forms and shoring for non-prestressed
- m. slabs, beams and girders over 20 feet clear
- n. span between permanent supports: 21 days
- o. Refer to ACI 347, Chapter 2, for additional requirements.

- END OF SECTION -

SECTION 03200 – REINFORCEMENT**PART 1 -- GENERAL****1.01 DESCRIPTION:**

This section covers furnishing and installing deformed steel bars and welded wire fabric for concrete reinforcement.

1.02 QUALITY ASSURANCE:**A. Reference Standards:**

1. American Concrete Institute Standards (ACI)
 - a. 301 Specifications for Structural Concrete.
 - b. SP-66 ACI Detailing Manual
 - c. 318 Building Code Requirements for Reinforced Concrete.
 - d.
2. As modified herein or on the Drawings.

B. Allowable Tolerances:

1. Fabrication Tolerances
 - a. Sheared length: ± 1 inch
 - b. Depth of truss: +0, -1/4 inch for concrete thickness 24 inches or less and
 - c. +0, -1/2 inch for concrete thickness over 24 inches.
 - d. Overall dimensions of stirrups, ties and spirals: +0, -1/4 inch for concrete thickness 24 inches or less and +0, -1/2 inch for concrete thickness over 24 inches.
 - e. All other bends ± 1 inch.
2. Placement Tolerances See PART 3.02.C

C. Welding: Do not weld reinforcement except where indicated on the Drawings for welded splices. Tack welding of reinforcement is not permitted, except where specified by the Engineer.

1.03 SUBMITTALS:

All submittals shall be made in accordance with SECTION 01330.

A. Shop Drawings:

1. Before fabrication of reinforcing steel, the Contractor shall review and approve shop drawings, bar lists, fabrication and setting drawings and shall submit the same to Engineer for review.
2. Show sizes, quantity and dimensions for fabrication and placing of reinforcing bars and bar supports. Indicate bar schedules, stirrup spacing, and diagrams of bent bars.

B. Certificates: Mill test certificates identifying chemical and physical analysis of

each load of reinforcing steel delivered.

- C. Manufacturer's Literature: Manufacturer's specifications and installation instructions for splice devices when these devices are called for on the Drawings.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver to site in bundles marked with metal tags indicating bar size and length.
- B. Carefully handle and store on supports that will keep the steel from coming in contact with the ground or standing water.

PART 2 -- PRODUCTS

2.01 REINFORCEMENT BARS:

- A. Bars: Steel reinforcement bars shall be new, deformed billet steel, meeting ASTM A 615; Grade 60 for reinforcing bars.
- B. Tie Wire: Annealed steel, Fed. Spec. QQ-W-461, 16 gauge minimum, epoxy coated.
- C. Fabrication: In accordance with CRSI Manual of Standard Practice except for the allowable tolerances specified herein in 1-2B.

2.02 BAR SUPPORTS:

- A. Conform to "Bar Support Specifications," CRSI Manual of Standard Practice.
- B. The portions of the supports or accessories within 1/2-inch of the concrete surface shall be coated with plastic at least 3/32-inch thick at points of contact with the formwork. Other requirements shall be in accordance with Class 1, maximum protection, plastic protected bar supports, in Chapter 3 of the Manual of Standard Practice by CRSI.
- C. The concrete block supports at the base of the wall and for the slab-on-grade shall be specially fabricated for this project, either by the contractor or by a specialty supplier acceptable to the Engineer. They shall be 4-inches square and 2-3/8 inches thick and shall be made of similar concrete as specified for the structure, adjusted for elimination of the coarse aggregate.

2.03 WELDED WIRE REINFORCEMENT:

Welded Wire Reinforcement shall be electrically welded wire fabric of cold-drawn wire (70,000 psi yield point) of gauge and mesh size shown on the drawings, and shall conform to "Specification for Welded Steel Wire Reinforcement for Concrete Reinforcement" (ASTM A 185).

PART 3 -- EXECUTION

3.01 PREPARATION:

- A. Remove all mud, oil, loose rust or mill scale or other foreign materials that may reduce bond.
- B. Rust or mill scale that is "tight" will be permissible without cleaning or brushing provided weights, dimensions, cross-sectional area, and tensile properties meet requirements of ASTM A 615.

3.02 INSTALLATION:**A. Bar Placement:**

1. Conform to CRSI-WCRSI "Placing Reinforcing Steel.
2. Reinforcement shall be supported and wired together to prevent displacement by construction loads or the placing of concrete.

B. Bar Supports:

1. Provide at least the number of supports as required by ACI 315.
2. All reinforcement shall be tied to chairs to secure them from displacement during concrete placement. Reinforcement shall be secured at a maximum distance of four feet on center. All chairs shall be stapled to wooden soffits. Staples and tie wire only shall be used to secure chairs to forms, except as reviewed by the Engineer.
3. Do not use pebbles, pieces of broken stone, common or face brick, metal pipe or wood blocks to support reinforcement.
4. Spacing of supports for the floor tendons and reinforcement shall be at the spacing of the bars, each way.

C. Placement Tolerances:

1. Clear distance to formed surface: See 3.02.D Concrete Cover 1 and 2.
2. Minimum spacing between bars: -1/4 inch
3. Top bars in slabs and beams: See 3-2D Concrete Cover 1 and 2.
4. Spacing crosswise of members: Spaced evenly within 2-inches.
5. Lengthwise of members: $\pm$ 2-inches.
6. Maximum bar movement to avoid interference with other reinforcing steel, conduits or embedded items: one bar diameter. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangement of bars may be rejected by the Engineer.

D. Concrete Cover:

1. Except as otherwise indicated on the Drawings, provide the following minimum concrete cover for reinforcement.
 - a. Unformed surfaces adjacent to excavation
 - 1) Non-prestressed Concrete: 3 inches
 - 2) Prestressed Concrete: 1-7/8 inches
 - b. Formed or top surfaces exposed to
 - c. weather or saturated air, submerged or
 - d. in contact with earth:
 - 1) Non-prestressed Concrete: 2 inches
 - 2) Prestressed Concrete: 1-1/2 inches
 - e. Other locations: Bars in beams or

- f. columns, including stirrups & ties: 1-1/2 inches
 - 2. Cover for reinforcing steel shall not be less than the minimum given above (no minus tolerance), and shall not exceed the minimum by more than 1/4-inch where concrete thickness is 24 inches or less, or more than ½ inch where the concrete thickness is more than 24 inches.
 - 3. For circular columns and drilled piers, three equally spaced plastic disks (Plas-T-Clips) distributed by Spillman Company, Columbus, Ohio or equivalent (acceptable to Engineer) at 4-feet on center shall be used to space the column reinforcing away from the forms and drilled pier reinforcement away from the earth.
- E. Reinforcement Adjustment:
- 1. Move only as stated under PART 3.02.C.6.
 - 2. Do not heat, bend or cut bars without Engineer's acceptance.
 - 3. Grade 60 bars shall not be bent after being partially embedded in hardened concrete.
- F. Splices:
- 1. Do not splice bars except at locations shown on the Drawings without the Engineer's acceptance.
 - 2. Minimum lap distance shall be as shown on the Drawings. If not shown, splices shall be Class B tension lap splice as specified in ACI 318.
 - 3. Tie splices securely to prevent displacement by construction loads or during placement of concrete.
 - 4. Splices in horizontal wall reinforcement in circular tanks shall be staggered such that no more than one bar in two is spliced in any 4-foot wide vertical section.
 - 5. Reinforcement shall be continuous around corners or corner bars provided.
- G. Welding: Reference PART 1.02.C.

- END OF SECTION -

SECTION 03253 – WATERSTOPS**PART 1 -- GENERAL****1.01 DESCRIPTION:**

This section covers the furnishing and installation of waterstops.

1.02 QUALITY ASSURANCE:

Reference standards:

- A. U.S. Corps of Engineers, CRD C-572
- B. Tennessee Valley Authority (T.V.A.) Specification No. PF-1001.

1.03 PRODUCT HANDLING:

- A. PVC waterstops shall be delivered in standard roll lengths of at least 50 feet each.
- B. Protect waterstops from damage, sun and weather during storage.

1.04 INSPECTION:

Prior to concrete placement and after waterstops have been positioned, waterstops are to be inspected by the Engineer for correct splicing and for correct, secure, positioning.

PART 2 -- MATERIALS**2.01 MATERIALS**

- A. All PVC waterstops shall be manufactured from virgin polyvinyl chloride plastic compound, and shall not contain any scrap or reclaimed material.
 - 1. Shall be rated for at least 125-feet head of water.
 - 2. Shall be flat, ribbed, 3/8-inch thick, 6-inches wide, with large center bulb.
- B. Furnish electrically heated splicing iron per waterstop manufacturer's recommendations for welding operations.
- C. Adhesive expansive rubber waterstops shall be Adeka MC-2010M, Spearfish SD, Greenstreak CJ-1020-2K Hydrotite, St. Louis MO, or equivalent acceptable to the Engineer.

PART 3 -- EXECUTION**3.01 PREPARATION FOR WATERSTOPS:**

- A. Waterstops shall be cut and/or spliced so that they are at least the full length of the concrete joint.
- B. End cuts shall be straight and square.
- C. Field splicing of PVC waterstops shall be butt splices only and shall not be performed until the splicing iron has reached 425 degrees F.
 - 1. Square cut ends to be butt spliced together so that they are matched.
 - 2. Heat waterstop ends with splicing iron until the material melts. There will be 1/8-inch bead of melted material all around edges to be joined. Do not

overheat so that material chars.

3. Remove the splicing iron from the splice, press the melted ends together immediately and maintain ends in this position at least 15 seconds. Accelerate cooling with water, if desired. Do not trim.

- D. Factory-made splices shall be furnished for vertical or horizontal flat ells, tees, crosses or special configurations.

3.02 INSTALLATION OF ADHESIVE WATERSTOPS:

- A. Concrete surfaces shall be clean, dry, frost-free and primed in accordance with the manufacturer's recommendations.
- B. Waterstops shall be applied in accordance with the manufacturer's recommendations and shall adhere tenaciously to the primed concrete surface.

- END OF SECTION -

SECTION 03300 – CAST-IN-PLACE CONCRETE**PART 1 -- GENERAL****1.01 DESCRIPTION:**

- A. This section covers cast-in-place concrete, including furnishing materials, transporting, placing, finishing, curing and other appurtenant items of construction.
- B. Inform Engineer at least 2 weeks in advance of time and places at which Contractor intends to place concrete. All preparation work for concrete placements shall be substantially completed at least 2 workdays prior to the scheduled start of concrete placement to allow for the Engineer's review and any necessary corrections.

1.02 QUALITY ASSURANCE:

- A. Reference standards.
 - 1. Except as noted or modified in this SECTION, all concrete materials, transporting, placing, finishing and curing shall conform to requirements of following standard specifications:
 - a. American Concrete Institute Standards (ACI)
 - 1) 301 Specifications for Structural Concrete.
 - 2) 304 Recommended Practices for Measuring, Mixing, Transporting, and Placing Concrete.
 - 3) 304 Placing Concrete by Pumping Methods.
 - 4) 305 Recommended Practices for Hot Weather Concreting.
 - 5) 306 Recommended Practices for Cold Weather Concreting.
 - 6) 308 Standard Practices for Curing Concrete.
 - 7) 309 Recommended Practices for Consolidation of Concrete.
 - 8) 318 Building Code Requirements for Reinforced Concrete.
 - b. American Society for Testing and Materials (ASTM).
- B. Contractor shall keep at least one copy of above listed ACI publications, latest edition, in project field office at all times.
- C. Any material or operation specified by reference to the published specifications of a manufacturer shall be complied with unless directed otherwise by the Engineer.
- D. In case of a conflict between the referenced specifications or standards and this Specification, the one having the more stringent requirements, as determined by the Engineer, shall govern.

1.03 SUBMITTALS:

All submittals shall be made in accordance with SECTION 01300. Mix designs, shop drawings and catalog information shall be submitted for related equipment and

components, in order to show that concrete and items selected and to be installed by the Contractor generally conform to the Contract Documents. Submittal information includes, but is not necessarily limited to the following:

A. Miscellaneous product information:

1. Catalog information and shop drawings for: waterstops, admixtures, bonding agents, membrane curing compound, joint sealer, embedded items, non-shrink grout, wedge-type expansion anchors, and other concrete appurtenances.

B. Proposed concrete mix design. (Note: Contractor shall be responsible for fully informing the concrete supplier of all specification requirements regarding the concrete mix before the proposed mix design is submitted.)

1. The proportions of ingredients shall be selected to produce the proper workability (slump), durability (air content), strength, maximum water-cementitious materials ratio, time of set and other required properties of SECTIONS 2.01 and 2.02.

The proportion of ingredients shall be such as to produce a mixture with slump and durability that will work readily into the corners and angles of the forms and around reinforcement by the methods of placing and consolidation employed on the work. Do not permit the materials to segregate or excessive free water to collect on the surface.

An independent testing laboratory acceptable to the Engineer shall perform concrete trial mixtures and testing. The costs of the mix designs and testing shall be borne by the Contractor.

2. Prior to commencing concrete work, submit and obtain Engineer's review of certified test reports describing proposed concrete mix design, which shall be prepared in compliance with ACI Standard 301, with concrete proportions established on the basis of previous field experience or laboratory trial batches, except as modified herein. Test reports shall also include:
 - a. Fine aggregates - Source, type, gradation, deleterious substances and bulk specific gravity on basis of weight of saturated surface-dry aggregate. ASTM C 128.
 - b. Coarse aggregate - Source, type, gradation, deleterious substances and bulk specific gravity on basis of weight of saturated surface-dry aggregate. ASTM C 127.
 - c. Ratio of fine to total aggregates.
 - d. Weight (saturated surface-dry) of each aggregate per cubic yard.
 - e. Total water content in gallons per cubic yard.
 - f. Slump on which design is based.
 - g. Brand, type and quantity of cement.
 - h. Brand, type and quantity of admixtures.
 - i. Water-cementitious materials ratio (shall be not greater than specified in PART 2-2).

- j. Air content (which shall be within the upper half of the allowable range).
- k. For the laboratory trial batches method, the determination of the cementitious materials content necessary to attain the required strength and other properties, without exceeding the maximum water-cementitious materials ratio, shall be by preliminary tests in accordance with the following procedures:

Concrete trial mixtures having proportions and consistency suitable for the work shall be made using at least three different cementitious materials contents which will produce a range in strengths encompassing those required for the work.

Proportions of ingredients shall be determined and tests conducted in accordance with the basic relationships and procedures outlined in "Recommended Practice for Selecting Proportions for Normal and Heavy- Weight Concrete (PART I):" (ACI 211.1).

For each cementitious materials content, at least three specimens for each age to be tested shall be made and cured in accordance with "Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Laboratory" (ASTM C 192) and tested for strength at 1, 7, and 28 days. Tests shall be conducted in accordance with "Method of Test of Compressive Strength of Molded Concrete Cylinders" (ASTM C 39).

From the results of these tests, a curve shall be plotted showing the relationship between cementitious materials content and the average 28-day compressive strength. The minimum cementitious materials content to be used shall be that value shown by the curve to produce a strength of at least 1500 psi in 24 hours and at least 1200 psi greater than the 28-day strength specified. In any case, the minimum cementitious materials content shall not be less than that specified in PART 2-2.

If the previous field experience method is used in proportioning, the strengths shall be in compliance with ACI 301. In addition, the Contractor shall demonstrate the ability of the proposed mixture proportions to produce concrete meeting all the requirements of these Specifications.

- 3. In addition to the test data described above, when it is expected that concrete will be placed under hot weather concrete conditions as defined in SECTION 03300, PART 1-5.A, trial batches shall be tested at the maximum temperature that the concrete is expected to be placed. Alternatively, sufficient records may be submitted that show field concrete performance under these temperatures and which are acceptable to Engineer.

C. Cylinder compression test reports.

- 1. Submit 2 copies of certified test reports to Engineer for 1.02.B.2.K.

D. Ready-mix delivery tickets: Submit delivery tickets for each load at time of

delivery indicating following:

1. Quantity delivered with Mix Identification Number.
2. Quantity of each material in batch.
3. Outdoor temperature in shade.
4. Time at which water was added.
5. Elapsed time between when water was added and concrete load was in place.
6. Amounts of initial and supplemental water added, including any corrections for water in aggregate. Note: Total water amount shall result in a water-cementitious materials ratio not greater than the maximum permissible.
7. Name of individual authorizing supplemental water.
8. Numerical sequence of delivery by indicating cumulative yardage delivered on each ticket.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Cementitious materials.
 1. Store in weather-tight enclosures and protect against dampness, contamination and warehouse set.
 2. Do not use cementitious materials that have become caked or lumpy.
- B. Aggregates.
 1. Stockpile to prevent excessive segregation, or contamination with other materials or other sizes of aggregates.
 2. Use only one supply source for each aggregate stockpile.
 3. The bottom 6 inches of all aggregate piles in contact with ground shall not be used.
 4. Frozen or partially frozen aggregates shall not be used.
- C. Admixtures.
 1. Store to prevent contamination, evaporation, or damage.
 2. Protect liquid admixtures from freezing or harmful temperature ranges.
 3. Agitate emulsions prior to use.
- D. Rubber and plastic materials.
 1. Store in cool place away from direct sunlight.
- E. Mixing and transporting ready-mixed concrete.
 1. Maximum elapsed time from time water is added to mix until concrete is in place shall not exceed 1-1/2 hours when concrete is transported in revolving drum truck bodies unless all other provisions of these specifications can be met, including maximum water-cementitious materials ratio, workability, strength and air content. Comply with ASTM C 94.

1.05 JOB CONDITIONS:

A. Environmental requirements:

1. Do not place concrete during rain, sleet, or snow unless adequate protection is provided and Engineer's approval is obtained.
2. Do not allow rainwater to increase mixing water or damage surface finish.
3. For cold or hot weather concreting conditions, lab cured cylinder tests may not be an accurate indication of field achieved strengths. Under these weather conditions, the Engineer may require job cured cylinder breaks to determine field strength (cylinders to be job cured in same manner as the in-place concrete.) The Contractor shall pay for testing. Refer to SECTION 03300, PART 3.10 for related items to be furnished by Contractor. If cold or hot weather concreting practices specified in SECTIONS 1.05.B and 1.05.C are not adhered to, the Engineer may require Contractor, at Contractor's expense, to provide additional pullout tests in accordance with ASTM C 900, job cured cylinder tests, or 2-inch diameter cored samples from areas in question to determine field strengths achieved.

B. Changes in temperature of the concrete shall be as uniform as possible and shall not exceed 10 degrees F in any 1-hour or 45 degrees F in any 24-hour period.

C. Cold Weather Concreting. Conform to ACI 306, "Cold Weather Concreting" in addition to this specification.

1. Temperature of concrete when placed shall not be less than following:
Minimum Concrete Temp, C.

<u>Air Temp.</u> <u>Degrees F</u>	<u>Sections with least dimension</u> <u>Under 12 in.</u>	<u>12 in. and Over</u>
30 to 45	60	50
0 to 30	65	55
Below 0	70	60

If water or aggregate has been heated, the water and aggregate shall be combined in the mixer before cementitious materials are added. Cementitious materials shall not be added to mixture of water and aggregate when the temperature of the mixture is greater than 95 degrees F.

2. When placed, heated concrete shall not be warmer than 80 degrees F.
3. Prior to placing concrete, all ice, snow, surface and subsurface frost shall be removed, and temperature of surfaces to be in contact with new concrete shall be raised to a minimum of 35 degrees F.
4. Protect concrete from freezing during specified curing period. See PART 3.09 "Curing", for temperature to be maintained during initial curing period.
5. When the mean daily temperature of the atmosphere is less than 40 degrees F, forms shall be left in place a minimum of 5 days to aid in retaining heat.
6. Heated enclosures shall be strong and windproof to insure adequate

- protection of corners, edges and thin sections.
7. Do not permit heating units to locally heat or dry concrete.
 8. Do not use combustion heaters during first 24 hours unless concrete is protected from exposure to exhaust gases, which contain carbon dioxide.
 9. If air temperatures drop below 35 degrees F, the Contractor shall install a high-low temperature gauge into the most exposed portion of concrete during the curing protection period. The gauge shall be equipped to register the lowest overnight temperature. If the concrete temperature drops below the specified temperature, the curing period shall be extended until the degree-days (PART 3.09) are satisfied.
 10. Refer to ACI 306 for further requirements.
- D. Hot Weather Concreting: Conform to ACI 305, "Hot Weather Concreting" in addition to this specification.
1. Take precautions when ambient air temperature is 90 degrees F or above. These measures may include installation of windbreaks, shading, fog spraying, sprinkling, ponding, or wet covering of a light color. If daytime highs are expected to exceed 100 degrees F, floor and roof slab concrete shall be placed overnight, with placement commencing not prior to 3 hours before sunset.
 2. Temperature of concrete when placed shall not exceed 85 degrees F.
 3. Cool forms and reinforcing to a maximum of 90 degrees F by spraying with water prior to placing concrete.
 4. Do not use cementitious materials that have reached a temperature of 105 degrees F or more at the time they enter the concrete mix.
 5. Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
 6. Do not place concrete when evaporation rate (actual or anticipated) is 1.0 kg per square m per hour or above, as determined by Figure 2.1.5 of ACI 305.
 7. Set-retarding and water-reducing admixtures may be used when the ambient air temperature is 90 degrees F or above to offset accelerating effects of high temperature.
 8. Refer to ACI 305 for further requirements.
- E. Protection from Mechanical Injury: During the curing period, the concrete shall be protected from damaging mechanical disturbances particularly load stresses, heavy shock and excessive vibration. All finished concrete surfaces shall be protected from damage caused by construction equipment, materials, or methods and by rain or running water. Self-supporting structures shall not be loaded in such a way as to over-stress the concrete.

PART 2 -- PRODUCTS

2.01 CONCRETE MATERIALS:

- A. Cement shall conform to the "Standard Specification for Portland Cement," ASTM C 150, Type V with Colorado Department of Transportation (CDOT) Class

3 sulfate resistance (*Standard Specifications for Road and Bridge Construction, 2017, SECTION 601*). Once cement type is chosen, the type and source shall remain the same throughout the project.

Fly ash shall be Class F (ASTM C 618).

B. Aggregates.

1. Fine aggregate - ASTM C 33.
2. Coarse aggregate - ASTM C 33 Size No. 67.
3. Once aggregates are chosen, the same source and type of aggregates shall be used throughout the project.

C. Water.

1. Shall be clean, fresh and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances that may be deleterious to concrete or reinforcement.

D. Admixtures.

1. Use only as specified or reviewed and acceptable to Engineer.
2. Xypex Chemical Corporation - Xypex Admix C-Series.
3. Include any admixtures to be used in the proposed concrete mix designs.
4. Calcium chloride is not permitted as an admixture or as an ingredient of an admixture.
5. Air-entraining Admixture: ASTM C 260.
6. Water-Reducing and Retarding: ASTM C 494. Use high range water reducing admixture as required to meet minimum slump.

E. Tests for Chloride Ions.

1. For all prestressed concrete or concrete in which aluminum or galvanized metal is to be embedded, it shall be demonstrated by tests in accordance with AASHTO T-260 that the hardened concrete, including the aggregates, cementitious materials and any admixtures used, will not contain more than 0.06 percent water soluble chloride ions by weight of cement.

2.02 CONCRETE PRODUCTION:

A. Ready-mixed concrete.

1. Mixed and delivered, ASTM C 94.
2. Retempering. Indiscriminate addition of water to increase slump shall be prohibited.

Concrete shall be mixed only in quantities required for immediate use. Concrete that has partially set shall not be retempered, but shall be discarded.

When concrete arrives at the project with slump below that suitable for placing, first the concrete shall be remixed for at least one minute at mixing speed. If the slump is still too low, water may be added only if

neither the maximum permissible water-cementitious materials ratio nor the maximum slump is exceeded. The water must be incorporated by additional mixing equal to at least half of the total mixing required. The Engineer must review such addition.

- B. Batching and mixing equipment.
 - 1. Conform to "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete," ACI 304.
- C. Proportioning.
 - 1. Proportion ingredients to produce a well-graded mix of high density and maximum workability consistent with the accepted mix design.
 - 2. Entrained air, 4 to 6 percent for ASTM C 33 Size 67 coarse aggregate. Refer to ACI 301 for air entrainment required for other coarse aggregate sizes.
 - 3. Time of Set.
 - a. Six (6) hours plus or minus one hour.
 - 4. Strength and General Requirements.

Design and proportion concrete to meet the following minimum compressive strengths and other criteria:

<u>Location</u>	<u>Design Strength 28-Day (psi)</u>	<u>ASTM C 33 Aggregate Size No.</u>	<u>Slump Inches</u>	<u>Cementitious Material Content (lbs./CY)</u>	<u>Minimum Fly Ash Content (lbs./CY)</u>	<u>Maximum W-C Materials Ratio*</u>
All Concrete	4000	67	5 to 7	615-660	140 lb./CY	0.40

*The maximum water-cementitious materials ratio by weight, which shall be based on all water in the mix, including correction for moisture in aggregates, and shall be based on the total cementitious materials including cement and fly ash.

2.03 CONCRETE ACCESSORY MATERIALS:

- A. Curing Materials.
 - 1. Sheet material: ASTM C 171
 - 2. Liquid membrane: membrane-curing compound shall be in accordance with ASTM C 309 and shall be non-toxic and suitable for potable water tanks. Membrane curing compound shall be sprayable, 18% minimum solids content, Master Builders MB-429 or equivalent acceptable to Engineer.
- B. Joint Sealers.
 - 1. Joint Sealer: Joints indicated on Drawings, shall be sealed with a polyurethane joint sealer material of uniform, non-sag consistency. The sealant shall, when installed, tenaciously adhere to primed concrete surfaces and shall remain permanently elastomeric.

The material shall be of a type that will, when properly installed,

effectively and permanently seal joints subject to minor movements. Install with primer and cure in accordance with the manufacturer's instructions and recommendations.

Except as noted on the Drawings, joint sealer shall be Sikaflex 2C-NS or 2C-SL Elastic Sealant/Adhesive, as manufactured by Sika Chemical Corporation or other material acceptable to the Engineer. Add color as required to match adjacent surfaces where exposed to view.

- C. Non-Shrink Grout: Non-shrink grout shall be "Masterflow 713" or equivalent acceptable to the Engineer. Grouts with iron filings are not acceptable. The grout shall be compatible with the surface to be bonded.
- D. Epoxy Bonding Agent: Bonding agent shall be a two-component moisture insensitive epoxy adhesive, Sikadur 32, Hi-Mod or equivalent acceptable to the Engineer.
- E. Expansion Joint Filler Material: Joint filler material shall be closed cell neoprene or rubber conforming to ASTM D 1056, Grade 2A3. Material shall be glued securely to concrete surfaces.
- F. Sand-Cement Grout: Sand-cement grout, where specified, shall be a mixture of Portland cement, sand and water with a maximum water-cement ratio of 0.38 by weight. The cement used shall be of the same type and source as used in the other concrete on this project. The grout shall have a consistency similar to thick paint.
- G. Wedge-Type Expansion Anchors: Expansion bolts and anchors fastened to concrete shall be stainless-steel; "KWIK-BOLT TZ" manufactured by Hilti, Inc., Phillips Red Head wedge anchors, or equivalent acceptable to Engineer.
- H. Epoxy Sealant: Epoxy sealant shall be a two-component, moisture insensitive, low viscosity, solvent free, epoxy resin, Sikadur 35, Hi-Mod LV or equivalent acceptable to the Engineer.
- I. Concrete Support Blocks: Concrete support blocks for the floor reinforcement and the support of the vertical reinforcement at the base of the wall shall be a mixture of Portland cement, sand and water with a maximum water-cement ratio of 0.38 by weight. The cement used shall be of the same type and source as used in the other concrete on this project.

PART 3 -- EXECUTION

3.01 INSPECTION:

- A. General.
 - 1. Assure that excavations and formwork are completed.
 - 2. Assure that dirt, mud, encrusted concrete, debris and excess water have been removed.
 - 3. Check that reinforcement is properly positioned and secured in place.
 - 4. Verify that expansion joint material, anchors, and other embedded items are secured in proper position.

3.02 PREPARATION:

- A. General.
 - 1. Remove any hardened concrete and foreign material from inner surface of conveying equipment.
 - 2. Prepare slab subgrade in accordance with ACI 301.
 - 3. Designate limits of each placement and obtain Engineer's review of entire installation prior to proceeding.
- B. Concrete placed against gravel or crushed stone.
 - 1. Prevent loss of water from concrete with a minimum 2-inch layer of material having 25 percent fines passing a No. 4 sieve.
- C. Concrete placed against rock.
 - 1. Remove all loose pieces of rock.
 - 2. Clean exposed rock surface in accordance with Soils Engineer's recommendations.
- D. Concrete placed against hardened or existing concrete.
 - 1. Prior to placing fresh concrete against surface of hardened concrete, complete the following:
 - a. Remove all laitance, foreign substances (including curing compound), wash with clean water, and thoroughly wet hardened surface before placing fresh concrete.
 - b. Apply epoxy-bonding agent at blockouts, cutouts and in locations directed by Engineer.

3.03 PLACEMENT:

- A. Conveying.
 - 1. Convey concrete from mixer to final position as rapidly as practicable without segregation or loss of material.
 - 2. Use only metal or metal-lined chutes with maximum length of 20-feet, having a maximum slope of 1 vertical to 2 horizontal, and a minimum slope of 1 vertical to 3 horizontal.
 - 3. Provide a hopper at the end of long-belt conveyors and chutes not meeting the requirements in 2 above.
 - 4. Conveying by pumping methods shall conform to ACI 304, Chapter 9.
- B. Depositing in Walls.
 - 1. Deposit concrete in a continuous operation until section is completed.
 - 2. Concrete shall be deposited as nearly as practicable to its final position to avoid segregation due to rehandling or flowing.
 - 3. Place concrete in approximately horizontal layers 2-feet maximum thickness.
 - 4. Each layer of concrete shall be plastic when covered with following layer.

5. Rate of vertical rise not more than 2-feet per hour.
6. Provide placement capacity as necessary to comply with these requirements with construction and other joint locations shown on the Drawings.
7. Maximum height of concrete free fall, 4-feet.
8. Pump concrete or use a tremie having varying lengths for placing concrete in columns and walls to prevent free fall of more than 4-feet.
9. Concrete shall not be dropped through reinforcing steel nor subjected to any other procedure that will cause segregation.
10. Place and consolidate concrete in wall or column forms at least 24 hours prior to the time concrete or any reinforcing steel is placed in the system to be supported by such walls or columns except as noted below.
11. Do not exceed 6-feet of vertical height for any portion of a wall or column placed monolithically with floor or roof slab.
12. Allow concrete to thoroughly settle before top is finished. Remove all laitance, debris, and surplus water from surfaces at tops of forms by screeding, scraping, or other effective means.
13. Overfill forms wherever top of a wall will be exposed to weathering and after concrete has settled, screed off excess.
14. See PART 3.04.C. "Construction Joints" for preparation of construction joints prior to placing wall concrete.

C. Depositing in Floor and Roof Slabs.

1. Deposit concrete in a continuous operation until section is completed.
2. Concrete shall be deposited as nearly as practicable to its final position to avoid segregation due to rehandling or flowing.
3. Place concrete in strips approximately 10-feet wide approximately parallel to the wind direction at the time of placement. At least two placing crews shall be used, one working back and forth on each half of the slab, working the 10-feet wide strips continuously from one edge of the slab to the opposite edge.
4. Each strip of concrete shall be covered with 6 mil thick plastic 12-feet wide or Burlene, overlapped approximately 1.5-feet, prior to the development of plastic shrinkage cracks.

D. Consolidation.

1. During and immediately after placement, thoroughly compact and work around all reinforcements, embedments, and into corners of forms, eliminating all air or stone pockets that may cause honeycombing, pitting, or planes of weakness.
2. Use mechanical vibrators that will maintain at least 9,000 cycles per minute when immersed in concrete.
3. Minimum horsepower per vibrator shall be 1-1/2.
4. Number and type of vibrators shall be as acceptable to Engineer. A

spare vibrator will be available at all times in case of mechanical problems.

5. Over-vibrating and the use of vibrators to transport concrete laterally in forms will not be allowed.
6. Vertically insert vibrators at points approximately 2-feet apart and to a depth to penetrate 6 inches into the preceding layer.
7. Vibrate each location for a length of time to obtain adequate consolidation generally 5 to 15 seconds).

3.04 JOINTS:

A. Watertight joints.

1. Use at all locations where water is to be contained, groundwater is to be resisted and as shown on Drawings. Groundwater shall be considered to be at-grade at this site.

B. Expansion and contraction (control) joints.

1. At locations shown on Drawings.
2. Extend reinforcement continuously through joints, except "Expansion Joints," unless specifically shown on Drawings.
3. Form joint with felt, ASTM D 2475, where "bond breaker" is indicated.
4. Flexible joint filler material as indicated in PART 2.03, shall be used in Expansion Joints.
5. Expansion and contraction joints shall be caulked with a joint sealer as indicated in PART 2.03.

C. Construction Joints.

1. Provide where shown on Drawings.
2. Obtain Engineer's approval for proposed locations of construction joints not shown on Drawings or for proposed elimination of construction joints shown on Drawings.
3. Locate joints to least impair the strength and serviceability of the structure, generally as follows:
 - a. Columns and walls.
 - 1) At underside of beams, girders, haunches, drop panels, slabs, and at floor levels.
 - 2) All haunches and drop panels shall be considered as parts of supported floor or roof and shall be placed monolithically therewith.
 - b. Suspended slabs.
 - 1) At or near the one-quarter span in flat slab construction.
 - c. Construction joints in walls, beams, girders, and slabs shall be perpendicular to planes of their surfaces, with expansive rubber waterstops, and shall not be keyed except as shown on Drawings.

- d. Maximum length of wall segments without construction joints shall be 500-feet or as shown on the Drawings.
- 4. The surfaces of concrete to be cast against shall be thoroughly cleaned and all laitance removed. Concrete shall be vibrated adequately to prevent honeycombing at the joint.
- 5. Construction joints shall require bond. After cleaning, before new concrete is placed, vertical joints shall be wetted unless otherwise detailed on Drawings or directed by Engineer. Prior to placement of concrete in walls, the bottom construction joint must be slushed with 2 to 3-inches of sand-cement grout. The sand-cement grout shall have a consistency similar to thick paint and shall be proportioned as specified in PART 2.03. The fresh concrete shall be placed before the grout has attained its initial set.
- 6. Joints where indicated on Drawings or where directed by the Engineer to receive an epoxy bonding agent shall have been prepared and the bonding agent applied in accordance with the manufacturer's recommendations prior to placing fresh concrete.

3.05 EMBEDDED ITEMS:

- A. Refer to Concrete Formwork — SECTION 03100 - PART 3.01.B “Embedded Items”.

3.06 FINISHING EXPOSED SURFACES:

- A. Finishing unformed surfaces.
 - 1. Slabs for aprons, slabs-on-grade, and tops of walls.
 - a. Provide surface conforming to proper elevation and contour. Except as noted otherwise on the Drawings, all walks and slabs shall slope 2 percent away from buildings. All other walks, exterior concrete steps, etc. shall be pitched to drain out with a slope of 1-1/2 inch per foot. All aggregates shall be completely embedded in mortar by screeding.
 - 1) Screeded surfaces shall be free of surface irregularities.
 - 2) Maximum variation from a plane surface in any 10-foot section shall be 1/4-inch.
 - 2. Coordination of Finishing and Placement.
 - a. Mixing and placing shall be carefully coordinated with finishing. Concrete shall not be placed on the subgrade or forms more rapidly than it can be spread, straight edged, and bull floated. These operations must be performed before bleeding water has an opportunity to collect on the surface.
 - b. To obtain good surfaces and avoid cold joints, the size of placing and finishing crews shall be planned with due regard for the effects of concrete temperature and atmospheric conditions on the rate of hardening of the concrete.

- c. All flatwork finishers on the project shall be ACI Certified flatwork finishers or equivalent acceptable to the Engineer.
- 3. Jointing and Edging.
 - a. Joints in slabs shall be located and detailed as indicated on the Drawings and in the Specifications.
 - b. Where saw-cut joints are required or permitted, cutting shall be timed properly with the set of the concrete. Cutting shall be started as soon as the concrete has hardened sufficiently to prevent aggregates from being dislodged by the saw. Cutting shall be completed before shrinkage stresses become sufficient to produce cracking. In all cases, the saw cutting shall be completed no later than within the first 12 hours after the slab finishing operations have been completed.
 - c. Edge exposed edges of floated or troweled surfaces with a tool having a 1/4-inch corner radius, unless these edges are specified to be beveled.
- 4. Consolidation.

Concrete in slabs shall be thoroughly consolidated. Internal vibration shall be used in beams and girders of framed slabs and along the bulkheads of slabs on grade. Consolidation of slabs shall be obtained with vibrating screeds, roller pipe screeds, internal vibrators, or other acceptable means. The concrete surfaces shall not be manipulated prior to finishing operations.
- 5. Finishes.
 - a. Unless selection of finishes is made in the Specifications or on the Drawings, the following finishes shall be used, as applicable.
 - 1) Floated Finish - Use for tops of walls, footings, pile caps, etc.
 - 2) Troweled Finish - Use for floors in finished areas and where called for on Drawings.
 - 3) Broom Finish - Use for floor slabs, concrete stairs, landings, sidewalks, concrete path, curb and gutters.
 - 4) Raked Finish - Use for slabs to receive topping or secondary concrete
 - b. The following finishes shall be utilized on this project unless specified or detailed otherwise.
 - 1) Floated Finish: After the concrete has been placed, consolidated, struck-off, and leveled by bull floating, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared and/or when the mix has stiffened sufficiently to permit the proper operation of a power-driven float. The surface shall then be consolidated with power-driven floats of the impact type, except in thin sections, such as pan

slabs, which shall be floated by hand. Hand floating with wood or cork-faced floats shall be used in locations inaccessible to the power-driven machine. Trueness of surface shall be rechecked at this stage with a 10-foot straightedge applied at not less than two different angles. All high spots shall be cut down and all low spots filled during this procedure to produce planes checking true under the straightedge in any direction, with tolerances not exceeding 1/4-inch in 10-feet. The slab shall then be refloated immediately to a uniform, smooth, granular texture.

- 2) Troweled Finish: Where a troweled finish is specified, the surface shall be finished first with impact power floats, as specified above where applicable, then with power trowels and finally with hand trowels. The first troweling after power floating shall be done by a power trowel and shall produce a smooth surface that is relatively free of defects, but which may still contain some trowel marks. Additional troweling shall be done by hand after the surface has hardened sufficiently. The final troweling shall be done when a ringing sound is produced as the trowel is moved over the surface. The surface shall be thoroughly consolidated by the hand troweling operations. The finished surface shall be free of any trowel marks and shall be uniform in texture and appearance, with tolerances not exceeding 1/4-inch in 10-feet. On surfaces that support floor coverings, any defects of sufficient magnitude to show through the floor covering shall be removed by grinding.
- 3) Broom Finish: Slabs shall be given a coarse transverse-scored texture by drawing a broom across the surface. This operation shall follow immediately after bull floating operations and hand floating as required to close the surface. Provide a uniform abrasive texture of constant color. On paths, broom at right angles to normal traffic direction.

3.07 REPLACEMENT, REPAIRING AND PATCHING OF DEFECTIVE CONCRETE:

- A. Removal and replacement of defective concrete
 1. After forms have been removed, any concrete that is not formed as shown on the Drawings, is out of alignment or level beyond the required tolerance, shows a defective surface that cannot be properly repaired or patched, or cannot be shown to prevent water migration through concrete surfaces or joints, shall be removed and replaced at the Contractor's expense.
 2. Liquid retaining concrete walls, slabs, beams, etc., cannot have any honeycombing, cold joints, cracks greater than 0.004-inch wide, or leakage of water through the concrete thickness or joints. If in the opinion of the Engineer the honeycombing, cold joints, cracks or leakage are excessive, the Contractor shall be required to remove the complete

concrete segment and replace it. Where minor honeycombing, cold joints, cracks or leakage occurs, it shall be repaired as indicated in PART 3.07.B and C below.

- B. Repair of tie holes, blockouts, cutouts and defective concrete.
1. Immediately after form removal, repair, to the satisfaction of the Engineer, all repairable surface defects, including tie holes, in concrete surfaces. In all cases, repair work shall be completed within 24 hours of removal of the forms.
 2. Replace, to satisfaction of Engineer, within 48 hours after adjacent forms have been removed, all other honeycombed and defective concrete areas that cannot be immediately repaired as noted in item 1 above.
 3. Cut out and remove to sound concrete, with edges square-cut to avoid feathering, all honeycombed or otherwise defective concrete.
 4. Repair work shall conform to ACI 301 and these specifications. At all blockouts, tie-holes and cutouts, after being thoroughly cleaned, apply an epoxy-bonding agent and fill with non-shrink grout, as specified in the materials section of this specification. Color shall be added to match surrounding concrete.
 5. Perform in a manner that will not interfere with thorough curing of surrounding concrete.
 6. Adequately cure all repair work.
- C. Repair of cracks and minor honeycombed areas.
- All cracks, minor honeycombed concrete or other areas of apparent leakage, including wet spots on the wall, shall be sealed with Epoxy Sealant injection or other acceptable means so that the concrete is watertight as defined in Specification SECTION 02676 "Watertightness Testing."

3.08 FINISHING FORMED SURFACES:

- A. Finishing.
1. Rough form finish - All surfaces not exposed to view such as surfaces in contact with earth.
 - a. Chip off all fins and other surface projections greater than 1/4-inch high.
 - b. Fill all tie holes and repair and patch all defects.
 2. Smooth form finish - All exposed surfaces not generally exposed to view including interior surfaces of tank.
 - a. Use form facing to produce a smooth, hard uniform surface.
 - b. Keep number of seams to a minimum.
 - c. Remove all fins and projections.
 - d. Clean, coat, and fill all tie holes.
 - e. Repair and patch all defects.

3.09 CURING:**A. General.**

1. Freshly deposited concrete shall be protected from premature drying and excessively hot or cold temperatures and shall be maintained without drying at a relatively constant temperature for the period of time necessary for the hydration of the cementitious materials and proper hardening of the concrete. A list of all intended curing methods including a description of materials shall be submitted to the Engineer for review.
2. Initially, the concrete temperature shall be maintained at or above 70 F for 3 days or at or above 50 degrees F for 5 days. Continue curing as required to achieve the specified 28-day strength. See PART 1.05 "Job Conditions" for additional information.
3. Keep concrete continuously moist for at least 7 days after placement by:
 - a. Ponding or continuous sprinkling.
 - 1) Begin as quickly as possible after initial set.
 - 2) Provide complete coverage with minimum of runoff by regulating rate of water application.
 - 3) Interrupt application of water to walls for finishing or repair work only over areas being finished.
 - 4) Do not permit wall areas to become dry that are not being finished.
 - 5) Resume curing immediately after each day's finishing operations.
 - b. Polyethylene film, see Item C. below.
 - c. Wet burlap, wet absorptive mats, or wet sand.
 - d. Leave forms in place for concrete walls and keep wet.
4. Use membrane-curing compound as noted below.

B. Membrane curing compound (conforming to ASTM C 309).

1. Shall be used prior to placement of plastic sheeting on concrete floor and roof slabs, walls and other miscellaneous concrete areas where approved by Engineer.
2. Spray-apply in 2 coats perpendicular to each other at coverage recommended by manufacturer.
3. Cover unformed surfaces with curing compound within 30 minutes after final finishing.
4. Apply curing compound immediately to formed surfaces if forms are removed before end of specified curing period. Curing compound sprayed in tie holes is to be cleaned out before patching tie holes. Forms may be left in place for all or part of the curing period; wood forms shall be kept wet.
5. Protect compound against abrasion during curing period.

- C. Film Curing (conforming to ASTM C 171).
1. Film curing shall not be used in lieu of water curing on tank floor and roof slabs. Use only where specifically reviewed and acceptable to Engineer.
 2. Concrete placed early in the concrete placing operation shall not be allowed to dry out. Apply Membrane Curing Compound as noted above prior to placing the polyethylene film or other coverings.
 3. Begin as quickly as possible after initial set of concrete.
 4. Cover surfaces completely with polyethylene sheeting.
 5. Overlap edges for proper sealing and anchorage.
 6. Cover joints between sheets with dunnage as required to prevent displacement due to wind or other factors.
 7. Promptly repair all tears, holes, and other damage.
 8. Anchor continuously all edges and anchor surface as necessary to prevent billowing.

3.10 **QUALITY CONTROL:**

- A. Concrete tests.
1. Shall be paid for by the Contractor on the Owner's behalf, except where noted otherwise in these specifications, and shall be in accordance with the requirements of ACI 301, except as noted or modified in this SECTION. Test specimens shall be taken by an ACI Certified Concrete Field Testing Technician - Grade 1 in accordance with the "Standard Method of Making and Curing Concrete Test Specimens in the Field," ASTM C 31.
 - a. Strength test.
 - 1) Mold and laboratory cure seven cylinders from each sample.
 - 2) Test two cylinders at 7 and 14 days per ASTM C 39. Test two cylinders at 28 days for acceptance. Keep the remaining one as a spare to be tested as directed by Engineer.
 - 3) The seventh, spare cylinder for each sample may be eliminated after the first several concrete placements of each type of concrete if, in the opinion of the Engineer, test results are consistent and within specifications.
 - b. Minimum samples.

Collect the following minimum samples for each 28-day strength concrete used in the work for each day's placing:

<u>Concrete Quantity</u>	<u>Number of Samples</u>
50 CY or less	one
50 to 100 CY	two
100 CY or more	two plus one sample for each additional 100 CY

- c. Slump test.
 - 1) Conduct test for each strength test sample and whenever consistency of concrete appears to vary.
 - 2) Slump tests shall be made using "Method of Test for Slump of Portland Cement Concrete" (ASTM C 143).
 - d. Air content.
 - 1) Conduct test from one of first three batches mixed each day and for each strength test sample.
 - 2) Samples indicating low air contents by the pressure method air content tests in accordance with ASTM C 231 shall be verified by the gravimetric method, ASTM C 138, and the volumetric method, ASTM C 173, before adding additional air entraining admixture in the field.
2. The Contractor shall provide the following to the Owner and the Testing Agency at no additional cost to the Owner:
- a. Incidental labor required to facilitate testing.
 - b. Minimum one day's advance notice when concrete is to be placed.
 - c. Storage facilities for concrete test cylinders; including, when necessary, a specially prepared box with high-low thermometer and thermostatically controlled heating devices for storage of the cylinders for the first 24 hours after molding.
 - d. Materials, samples, and access to materials as required for testing.
 - e. Labor and material to install pullouts and to patch all pullout holes after testing as specified for repairing defective concrete.
 - f. Reimbursement of costs for testing and inspection resulting as a consequence of the following:
 - 1) Work not in compliance with the Contract Documents.
 - 2) Testing requested by the Contractor or Subcontractor such as field-cured cylinder tests for stripping strengths, etc.
 - 3) Testing to verify the adequacy of work done, without prior notice, without proper supervision, or contrary to standard construction practice.
 - g. The use of testing services shall in no way relieve the Contractor of his responsibility to furnish materials and construction in full compliance with the Drawings and Specifications.
- B. Acceptance of Concrete.
- 1. If the 7-day strength tests fall below the 7-day strength deemed necessary to achieve the specified 28-day strength, the Engineer shall have the right to require conditions of temperature and moisture necessary to secure the required strength. The Engineer may also require pull out tests in accordance with ASTM C 900 or core tests in

accordance with ASTM C 42.

2. Strength level of concrete will be considered satisfactory so long as average of all sets of two consecutive strength test results equals or exceeds specified 28-day strength and no individual strength test result falls below specified strength by more than 500 psi.

C. Failure of Test Cylinder Results.

1. Upon failure of the 28-day test cylinder results, Engineer may require Contractor at his expense, to obtain and test at least three pullout tests or 2-inch diameter cored samples from area in question.
2. Concrete will be considered adequate if average of three pullout or core tests is at least 85 percent of, and if no single core is less than 75 percent of the specified 28-day strength.
3. Upon failure of the pullout or core test results, Engineer may require Contractor, at his expense, to perform load tests as specified in ACI 318, Chapter 20.
4. In the event an area is found to be structurally unsound, the Engineer may order removal and replacement of concrete as required. The cost of the pullout or core tests, and the load test and the structural evaluation shall be borne by the Contractor.
5. Fill all pullout or core holes as specified for repairing defective concrete.

3.11 SPECIAL TESTING REQUIREMENTS:

- A. Further concrete testing, in addition to Quality Control Testing and testing for proposed mix designs, may become necessary during the project. Testing shall be provided under the conditions stated in each specification section and shall be in accordance with the requirements of ACI 301 and this specification. Refer to PART 3.10B and 3.10C for acceptance criteria and procedures upon failure of tests.
- B. In all cases, the Contractor shall provide the Owner and the testing agency, at no additional cost to the Owner, with the items listed in PART 3.10.A.2.
- C. Sampling and Test Groups.
 1. When job cured cylinders are used, samples shall be obtained as specified in SECTION 03300, PART 3.10A.1.a, 3.10A.1.b and 3.10A.1.c, unless directed otherwise by the Engineer.
 2. When core tests are used, samples shall be obtained in accordance with ASTM C 42 and as directed by the Engineer.

- END OF SECTION -

SECTION 04200 – MASONRY**PART 1 -- GENERAL****1.01 DESCRIPTION:**

The work of this section includes construction of masonry, both reinforced and non-reinforced, and glass block masonry.

The work to be performed in accordance with the requirements of this specification consists of furnishing all materials, equipment, supplies, and accessories required and of performing all operations needed in connection with all masonry work shown on the Drawings, and herein specified.

Masonry work shall include patching around all pipes that pass through special blocks, strips, bolts, anchors, etc., for other work furnished under other Specifications that shall be installed during masonry work, as required. Prepare holes, recesses and bedding as required for all chases and duct spaces, as required for installing of plumbing, electrical work, ventilation, etc.

1.02 SUBMITTALS:

Submit information in accordance with SECTION 01330 of sufficient detail and quantity to confirm conformance with all requirements specified herein.

PART 2 -- PRODUCTS**2.01 CONCRETE BLOCK:**

The concrete blocks for all walls shall be steam cured, hollow, load-bearing, colored concrete masonry units conforming to the requirements of ASTM Specification, Designation C90, Grade N-1, and shall have a minimum face shell thickness of 1-1/4 inches. The block face shall have a smooth scored or split face to the exterior, as shown on the Drawings, with a smooth face to the interior of the structure.

The nominal dimensions of all blocks shall be 8-inches high, 16-inches long, and at widths indicated on the Drawings. Block color to be approved by Engineer, based on samples furnished. Color shall approximately match the Two River Lift Station (LS14000) at the east end of Two Rivers Park.

All units shall be sound and free of cracks or other defects that would interfere with the placing, that would impair their strength, and that would detract from the appearance of the completed walls.

All units shall comply with materials scheduled on Drawings. Block to be used in this structure is as follows: Standard Lightweight Block with aggregates meeting ASTM C331 requirements.

All masonry units will meet WPI ratings as measured by the Standard Masonry Permeability Test.

2.02 WALL REINFORCEMENT:

- A. The horizontal wall reinforcement at brick and block shall be standard galvanized "Dur-O-WAL", or equivalent acceptable to the Engineer, with deformed side rods. The reinforcement shall be butt-welding construction with ladder type design. The rods shall comply with the material requirements of ASTM A82. The

minimum weight of tensile steel in the reinforcement shall be 0.18 pounds per lineal foot. When cast in regular mortar joints, the formation of the side rods shall be of such extent as to develop a minimum surface bond stress of 700 psi. Provide drip on cross ties at cavity walls.

- B. All masonry walls shall be vertically reinforced with #5 at 32 inches O.C., or as shown on the drawings. Vertical reinforcement shall extend to within 1½-inches of tops of bond beams, where applicable. Provide additional reinforcement at each side of doorways, windows, and other openings greater than 1'-0" wide, full height of wall. Where openings are four-feet or wider, provide two vertically reinforced and grouted cells each side.

2.03 BOND BEAMS:

The bond beams at the top of the masonry wall and below roof bents shall be constructed in accordance with the details shown on the Drawings. The concrete for the bond beams shall be made with ¾-inch aggregate and not less than 5-1/2 sacks of Portland cement per cubic yard.

2.04 LINTELS:

- A. Masonry lintels shall be construction of bond beam blocks filled with reinforced concrete. Blocks shall meet the requirements of this Specification. Reinforcement shall be equivalent to the requirements of ASTM A615, Grade 60.
- B. Provide masonry lintels over all openings wider than 1'-0" in walls unless steel lintels are shown. Lintels shall be 8 inches deep at openings up to 4'-0" wide and 16 inches deep at wider openings. Reinforce with two #5 bottom, full length, and provide one #5 fully grouted below windows and other openings, where possible, extending 24 inches past opening at each side. Bear 24 inches minimum on each side of opening.

2.05 MORTAR:

Mortar for all masonry work shall conform to the requirements of ASTM C 270. Mortar shall be Type "S" (Modified) Cement and Hydrated Lime with a 28-day compressive strength of 2000 psi. To all mortar work shall be added "Omicron" waterproofing in the approved integral treatment, proportioned in accordance with the directions of the manufacturer, the Master Builders Company. The use of masonry cement will not be permitted, unless acceptable to the Engineer. Portland cement shall be the same as specified for concrete, and hydrated lime shall conform to ASTM C207, Type S.

The sand for the Mortar shall conform to ASTM C144, and shall pass a No. 16 sieve. Proportions shall be one-part Portland cement, ½ part hydrated lime, and 4½ parts mason's sand damp loose condition. All mortar shall be thoroughly mixed in rotary machine and shall be mixed only in such quantities as are needed for immediate use. No retempering will be permitted, and masonry mortar which has been mixed for a period greater than 150 minutes shall in no case be used on any portion of the work, and must be discarded.

Mortar to be uniformly colored to match the block color.

2.06 CAULKING:

General Electric Silicone "Sil Pruf" guaranteed against staining or approved equal.

2.07 GROUT:

Grout shall be proportioned by volume and shall have sufficient water added to produce consistency as fluid as possible for placing without segregation. Coarse aggregate shall be pea gravel (3/8-inch diameter or less) conforming to ASTM C 33, Size No. 8.

Grout for vertically reinforced cells shall be composed of one-part Portland cement, two to three parts damp loose sand, and not more than two parts coarse aggregate. In addition, grout for pumping shall have not less than seven sacks of cement in each cubic yard of grout.

Grout shall attain a minimum compressive strength of 3000 pounds per square inch at 28 days.

2.08 INSULATION:

Cells in the masonry walls that are not filled with concrete reinforcement shall be filled completely with foam injection insulation. Provide 0.8 PCF density foam with R-value 4.9 per inch. Design Basis Product: Core-Fill 500.

2.09 GLASS BLOCK UNITS:

- A. Glass block units, nominally 8-inches by 8-inches by 4-inches thick. The blocks shall be partially evacuated hollow units made of clear, colorless glass with a polyvinyl butyral edge coating. The pattern shall be similar or equal to Pittsburgh Corning Corporation Premier Series Thickset 60 Decora.
- B. Panel Reinforcing: Two parallel 9-gauge wires either 1-5/8 inch or 2-inch on center with electrically butt-welded cross-wires spaced at regular intervals, galvanized after welding.
- C. Panel Anchors: 20-gauge perforated steel strips 24 inches long by 1-3/4 inches wide, hot-dipped galvanized after perforation.
- D. Expansion Strips: They shall be made of polyethylene foam with a thickness of 3/8 inch.
- E. Asphalt Emulsion: A water-based asphalt emulsion shall be Karnak 100 or equal.
- F. Sealant: Shall be non-staining, waterproof mastic, type.
- G. Packing: Shall be polyethylene foam, neoprene, fibrous glass.

PART 3 -- EXECUTION**3.01 GENERAL:**

All work shall be done by skilled workmen. Care shall be taken to work units to the best advantage in horizontal runs. All masonry shall be braced and supported as necessary to ensure a completely safe condition until set and tied into the structure. The necessary bolts, inserts, sleeves, conduits, door frames, louvers, and other work required shall be accurately set and securely held in place in accordance with standard practices during laying of masonry.

All portions of the completed wall shall be thoroughly wet down and kept continuously wet for four hours after installation to slow curing and to reduce shrinkage.

Glass block masonry: The glass block shall be installed in accordance with the

manufacturer's requirements and recommendations. All panels shall be well sealed to prevent water entry.

3.02 WALL CONSTRUCTION:

All masonry shall be laid with level courses, uniform joints, square corners, plumb vertical lines, true surfaces, and uniform running bond. Masonry shall be laid in a full bed of mortar and shall be shoved into place with horizontal and vertical joints completely filled. All corners shall be bonded. All interior partitions shall be joined to the exterior walls by bonding with Dur-O-WAL type reinforcement. All masonry shall be close fitted and neatly trimmed, if necessary, against frames and walls, and rigidly anchored thereto. Cavities shall be kept clear of mortar extrusions and droppings so that there will be no interference with placing grout or insulation.

Joints on exterior faces of scored masonry shall be raked, for consistency and visual uniformity with the scores. Joints on exterior faces of split-face masonry shall be flush and shall follow the profile of the block face. Joints on interior faces of masonry to be flush. The mortar shall be worked to a hard, dense surface and shall be free of shrinkage cracks or other cracks between mortar and block. Tooling shall be delayed until mortar has initially set sufficiently to prevent shrinkage in the mortar due to excess water.

Finished work shall be protected by boards and plastic, and new work shall be covered at night. Cover masonry with plastic at all times, except when working, to prevent precipitation from falling on block. Provide temporary bracing of masonry walls.

No masonry shall be laid down when temperature of outside air is below 40 degrees F. An air temperature above 50 F shall be maintained on both sides of the masonry for a period of at least 8 hours. Contractors shall follow the recommended practice for cold weather masonry construction by the International Industry All-Weather Council.

The Contractor shall build in all lintels, plates, anchors, conduits, sleeves, pipes, etc., and shall provide all chases required by other crafts.

At the completion of the work all holes or defective mortar joints shall be jointed, and where necessary, defective joints shall be cut out and repointed. Exposed masonry shall be protected against staining from wall coverings or other sources and excess mortar shall be wiped off the surfaces as the work progresses. At the completion of the work, all exposed masonry shall be thoroughly cleaned.

3.03 CAULKING:

The caulking shall be applied with a gun, or by hand when necessary, to ensure a complete and deep installation. Caulking joints shall be not less than 1/4-inch, or more than 3/8-inch wide, and shall be a minimum uniform depth of 3/8-inch with approved non-staining backing. The joints shall be neatly trimmed and struck smooth and the surfaces shall be left true. All caulking shall be reviewed at the completion of construction and any sag or other defects shall be corrected.

The caulking shall be applied around all windows and louvers and around the exterior of door frames, at the intersection of materials or units, at the intersection of dissimilar materials, and elsewhere as shown or necessary to complete sealing of joints.

3.04 WALL TIES:

Install at 16 inches O.C. each way at concrete block veneer against concrete. Secure straps to concrete with expansion type anchors.

3.05 HORIZONTAL WALL REINFORCEMENT:

The reinforcement shall be placed in the first through bed course above the foundation line and in bed joints at 16-inch centers vertically. Also, where no lintels are specified, the reinforcement shall be placed in the first and second bed joint above and below openings, the reinforcements shall be continuous, and in the second bed joint above and below openings, it shall extend two feet beyond each side of the opening. Provide reinforcement at each course at mitered corners, extend minimum 24-inches horizontally. Coordinate with installation of insulation at cavity walls.

The reinforcement shall be wide enough to bridge the air spaces and shall be two inches less in width than the nominal thickness of the block. The splices shall ensure continuity, and the corners shall be cut and bent as required. The reinforcement shall not pass through the vertical masonry control joints or knock-out panels.

3.06 GROUTING:

Reinforcing steel shall be secured in place and reviewed before grouting starts. Vertical cells to be filled shall have vertical alignment to maintain a continuous unobstructed cell area not less than 3" x 4". Cells containing reinforcement shall be solidly filled with grout and lifts shall be stopped 1½ inches below the top of course to form a key at lift joints.

The tops of unfilled cell columns under a horizontal masonry beam shall be covered with metal lath or plugged with paper in individual cells, or special units shall be used, to confine the grout or concrete fill to the beam section.

All bolts, anchors, etc., inserted in the wall shall be solidly grouted in place. Spaces around metal door frames and other built-in items shall be filled solidly with grout or mortar.

Clean-out holes shall be provided at the bottom of all cells containing vertical reinforcement if the cell into which the grout is to be placed is over four feet deep (high-lift grouting). Mortar projections and droppings shall be washed out of the grout space and off the reinforcing steel with a jet stream of water as required to clean the space. All grout shall be consolidated at time of placing by puddling or vibrating and then reconsolidated by later puddling before the plasticity is lost.

At the Contractor's option, low-lift grouting may be used. In this method, walls shall be constructed in height increment of four feet or less, with grout placed after each height increment is complete; clean-out holes are not required, but cells to be grouted shall be kept clean as the construction of the wall progresses. Grout shall be puddled or vibrated in place. Grout shall be placed to no more than four-foot depths; after waiting at least one hour, another depth of four feet or less may be placed. The full height in each cell shall be placed in one day.

3.07 CLEANING:

Concrete and grout stains on the wall shall be removed immediately. Exposed masonry shall be protected against staining from wall coverings or other sources, and excess mortar shall be wiped off the surfaces as the work progresses. At the completion of the work, all exposed masonry shall be thoroughly cleaned. At the conclusion of the masonry work, the masonry contractor shall clean all exposed masonry with a 5 to 10% solution of muriatic acid in water; remove scaffolding and equipment used in the work; and remove all debris, refuse, and surplus masonry materials from the premises.

Glass block masonry: All mortar shall be removed immediately using a clean, wet sponge or a natural, non-abrasive stiff bristle brush. Never use harsh cleaners, abrasives, or wire

brushes that could scratch glass surfaces.

- END OF SECTION -

SECTION 04810 – KEYSTONE CONCRETE RETAINING WALLS

PART 1 -- GENERAL

1.01 DESCRIPTION

- A. Work shall consist of designing, furnishing and construction of a KEYSTONE Compac III Unit Retaining Wall System in accordance with these specifications and in reasonably close conformity with the lines, grades, design, and dimensions shown on the plans. No alternate wall systems will be considered.
- B. Work includes preparing foundation soil, furnishing and installing leveling pad, unit drainage fill, drainage pipe and backfill to the lines and grades shown on the construction drawings.
- C. Work includes furnishing and installing geogrid soil reinforcement of the type, size, location, and lengths designated on the construction drawings.

1.02 RELATED SECTIONS

- A. Section 31 00 00 - Earthwork

1.03 REFERENCE DOCUMENTS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM C140 Sampling and Testing Concrete Masonry Units
 - 2. ASTM C1372 Specification for Dry-Cast Segmental Retaining Wall Units
 - 3. ASTM D422 Particle-Size Analysis of Soils
 - 4. ASTM D698 Laboratory Compaction Characteristics of Soil -Standard Effort
 - 5. ASTM D1557 Laboratory Compaction Characteristics of Soil -Modified Effort
 - 6. ASTM D3034 Polyvinyl Chloride Pipe (PVC)
 - 7. ASTM D4318 Liquid Limit, Plastic Limit and Plasticity Index of Soils
 - 8. ASTM D4475 Horizontal Shear Strength of Pultruded Reinforced Plastic Rods
 - 9. ASTM D4476 Flexural Properties of Fiber Reinforced Pultruded Plastic Rods
 - 10. ASTM D4595 Tensile Properties of Geotextiles - Wide Width Strip
 - 11. ASTM D5262 Unconfined Tension Creep Behavior of Geosynthetics
 - 12. ASTM D5818 Evaluate Installation Damage of Geosynthetics
 - 13. ASTM D6637 Tensile Properties of Geogrids – Single or Multi-Rib
 - 14. ASTM D6638 Connection Strength - Reinforcement/Segmental Units
 - 15. ASTM D6706 Geosynthetic Pullout Resistance in Soil
 - 16. ASTM D6916 Shear Strength Between Segmental Concrete Units
- B. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO M 252 Corrugated Polyethylene Drainage Pipe
2. AASHTO M 288 Geotextile Specification for Highway Applications
- C. National Concrete Masonry Association (NCMA)
 1. NCMA SRWU-1 Test Method for Determining Connection Strength of SRW
 2. NCMA SRWU-2 Test Method for Determining Shear Strength of SRW

1.04 SUBMITTALS/CERTIFICATION

- A. Contractor shall submit a Manufacturer's certification, prior to start of work, that the retaining wall system components meet the requirements of this specification and the structure design.

1.05 QUALITY ASSURANCE

- A. Contractor shall submit a list of three (3) previously constructed projects of similar size and magnitude by the wall installer where the Compac retaining wall system has been constructed successfully. Contact names and telephone numbers shall be listed for each project.
- B. Owner shall/may provide soil testing and quality assurance inspection during earthwork and wall construction operations. Contractor shall provide all quality control testing or inspection not provided by the Owner. Owner's quality assurance program does not relieve the contractor of responsibility for quality control and wall performance.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Contractor shall check all materials upon delivery to assure that the proper type, grade, color, and certification have been received.
- B. Contractor shall protect all materials from damage due to jobsite conditions and in accordance with manufacturer's recommendations. Damaged materials shall not be incorporated into the work.

PART 2 -- PRODUCTS

2.01 DEFINITIONS

- A. Compac III Unit - a concrete retaining wall element machine made from Portland cement, water, and aggregates, manufactured by a licensed manufacturer of Keystone.
- B. Structural Geogrid - a structural element formed by a regular network of integrally connected tensile elements with apertures of sufficient size to allow interlocking with surrounding soil, rock, or earth and function primarily as reinforcement.
- C. Unit Drainage Fill - drainage aggregate that is placed within and immediately behind the Keystone concrete units.
- D. Reinforced Backfill - compacted soil that is placed within the reinforced soil volume as outlined on the plans.

2.02 KEYSTONE CONCRETE RETAINING WALL UNITS

- A. Keystone concrete units shall conform to the following architectural requirements:

1. Face color - Manufacturers' available options as approved by the Owner.
 2. Face finish - Manufacturers' available options as approved by the Owner.
 3. Bond configuration - running with bonds nominally located at midpoint vertically adjacent units, in both straight and curved alignments.
 4. Exposed surfaces of units shall be free of chips, cracks or other imperfections when viewed from a distance of 10 feet (3 m) under diffused lighting.
- B. Keystone concrete materials shall conform to the requirements of ASTM C1372 - Standard Specifications for Segmental Retaining Wall Units.
- C. Keystone concrete units shall conform to the following structural and geometric requirements measured in accordance with ASTM C140 Sampling and Testing Concrete Masonry Units:
1. Compressive strength: ≥ 3000 psi (21 MPa);
 2. Absorption: ≤ 8 % for standard weight aggregates;
 3. Dimensional tolerances: $\pm 1/8$ " (3 mm) from nominal unit dimensions not including rough split face;
 4. Unit size: 8" (203 mm) (H) x 18" (457 mm) (W) x 12" (304 mm) (D) minimum;
 5. Unit weight: 67-lbs/unit (30 kg/unit) minimum for standard weight aggregates.
- D. Keystone concrete units shall conform to the following performance testing:
1. Inter-unit shear strength in accordance with ASTM D6916 (NCMA SRWU-2): 600-plf (8 kN/m) minimum at 2-psi (13 kPa) normal pressure;
 2. Geogrid/unit peak connection strength in accordance with ASTM D6638 (NCMA SRWU-1): 500-plf (7 kN/m) minimum at 2-psi (13 kPa) normal force.
- E. Keystone concrete units shall conform to the following constructability requirements:
1. Vertical setback: $1/8$ " (3 mm) $\pm$ per course (near vertical) or 1" (25 mm) + per course per the design;
 2. Alignment and grid positioning mechanism - fiberglass pins, two per unit;
 3. Maximum horizontal gap between erected units shall be $\leq 1/2$ inch (13 mm).

2.03 SHEAR AND REINFORCEMENT PIN CONNECTORS

- A. Shear and reinforcement pin connectors shall be 1/2-inch (12 mm) diameter thermoset isophthalic polyester resin-pultruded fiberglass reinforcement rods to provide connection between vertically and horizontally adjacent units and geosynthetic reinforcement, with the following requirements:
1. Flexural Strength in accordance with ASTM D4476: 128,000 psi (882 MPa) minimum;

- 2. Short Beam Shear in accordance with ASTM D4475: 6,400 psi (44 MPa) minimum.
- B. Shear and reinforcement pin connectors shall be capable of holding the geogrid in the proper design position during grid pre-tensioning and backfilling.

2.04 BASE LEVELING PAD MATERIAL

- A. Material shall consist of a compacted crushed stone base or non-reinforced concrete.

2.05 UNIT DRAINAGE FILL

- A. Unit drainage fill shall consist of clean 1" (25 mm) minus crushed stone or crushed gravel meeting the following gradation tested in accordance with ASTM D-422:

<u>Sieve Size</u>	<u>Percent Passing</u>
1 inch (25 mm)	100
3/4-inch (19 mm)	75-100
No. 4 (4.75mm)	0 - 10
No. 50 (300um)	0 - 5

- B. Drainage fill shall be placed within the cores of, between, and behind the units as indicated on the design drawings. Not less than 1.3 cubic foot (0.036 m³), of drainage fill shall be used for each square foot (0.093 m²) of wall face unless otherwise specified.

2.06 REINFORCED BACKFILL

- A. Reinforced backfill shall be free of debris and meet the following gradation tested in accordance with ASTM D-422:

<u>Sieve Size</u>	<u>Percent Passing</u>
2 inch (50 mm)	100
3/4-inch (19 mm)	100-75
No. 40 (425um)	0-60
No. 200 (75um)	0-35

Plasticity Index (PI) <15 and Liquid Limit <40 per ASTM D-4318.

- B. The maximum aggregate size shall be limited to 3/4 inch (19 mm) unless installation damage tests have been performed to evaluate potential strength reductions to the geogrid design due to damage during construction.
- C. Material can be site-excavated soils where the above requirements can be met. Unsuitable soils for backfill (high plastic clays or organic soils) shall not be used in the backfill or in the reinforced soil mass.
- D. Contractor shall submit reinforced fill sample and laboratory test results to the Architect/Engineer for approval prior to the use of any proposed reinforced fill material.

2.07 GEOGRID SOIL REINFORCEMENT

- A. Geosynthetic reinforcement shall consist of geogrids manufactured specifically for soil reinforcement applications and shall be manufactured from high tenacity polyester yarn or high-density polyethylene. Polyester geogrid shall be made

from high tenacity polyester filament yarn with a molecular weight exceeding 25,000 g/m and a carboxyl end group value less than 30. Polyester geogrid shall be coated with an impregnated PVC coating that resists peeling, cracking, and stripping.

- B. T_a , Long Term Allowable Tensile Design Load, of the geogrid material shall be determined as follows: $T_a = T_{ult} / (R_{Fcr} \cdot R_{Fd} \cdot R_{Fid} \cdot F_S)$. T_a shall be evaluated based on a 75-year design life.
1. T_{ult} , Short Term Ultimate Tensile Strength shall be determined in accordance with ASTM D4595 or ASTM D6637. T_{ult} is based on the minimum average roll values (MARV).
 2. R_{Fcr} , Reduction Factor for Long Term Tension Creep. R_{Fcr} shall be determined from 10,000-hour creep testing performed in accordance with ASTM D5262. Reduction value = 1.45 minimum.
 3. R_{Fd} , Reduction Factor for Durability. R_{Fd} shall be determined from polymer specific durability testing covering the range of expected soil environments. $R_{Fd} = 1.10$ minimum.
 4. R_{Fid} , Reduction Factor for Installation Damage. R_{Fid} shall be determined from product specific construction damage testing performed in accordance with ASTM D5818. Test results shall be provided for each product to be used with project specific or more severe soil type. $R_{Fid} = 1.05$ minimum.
 5. F_S , Overall Design Factor of Safety. F_S shall be 1.5 unless otherwise noted for the maximum allowable working stress calculation.
- C. The maximum design tensile load of the geogrid shall not exceed the laboratory tested ultimate strength of the geogrid/facing unit connection divided by a factor of safety of 1.5. The connection strength testing and computation procedures shall be in accordance with ASTM D6638 Connection Strength between Geosynthetic Reinforcement and Segmental Concrete Units (NCMA SRWU-1).
- D. Soil Interaction Coefficient, C_i . C_i values shall be determined per ASTM D6706 at a maximum 0.75-inch (19 mm) displacement.
- E. Manufacturing Quality Control. The geogrid manufacturer shall have a manufacturing quality control program that includes QC testing by an independent laboratory. The QC testing shall include:
1. Tensile Strength Testing
 2. Melt Flow Index (HDPE)
 3. Molecular Weight (Polyester)

2.08 DRAINAGE PIPE

- A. If required, the drainage pipe shall be perforated or slotted PVC pipe manufactured in accordance with ASTM D-3034 or corrugated HDPE pipe manufactured in accordance with AASHTO M252.

2.09 GEOTEXTILE FILTER FABRIC

- A. When required, geotextile filter fabric shall be a needle punched, nonwoven

fabric that meets the requirements of AASHTO M288.

PART 3 -- EXECUTION

3.01 EXCAVATION

- A. Contractor shall excavate to the lines and grades shown on the construction drawings. Owner's or Contractors QA/QC representative shall inspect the excavation and approve prior to placement of leveling material or fill soils. Proof roll foundation area as directed to determine if remedial work is required.
- B. Over-excavation and replacement of unsuitable foundation soils and replacement with approved compacted fill will be compensated as agreed upon with the Owner.

3.02 BASE LEVELING PAD

- A. Leveling pad material shall be placed to the lines and grades shown on the construction drawings, to a minimum thickness of 6 inches (150 mm) and extend laterally a minimum of 6" (150 mm) in front and behind the Keystone wall unit.
- B. Soil leveling pad materials shall be compacted to a minimum of 98% Standard Proctor density per ASTM D-698 or 95% Modified Proctor Density per ASTM D1557.
- C. Leveling pad shall be prepared to insure full contact to the base surface of the concrete units.

3.03 KEYSTONE UNIT INSTALLATION

- A. First course of units shall be placed on the leveling pad at the appropriate line and grade. Alignment and level shall be checked in all directions and ensure that all units are in full contact with the base and properly seated.
- B. Place the front of units side-by-side. Do not leave gaps between adjacent units. Layout of corners and curves shall be in accordance with manufacturer's recommendations.
- C. Install shear/connecting devices per manufacturer's recommendations.
- D. Place and compact drainage fill within and behind wall units. Place and compact backfill soil behind drainage fill. Follow wall erection and drainage fill closely with structure backfill.
- E. Maximum stacked vertical height of wall units, prior to unit drainage fill and backfill placement and compaction, shall not exceed two courses.

3.04 STRUCTURAL GEOGRID INSTALLATION

- A. Geogrid shall be oriented with the highest strength axis perpendicular to the wall alignment.
- B. Geogrid reinforcement shall be placed at the strengths, lengths, and elevations shown on the construction design drawings or as directed by the Engineer.
- C. The geogrid shall be laid horizontally on compacted backfill and attached to the Keystone wall pins and within 1 inch of the face of the units. Place the next course of Keystone concrete units over the geogrid. The geogrid shall be pulled taut, and anchored prior to backfill placement on the geogrid.

- D. Geogrid reinforcements shall be continuous throughout their embedment lengths and placed side-by-side to provide 100% coverage at each level. Spliced connections between shorter pieces of geogrid or gaps greater than 2-inches between adjacent pieces of geogrid are not permitted.

3.05 REINFORCED BACKFILL PLACEMENT

- A. Reinforced backfill shall be placed, spread, and compacted in such a manner that minimizes the development of slack in the geogrid and installation damage.
- B. Reinforced backfill shall be placed and compacted in lifts not to exceed 6 inches (150 mm) where hand compaction is used, or 8 - 10 inches (200 to 250 mm) where heavy compaction equipment is used. Lift thickness shall be decreased to achieve the required density as required.
- C. Reinforced backfill shall be compacted to a minimum of 98% Standard Proctor density per ASTM D-698 or 95% Modified Proctor Density per ASTM D1557. The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer and shall be dry of optimum, +0%, -3%.
- D. Only lightweight hand-operated equipment shall be allowed within 3 feet (1 m) from the tail of the Keystone concrete unit.
- E. Tracked construction equipment shall not be operated directly upon the geogrid reinforcement. A minimum fill thickness of 6 inches (150 mm) is required prior to operation of tracked vehicles over the geogrid. Tracked vehicle turning should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid.
- F. Rubber tired equipment may pass over geogrid reinforcement at slow speeds, less than 10 MPH (15 KPH). Sudden braking and sharp turning shall be avoided.
- G. At the end of each day's operation, the Contractor shall slope the last lift of reinforced backfill away from the wall units to direct runoff away from wall face. The Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

3.06 CAP INSTALLATION

- A. Cap units shall be glued to underlying units with an all-weather concrete construction adhesive.

3.07 AS-BUILT CONSTRUCTION TOLERANCES

- A. Vertical alignment: $\pm 1.5"$ (40 mm) over any 10' (3 m) distance.
- B. Wall Batter: within 2 degrees of design batter.
- C. Horizontal alignment: $\pm 1.5"$ (40 mm) over any 10' (3 m) distance.
Corners, bends & curves: ± 1 foot (300 mm) to theoretical location.
- D. Maximum horizontal gap between erected units shall be $\leq 1/2$ inch (13 mm).

3.08 FIELD QUALITY CONTROL

- A. Quality Assurance - The Owner may engage inspection and testing services by a qualified geotechnical engineer, including independent laboratories, to provide quality assurance and testing services during construction. This does not relieve

- the Contractor from securing the necessary construction quality control testing.
- B. Quality Assurance should include foundation soil inspection. Verification of geotechnical design parameters, and verification that the contractor's quality control testing is adequate as a minimum. Quality assurance shall also include observation of construction for general compliance with design drawings and project specifications.
 - C. Quality Control – The Contractor shall engage inspection and testing services to perform the minimum quality control testing described in the retaining wall design plans and specifications. Only qualified and experienced technicians and engineers shall perform testing and inspection services.
 - D. Quality Control testing shall include soil and backfill testing to verify soil types and compaction and verification that the retaining wall is being constructed in accordance with the design plans and project specifications.

- END OF SECTION -

SECTION 05050 – MISCELLANEOUS METALS

PART 1 -- GENERAL

1.01 SCOPE:

The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the fabrication and installation of all miscellaneous metalwork shown on the Drawings and specified herein.

1.02 REFERENCES:

- A. American Society for Testing and Materials (ASTM)
- B. American National Standards Institute (ANSI)
- C. American Institute of Steel Construction (AISC)
- D. American Welding Standards (AWS)

1.03 CONTRACTOR SUBMITTALS:

Prior to fabrication or delivery and obtain Engineer's approvals. Show materials and specifications list, construction and fabrication details, layout and erection diagrams, and method of anchorage to adjacent construction. Give location, type, size and extent of welding and bolted connections and clearly distinguish between shop and field connections. Prior to submittal, coordinate shop drawings with related trades to insure proper mating of assemblies. Catalog work sheets showing illustrated cuts of item to be furnished, scale, details, and dimensions may be submitted for standard manufactured items.

Where items must fit and coordinate with finished surfaces or constructed spaces, take measurements at site and not from drawings. Where concrete, masonry or other materials must be set to exact locations to receive work, furnish assistance and direction necessary to permit other trades to properly locate their work. Where welded connectors, concrete, or masonry inserts are required to receive work, shop drawings shall show exact locations required, and all such drawings shall be furnished to the trades responsible for installing the connectors or inserts.

1.04 QUALITY ASSURANCE:

Unless otherwise specified all work shall conform to the applicable requirements of the following specifications and codes:

- A. Steel: Fabrication and erection of structural steel and miscellaneous steel shall be in accordance with the latest edition of the AISC "Specification for the Design, Fabrication and Erection of Steel for Buildings", and "Code of Standard Practice for Steel Buildings and Bridges". Rolled shapes, plates, and bars shall conform to the latest edition of the AISC "Manual of Steel Construction" and shall also conform to current ASTM Designation A-36.
- B. Aluminum: Fabrication of aluminum shall be in accordance with ASCE "Specification for Structures of Aluminum Allow 6061-T6, Second Progress Report of the Committee of the Structural Division on Design in Lightweight Structural Alloys".
- C. Weld Quality: All field and shop welding shall be performed by welders qualified

MISCELLANEOUS METALS – SECTION 05050

and certified in accordance with AWS D1.0 "Welding in Building Construction". Welding shall conform to AWS D1.1 Structural Welding Code.

1.05 GENERAL METALS:

- A. Structural Steel. Structural steel and miscellaneous metalwork not otherwise specified shall meet the requirements of ASTM Designation A36.
- B. Bolts and Connectors. All steel bolts and washers shall conform to ASTM Standard A-307, Grade A. Where called for on Drawings, Specifications, or where in contact with wastewater or air containing wastewater gases, bolts shall be fabricated from stainless-steel, Type 316, (B8M, B8MA) in accordance with ASTM Standard A-193. When fastening to galvanized steel, hot dip galvanized bolts shall be used. Hoisting eyes shall be galvanized.
- C. Expansion Bolts. Expansion bolts and anchors shall be stainless-steel and used only where specifically noted or detailed. Expansion bolts shall not be acceptable for anchorage of any vibrating machinery or equipment. Anchors for equipment and pipe supports are specified elsewhere in the Specifications. Where expansion bolts are used in Interior Dry Locations provide snap-off or flush shell concrete anchors produced by Phillips Self-Drilling Concrete Anchors, Star Selfdrill Shields, or equal. For exterior or wet locations, they shall be similar and equal to Molly Parabolts or Phillips Redhead. Where expansion bolts are used to fasten to concrete block, they shall be similar and equal to Rawl anchors.
- D. Fabrication. All miscellaneous metalwork shall be manufactured using the best practices of modern sheet metal, structural steel and foundry shops. Welding shall be performed by qualified welders with all exposed welds being ground smooth.
- E. Steel structural built-up members shall have full-length continuous welded joints to seal inaccessible surfaces.
- F. Painting. The prime coat of paint required by the Painting Specification shall be shop applied on all metalwork to be painted.

PART 2 -- PRODUCTS:

2.01 HOT DIP GALVANIZING:

When items are specified to be hot dip galvanized, hot dip galvanizing shall be completed after all fabrication and welding is completed. Hot dip galvanized sheet steel, plain or shaped, in accordance with ASTM A653. Hot dip galvanized items fabricated from rolled, pressed and forged steel shapes, plates, bars, and straps 1/8-inch thick and greater in accordance with ASTM A123. Hot dip steel hardware in accordance with ASTM A153 or F2329. Size threads to allow for galvanized coating, and re-run after galvanizing if required for a smooth fit.

2.02 MISCELLANEOUS METAL PRODUCTS:

- A. Pipe Supports: As specified in Specification 15200.

2.03 ACCESS HATCHES:

Hatches shall be aluminum and installed where shown on the drawings. Dimensions are shown on the Drawings, and are unobstructed clear opening. Comply with the following requirements for all hatches. Bilco "J-AL" series or equal.

- A. Reinforced for H-20 Loading

MISCELLANEOUS METALS – SECTION 05050

- B. Doors: Single leaf doors oriented to open in the direction shown on the Drawings.
- C. ¼-inch minimum thickness mill finish aluminum, diamond pattern, reinforced as required to withstand the specified loads. Doors shall open to 90 degrees and shall include an automatic hold-open arm with a positive automatic latch that will secure the door in the open position until the release handle is activated. Provide stainless-steel hold-open pin through holes in hold-open arms to insure against accidental hatch closure. Attach pin to hatch with a short stainless-steel chain to prevent loss. Submit details of latch for review. Door hinges shall be recessed or flush.
- D. Frame: ¼-inch minimum thickness aluminum channel with anchor flange all around for embedment in structural concrete. Channel shall be coated with asphaltic isolation coating where in contact with concrete, grout, or masonry. Frame channel shall be equipped with a drainage coupling to remove rainwater. Plumb a PVC drain line with a p-trap to a free discharge into the wet well below.
- E. Lock: Provide a slam lock with removable handle. Provide a hinged covered recess with door to frame padlock hasp.
- F. Lift assist: Provide stainless-steel compression spring(s) or pneumatic spring(s) enclosed in sealed telescoping tube(s).
- G. All non-aluminum metals and hardware: Type 316 stainless-steel.
- H. Float hangers: Provide hooks for suspension of pump control floats integral with the hatch frame.
- I. Safety Grate: Provide a secondary fall protection safety grate located beneath the solid hatch cover, which lifts independently from the cover and is equipped with a latch to hold it in the open position. The grate shall be manufactured from aluminum flat bars, load-rated for 300 pounds per square foot, and safety orange or yellow in color. The grate shall have a padlock hasp for locking in the closed position. The grate shall comply with OSHA Standard 1910.23 for fall protection.

2.04 CRANE FLOOR MOUNT

The crane used for the removal of the pumps and appurtenances from the wet well shall be supplied by the City of Glenwood Springs (Honeywell/Miller DuraHoist). The Contractor shall provide and install a flush floor mount sleeve in the wet well lid in accordance with the Drawings. The manufacturer/model shall be confirmed by the Contractor with the City but is believed to be Honeywell/Miller DH-20ZP.

2.05 PART 3 – FABRICATION AND INSTALLATION

2.06 GENERAL:

All fabrication shall be equal to the best practice in modern sheet metal and structural shops. Welding shall be performed by qualified welders, and welds exposed to view shall be ground smooth. Bolt hole templates shall be furnished or obtained where required, to or from other subcontractors and equipment suppliers to insure accurate locations for connections.

2.07 HANDLING:

Care shall be exercised in the handling and shipping of all miscellaneous metalwork to

MISCELLANEOUS METALS – SECTION 05050

prevent bending and distortion, scratching, and exposure to the elements. Provide temporary shoring and bracing with connections of sufficient strength to bear imposed loads. Provide temporary guy lines to achieve proper alignment of the structures as erection proceeds. Design and placement of temporary shoring and bracing shall be the complete responsibility of the Contractor.

2.08 ASSEMBLY:

Set structural members to the lines and elevations shown on the Drawings with all parts aligned and properly adjusted before permanently fastening. Unaligned bolt holes shall be re-drilled or reamed to permit bolting. Gas cutting torches shall not be used for correcting fabrication errors or discrepancies. Field welding is not permitted except where specifically allowed or called out on the Drawings.

Where connections are required between weirs, troughs, and walls, the bolted connections shall be sealed with neoprene sheet. Weirs shall be set exactly level. No leakage shall be permitted around plates, weirs, connections or through bolt holes.

2.09 ACCESS HATCHES:

Deliver hatches to job site in time for installation with the concrete pour. Ensure all surfaces to be in contact with concrete are coated with asphaltic isolation coating; touch up or recoat as necessary. Bare aluminum shall not be in contact with concrete. Prior to the concrete pour, install the PVC drain line, with p-trap, within the concrete formwork from the frame drain coupling to a free discharge opening flush with the ceiling of the wet well structure. Install in conformance with the manufacturer's installation instructions. Set frame level and true to plane at all four corners, and flush with adjacent finished surfaces. Doors, when closed, shall be flush with frames and flush with each other.

PART 3 -- EXECUTION (Not Used)

- END OF SECTION -

SECTION 06300 – CARPENTRY, MILLWORK AND MISC. WOODWORK

PART 1 -- GENERAL

1.01 SCOPE:

The work to be performed in accordance with the requirements of this Specification consists of furnishing all material, equipment, supplies, and accessories required and of performing all operations needed in connection with all woodwork shown on the Drawings and herein specified. The woodwork shall include, but not be limited to, all rafters, decking, exterior trim and siding, framing, nailers for roofing and other connection work and all interior ceilings and walls. Concrete form work is not included in this Specification.

1.02 REFERENCES:

All lumber used shall conform to the requirements of the latest revision of applicable standards. Standards used for lumber and lumber products include:

- A. International Building Code, as adopted by the City of Glenwood Springs
- B. American Lumber Standards, Simplified Practice Recommendations,
- C. West Coast Lumber Inspection Bureau,
- D. American Plywood Association,
- E. California Redwood Association,
- F. ASTM D245, Establishing Structural Grades and Related Allowable Properties for Visually Graded Lumber, and
- G. ASTM D2915, Allowable Properties for Grades of Structural Lumber,
- H. Western Wood Products Association (WWPA). American National Standards Institute (ANSI),
- I. National Design Standard for Stress Grade Lumber and Its Fastening.

1.03 CONTRACTOR SUBMITTALS:

Submit in accordance with SECTION 01300. Submit shop drawings on substituted equipment or material indicating materials and species, arrangement, thickness, size of parts, construction, fastenings, blocking, clearances, joints, and assembly and erection details. The Contractor shall submit, for approval, truss and beam designs which bear the seal of an engineer licensed to practice in the State of Colorado. The design shall include truss members, structural beams, fasteners, and anchors.

PART 2 -- PRODUCTS:

2.01 FRAMING LUMBER:

Lumber shall be new, clean stock of the species and grades shown for various uses. Grades shall conform to the grading rules of the manufacturers' association under whose rules the lumber is produced. Lumber shall bear the grade and trademark of the association under whose rules it is produced and a mark of mill identification. Dimension lumber shall be Douglas Fir-Larch. Unless otherwise shown on the Drawings, grading shall be as follows:

- A. Light Framing - Light framing lumber 2-4 inches thick and 2-4 inches wide for use

where high strength values are not required, such as studs, plates, sills, cripples, blocking, etc., shall be of WWP A Construction Grade.

- B. Studs - Studs 2-4 inches thick, 2-6 inches wide and 10 feet and shorter shall be of WWP A Stud Grade.
- C. Structural Light Framing - Structural light framing 2-4 inches thick and 2-4 inches wide shall be WWP A No. 2 Grade.
- D. Structural Joists and Planks - Structural joists and planks 2-4 inches thick and 5 inches and wider for joists, rafters, and general structural framing shall be WWP A No. 2 Grade.

Lumber shall be seasoned and kiln dried. Except for trim and millwork, lumber shall be seasoned for not less than 30 days before being covered with finish material. The moisture content of the lumber shall not exceed 15 percent, in accordance with WWP A seasoning designation MC-15.

Lumber in contact with concrete (or separate from concrete by a sill sealer) shall be pressure treated in accordance with AWPB Standard LP-22 (0.4 pcf CCA retention). All exposed lumber shall be pressure treated in accordance with AWPB Standard LP-2 (0.25 pcf CCA retention).

Sizes shown on the Drawings are nominal. Actual sizes shall conform to American Lumber Association Standards PS 20. All lumber shall be S4S (surfaced four sides) unless otherwise indicated.

2.02 PLYWOOD:

Each panel of construction and industrial plywood shall meet the requirements of the latest edition of U.S. Product Standard PS 1 and shall be identified with the appropriate grade-trademark of the American Plywood Association. All plywood shall be Exterior type.

Unless otherwise shown or specified, plywood shall be 3/4-inch thick A-C Exterior, Identification Index 32/16, DFPA. Nail with 8d common spaced 6-inch at panel edges and 12-inches at intermediate supports or as detailed on the Drawings.

2.03 WOOD PRESERVATIVE:

All wood used in this project that does not receive painting or other coating shall be coated with a wood preservative stain equal to chromated copper arsenate (5 percent minimum solution). All surfaces and edges shall be coated after any saw cutting. Color shall be specified by Owner.

2.04 CONNECTORS:

All bolts and washers shall be cadmium plated or galvanized. Nails shall be galvanized. Sizes shall be according to requirements of the International Building Code.

2.05 REDWOOD:

All redwood shall contain only heartwood. Redwood containing any sap wood will be rejected. All redwood shall have a minimum of 12 growth rings per inch. All 1-inch nominal lumber shall be a clear heart grade. All 2-inch nominal lumber shall be at least select heart grade.

2.06 PREFABRICATED TRUSSES AND GLULAM BEAMS:

Trusses and beams shall be designed to accommodate the following loads consistent with

the International Building Code adopted by the City of Glenwood Springs:

- A. Ground Snow Load: 50 psf
- B. Dead Load: 25 psf
- C. Live Load: 50 psf
- D. Wind Load: 85 mph
- E. Seismic Loading: Class C/D

2.07 FASTENERS:

- A. General: Provide fasteners of size and type indicated that comply with requirements specified herein for material and manufacture for use with carpentry and woodwork.
 - 1. Provide fasteners with hot-dip zinc coating complying with ASTM A153.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Wood Screws: ASME B18.6.1.
- D. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- E. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M).
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency. Expansion anchors shall be Type 304 stainless-steel.

PART 3 -- INSTALLATION

3.01 GENERAL:

Furnishing, fabrication, installation, fastening, boring, notching, and cutting of all wood framing shall be in accordance with the requirements of all public governing bodies, as well as truss and glulam beam manufacturers.

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- C. Apply field treatment complying with AWP A M4 to cut surfaces of preservative-treated lumber and plywood.

- D. Securely attach rough carpentry work to substrate by anchoring and fastening in accordance with the manufacturer's requirements.
- E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; pre-drill as required.
- F. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
- G. All wood in contact with or in close proximity to concrete or the ground shall be preservative protected.

3.02 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION:

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.

3.03 WOOD FURRING INSTALLATION:

Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

3.04 WOOD FRAMING INSTALLATION, GENERAL:

- A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.
- B. Where built-up beams or girders of 2-inch nominal-dimension lumber on edge are required, fasten together with 2 rows of 20d nails spaced not less than 32 inches O.C. Locate one row near top edge and other near bottom edge. For continuous members locate end joints over supports.

3.05 SHEATHING:

Nail with 8d common spaced 6-inches at panel edges and 12-inches at intermediate supports or as detailed on Drawings.

3.06 STORAGE-AT-SITE:

Protect all materials from damage and weather. Store all lumber off the ground. Provide adequate ventilation for material.

3.07 ALL EXPOSED WORK:

All exposed work shall be neat in every respect, with even spacing, straight blocking lines, and all nailing carefully done.

3.08 MISCELLANEOUS:

Provide all necessary blocking, backing, bridging, fire stops, nailers, headers, cripples, etc., as required for all wood framing.

- END OF SECTION -

SECTION 07050 – SEALANTS AND CAULKING**PART 1 -- GENERAL****1.01 SCOPE:**

Provide all sealant and caulking work, complete as indicated, specified, and required. This Specification is intended to be general in scope and not specific as to locations of caulking and sealants. Contractor shall examine all Drawings and Details thoroughly and familiarize himself with the extent of the caulking and sealing involved. Only a complete and absolutely watertight and weathertight job will be accepted. Additional information pertaining to sealing and/or caulking will be found in the various specific Specifications and shall be coordinated with the work of the Specification.

Unless otherwise noted on the drawings, sealants/caulking shall be applied at all following locations:

- A. Intersections of dissimilar materials for structures (e.g. masonry next to metal or wood; metal to glass)
- B. Joints between existing masonry walls and new walls.

1.02 REFERENCES:

- A. American Society for Testing and Materials (ASTM)
- B. American National Standards Institute (ANSI)

1.03 CONTRACTOR SUBMITTALS:

Submit in accordance with SECTION 01300. Submit technical data by all manufacturers of proposed materials sufficient to demonstrate compliance with the specification requirements. Submit full range standard color chart of each material for color selection by the Engineer. Submit material manufacturer's printed preparation and application instructions to Engineer.

1.04 QUALITY ASSURANCE:

Deliver sealant and caulking compounds in unopened factory labeled containers. Labels shall bear statement of conformance to standards specified for each material and shall bear manufacturer's name and product designation.

PART 2 -- PRODUCTS:**2.01 SEALANT FOR HORIZONTAL SURFACES, EXTERIOR OR INTERIOR:**

Sealant shall be a two-part self-leveling and pourable urethane equal to Vulkem 45 as manufactured by MAMECO International (The Master Mechanical Company), or approved materials produced by Product Research and Chemical Corporation, or Sika Chemical Company, or equal. Color shall be chosen by the Engineer.

2.02 SEALANT FOR VERTICAL SURFACES, EXTERIOR OR INTERIOR:

Sealant shall be a two-part non-sag (gun grade) manufactured by MAMECO International Vulkem 227, Sika Chemical Company, or equal. Color shall be aesthetically compatible with the adjacent surfaces and shall be chosen by the Engineer.

2.03 PRIMER:

Where required primer shall be used as recommended in writing by the sealant manufacturer. Primer shall have been tested for non-staining characteristics and durability on samples of actual surfaces to be sealed.

2.04 BACK-UP MATERIALS AND PREFORMED JOINT FILLERS:

Use non-staining material, compatible with sealant and primer, and of a resilient nature, such as closed cell polyethylene rod, or elastomeric tubing or rod (neoprene, butyl, or EPDM). Materials impregnated with oil, bitumen, or similar materials shall not be used. Size and shape shall be as indicated by joint details in drawings and shall be as recommended by sealant manufacturer in writing. Sealant shall not adhere to back-up material.

2.05 BOND BREAKERS:

Where required, shall be polyethylene tape as recommended by sealant manufacturer in writing.

PART 3 -- INSTALLATION**3.01 GENERAL:**

Install sealants and caulking by material manufacturer's approved applicator in strict conformance with manufacturer's printed instructions. Sealant installer shall examine all surfaces and report to the Contractor all conditions not acceptable. Thoroughly clean all joints, removing all foreign matter such as dust, oil, grease, water, surface dirt, frost, and old caulking materials. Sealant must be applied to the base surface. Previously applied paint or primer must be entirely removed.

Porous materials such as concrete, masonry or stone should be cleaned where necessary by grinding, blast-cleaning, mechanical abrading, acid washing or combination of these methods to provide a clean, sound base surface for sealant adhesion. Concrete shall be cured sufficiently prior to application. Laitance shall be removed by acid washing, grinding, or mechanical abrading. Form oils shall be removed by blast-cleaning. Loose particles present or resulting from grinding, abrading or blast-cleaning shall be removed by blowing out joints with oil-free compressed air (or vacuuming) prior to application of primer and sealant.

Non-porous surfaces, such as metal and glass, shall be cleaned either mechanically or chemically. Protective coating such as methacrylate lacquer on metallic surfaces shall be removed by a solvent that leaves no residue. Solvent shall be used with a clean cloth or lintless paper towel. Do not allow solvent to air dry without wiping. Wipe dry with a clean, dry cloth or lintless paper towel. Joint areas to be protected with masking tape or strippable films shall be cleaned before application of tape or film. All joints to receive sealant shall be as indicated on the Drawings or shop drawings. Do not seal joints until they are in compliance with Drawings or meet with the approval of the Engineer.

Joints to receive sealant shall be a minimum of 1/4-inch wide by 1/4-inch deep, unless otherwise approved. For joints in concrete, masonry, or stone, the depth of the sealant may be equal to the width of joints up to 1/2-inch wide. For joints 1/2-inch to 1-inch wide the depth shall be 1/2-inch. For expansion and other joints, 1 to 2-inches wide the depth shall be not greater than 1/2 the applied sealant width. For joints exceeding 2-inches in width: depth shall be as directed by sealant manufacturer.

For joints in metal, glass and other non-porous surfaces the sealant depth shall be a minimum of $\frac{1}{2}$ the applied sealant width, and shall in no case exceed the applied sealant width. Joints to receive sealant, back-up material or preformed joint filler shall be cleaned out, raked to full width and depth as required by sealant installer. Joints shall be of sufficient width and depth to accommodate specified back-up material or preformed joint filler and sealant.

3.02 APPLICATION:

Install back-up material or joint filler, of type and size specified or required by the sealant manufacturer, at proper depth to provide sealant dimensions as detailed. Back-up material shall be of suitable size and shape and compressed 25-50 percent to fit joints as required. Sealant shall not be applied without back-up material and/or bond breaker strip. When using back-up tube avoids lengthwise stretching. Tube or rod shall not be twisted or braided.

Apply masking tape, where required, in continuous strips in alignment with joint edge. Prime surfaces, where required, with primer as recommended by sealant manufacturer. Follow sealant manufacturer's instruction regarding mixing (if required), surface preparation, priming, and application procedure. For sealant application when air temperature is below 40°F consult sealant manufacturer for recommendations before applying sealant.

Apply sealant under pressure with hand or power actuated gun or other appropriate means. Gun shall have nozzle of proper size and provide sufficient pressure to completely fill joints as designed. All joint surfaces shall be tooled to provide the contour as indicated on the Drawings. When tooling joints, use tooling solution recommended by manufacturer. Remove masking tape immediately after joints have been tooled. Cure in accordance with manufacturer's recommendations.

3.03 CLEAN UP:

Clean adjacent surfaces of sealant as work progresses. Use solvent or cleaning agent as recommended by sealant manufacturer. All finished work shall be left in a neat, clean condition. The sealant joints shall be uniformly smooth, free of wrinkles, flush with adjacent surfaces and absolutely water tight. Adjacent surfaces which have been soiled by the application of the sealing compound shall be wiped clean and be left neat. The work will be adjudged defective due to the sealant's hardening, cracking, crumbling, melting, wrinkling, shrinking, splitting, leaking, or running.

- END OF SECTION -

SECTION 07610 – METAL ROOFING SYSTEM

PART 1 -- GENERAL

1.01 SCOPE:

The work to be performed in accordance with this Specification consists of furnishing and installing roof panels, clips, closures, flashing, vents, soffit panels (vented and non-vented), sealants, and other items required for a complete metal roofing system.

1.02 REFERENCES:

- A. American Society for Testing and Materials (ASTM)
- B. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
- C. American Iron and Steel Institute (AISI)
- D. Aluminum Association (AA)

1.03 CONTRACTOR SUBMITTALS:

Submit in accordance with Specification 01300. Submit shop drawings approved by the manufacturer's technical engineering department. Drawings shall show all typical and special conditions including flashings, soffits (distinguish vented and non-vented), dimensions, anchoring methods, sealant locations, provisions for thermal movement and lines fixity. Submit technical data, load chart and installation instructions for the metal roofing system. Submit calculations showing structural capacity of components and ability to withstand specified design criteria. Submit certification that product has been tested and approved in accordance with design requirements.

Submit documentation showing that the installer is authorized by the roofing manufacturer to install the roof product and that the installer has a minimum of (5) years experience and five (5) jobs of similar scope.

Submit the following samples:

- A. Three samples of each type of fastener to be used,
- B. One sample of closed cell foam closure,
- C. One sample of each standard manufactured accessory,
- D. One sample of the roofing panel to be used showing the proposed profile, and
- E. Full range color samples, for color selection by Owner.

1.04 QUALITY ASSURANCE:

The metal roofing manufacturer's technical engineering department shall review and approve shop drawings prior to submittal to Engineer for review and, once approved, for manufacture of metal roofing.

The roofing manufacturer shall adhere to all local Garfield County and City of Glenwood Springs Code regulations, summarized as follows unless otherwise directed by the Agency Having Jurisdiction:

- A. 2009 International Building Code, with local amendments. Wind Loads shall be 85 mph, seismic design category shall be B/C, and Ground Snow Load shall be 50 psf minimum.

- B. 2009 International Fire Code, with local amendments.

1.05 STORAGE AND HANDLING:

Keep the panels dry. If they are covered with plastic, provide ventilation. Protect against damage and discoloration. Handle panels with non-marring slings. Do not bend panels. Store panels with one end elevated for drainage. Protect panels against standing water and condensation between adjacent surfaces.

PART 2 -- PRODUCTS:

2.01 GALVANIZED STEEL ROOFING:

- A. Preformed roof panels, flashing and trim shall be made of 24-gauge galvanized steel sheet, in accordance with ASTM A653. The panels shall be field mechanically seamed and have locked ribs. The ribs shall be 2-inches high and 12-inches wide. Provide panels in full, unbroken, continuous lengths. Panel end laps shall not be permitted.
- The material shall be similar or equal to Ultra Seam US-200 as manufactured by U.S. Metals Corporation.
- B. Pipe Flashing shall be equal to Dektite pipe flashing for roof penetrations as manufactured by Buildex.
- C. The concealed clips shall provide for thermal expansion and contraction and shall be designed to meet the wind uplift requirements. The clips shall be made of stainless-steel.
- D. Clip fasteners shall be stainless-steel and sized to meet the performance requirements.
- E. All exposed fasteners shall be stainless-steel with neoprene washers to match the roofing color.
- F. The end closures shall provide waterproof, laminated, semi-rigid, cross-linked, polyethylene closed cell foam or neoprene. The closures shall tightly fit the panel configuration.

2.02 FACTORY COLOR FINISH:

The roof panels shall have a factory color finish on the exposed side. The exterior finish shall consist of a Kynar 500 coating. The color shall be chosen by the Engineer and the Owner. The dry film thickness of the exterior coating shall be not less than 0.8 mil over a primer coat with a total dry film thickness of 1.0 mil, 0.5 mil standard washcoat reverse.

Note that a two-color system will be selected by the Engineer and Owner, with roof panels and an associated flashing of one color (dark brown), and soffit panels and fascia with associated flashing of a second color (light tan, similar to the color of natural-stained wood).

2.03 ICE AND WATER SHIELD:

The shield shall be a resilient, non-woven glass fiber mat, which is permeated and coated with SBS modified bitumen to a thickness of 55 mils. The ice and water shield shall be IKO Protecto Ice & Water Protector or approved equal.

PART 3 -- FABRICATION AND INSTALLATION

3.01 GENERAL:

The preformed metal roofing shall be installed in accordance with the manufacturer's written specifications and requirements. The panels shall run continuous with no horizontal joints. They shall be attached to the structure by means of concealed anchorage system. No through penetrations of fasteners of roofing panels will be permitted except at the eave, and for approved flashing attachments. Roofing anchor clips shall be spaced to meet design load requirements and approved engineering calculations.

3.02 SECURE:

Secure panels without warp or deflection. Ensure proper engagement of anchor clips with each panel rib before positioning next panel. Install work watertight, plumb, level and true with components securely attached and in accordance with manufacturer's recommendations.

3.03 FLASHING, FASCIA AND SOFFITS:

Details in installation which are not indicated shall be in accordance with NRCA Construction Details, SMACNA Architectural Sheet Metal Manual, AA Specifications for Sheet Metal Work, panel manufacturer's printed instructions and details and the approved shop drawings. Installation shall allow for expansion and contraction of the flashing.

3.04 SEALANTS:

All edges and joints shall be continuously sealed with Sikaflex 15LM low modulus polyurethane sealant of matching color.

3.05 TOUCH-UP AND CLEANING:

Workmen who will be walking on roofing panels shall wear clean, soft soled shoes that will not pick up stones or other abrasive material which could damage panel surfaces. Touch-up damaged paint surfaces in accordance with manufacturer's instructions. At completion of each day's work and at work completion, sweep panels and flashing clean. Do not allow fasteners, cuttings, fillings or scraps to accumulate on finish surfaces.

- END OF SECTION -

SECTION 08100 – DOORS**PART 1 -- GENERAL****1.01 SCOPE:**

The work of this section includes providing and installing all hollow metal doors and frames to be set in CMU wall. Provide all items that are necessary to comply with applicable fire and building codes regardless of whether scheduled or not.

1.02 CONTRACTOR SUBMITTALS:

Submit the following in accordance with SECTION 01330:

- A. Product information of sufficient detail and quantity to demonstrate compliance with the requirements specified herein.
- B. Schedule of all finished hardware required. The schedule shall follow the requirements of the Specifications and shall indicate type, manufacturer's name and number, location and finish of each item required. Approval of the schedule will not relieve Contractor of responsibility for furnishing all necessary hardware.
- C. Certificates of compliance.
- D. Manufacturer's installation instructions.

1.03 PRODUCT HANDLING:

Items shall be stored in the original container out of inclement weather for protection against the elements.

PART 2 -- PRODUCTS**2.01 MANUFACTURER:**

Similar to and equal to Ceco Door Products Imperial Maxim vandal-resistant door and frame system, flush panel design, without glass light.

2.02 MATERIALS:

- A. Conform to Steel Door Institute guide specifications, and ANSI A250.8.
- B. Extra heavy duty 14-gauge galvanized steel, for doors and frames. Exterior grade. Seamless fabrication. Foamed-in-place polyurethane core for thermal and impact resistance.
- C. Dimensions: Provide door of nominal 3'-0" x 7'-0" dimensions.

2.03 SECURITY HANDLES/LOCKSETS:

- A. Locksets and exterior handles shall be heavy duty, exterior rated, vandal resistant. Locksets shall comply with and be keyed per the Owner's requirements. Submit options to the Owner for review and selection.
- B. Provide heavy duty door strike security plate to prevent exterior access to or tampering of the bolt.

2.04 HINGES:

ANSI A156.7, heavy weight, 7 gauge. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames. Full mortise. Antifriction bearing

hinges, stainless-steel with stainless-steel pin, maximum security design.

2.05 SURFACE CLOSERS:

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 - 1. Surface Closer with Cover: Grade 1; Modern Type with mechanism enclosed in cover.
 - 2. Mounting: Parallel arm.
 - 3. Type: Hold open with spring-cushioned stop arm.
 - 4. Backcheck: Adjustable, effective between 60 and 85 degrees of door opening.
 - 5. Cover Material: Molded plastic.
 - 6. Closing Power Adjustment: At least 50 percent more than minimum tested value.

2.06 DOOR GASKETING:

- A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
- B. Adjustable, Housed, Perimeter Gasketing: Silicone bulb gasket material held in place by aluminum housing; fastened to frame stop with screws.
- C. Door Sweeps: Vinyl gasket material held in place by flat aluminum housing or flange; surface mounted to face of door with screws with integral rain drip.

2.07 THRESHOLDS:

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
- B. Saddle Thresholds:
 - 1. Type: Applied gasketed stop and fluted top, barrier free.
 - 2. Base Metal: Aluminum.

2.08 KICK PLATES:

Satin finish stainless-steel, 0.050 gauge with beveled edges, 12-inches high x 1-1/2 inch narrower than the single door. Provide on interior and exterior faces.

2.09 EXIT DEVICES:

Touch bar type: Heavy-duty type UL listed for accident hazard and capable of meeting UL "A" label rating, rim latch or mortise design with 3/4-inch anti-friction latch bolt. Latch bolt shall retract when horizontal pressure is exerted on touch bar. Latch bolts on vertical rod devices shall remain retracted until door closes. Plate all exposed surfaces to match hardware finishes. Provide stainless-steel touch bars, satin finish.

2.10 FABRICATION:

- A. Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.
- B. Exterior Door Construction: For exterior locations and elsewhere as indicated, fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction.
- C. Core Construction: One of the following manufacturer's standard core materials that produce a door complying with SDI standards:
- D. Polystyrene, polyurethane or polyisocyanurate.
- E. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- F. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
- G. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- H. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.
- I. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
- J. Frame Construction: Fabricate frames to shape shown.
 - 1. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints.
 - 2. Provide welded frames with temporary spreader bars.
- K. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
- L. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

2.11 FINISHES:

- A. Prime coat from factory with oven-cured primer paint in accordance with manufacturer's standard compatible with galvanized steel substrate. Comply with ANSI A250.10.
- B. Field Finish: Apply a finish coat in the field compatible with factory prime coat in accordance with Specification 09900. Color shall match adjacent masonry wall color.

PART 3 -- EXECUTION**3.01 INSTALLATION:**

- A. General: Install according to Shop Drawings, manufacturer's instructions, and as specified.
- B. Placing Frames: Comply with provisions in SDI 105. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - 1. Place frames before construction of enclosing walls and ceilings. In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
 - 2. Fill frames with spray insulation foam as recommended by insulation manufacturer.
- C. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.

3.02 ADJUSTING AND CLEANING:

- A. Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.
- B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.
- C. Field Coating: Coat factory prime coat in accordance with Specification 09900 in the field. Do not coat stainless-steel and other hardware and appurtenant items not to be coated.

- END OF SECTION -

SECTION 09900 – PAINTING AND COATINGS

PART 1 -- GENERAL

1.01 DESCRIPTION:

The work to be performed in accordance with the requirements of this Specification consists of furnishing all materials, equipment, supplies, and accessories required and of performing all operations needed in connection with the painting of the various parts of the work.

No paint shall be applied to permanently finished equipment which is considered to be acceptable by the Engineer such as factory-finished motor control centers, control consoles, and factory finished equipment. Equipment and their appurtenant parts such as guards and bases which arrive on the job site only primed, shall be painted in accordance with the appropriate painting system described following. All shop prime coats by equipment manufacturers shall be applied to surfaces as specified herein with paint that is approved and compatible with accepted top coat paint.

A "Summary of the Items to be Painted or Stained" under this contract is given following these General Requirements.

1.02 QUALITY ASSURANCE:

- A. National Association of Corrosion Engineers (NACE);
- B. Steel Structures Painting Council (SSPC).

The manufacturer shall have 10 years of successful experience and shall be able to demonstrate successful performance on comparable projects.

The applicator shall be able to demonstrate a minimum of 5 years application experience on projects of similar size and complexity to this project. All applying personnel must be trained and experienced in the application of each product.

1.03 MANUFACTURER'S RECOMMENDATIONS:

All paint shall be mixed and applied with strict conformance to the paint manufacturer's directions, which will take precedence over this Specification. Selection of paints to be applied to each specific substrate material shall be verified with the paint manufacturer and his approval obtained.

1.04 MATERIALS SUBMITTAL:

The paints to be used on the various substrate materials shall be of the best quality commercial and industrial grades and shall be manufactured by nationally known and approved paint manufacturers with local representation. The Contractor shall submit to the Engineer, in time to allow the Engineer reasonable review time, a minimum of three copies of a Painting Schedule. This Schedule shall give the information listed below for all the paints and stains he intends to use on all the items requiring paint. This shall be done for substituted paints as well as those listed in the Painting Systems.

- A. Name of the manufacturer of the paint;
- B. Generic name of paint (chemical composition type such as alkyd, epoxy, vinyl, etc.);
- C. Trade name and number of each specific paint;

- D. Number of coats to be applied for each paint;
- E. Dry film thickness to be achieved for each coat;
- F. Spreading rate at which each coat will be applied;
- G. Color name and number accompanied by color chart;
- H. Results of accepted tests (ASTM, Federal Std.) for hardness, abrasion, impact, humidity, etc.
- I. Termination and transition details for wet well protective coatings.

Paints shall be supplied to the jobsite in unbroken containers on which will be labeled the designated name, formula, or specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer, all of which shall be plainly legible at the time of use.

With the approval of the Engineer, the field applied primer coat may be omitted when the equipment or material installed has a satisfactory primer coat that is compatible with top coats. Some paint systems require no primer coat, only one or more coats of the paint used as the topcoat. In these cases, primers will not be required, but only when omitting the primer is in accordance with the paint manufacturer's directions.

1.05 DELIVERY, STORAGE, AND HANDLING:

The materials shall be delivered to the site in the manufacturer's original, unopened containers and packaging and with labels clearly identifying:

- A. Coating or material name,
- B. Manufacturer,
- C. Color name and number
- D. Batch or lot number,
- E. Date of manufacture, and
- F. Mixing and thinning instructions.

Store materials in a clean dry area and within temperature range in accordance with manufacturer's instructions. Keep the containers sealed until they are ready for use. Do not use materials beyond manufacturer's shelf life limits. Protect materials during handling and application to prevent damage or contamination.

1.06 COLORS:

The exact colors to be used on the various substrate materials will be confirmed by the Engineer from color charts submitted by the Contractor as a portion of the Painting Schedule. General colors to be submitted for use on the various materials are listed with the "Summary of the Items to be Painted and Stained" following these General Requirements.

PART 2 -- MATERIALS

2.01 GENERAL:

- A. Surfaces to receive paint protective coating materials as specified in this SECTION shall be coated in conformance with the applicable coating systems specified. So far as possible, all paint and coating materials shall be provided by

a single source supplier.

- B. Products shall be standard for recognized manufacturer engaged in production of such materials for essentially identical or similar applications in the water and wastewater treatment industry.
- C. Only compatible materials shall be used in the work. Particular attention shall be directed to compatibility of primers and finish coats. If necessary, subject to approval of the Owner, a compatible barrier coat shall be applied between all existing prime coat and subsequent field coats to ensure compatibility.

PART 3 -- EXECUTION

3.01 SURFACE PREPARATION:

Surface preparation of each substrate material shall be as described in the painting system breakdown and completed prior to beginning the painting operation.

All structural steel, metalwork, piping, and other metal surfaces to be painted shall be thoroughly cleaned of grease, oil, and contaminants by the use of solvents recommended by the manufacturer of the paint which will be applied. When blasting is required in the surface preparation of a painting system, the blasting shall be performed within conformance of the "Standard for Surfaces of New Steel Airblast Cleaned with Sand Abrasive" as written by the National Association of Corrosion Engineers, 2400 West Loop South, Houston, Texas, hereinafter referred to as NACE. Blasting shall be accomplished in a manner and with the appropriate grit to limit the depth of finished surface profile to a of the dry mil thickness of the paint. Any dust permits required for field blasting shall be obtained by the Contractor.

Acceptance of the final blasted steel surfaces will be made by the Engineer utilizing the visual standards test method NACE TM-01-70 or an illuminated magnifier comparator (Keane-Tator) to visually compare the specified NACE surface with the steel actually being blasted. NACE standards of quality are called out for each painting system where blasting is required as a portion of the surface preparation. NACE standards referred to are:

NACE № 1:	White Metal Blast	(SSPC-SP5)
NACE № 2:	Near-White Blast	(SSPC-SP10)
NACE № 3:	Commercial Blast	(SSPC-SP6)
NACE № 4:	Brush-Off Blast	(SSPC-SP7)

The Contractor shall continue to blast the surface of the steel until such time as the Engineer is satisfied that the steel being blasted is of a quality equal to the specified NACE grade.

All dust created by the blasting operation must be removed immediately after the blasting operation by vacuuming. The first coat of paint should be applied to the steel as soon as possible and always the same day that the blasting is done.

3.02 APPLICATION METHODS:

Exterior painting shall not be done during damp weather when ambient temperature is below 50°F. Paint manufacturer's directions for cold weather applications shall be followed explicitly. All fresh work shall be protected from damage. For interior work, the temperature shall not be allowed to fall below 50°F while paint is being applied or while it is drying.

All paint shall be evenly applied in a uniform coat. The finished painting shall show no drops, runs, or sagging of materials.

In addition to preparatory sanding, each coat, except the last, shall be fine-sanded. Avoid cross scratches and swirls.

Each coat of paint shall be given at least 48 hours to dry before the next coat is applied, unless otherwise directed by the manufacturer's instructions. Any walls that are to have dampproofing applied thereto will be marked with chalk lines to the approval of the Engineer to establish a clean-cut line at which the dampproofing stops.

All metalwork which has been shop-painted with rust-inhibitive prime coat shall be handled with care to preserve such coating. Before painting, the Contractor shall repaint all defective or damaged areas with an approved prime coat after cleaning and removing dust.

On metal surfaces, each coat of paint shall be applied at the rate specified to achieve the minimum dry mil thickness required. On concrete and/or masonry, application rates will vary according to surface texture. However, in no case shall the stated spreading rate be exceeded. On porous surfaces, a protective and decorative finish shall be achieved. Deficiencies in the film thickness shall be corrected by the application of an additional coat(s) of paint. Where conditions are other than normal because of the weather or because painting must be done in confined spaces, longer drying times will be necessary. Additional coats of paint shall not be applied, nor shall be returned to service until existing paints are thoroughly dry.

Special care shall be taken when painting surfaces in contact with potable water or water in the treatment process so that adequate curing is accomplished. No paint or curing agents shall be used that could impart a taste, odor or discoloration to the water in the process. Manufacturer's instructions shall be strictly followed.

Where thinning is necessary, only the products of the manufacturer furnishing the paint or for the particular purpose shall be allowed; all such thinning shall be done strictly in accordance with the manufacturer's instructions, as well as with the full knowledge and approval of the Engineer. Where two or more coats are specified, the first coat shall be tinted a shade lighter than the following coat, and progressively to the color specified for the final coat, and subject to approval.

Paint both faces and all edges of doors which require painting. Doors between rooms having different finishes shall have edges finished to match the room the door opens into.

Knife-putty nail holes upon the priming coat with putty tinted to color of finished work. Putty full and flush with surrounding surfaces; thumb-puttying will not be permitted. Permit to dry and harden before applying next coat.

3.03 CLEAN-UP/TOUCH-UP WORK:

Upon completion, carefully remove all splatterings of paint material from adjoining work, glass, plumbing fixtures, trim and concrete surfaces. A detailed inspection of paint work shall be made and disfigured portions thereof shall be satisfactorily touched up or refinished to produce an acceptable job. All disused implements of service, rubbish and debris, resulting from the work shall be removed from the premises and the entire project left in a neat, clean, and acceptable condition.

3.04 WRITTEN APPROVAL OF COATINGS MANUFACTURER:

For all coatings to be applied to new and existing concrete, concrete block, plaster and

asbestos cement paneling, written approval shall be obtained from the coatings manufacturer for the items listed below. Three copies of this written approval shall be submitted to the Engineer after the coatings manufacturer has personally inspected each of the following conditions:

- A. Final surface preparation of all surfaces prior to coating application.
- B. Sequencing of application of coatings as to when each surface of each wall and ceiling shall be coated.

This is intended to keep the coatings manufacturer informed of the status of the job at all times so that he can govern the application process to be assured that all coatings are applied within his recommendations.

3.05 SUMMARY OF ITEMS TO BE PAINTED:

A summary of the items to be painted and stained under this contract is listed below. A description of acceptable painting systems follows this summary. Where colors are not listed, they shall be selected during the submittal procedure.

Item	Color	Paint System
Interior masonry walls	White	A4
Interior ceiling panels	White	E1
Metallic doors, louvers, and vent hoods	Match Bldg CMU	B2
Hoist Socket	Match City Hoist	B2
Exterior PVC piping	Match adj. surface	D1
Misc. ferrous items not listed elsewhere, shipped uncoated or prime coated	Match adj. surface	B2
Misc. ferrous items not listed elsewhere galvanized	Match adj. surface	B3
Interior wet well and transition manhole concrete surfaces (including floor, walls and ceiling)	Manufacturer's std.	F1
Ductile iron piping and accessories in the wet well	Manufacturer's std.	F2

3.06 PAINTING SYSTEMS BREAKDOWN:

Paint only those items listed in the above "Summary". Painting schedule is to be submitted for each of the systems which will be utilized.

- A. Concrete and Masonry Surfaces. Paint shall be similar and equal to that manufactured by the Tnemec Co. unless noted otherwise.
 - 1. Interior Concrete Block – (Semi-Gloss Polyamide Epoxy)

Surface Preparation. Concrete surfaces must be clean and free of excess dirt, mortar, paint, films, protective coatings, efflorescence, etc. in accordance with SSPC-SP 13/NACE 6. Substrate surface is to be sound, clean and free of dirt, loose mortar, paint, insulation, insulation glue and mastic films, protective coating, efflorescence, etc. Allow concrete and mortar to cure for a minimum of 14 days before coating. Patch any other defects as directed. If cleaning is necessary, prepare surfaces by etching with solution containing 1-part muriatic acid to 2 to 4 parts fresh water. Rinse with clean water under pressure while scrubbing with stiff brushes

or brooms. Test with Ph paper and continue rinsing until Ph of 7 or higher is obtained.

<u>Paint Name and No.</u>	<u>Dry Mil Thickness</u>	<u>Spreading Rate</u>
Block Filler: Series 130 Envirofill	N/A	80-100 sq. ft./gal.
Coat № 1 Series N69-Color H.B. Epoxoline	4.0 mils	277 sq. ft./gal.
Coat № 2 Series N69-Color H.B. Epoxoline	4.0 mils	277 sq. ft./gal.

B. Miscellaneous Metal Surfaces. Paint shall be similar and equal to that manufactured by Tnemec Co.

1. Interior/Exterior Railings, Metal Windows, Doors and Frames, Miscellaneous Metalwork (Not submerged, but exposed to moist atmosphere and/or sunlight and weather). (Aliphatic Polyurethane Semi-Gloss Enamel over Polyamide Epoxy)

Surface Preparation. Remove all grease, oils and contaminants. Remove all weld splatters and grind rough and sharp welds to smooth, rounded contour and blast clean to near-white blast finish (NACE № 2). Surface to be dry.

<u>Paint Name and No.</u>	<u>Dry Mil Thickness</u>	<u>Spreading Rate</u>
Coat № 1 High-Build Epoxoline N69	5.0 ± 1.0	175 sq.-ft./gal.
Coat № 2 Endura Shield 73	2.5 min. + 1.0	372 sq.-ft./gal.

2. Galvanized Steel and Nonferrous Metal Pipes and Surfaces. Paint shall be similar and equal to that manufactured by Tnemec Co.

a. Exterior Exposed

Surface Preparation: Remove all grease, oils and contaminants. Remove all rust from galvanized steel. Remove white rust from galvanized steel by hand or power brushing. Remove rust from old galvanized steel in accordance with SSPC-SP 2 or SP3. Do not damage or remove galvanizing. Lightly sand galvanizing to provide surface roughness as recommended by the manufacturer to achieve suitable bond.

<u>Paint Name and No.</u>	<u>Dry Mil Thickness</u>	<u>Spreading Rate</u>
Coat № 1 Series N69 Hi-Build Epoxoline	4.0 mils	225 sq. ft./gal.
Coat № 2 Series 73 Endura-Shield	3.0 mils	N/A

b. Interior Exposed:

Surface Preparation. Removal all grease, oils and contaminants. Remove all rust from galvanized steel. Remove white rust from

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galvanized steel by hand or power brushing. Remove rust from old galvanized steel in accordance with SSPC-SP2 or SP3. Do not damage or remove galvanizing. Lightly sand galvanizing to provide surface roughness as recommended by the manufacturer to achieve suitable bond.

<u>Paint Name and No.</u>	<u>Dry Mil Thickness</u>	<u>Spreading Rate</u>
Coat № 1 Series N69 Hi-Build Epoxoline	4.0 mils	225 sq. ft./gal.
Coat № 2 Series N69 High-Build Epoxoline	4.0 mils	225 sq. ft./gal.

- C. PVC Pipe and Fittings. Paint shall be similar and equal to that manufactured by the Tnemec Co.

1. Exterior Exposed

Surface Preparation: Ensure surfaces are clean, dry and free of oil, grease, dirt, dust, and other contaminants. Scarify the surfaces.

<u>Paint Name and No.</u>	<u>Dry Mil Thickness</u>	<u>Spreading Rate</u>
Coat № 1 Series N69 Hi-Build Epoxoline	3.0 mils	N/A
Coat № 2 Series 73 Endura-Shield	3.0 mils	N/A

- D. Wood, drywall, Masonite: Paint shall be similar and equal to that manufactured by Tnemec Co. or as specified herein.

1. Interior/Exterior

Surface Preparation. Remove all grease, oil and contaminants. Putty all nail holes. Sand smooth. Surface to be clean and dry.

<u>Paint Name and No.</u>	<u>Dry Mil Thickness</u>	<u>Spreading Rate</u>
Drywall:		
Coat № 2 151-Elasto-Grip	1.0 mils	400 sq. ft./gal.
For Wood:		
Coat № 1 10-99 White	3.0 mils	300 sq. ft./gal.
For Both:		
Coat № 2 Series 114 H.B. Tnemec-Tufcoat	5.0 mils	135 sq. ft./gal.

- E.

- F. Wet Well Protective Coatings: Blended Amine Cured Epoxy – spray applied. Designed specifically for immersed, non-immersed, corrosive environments, especially for headspace environments that are corrosive due to biogenic sulfide corrosion. Non-potable, specifically designed for long term use in wastewater environments. Coating is suitable for application on concrete and ferrous surfaces.

1. Concrete Surfaces Surface Preparation.

Surface preparation shall not begin until at least 30 days after the

concrete has been placed and allowed to dry to the moisture content recommended by the coating manufacturer. Moisture content may be tested by the Engineer or coating manufacturer.

Oil, grease, and form release and curing compounds shall be removed by abrasive blasting and chipping.

All coating termination and transition details shall be prepared in accordance with the coating manufacturer's standard detail drawings. This includes coating termination details, coating transitions at vertical and vertical to horizontal corners, coating terminations at joints, concrete crack treatment, pipe penetration treatment, coating terminations at metal embedments in the concrete substrate, and other details. The coating manufacturer's standard detail drawings shall be submitted for all such coating applications. If standard details are not available for a given detail treatment, the coating manufacturer shall be required to produce one at no additional cost to the Owner.

Concrete surfaces to be coated shall be abrasive blast cleaned to remove existing coatings, laitance, and deteriorated concrete. Surface Preparation must open up all shelled over air voids or bug holes to fully expose the void's depth, width, and length. Concrete shall be abraded to achieve a uniform concrete surface profile of CSP-5 in accordance with ICRI 310.2.

a. Paint Name:

Carboline Plasite 4500S; Sauereisen Sewergard 210S; Raven 400; Tnemec Series 435; or equal.

b. Thickness:

For Concrete: 60 mils DFT minimum, applied in one or more coats as recommended by the manufacturer.

c. Field Inspection and Testing:

General: The Contractor shall give the Engineer a minimum of 3 Days advance notice of the start of any field surface preparation or coating application, and a minimum of 7 Days advance notice of the start of any surface preparation activity.

Such Work shall be performed only in the presence of the Engineer, unless the Engineer has granted prior approval in writing to perform such Work in its absence. If the Contractor proceeds with preparation or coating without Engineer inspection or waiver of inspection, the Engineer may require removal and reapplication of the coating, which will be at the Contractor's sole expense.

Inspection by the Engineer, or the waiver of inspection of any particular portion of the Work, shall not relieve the Contractor of its responsibility to perform the Work in accordance with these Specifications.

Scaffolding shall be erected and moved to locations where requested by the Engineer to facilitate inspection. Additional

illumination shall be furnished on areas to be inspected.

Inspection Devices: The Contractor shall furnish inspection devices in good working condition for the detection of holidays and measurement of dry film thicknesses of coatings. Dry-film thickness gauges shall be made available for the Engineer's use while coating is being done, until final acceptance of such coatings. The Contractor shall furnish the services of a trained operator of the holiday detection devices until the final acceptance of such coatings. Holiday detection devices shall be operated only in the presence of the Engineer.

Holiday Testing: The Contractor shall test for continuity all coated surfaces. Areas that contain discontinuities shall be marked and repaired or recoated in accordance with the coating manufacturer's printed instructions and then be retested. The Engineer reserves the right to test a representative sample of surface area for both holidays and coating thickness at its discretion.

Holiday detection shall be performed in accordance with NACE RP0188. Pulse- type holiday detector such as Tinker & Rasor Model AP-W, D.E. Stearns Co. Model 14/20, or equal shall be used. The unit shall be adjusted to operate at the voltage required to cause a spark jump across an air gap equal to twice the required coating thickness.

Film Thickness Testing: On non-ferrous substrates, the coating thicknesses shall be measured at the time of application using a wet film gauge.

d. Holiday Repair:

Using a pencil grinder or other suitable power tool, remove the coating system at all pinholes or holidays in an area at least 2-inches in diameter or in both dimensions around the defect back to the concrete substrate.

Chip out and remove the concrete to expose the full dimensions in all three directions of the air void responsible for the defect.

Aggressively abrade or sand the intact coating system surface at least 3-inches beyond the removal area in all directions to produce a uniform 6 to 8 mil profile in the intact coating system.

Vacuum clean the prepared area to remove all dust, dirt, etc. leaving clean sound surfaces.

Tape to mask the periphery of the prepared intact coating area to prevent coating repair application onto the prepared area.

Using a putty knife or other suitable tool, fill the opened void with the approved filler/surfacer material completely and strike-off. Allow to cure per coating manufacturer's recommendations.

Apply the coating system in the number of coats necessary to achieve the specified 60 mils DFT over the defect and coating

removal area and feather the coating onto the abraded coated surfaces around the removal area to avoid a lip and to achieve a neat repair outline. Allow to cure properly.

2. Ferrous Surfaces (Ductile Iron Pipe and Fittings) Surface Preparation:

Workmanship for metal surface preparation shall be in conformance with the current SSPC Standards and this SECTION. Blast-cleaned surfaces shall match the standard samples available from the National Association of Corrosion Engineers, NACE Standard TM-01-70 – Visual Standard for Surfaces of New Steel Airblast Cleaned with Sand Abrasive and TM-01-75 – Visual Standard for Surfaces of New Steel Centrifugally Blast Cleaned with Steel Grit.

Oil, grease, welding fluxes, and other surface contaminants shall be removed by solvent cleaning per SSPC SP1 – Solvent Cleaning prior to blast cleaning.

Sharp edges shall be rounded or chamfered, and burrs and surface defects and weld splatter shall be ground smooth prior to blast cleaning.

Shop-applied coatings shall not be incorporated in the coating system. Shop-applied coatings shall be completely removed during the surface preparation process.

General ferrous metal surfaces shall be prepared in accordance with SSPC SP-5 (White Metal Blast Cleaning) to achieve a uniform surface profile of 3.0 to 3.5 mils. Blast Cleaning shall produce a minimum surface profile of 3.0 mils.

Cast or ductile-iron piping surfaces including fittings shall be prepared in accordance with NAPF 500-03, NAPF 500-03-04, and NAPF 50. Cast or ductile iron surfaces shall be abrasive blast cleaned to a clean, gray uniform metal appearance free of variations in color and loose materials.

Remove traces of grit, dust, dirt, rust scale, friable material, loose corrosion products or embedded abrasive from substrate by vacuum cleaning prior to coating application.

Care must be taken to prevent contamination of the surface after blasting from worker's fingerprints, deleterious substances on workers' clothing, or from atmospheric conditions.

- a. Paint Name: Same as specified for PART 3.06.E.1.a
- b. Thickness: For Ferrous Items: 30 to 40 mils DFT, applied in one or more coats as recommended by the manufacturer.
- c. Field Inspection and Testing: Same as specified for PART 3.06.E.1.b and:

Film Thickness Testing: On ferrous metals, the dry film coating thickness shall be measured in accordance with the SSPC Paint Application Specification No. 2 using a magnetic type dry film thickness gauge such as Mikrotest Model FM, Elcometer Model 111/1EZ, or equal. Each coat shall be tested for the correct thickness. No measurements shall be made until at least 8 hours after application of the coating.

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- d. Holiday Repair: As specified in PART 3.06.E.1.d, modified as recommended by the manufacturer for ferrous surfaces.

- END OF SECTION -

SECTION 11005 – GENERAL EQUIPMENT**PART 1 -- GENERAL****1.01 SCOPE:**

These General Equipment Provisions, which apply to all systems and equipment, are hereby made a part of each and all of the separate SECTIONS of this Specification. Contractor shall direct the attention of all Subcontractors and suppliers of mechanical and related appurtenances for the work to the provisions of the Contract Documents and this Specification.

1.02 MANUFACTURER'S EXPERIENCE:

Unless specifically named in the detailed specifications, a manufacturer shall have furnished equipment of the type and size specified which has demonstrated successful operation and is in regular use. Each manufacturer shall be represented by a local (Colorado) firm.

1.03 STANDARD OF QUALITY:

Items of equipment are specified by the name of a manufacturer for the purpose of establishing a standard of quality and acceptable experience. Substitute equipment will be acceptable if it can be demonstrated to the Engineer that the substitute is in strict accordance with the Specifications and equal in quality, type, function, efficiency, and standard of design to those models specifically named. Manufacturers specified have been determined by the Engineer to be capable of meeting or exceeding the minimum acceptable standard for the designated equipment style and model. Only one brand, kind, or make of material or equipment shall be used for each specific purpose throughout the work notwithstanding that similar material or equipment of two or more manufacturers may be specified for the same purpose. All materials and equipment incorporated in the work shall be new unless otherwise specified. Material and equipment not covered by detailed requirements in the Contract Documents shall be of the best commercial quality, suitable for the purpose intended, and approved by the Engineer prior to use in the Work. Where materials or equipment are referred to in the singular number, it is intended unless otherwise limited that such references shall be applied to as much material or equipment as is required to complete the Work. The recommendations and instructions of the manufacturers of products used in the Work are hereby made part of these Specifications, except when superseded by other requirements of these Specifications.

1.04 SUBMITTALS:

Contractor shall examine the details and data on each submittal to ensure that it complies with the requirements of the specifications. Submittals received by the Engineer without Contractor review acknowledgement will be rejected and returned immediately for amendment and resubmittal. Any approval by the Engineer of submitted data shall in no way relieve the Contractor of the responsibility of supplying equipment properly designed and manufactured to produce the quality, efficiency, and capability specified or implied.

- A. Storage and Installation Instructions. Submit manufacturer's storage installation instructions to the Engineer for approval prior to delivery of the equipment. The Contractor shall be responsible for following the manufacturer's installation and storage instructions, as approved by the Engineer, including the rotation of idle pumps and motors and all other items, until acceptance by the Owner. No

equipment shall be delivered unless such instructions have been approved by the Engineer.

- B. Manufacturer's product information and data for items listed herein of sufficient quantity to demonstrate compliance with the Specification requirements. Submit together with the associated equipment item specified elsewhere in these Specifications.
- C. Shop Drawings. Unless otherwise specified or directed, submit shop drawings for all mechanical equipment specified. Shop drawings shall be submitted to the Engineer in complete sets indexed by Specification paragraph and Drawing number describing the various equipment items or systems. An anchor bolt template shall be shown on the shop drawings and shall be furnished unless waived in writing by the Engineer.
- D. Documentation and certification of witnessed or non-witnessed factory test results.
- E. Operation and Maintenance Manuals. Prepare and submit required manuals covering all mechanical equipment and machinery.
- F. Operational Demonstration Testing Procedure Plan, as specified herein.
- G. Manufacturer's Certified Reports. Each major equipment manufacturer, or their authorized representative, shall submit a written report with respect to the furnished equipment certifying that:
 - 1. The equipment has been properly installed and lubricated under their supervision;
 - 2. The equipment is in accurate alignment;
 - 3. They were present when the equipment was placed in operation;
 - 4. The equipment has been operated and inspected under full load conditions and operated satisfactorily; and
 - 5. The equipment is fully covered under the terms of the guarantee.

1.05 GUARANTEE AND WARRANTIES:

The Contractor shall guarantee all equipment for a period of at least two (2) years from the date of final acceptance of the Work. In addition to the general guarantee requirements, equipment guarantee shall cover:

- A. Faulty or inadequate design;
- B. Improper assembly or fabrication;
- C. Defective workmanship or materials, and
- D. Leakage, breakage or other failure. It shall be the manufacturer's responsibility to ascertain the conditions and service under which the equipment will operate and to warrant that operation under those conditions shall be successful.

For equipment bearing a manufacturer's standard warranty in excess of two (2) years, or where a special warranty or guarantee period greater than two years is required in a specification section for specific equipment, furnish a copy of the warranty to Owner with Owner named as beneficiary. Any defects or failure within the guarantee period shall immediately be repaired or replaced by the Contractor at no additional cost to the Owner.

PART 2 -- PRODUCTS**2.01 MATERIALS AND WORKMANSHIP:**

All parts of the equipment shall be amply proportioned for all stresses that may occur during fabrication, erection, and intermittent or continuous operation. All equipment shall be designed, fabricated, and assembled in accordance with the best modern engineering and shop practices. Individual parts shall be manufactured to standard sizes and gages so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required by tests. Materials shall be suitable for service conditions and installation location.

2.02 EQUIPMENT ITEMS:

Refer to applicable sections in Divisions 11, 12, 13, 15, and 16 of these Specifications for specific equipment and mechanical work items.

2.03 DRIVE UNITS:

Provide drive units designed with an AGMA rating and service factor suitable for continuous duty service under operating load, constructed to preclude oil leakage around shafts. Thermal rating of each unit shall exceed the design load or proper cooling devices shall be provided. All drives shall be designed especially for the service for which they are to operate.

2.04 ELECTRIC MOTORS:

In accordance with Specification 11125.

2.05 LUBRICATION:

Provide and install lubricants of types recommended by equipment manufacturers to properly place equipment into operation. The Contractor shall furnish all equipment with the same type of pressure grease-gun fittings, provide a separate, lever operated grease gun for each type of grease required. Lubrication of equipment shall ensure constant presence of lubricant on all wearing surfaces. Lubricant fills and drain openings shall be readily accessible after installation.

2.06 NAMEPLATES AND DATA PLATES:

Provide corrosion-resistant nameplates of ample size with embossed lettering, fastened to equipment and drives in a prominent place with corrosion-resisting pins. On nameplates, display manufacturer, serial number, date of manufacture, model number and essential operating characteristics.

2.07 ANCHORS AND SLEEVES:

Provide anchor bolts of sufficient length to allow for 1-1/2 inches of grout under baseplates and adequate anchorage into structural concrete. Other specifically detailed lengths either shown or specified will supersede this requirement. Provide sleeves of at least 1.5 times the anchor bolt diameter and of the same material as the anchor bolts.

Anchor all motor-driven equipment with cast-in-place or drilled-in anchors set with epoxy adhesive. Expansion type anchors shall not be used for vibrating or motor-driven equipment.

Unless noted otherwise in the technical specification for specific equipment, provide

anchors and associated hardware complying with the following material requirements:

- A. Submerged locations and in corrosive areas (at a minimum, spaces with electrical classifications of Class 1 Divisions 1 and 2 shall be considered corrosive): Type 316 Stainless-steel.
- B. Moist locations, or buried in earth (at a minimum, any space wholly or partially underground, or having a wall or ceiling forming head space of part of a water channel or basin, shall be considered moist): Type 304 Stainless-steel.
- C. Dry locations, or outside exposed to the elements: Hot dip galvanized steel.
- D. When applicable, use other materials specifically identified in the specification sections for specific equipment or shown on the Drawings.

2.08 GROUT:

Non-shrink, high strength, inorganic, resistant to acids, alkalis, oil and water. Superior bond to steel and cured concrete. Five Star Grout manufactured by U.S. Grout Corporation, or equal.

2.09 SAFETY GUARDS:

Belts, chain drives, projecting set screws, keys, fan blades, couplings, exposed shafts and other moving or rotating parts located so that a person could come in contact therewith shall be enclosed or properly guarded on all sides with safety guards conforming to all Federal, State, and local codes and regulations pertaining; conform to the most restrictive requirements. Use corrosion-resistant materials at least equivalent to hot-dip galvanized steel, 16 USS gage or heavier, or 1/2-inch mesh galvanized expanded metal. Design guards for easy installation and removal. Provide necessary supports, accessories, and fasteners, of hot-dip galvanized steel or stainless-steel. Design guards in outdoor locations to prevent entrance of rain and dripping water.

Guards or thermal insulation shall also be provided for surfaces within reach of normal personnel access or movement that may have a temperature sufficient to burn human skin.

2.10 SPECIAL TOOLS:

For all equipment furnished, provide a complete set of special, non- standard, tools and keys necessary for adjustment, operation, and maintenance of the equipment. Label the tools as to which equipment they are applicable to and their use, and deliver to the Owner.

2.11 SPARE PARTS:

When identified in specification sections for specific equipment or mechanical items, provide indicated spare parts to the Owner. Spare parts shall be in the manufacturer's original packaging and with original labeling. Owner's written acknowledgement of receipt is required for project completion.

2.12 FINISHES:

Unless noted otherwise in the specification section for specific equipment, all equipment furnished, including drives and panels, shall have a complete protective coating system provided at the factory in accordance with the manufacturer's standard. The coating system shall be suitable for the proposed installation location and exposure. Complete systems shall include a prime coat and finish coat designed to provide protection from corrosion and the elements for the life of the equipment. Damage to the coating system

associated with shipping, installation or other mode prior to final acceptance shall be repaired at no additional cost in accordance with the manufacturer's instructions and recommendations.

If equipment is specified elsewhere to receive a field coat, comply with the applicable requirements of Specification 09900.

2.13 DISSIMILAR METAL CONTACT:

When installation of equipment or mechanical items will result in dissimilar metal contact between mating surfaces or interconnecting piping, provide suitable electrical insulation between surfaces to eliminate direct contact. Piping connections shall utilize dielectric couplings, unions, bushings, or flange insulation kits.

NOISE AND VIBRATION: Equipment, as installed, shall not create sound levels that are in excess of that permitted to OSHA for 8-hours per day of personnel exposure, unless noted otherwise in the specification for specific equipment. If the sound level cannot be achieved by the bare equipment, provide sound attenuating enclosures designed by the equipment manufacturer to maintain proper ventilation, access, and operation of the equipment.

Equipment that, when operating, has obvious excessive vibration shall be repaired or replaced as directed by the Engineer. Baseline vibration measurements shall be made if specified elsewhere for the specific equipment.

2.14 FACTORY TESTING:

Provide factory tests when required in the specification for specific equipment, noting that factory tests may be required in the standards referenced for the equipment. Factory tests shall be conducted at the same conditions and speeds at which the equipment will operate in the project.

If the factory tests are to be witnessed, provide 30 calendar days' notice so that arrangements can be made for the Engineer or Owner to witness the test. When non-witnessed tests are to be performed, submit certified test results.

PART 3 -- EXECUTION

3.01 ADAPTATION OF EQUIPMENT:

Proposed substitute equipment which requires alteration of other equipment, structures, piping, or other affected elements, existing or new, will be considered only if the Contractor assumes all responsibility for making and coordinating all necessary alternations. Engineer approval of all revisions to structures, mechanical, electrical, other equipment, or other work made necessary by such substitution shall be obtained and the cost of said revisions, including cost of redesign, shall be made at the Contractor's expense.

- A. Horsepower Ratings specified or shown for the proposed equipment are in accordance with the best information available to the Engineer at the time of design. In the event any equipment item proposed by the Contractor should require motors with larger horsepower rating than indicated on the Drawings or Specifications, it shall be the Contractor's responsibility to provide the proper control equipment, required modifications to motor control centers, starting equipment, feeder and branch circuits, and all other accessories and appurtenances as required to make the installation comply with the electrical code and to prevent excessive voltage drop without added cost to the Owner.

- B. The Contractor shall ensure that the materials and equipment to be furnished fit the space available, and shall make the necessary field measurements to ascertain the space requirements including those for connections. Where equipment to be furnished is installed in an existing enclosure or adjacent to existing equipment, the Contractor shall field verify the dimensions of existing equipment, location of conduits, piping, etc., and shall familiarize themselves with all existing conditions and constraints to be encountered in performing such work.
- C. All equipment must have a specified capacity, efficiencies, and operating characteristics at the elevation above Sea Level Datum of the project site identified on the Drawings. Minimum service factor shall be 1.15.

3.02 JOB CONDITIONS AND COORDINATION:

Drawings are diagrammatic and show the intended arrangement of principal apparatus, piping, and appurtenances. Conform to Drawings as closely as possible and exercise care to secure approved headroom and space conditions (including space needs for movement of personnel, maintenance access, disassembly, and opening of access doors or panels), neat arrangement of piping, valves, hangers, and like items, and to overcome structural and other interferences wherever encountered.

The Contractor shall take all measurements for the Work and associated installations, verify all subcontractor drawings, and be responsible for the proper installation, within the available space of the apparatus specified and shown on the Drawings. Submit written details and reasons for proposed deviations from Drawings and Specifications, and do not deviate therefrom unless authorized by the Engineer. If approved changes require alteration of structures or other related work, make such alterations as approved in advance by the Engineer at no additional cost to the Owner.

3.03 PRODUCT DELIVERY, STORAGE, AND HANDLING:

Box, crate, or otherwise enclose and protect equipment during shipment, handling, storage, and following installation so as to ensure the preservation of the required quality and fitness of all materials and equipment until final acceptance of the project. Keep equipment dry and covered from exposure to weather. Store pumps, motors, electrical equipment, controls, insulation, and equipment having anti-friction or sleeve bearings in weather-tight storage facilities. Lift large equipment items only at the points designated by the manufacturer. Protect factory painted surfaces against impact, abrasion, discoloration, and other damage. Repair damage as directed and approved.

3.04 EXAMINATION:

Inspect each item of equipment for damage, defects, completeness, and correct operation before installing. Inspect previously installed related work and verify that it is ready for installation of equipment.

3.05 EQUIPMENT:

Manufacturer's details and instructions shall be followed in the installation. Employ skilled craftsmen experienced in installation of the types of equipment specified. Use specialized tools and equipment, such as precision machinist levels, dial indicators, gages, and micrometers, as applicable to produce installations free of vibration, in proper alignment, and free of defects.

3.06 ANCHORS:

Deliver bolts with templates or setting drawings and verify that bolts are correctly located before structural concrete is placed. Use double nut with cut washers to level and plumb equipment.

3.07 BASE AND BEDPLATE GROUTING:

Do not place grout until initial fitting and alignment of connected piping is completed. Level and align equipment of the concrete foundations, then entirely fill the space under base or bedplates with the specified non-shrink grout. Bevel exposed grout at 45-degree angle, except round exposed grout at horizontal surfaces for drainage. Trowel or point exposed grout to a smooth dense finish and damp cure with burlap for three days. When grout is fully hardened tighten nuts on anchor bolts. Check the installation for alignment and level, and perform approved corrective work as required to conform to the tolerances given in the applicable manufacturer's instructions.

3.08 FIELD PAINTING:

When equipment is specified elsewhere to be field painted, comply with Specification 09900 for execution. Mask or otherwise protect nameplates and data plates, lubricated items, seals, shafts, and other items not to receive coating from being coated.

3.09 OPERATIONAL DEMONSTRATION:

Field services of the equipment manufacturer or their authorized and factory-trained representative shall be provided for installation support to the Contractor as necessary, and to check the finished installation and adjust equipment prior to startup and operational testing. The representative shall be experienced and knowledgeable of the installed equipment.

All equipment shall be field tested after installation and adjustment. All costs for manufacturer's field services and for performing operations demonstrations and system tests shall be included in the Contract Price, and no extra payment will be made to the Contractor for costs required to perform and complete the demonstrations and validation tests. Requirements specified herein are in addition to the demonstration and test requirements specified for specific equipment elsewhere in these Specifications. All testing shall be performed by the Contractor, with field support of the equipment manufacturer, in accordance with the submitted and approved procedure plans to demonstrate to the Engineer's satisfaction that all components are fully and properly completed and operable; and that all systems operate with the efficiency, repeatability, and accuracy indicated and specified. Test schedules shall be established to allow continuous inspection by the Engineer.

The Contractor shall demonstrate that the performance of installed equipment complies with all requirements indicated and specified. The Contractor and each respective equipment manufacturer's representative shall operate each equipment item through entire no-load to full- load range in accordance with the approved procedure for not less than 24 consecutive hours. Operate variable speed equipment to cycle through the applicable speed range at a steady rate of change. Induce simulated alarm and distressed operating conditions to test controls and protective devices for correct operation in adjusting system functions or causing system shutdown. Submit certified reports as specified herein.

3.10 TRAINING:

The Owner shall be provided instruction in the operation and maintenance of the equipment. This instruction period shall be scheduled at least 10 days in advance with the Owner. The final approved copies of operation and maintenance manuals must have been delivered to the Owner prior to the instruction.

- END OF SECTION -

SECTION 11125 – SUBMERSIBLE GRINDER PUMPS

PART 1 -- GENERAL

1.01 SCOPE:

This specification covers furnishing and installing, complete and tested, rail mounted submersible wastewater grinder pumps. Units shall be complete with discharge base elbow, quick removal mount, rail system, hoist chain, and all other appurtenances as specified or as shown on Drawings or required to make a complete and fully functioning system.

1.02 REFERENCES:

- A. American Society for Testing and Materials (ASTM)
- B. Hydraulic Institute Standards

1.03 CONTRACTOR SUBMITTALS:

In accordance with SECTION 01300 and SECTION 11050. Submit certificates of compliance with manufacturer's literature. The curves shall be developed for the individual pump and must include overall efficiencies. The curves shall show a flow capacity range from 0 to 125 percent of the maximum specified flow.

- A. The Contractor shall submit the following on all pump units:
 - 1. Motor horsepower for maximum load condition
 - 2. Shaft sizes
 - 3. Power factor at design load
 - 4. Motor efficiency at design load
 - 5. Wire to water efficiency at design load
 - 6. Shut off head in feet
 - 7. Safety Factor of drive system

Submit typical wet well installation drawings indicating dimensions and minimum clearances. Submit guide rail and other accessory data.

Submit certified non-witnessed factory performance testing in accordance with Hydraulics Institute Standards for each pump. Obtain approval from Engineer prior to shipment.

1.04 WARRANTY:

All items shall be covered by a minimum two (2) year warranty which shall cover 100% of shop labor and parts for the first two (2) years after Final Acceptance.

1.05 GENERAL:

Pumps shall be designed such that no damage will occur in the event of backflow through the pump. Pumps shall be constant speed. Motor horsepower provided shall be non-overloading throughout the entire pump curve.

Pump assembly, including motor, pump, and cable accessories shall be rated for Class 1, Division 1 hazardous environment, explosion proof, Groups C and D.

All pumps shall be of the same manufacturer.

Acceptable manufacturers and model numbers:

- A. Weil Model 2-2516 VFD (3450 RPM), 2-inch discharge, 6.25"Ø impeller.
- B. Pentair-Myers Model VSX50 (3PH) VFD (3450 RPM), 2-1/2-inch discharge, 4.75"Ø impeller.
- C. Or approved equal.

PART 2 -- PRODUCTS

2.01 DESIGN REQUIREMENTS:

- A. Design pumping equipment for the following conditions:
 - 1. Single pump design capacity: 70 GPM to 100 GPM
 - 2. Rated head at design capacity: 46' TDH to 54' TDH
 - 3. Pump operating speed: constant speed 3,450 synchronous
 - 4. Shut-off head: Not less than 72 feet
 - 5. Maximum motor HP: 6
 - 6. Pump discharge size: As required, 2-inch minimum
 - 7. Minimum solid passage size: N/A (Grinder)
 - 8. Power supply: 3 phase, 60 Hz, 208 VAC
 - 9. Minimum submergence for continuous operation: 18 inches above the wet well floor maximum. Additionally, pump shall be capable of intermittent operation below this level for the purposes of wet well self-cleaning.
- B. Pump(s) shall be capable of handling raw unscreened sewage and similar solids and rags/flushable wipes-laden fluids without clogging.
- C. Permanently install the discharge base and elbow in the wet well and connect to the discharge piping as shown on plans.
- D. Connecting of the pumping unit to the guide rail base shall be accomplished by a simple linear downward motion of the pump, without need for personnel to enter the wet well.
- E. The sliding guide bracket shall not be an integral part of the pumping unit and shall be a standard ASA flange dimension so the base is interchangeable with other pumps and not limited to a specific pump.
- F. No portion of the pump shall bear directly on the floor of the sump.
- G. The pump with its appurtenances and cable shall be capable of continuous submergence to a depth of at least 20 feet without damage.
- H. Pump construction shall be as follows:
 - 1. Case – Cast Iron
 - 2. Impeller – Stainless-steel.
 - 3. Rotating Cutter – Stainless-steel
 - 4. Shredder Ring – Stainless-steel

5. Stainless-steel Hardware
 6. Self-Cleaning Front Plate – High chrome cast iron.
 7. All external screws and fasteners shall be 316 or greater stainless-steel. Type 304 is not acceptable.
- I. Submersible motor construction shall be as follows:
1. Three Phase Motor
 - a. 3450 RPM
 - b. 60 Hz, 208 Volt
 - c. CUL/UL Explosion Proof Motor
 2. Double Seal – Tandem
 - a. Upper – Carbon against ceramic
 - b. Lower – Silicon carbide against silicon carbide
 3. Air Filled Hermetically sealed
 4. Shaft – Type 316 stainless-steel
 5. Motor Shell – Cast Iron
 6. Insulation – Class F
 7. Ball Bearings – 2 – Double sealed
 8. Power cable length – 50 feet
 9. All external screws and fasteners shall be Type 316 stainless-steel. Type 304 is not acceptable.
 10. Minimum motor service factor to be 1.15.
 11. Motor shall be rated explosion proof by Factory Mutual, and comply with NEC requirements for Class 1 Division 1 locations.
 12. Pump and motor protection: Provide moisture detection probes located between the mechanical seals or float switch in the stator chamber. Provide automatically-resetting thermal sensors embedded in the motor windings. Relays for the protection devices shall be provided by the pump manufacturer or shall be guaranteed by the Contractor to be compatible with each pump in accordance with the pump manufacturer requirements. Install in the pump starter enclosure.
- J. Factory Coating: Pump, motor, and accessories shall be factory applied and finish coated in accordance with the manufacturer's standard.

2.02 SPECIAL NON-CLOG FEATURE:

No non-clog features are required by the City of Glenwood Springs for this project.

2.03 RAIL MOUNTING SYSTEM:

Each pump shall be furnished with quick-disconnect discharge floor elbow, Schedule 40 pipe guide rails, upper guide rail bracket(s) for mounting to the wet well lid, intermediate guide rail bracket(s), rail-guided lifting assembly, sub base and studs for floor elbow, level controls, and lifting chain or cable of sufficient strength to raise and lower pump. Provide

intermediate guide rail support brackets spaced as recommended by the pump manufacturer.

All guide rail components and fasteners shall be Type 316 stainless-steel. Coated ductile iron is acceptable only when stainless-steel is not an option. Contractor and supplier shall note that Type 304 stainless-steel is **not** an acceptable substitute for Type 316 and shall not be submitted or supplied.

2.04 ACCESSORIES:

- A. Pressure Gauges: Provide wafer ring-style analog discharge pressure gauges for each pump with features and accessories in accordance with SECTION 15200. Gauges to be located in the control building upstream of the check valve. Pressure range shall be 0 to 100 psig.
- B. Hydrostatic Level Sensors: Provide two (2) complete hydrostatic level sensor units, consisting of sensing element and transmitter. Transmitters to be furnished with the Control Panel. Sensing element shall be rated for use in explosion hazard, corrosive wastewater environments, Class 1 Division 1. Endress + Hauser Waterpilot FMX21 with flush mounted process isolating diaphragm (42mm/1.65"Ø) and mounting clamp, or City-approved equal.
- C. Float Switches: Weighted cable type. Polypropylene float with integral switch, PVC-coated cable. Activation level shall be adjustable by movement of the weight along the cable or adjustment of the height at the cable attachment point. Relays shall be intrinsically safe where installed in hazardous locations. Flygt, Conery, or equal.
 - 1. High level floats shall be normally closed (closed when float is down), open when float moves up to high level.
 - 2. Low level floats shall be normally closed (closed when float is up), open when float moves down to low level.

2.05 SPARE PARTS:

Each pump unit shall be provided with the following spare equipment with instructions:

- A. One complete mechanical seal assembly kit,
- B. One volute case wearing ring or wear plate,
- C. One set of gaskets and O-rings.

2.06 CONTROLS:

See SECTIONS 16050 through 16951.

PART 3 -- EXECUTION

3.01 INSTALLATION:

Equipment and accessories shall be installed in strict conformance with the manufacturer's installation instructions.

3.02 MANUFACTURER'S FIELD SERVICES:

The manufacturer of the pumps shall supply a certified factory trained field service engineer to thoroughly check and inspect the pumps after installation, place the pumps in operation and make necessary adjustments, and instruct Owner's personnel in proper

operating and maintenance procedures.

3.03 PUMP CONTROL DESCRIPTION:

See SECTIONS 16050 through 16951.

3.04 PUMP PERFORMANCE TESTS:

Provide field quality testing in accordance with General Equipment Technical Specification 11005.

- END OF SECTION -

SECTION 15200 – INTERIOR PROCESS PIPING**PART 1 -- GENERAL****1.01 SCOPE:**

The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories, and performing of all operations needed for the construction of all interior piping, piping under structures and through walls, and piping to the outside of a wall pipe of any structure, or as shown on the Drawings.

Due to the diagrammatic nature of the Drawings, not all offsets, fittings, etc. which may be required may be shown. The Contractor shall furnish, install, and test pipe, pipe supports, fittings, specials, and all required appurtenances as shown on the Drawings and as required to make the entire piping system properly assembled and operable. Space requirements and locations of connections of equipment the Contractor proposes to furnish shall be fully investigated and vetted prior to ordering equipment or releasing items for fabrication. The Contractor shall not scale off the drawings to cut pipe or as a basis for making connections to equipment. Piping layouts or appurtenances which will not enter the openings or which will not adequately fit the assigned space will not be acceptable. All drawings relating to the construction, including architectural, structural, electrical, plumbing, piping, heating and ventilating, together with these specifications shall be considered collectively.

1.02 REFERENCES:

- A. American Society for Testing and Materials (ASTM)
- B. American National Standards Institute (ANSI)
- C. American Water Works Association (AWWA)
- D. Federal Specifications (FS)
- E. International Plumbing Code (IPC)

1.03 CONTRACTOR SUBMITTALS: IN ACCORDANCE WITH SECTION 01300, SUBMIT:

- A. Certificates of compliance.
- B. Shop drawings, complete with dimensions and elevations, material, grade and class on all pipe, fittings, and couplings and on all joints, coatings, and appurtenances.
- C. Detailed catalog and engineering data sheets for all items, components, and appurtenances, of sufficient quantity and content to demonstrate conformance with the specification requirements. Highlight or identify items proposed for use. Cross out extraneous items.
- D. Proposed pipe support plan for all piping, except where pipe supports are specifically detailed on the Drawings.
- E. Proposed schedule for delivering and installing the piping systems.
- F. Manufacturer's installation instructions and recommendations.
- G. Test results.

1.04 PRODUCT HANDLING:

- A. Pipe, fittings, valves, and all other accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage to them. Under no circumstances shall any materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground. Skidding which damages protective coatings or primers will not be permitted.

All pipe and fittings shall be so handled that the coating and lining will not be damaged. If, however, any part of the coating or lining is damaged, the repair shall be by the Contractor at their expense in a manner satisfactory to the Engineer. Any area damage beyond repair must be cut off and discarded.

- B. Examination: All piping components and accessories shall be field inspected at the job site and checked for conformance to these specifications. Pipe and fittings will be checked for out-of-round or damaged joints, interior and exterior surface damage, gasket damage and the other requirements listed herein. Any pipeline or appurtenant material found defective will be rejected. Any material rejected at the job site shall be marked "Rejected," and the Contractor shall remove it immediately from the job site.
- C. Do not store materials directly on the ground. Polyvinyl chloride (PVC) pipe shall be stored under opaque cover that does not transmit UV light.

PART 2 -- PRODUCTS**2.01 GENERAL:**

All pipe, fittings, couplings, and appurtenant items shall be new, free from defects or contamination, and wherever possible shall be the standard product of the manufacturer. They shall be furnished in pressure or thickness classes as specified or shown. All pipes shall have joints as called for in the specifications or indicated on the Drawings.

2.02 HARDWARE MATERIALS:

All hardware used for the assembly of piping systems, flanges, joints, and appurtenances (including coupling bolts, tie rods, mechanical restraint systems, and the like) shall be Type 316 stainless-steel.

2.03 DUCTILE IRON PIPE:

- A. Pipe: Ductile iron pipe shall comply with AWWA C151/ANSI A21.51. Unless shown otherwise on the Drawings, provide Thickness Class 53 except that piping through concrete encasements, below slabs or structures, within sludge or sewage containing vessels, or otherwise inaccessible shall be Thickness Class 55.
- B. Joints: Ductile iron pipe shall be flanged, push-on, or mechanical joint as shown on the Drawings. In general, flanged pipe shall be used above ground or where exposed, while restrained push-on or mechanical joint will be used where buried in earth.

Flanged joints shall conform to AWWA C115/ANSI A21.15 and ANSI B16.1 Class 125, except provide Class 250 when specifically shown on the Drawings or required for connection to equipment. Flanges shall be accurately shop faced and drilled true. Where tap or stud bolts are shown or otherwise required, flanges shall be tapped. Flanged pipe joints shall be made with full face gaskets

of cloth inserted rubber compound, not less than 1/8-inch in thickness. EPDM compound shall be provided for sewage service. Gaskets shall be rated for at least 1.5 times the specified test pressure of the pipeline.

Mechanical joints shall conform to AWWA C111/ANSI A21.11. Gaskets shall be EPDM compound.

- C. Fittings: Ductile iron. Comply with AWWA C110 or C153. Joint type and pressure rating shall match those specified for the adjacent pipe and as shown on the Drawings. Wall pipe shall have collars integrally cast. Collars shall be located so as to be in the center of the concrete wall or floor into which they are to be placed.
- D. Exterior Coating: Piping and fittings buried in earth and exposed within the valve vault shall be furnished with asphalt coating per AWWA C151. Piping and fittings to be installed in submerged locations shall be supplied by the factory bare, for shop blasting and application of the specified submerged protective coating system. Asphalt coated pipe shall not be used in submerged locations.
- E. Interior Lining: Piping and fittings conveying raw sewage shall be lined with ceramic epoxy; Protecto 401 as manufactured by U.S. Pipe, or approved equal.
- F. Joint Restraint: All pressurized ductile iron piping systems shall be fully restrained against thrust. Flanged connections are considered fully restrained. Push-on or mechanical joints shall be restrained through the use of concrete thrust blocking in accordance with the details shown on the Drawings and mechanical restraining systems as follows:

Push-on joints: Restraint ring with serrated wedges on the spigot end of the pipe, with a split bell ring that engages behind the bell without serrations on the other. Ductile iron construction per ASTM A536 with protective coating, hardware material as specified elsewhere herein. EBBA Iron Megalug Series 1700 or approved equal with stainless-steel hardware.

Mechanical joints: Restraint ring with serrated wedges and incorporating a follower gland, designed to bolt to a mechanical joint drilling pattern. Ductile iron construction per ASTM A536 with protective coating and stainless-steel hardware material as specified elsewhere herein. EBBA Iron Megalug Series 1100 or approved equal.

2.04 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS FOR PRESSURE SERVICE:

Plastic pipe and fittings for pressure service, 4-inches and smaller in diameter, shall conform to the following requirements.

- A. PVC Compound: Rigid, non-plasticized compound for pipe and fittings shall conform to the requirements of ASTM D1784, Class 12454-B with a minimum specific gravity of 1.35.
- B. Pipe: Pipe shall conform to the requirements of ASTM D1785, Schedule 80, Type LV, Grade 1, white in color, and the fiber stress for deriving the short-time burst pressure requirement in accordance with Table 6, therein, shall not be less than 6,000 psi at 73.4°F. Pipe shall bear National Sanitation Foundation Seal for potable water pipe and shall be marked with class, size, pressure rating, and name of manufacturer.

- C. Fittings: Fittings shall be the same material as the pipe, white in color, and Schedule 80 conforming to the requirements of ASTM D2467.
- D. Joints: Joints for pipe and fittings shall be solvent welded, except as otherwise indicated on the Drawings or specified herein. Solvent cement and primer shall be as recommended by the pipe manufacturer for the schedule and size to be joined, and meet the requirements of ASTM D2564 and ASTM F656.

Flanges, where indicated or necessary for the connection of equipment or accessories, shall be of the same material as the pipe. Hardware material for use with PVC flanges shall be as specified elsewhere herein. Gaskets for flanged connections shall be of a Teflon envelope with a non-asbestos fiber or high polyment chloride resin core.

Provide threaded adapter fittings where indicated or required for connection to equipment or accessories. Use Military Specification T 27730A tape for threaded joints.

Unions shall be Schedule 80, have solvent weld end connections, threaded with O-ring gaskets.

2.05 COPPER TUBING AND FITTINGS:

- A. Materials: Copper piping shall be seamless copper tubing, hard-drawn conforming to the requirements of ASTM Designation B88, Type L where exposed, and Type K for buried service. Connection between pipes of dissimilar materials shall be made with the appropriate transition coupling including insulation for jointing pipes with potential galvanic reaction.
- B. Fittings: Fittings shall be compression and hard-solder type as required. Flared type shall be Parker-Hannefin Triple-Lock, American Brass Anaconda, Imperial-Eastman High-Seal, or equal. Hard solder fittings shall be wrought copper or cast brass conforming to the requirements of ASTM Designation B62. Solder and flux shall be NSF 61 approved and contain less than 0.2% lead.
- C. Hangers and Supports: Where copper piping are in direct contact with metal pipe supports, a protective copper saddle shall be soldered to the underside of the pipe. Saddles may be of split copper pipe. Alternatively, provide felt or rubber-lined hangers designed for use with copper piping to provide galvanic isolation. Channel support clamps shall be Unistrut "Cush-A-Clamp" or equivalent.

2.06 SMALL PIPING VALVES:

In general, small piping valves 4-inches and smaller in diameter shall be suitable for use with the contents being transported. Water piping valves shall be bronze complying with ASTM B62 with screwed end connections.

- A. Plug valve: See SECTION 15215.
- B. Globe valves shall be of bronze disc type with 125-pound rating and repackable while under pressure, and shall be similar and equal to Stockham Fig B 13TC.
- C. Check valves: See SECTION 15215.
- D. Corporation stops to be all bronze with tapered inlet threads with pipe outlet depending on service line materials. Stops shall be approved equal to Ford Series F-1000. Saddles will be required in all PVC pipe. Saddles will be required on ductile-iron pipe in accordance with the standards established by the

Ductile-Iron Pipe Research Association.

- E. Ball valves in metallic piping shall be bronze body, chrome-plated ball with Teflon seats, threaded joint connections, lever actuator and 400 psi WOG rating. Ball valves shall be Apollo 70-100, Watts B-6000, or approved equal.
- F. Ball valves in PVC piping shall be PVC body, Teflon seats, Viton O-ring seals, solvent welded end connections with integral unions, rated for 150 psi at 74 degrees F. Asahi Pro Block, R&G Sloane, or approved equal.

2.07 EXPANSION JOINTS:

Expansion joints shall be a rubber spool type of a single, filled wide arch design (full bore). Joint construction shall consist of an elastomer tube and cover, reinforced with a suitable woven fabric and steel rings support. Tube and cover elastomers EPDM. Joints shall be designed to meet a minimum design pressure of 200 psi and 250 degrees F.

Expansion joints ends shall be flanges drilled to 150# Class standards, and be full rubber faced and integral to the body. Split flange backing rings of Type 316 stainless-steel shall be provided.

Expansion joints shall be capable of accommodating piping system and equipment movements and vibration as needed.

Control units with tie rods of Type 316 stainless-steel shall be included to prevent overextension of the expansion joints from pressure thrust loads. The number and size of the control rods shall be sufficient for the maximum system test pressure.

Use Flexicraft Industries, Ultraspool Model.

2.08 FLEXIBLE COUPLINGS:

Flexible couplings shall be the types below as shown on the Drawings or as otherwise permitted by the Engineer. The flexible couplings shown on the Drawings are the minimum required; the Contractor may add as many as required to expedite the work subject to approval by the Engineer. Couplings shall provide the requisite pipe flexibility without jeopardizing pipe joint integrity due to hydraulic thrust or location of pipe supports, and shall have the same pressure-rating as the pipe. Couplings shall comply with AWWA C219 and have all metal bearing surfaces. Hardware shall comply with the materials specified elsewhere herein based on installation location. EPDM or NBR gaskets shall be used for raw sewage service.

- A. Sleeve Type Couplings shall be properly gasketed and shall be of the diameter and type recommended by the manufacturer to fit the outer diameter and type of pipe to which it is connecting. Each coupling shall consist of a ductile iron or stainless-steel middle ring, 2 ductile iron or stainless-steel followers, 2 gaskets, and the necessary Type 316 stainless-steel hardware to compress the gaskets. The couplings shall be Smith Blair 411, 413, or 441 (as appropriate for the pipe type and pressure rating), or approved equal. Couplings to be fusion epoxy lined and coated. Polyethylene encase when buried in earth.
- B. Flanged Coupling Adapters (FCA) shall have a ductile iron body and flange, EPDM gaskets, anchor studs and Type 316 stainless-steel hardware as required to compress the gaskets. Flange shall be compatible with the flange to which it will mate. Fusion epoxy line and coat. Flanged coupling adapters shall be Smith Blair Model 912 or approved equal.

- C. Restraint: Flexible couplings shall be fully restrained against thrust unless the Engineer has given written approval to omit this feature for specific cases.

Exposed locations: Restraints shall consist of tie rod restraint harnesses as specified elsewhere herein. Megalug style serrated wedge restraint systems shall not be used unless specifically approved by the Engineer in writing. Anchor studs or set screws shall not be used for restraint.

Buried locations: Couplings shall be restrained by the use of concrete thrust blocks in accordance with the details shown on the Drawings. Only when specifically allowed by the Engineer in writing, or if specifically shown on the Drawings, mechanically restrained couplings may be substituted for thrust blocking. Buried mechanically restrained couplings shall be ductile iron in accordance with ASTM A536, with protective coating system. Hardware and bolts shall be as specified elsewhere herein for buried locations. Polyethylene encase in accordance with AWWA C105. EBBA Iron Series 3800 or approved equal.

2.09 PIPE HANGERS AND SUPPORTS:

All pipe supports are not shown on the Drawings. The Contractor shall be responsible for design and layout of hangers and supports. Pipe hangers, brackets, saddles, clamps and other supports shall be adjustable type conforming to the requirements of ANSI B31.1, SECTION 6. Supports shall have ample strength and rigidity to resist the hydraulic thrusts at changes in direction and at dead ends as well as the dead weight loads and the contents carried. Supports shall maintain required grade, prevent vibration, and allow expansion and contraction. Computations showing adequacy of hangers and supports to meet these requirements shall be submitted with the shop drawings.

- A. General: Hangers and supports shall include all hanging and supporting devices of metallic construction shown, specified, or required for pipe lines, apparatus, and equipment other than electrical equipment. The Contractor's working drawings, as required herein, shall show the quantity, type, design, and location of all hangers and supports required under the various contract items.

Except where otherwise shown, specified, or required, hangers, supports, anchors and concrete inserts shall be the standard types as manufactured by Crane Co., Anvil International, Fee and Mason Manufacturing Co., or equal meeting the requirements specified herein. Unless otherwise approved by the Engineer, all hangers, supports, and concrete inserts shall be listed with the Underwriters' Laboratory. Chain or perforated strap hangers will not be permitted.

- B. Design: Hangers and supports shall be adequate to maintain the pipelines, apparatus, and equipment in proper position and alignment under all operating conditions. Supports shall be provided so that no weight shall be transmitted to any equipment to which the piping is connected and have springs where necessary. Hangers and supports shall be of standard design where possible, and be best suited for the service required, as approved by the Engineer. Where required, they shall be screw adjustable after installation. Supporting devices shall be designed in accordance with the best practice and shall not be unnecessarily heavy. Sufficient hangers and supports shall be installed to provide a working safety factor of not less than 12 for each hanger, assuming that the hanger is supporting 12 linear feet of pipe filled with water.

- C. Supports for PVC Piping: Rigid plastic piping normally shall be supported by the same type of hangers used with metallic pipe. Support spacing shall be based on the plastic pipe manufacturer's recommendations for the service conditions but not greater than 5 feet on center. Flexible plastic tubing or rigid plastic pipe operating at temperatures high enough to materially lower its strength, shall be supported continuously by light metallic angles or channels and special hangers.
- D. Floor Pipe Support Stands: Floor pipe support stands shall be of the two-piece, full circle adjustable type. Each stand shall consist of a length of wrought pipe fitted at the base with a standard screw threaded cast iron flange and at the top with an adjustable saddle or roll. The base flange shall be bolted to the floor or foundation. Stanchions shall be of similar construction to the floor pipe support stand, except that they shall be fitted at the top with a two-piece, full circle saddle clamp. Where adjustable supporting devices are not required, pipe lines 3-inches in diameter and smaller may be supported on approved cast iron, malleable iron, or wrought steel hooks, hook plates, ring or ring plates.
- E. Pipe Anchors: Anchors shall be furnished and installed where specified, shown, or required for holding the pipe lines and equipment in position or alignment. Pipe anchors shall be designed for rigid fastening to the structures, either directly or through brackets. The design of all anchors shall be subject to approval by the Engineer. Pipe anchors shall be fabricated of materials as specified below based on installation location.
- F. Inserts: Inserts for concrete shall be furnished and installed in the concrete structures where required for fastening supporting devices. Coordinate with all trades as required to ensure inserts are included with the cast-in-place concrete work, or casting yard if structures are to be precast. They shall be designed to permit the rods to be adjusted to hang vertically. Nail slots shall be provided in the exposed flanges of the insert. Inserts shall be designed to carry safely the maximum load that can be imposed by the rod which they engage. Materials of fabrication shall be as specified below based on installation location.
- G. Materials: Hangers and supports of metallic construction shall conform to the requirements specified herein and to the following standards:
 - 1. Structural Steel ASTM A36 and A283
 - 2. Steel Bars (Grade 1022) ASTM A575
 - 3. Steel Castings (Grade N-1) ASTM A27
 - 4. Wrought Steel Pipe (Grade A, Schedule 40) ASTM A53
 - 5. Cast Iron Pipe Fittings (Class 125) ANSI B16.1
 - 6. Malleable Iron Castings ASTM A47
 - 7. Bolting Materials, Steel
 - a. Bolts, Yokes and Stud Bolts ASTM A307
 - b. Nuts ASTM A563
 - c. Physical requirements:
 - 1) Tensile strength 60,000 psi minimum
 - 2) Yield strength 48,000 psi minimum

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- 3) Elongation 27 percent maximum
 - 4) Reduction of area 35-55 percent
 - 8. Bolting materials, silicon bronze
 - a. Bolts, stud bolts yokes and nuts (alloy A) ASTM B98
 - b. Physical requirements:
 - 1) Tensile strength 70,000 psi minimum
 - 2) Yield strength 38,000 psi minimum
 - 3) Elongation 17 percent maximum
 - 9. Bolting materials, stainless-steel
 - a. Bolts, stud bolts and nuts (Type 304/316) ASTM A276
 - b. Physical requirements:
 - 1) Tensile strength 75,000 psi minimum
 - 2) Yield strength 30,000 psi minimum
 - 3) Elongation 35 percent maximum
 - 4) Reduction of area 45 percent
 - 10. Where specified or shown, bolts, stud bolts, rods, yokes and nuts of hangers and supports shall be of silicon bronze or stainless-steel as specified above with dimensions, threads and sizes equivalent to those specified in steel.
 - 11. Provide support systems, including anchorages, of the following materials, as specified above, based on installation location:
 - a. Interior dry locations, or exterior above grade: Hot dip galvanized steel or Type 304 stainless-steel (excludes wastewater pipe supports). Wastewater pipe supports shall be Type 304 stainless-steel.
 - b. Moist locations (at a minimum, any interior or exterior space wholly or partially below grade level including vaults or pits, or having a wall or ceiling forming head space of part of a water channel or basin, shall be considered moist): Type 304 stainless-steel.
 - c. Submerged locations (in raw or potable water): Type 304 stainless-steel.
 - d. Submerged locations (in raw sewage or process fluids) and in corrosive areas (at a minimum, spaces with electrical classifications of Class 1 Division 1, and in chemical storage and pumping areas, shall be considered corrosive): Type 316 stainless-steel or silicon bronze.
- H. Brackets for Piping: Brackets for support of piping from walls and columns shall be fabricated from materials specified herein based on installation location.

When brackets are designed to support 1500 lbs. or more, back plates of adequate size and thickness shall be furnished and installed to distribute the load against the wall. When used on concrete walls the back plates shall be cast in the concrete. Where the use of back plates is not practicable, the brackets shall be fastened to the wall in such a manner that the safe bearing strength of the wall will not be exceeded. Pipe rolls or chairs shall be of the cast iron type. Pipe rolls shall be provided with threaded rods.

- I. Spacing of Hangers: In some cases, more stringent requirements are indicated on the Drawings or elsewhere in these Specifications, but in no case shall the spacing of hangers exceed ten feet.
- J. Where concentrations of valves, fittings and equipment occur, closer spacing of supports will be required. In no case shall any total hanger load (weight of piping, insulation, and contents) exceed the following (based on load carrying capacities of hot rolled steel rod per ASTM A575. Load capacities shall be adjusted accordingly for other materials of construction).

<u>Nominal Rod Diameter-inches</u>	<u>Maximum Safe Load-Pounds</u>	<u>Nominal Rod Diameter-inches</u>	<u>Maximum Safe Load-Pounds</u>
1/4	1,130	1-1/8	6,230
3/8	1,810	1-1/4	8,000
1/2	2,710	1-3/8	9,470
3/8	3,770	1-1/2	11,500
1	4,960	1-3/4	15,400

2.10 TIE ROD HARNESS (THRUST) RESTRAINTS:

Where specified herein or required or shown on the Drawings for thrust restraint of piping accessories in exposed (unburied) locations, provide tie rod harness restraints. Restraints shall be consistent with AWWA Manual M11, Chapter 13. Hardware and rod materials shall be as specified elsewhere herein based on installation location.

Provide flange lugs ("dog ears") attached to the nearest flanges on each side of the item to be restrained for anchorage of the tie rods. Tie rods shall not anchor directly to flange bolt holes. Flange lugs shall be fabricated from 3/4-inch thick structural steel plate and designed to fit the flange and bolt pattern of the flanges to which they are attached. Provide at least 2 tie rods per restraint, spaced equally around the pipe. Tie rods shall have a minimum yield stress of 46,000 psi. Double nut all tie rods to prevent loosening under vibration.

Megalug style serrated wedge restraint systems shall not be used as a substitute for tie rod harness restraints unless specifically approved by the Engineer in writing. Anchor studs or set screws shall not be used for restraint.

2.11 ANALOG PRESSURE GAUGES:

Pressure gauges shall have 4-1/2-inch dial with white face, 1/2-inch MPT bottom connection, phenolic turret case, liquid filled phosphor stainless-steel bourdon tube. Accuracy shall be 1/2 percent of full scale. Each gauge installation shall include the gauge, Type 316 stainless-steel isolation valve, Type 316 stainless-steel pulsation snubber and a glycol or glycerin-filled bolt-through isolation ring sandwiched between pipe flanges (Ashcroft Type 81, or equal). Ring liner to be EPDM and metals to be Type 316 stainless-

steel. Gauges shall be mounted vertically. All gauges and accessories shall be supplied by the same manufacturer. Gauges shall be as manufactured by Ashcroft, U.S. Gauge, or approved equal.

Pressure range of the gauge shall be as specified in the applicable equipment specifications.

Pressure switches, transducers, and transmitters are specified elsewhere in the Specifications, if applicable.

2.12 FLOOR PENETRATION SEALS:

Wastewater pipes penetrating the control building floor shall be sleeved and sealed using a watertight manufactured sleeve seal system. Use Thru Wall and Floor Seals by O-Z/Gedney, or approved equal. All sleeves shall be cast-in-place with the concrete.

2.13 WALL PENETRATION SEALS:

All pipes penetrating the wet well shall be sleeved and sealed using a modular elastomer sealing system that creates a permanent hydrostatic seal. Use GPT Industries Link-Seal seals with HDPE Century-Line sleeves, or approved equal. All sleeves shall be cast-in-place with the concrete.

2.14 FLOOR DRAIN:

Floor drains shall be 8-inch minimum top round or square 304/316 stainless-steel, 4-inch diameter bottom outlet, with 2-1/2 inch deep slotted removable sediment bucket. Install floor drains at low points of the surface areas to be drained. Set grates of drains depressed 1/4 inch below adjacent finish floor. Install floor drain flashing collar or flange so that no leakage occurs between the drain and the adjoin flooring. Maintain integrity of waterproof membranes where penetrated.

PART 3 -- EXECUTION

3.01 GENERAL:

- A. Care and Handling of Materials: All materials shall be carefully handled in all steps of fabrication, storing, loading, transporting, unloading, storing at the site, and installation, using the means and following the procedures approved with the shop drawings.

Pipe slings used during handling, and tie-down straps during transit shall be not less than 4-inch wide flat fiber or plastic straps. During storage and in transit, pipe 8-inches and larger shall be rested on saddles or on another support system approved by the Engineer, which will ensure freedom from damage of the barrel, interior lining, and exterior coating. Not less than 3 saddles or other longitudinal pipe supports shall be used during transit.

- B. Installation:

1. The different kinds of buried and above ground piping shall be installed in accordance with the Drawings, these specifications, and the procedures and methods approved with the shop and erection Drawings. Piping carrying liquids shall be installed without high points which could trap gasses and shall be kept below the static water level of the items which they connect. The interior of pipe, fittings, and couplings shall be clean and free from contamination when installed and effective means shall be

taken to prevent the entrance of foreign matter during progress of the work. The types and sizes of pipes and fittings to be used shall be as specified herein and as shown on the Drawings. Where required fittings are omitted from the Drawings, they shall be the same size as the piping and in all cases shall conform to the plumbing code requirements.

2. All pipe shall be carefully placed and supported at the proper lines and grades and where practicable shall be sloped to permit complete drainage. Piping runs shown on the Drawings shall be followed as closely as possible, except for minor adjustments to avoid architectural and structural features or to suit the type or make of approved equipment purchased by the Contractor. If relocations are required, they shall be subject to the approval of the Engineer. Provisions for maximum flexibility are not always shown and the Contractor may add flexible joints where required and approved by the Engineer. Exposed pipe shall be run parallel with or at right angles to the adjacent walls and floors, unless shown differently on the Drawings.
 3. All piping shall be installed as closely as possible to walls, ceilings, columns, beams, and equipment (consistent with proper space requirements for maintenance and operational appurtenances) so as to occupy the minimum of space, and all offsets, fittings, etc., required to accomplish this must be furnished by the Contractor at their own expense.
- C. Joints: In erecting the pipe, a sufficient number of screw unions or flanged joints shall be used to allow any section or run of pipe to be disconnected without taking down adjacent runs. Screw unions may be employed on pipelines 3-inches in diameter and under. Flanged joints shall be employed on pipe 4-inches in diameter or larger unless otherwise shown on the Drawings. Dielectric unions or flange insulation kits are to be installed at the junction of dissimilar metals.
- D. Verification of Dimensions: All dimensions essential to the correct location of the pipe, or fit of piping at equipment and valves, or to the proper location and orientation of pipe sleeves and wall castings, or to the avoidance of obstructions or conflict with other improvements, shall be accurately determined by the Contractor prior to fabrication of the piping involved. Any required change from the nominal locations shown on the Drawings shall be made by the Contractor and shall be included as a part of the work hereunder and be subject to the approval of the Engineer.

3.02 BURIED PIPING:

- A. Buried Pipe Installation: Buried piping shall be laid to the grades and alignment shown on the Drawings, and all trenching, bedding, and backfilling shall conform to the application requirements of SECTIONS 02520 and 02614. Conform to the following sections of AWWA Standard C600: SECTION 1.2, Work Included; SECTION 2, Inspection; SECTION 3, Responsibility for Material; SECTION 4, Handling of Material; SECTION 5, Alignment and Grade; SECTION 7, Laying; SECTION 9b, Joining of Mechanical Joint Pipe; SECTION 10, Setting of Valves and Fittings; and SECTION 12, Anchorage. The foregoing requirements shall govern the work, regardless of the type of pipe installed unless a more stringent requirement is specified.

1. When the work is not in progress, open ends of pipe and fittings shall be securely closed. The piping shall be placed when trench and weather conditions are suitable. No pipe shall be laid in water, and responsibility for the diversion of drainage and dewatering of trenches during construction shall be borne by the Contractor. In all backfilling operations, the Contractor shall be responsible for damage to or misalignment of the pipe.
 2. When required in SECTIONS 02520 and 02614, a tracer wire, with loose ends accessible at valve boxes, cleanouts, or other suitable method for access, shall be buried over all nonmetallic piping to be laid underground. Detectable or non-detectable buried warning tape shall be installed within the backfill above all buried pipelines as specified in SECTIONS 02520 and 02614, unless directed otherwise by the Engineer.
 3. Joints of all sizes shall conform to the applicable requirements specified hereinafter for aboveground piping. Care shall be taken to keep pipe in correct alignment when making joints. Friction or lever pullers or other approved means of ensuring straight pulling shall be used on pipe larger than 8 inches and also on smaller sizes where damage to the end might occur. The use of "popping-on" of joints will not be permitted. The fitting of piping to valves, hydrants, and wall castings shall be worked out in advance of installation to ensure correct orientation of the mating ends and bedding of approach piping.
 4. When pipe (except copper or wrought steel) passes from a structure, manhole, vault, encasement, or the like to the earth, a bell and spigot, wedgelock, ringite, or other flexible-type joint or coupling shall be installed within two feet of the structure. Particular care shall be taken to secure full support to the pipe in the earth.
- B. Thrust Blocks: Thrust Blocks shall be installed in accordance with SECTION 02614.
- C. Coverage: Unless otherwise shown on the Drawings, all buried piping shall have a coverage of at least 3-feet between the top of the pipe and the finished surface. Variations from the pipeline grade and alignment may be allowed to accommodate fabrication with the approval of the Engineer. All changes of grade shall require the approval of the Engineer on the installation Drawings.

3.03 ABOVEGROUND PIPING:

- A. Aboveground Pipe Installation: All piping shall be installed in accordance with the erection drawings and the erection procedure submitted with the approved shop or erection drawings. The horizontal piping shall be run parallel to the building walls and shall be level except where otherwise shown or specified; parallel lines shall be grouped on the same horizontal or vertical plane wherever possible. Vertical piping shall be plumb, and the entire piping configuration shall allow adequate clearances for the actuation of valves, and for convenient access for painting and preventive maintenance of valves and other accessories. Piping shall clear obstructions, preserve headroom, and keep openings and passageways clear. If structural difficulties or other work prevent the running of pipes or the setting of equipment at the point indicated on the Drawings, the necessary minor deviations as determined by the Engineer, will be allowed, and

shall be shown on the erection drawings to be furnished. Except as otherwise shown or specified, piping installation work shall conform to the requirements of ANSI B31.1.0 and the printed or written recommendations of the manufacturer of the product involved for the given conditions.

- B. Joint Installation: Installation of joints and couplings shall conform to the following requirements:
1. Joints and Couplings: Joints and couplings shall be made in accordance with the specified requirements made part of the erection procedure submitted by the Contractor.
 2. Pipe Threads: Pipe threads shall be in accordance with the requirements of ANSI B2.1, and shall be cut full and free from torn or ragged surfaces. No more than three threads on the pipe at any joint shall remain exposed after installation. Threaded joints shall be established with joint compound applied to the male ends only. The use of thread cement or caulking of threaded joints to stop or prevent leakage will not be permitted. Sharp-toothed pipe wrenches or similar wrenches shall not be used in making up copper or brass pipe.
 3. Flanged Joints: Flanged joints shall be made with the gaskets specified for the pipeline service centered in the joint. Bolts studs, and nuts shall be lubricated with graphite and oil so that the nuts can be turned by hand. Install anti-galling compound on stainless-steel bolt and nut threads to prevent seizing. Care shall be taken to prevent excessive initial tension to the bolt and studs and so that the tension applied is as nearly uniform as possible. The rust preventive compound applied to the faces of flanges before shipment shall be removed before installation. Where slip-on flanges are used, they shall be fillet welded to the pipe on both front and back sides. Where raised faced and flat faced flanges are joined, the raised face flange shall be ground smooth and full-face gaskets shall be used.
 4. Tubing:
 - a. Tubing which is to be soldered shall be cut square and all burrs shall be removed. Both the inside of the fitting and the outside of the tubing shall be well cleaned with steel wool before sweating. Care shall be taken to prevent annealing of fittings or hard-drawn tubing when making connections. Joints for soldered fittings shall be made with a non-corrosive, paste flux and solid string or wire solder composed of 95-5 tin-antimony solder. Soft solder or cored solder will not be permitted. Tubing to be coupled with flared compression type fittings shall conform to the applicable provisions of the Joint Industry Conference (JIC) Standards and the recommendations of the manufacturer.
 - b. All concealed piping shall be tested in the presence of the Engineer before concealing. Changes in direction shall be made with fittings. Kinks and wrinkles shall not be acceptable.
 5. Flexible Type Joints of the sleeve, split sleeve, and flanged coupling adapter types of flexible couplings shall be made in accordance with the printed instructions of the manufacturer. The pipe ends to receive the

couplings shall be finished to the outside diameter and surface finish required by the coupling manufacturer. Prior to assembly, all surfaces which will be inaccessible after installation shall be given protective coating.

6. Tie Rod Restraint Harnesses shall be provided at flexible type joints where shown on the Drawings and as required. The harnesses shall be tightened just sufficiently to preclude displacement of the downstream piping under hydraulic thrust. Double nut all rods to prevent loosening under vibration.
 7. Electrical/Dielectric Insulation shall be provided at all connections between ferrous and nonferrous pipe except where the nonferrous pipe is an electrical nonconductor. The joint shall be tested after completion to verify non-conductivity. Flange isolation kits shall be PSI, APS, or approved equal. Dielectric unions shall be Epco or approved equal.
 8. PVC Pipe Joints at fittings and couplings to valves and equipment shall be made in accordance with the manufacturer's printed instructions.
- C. Pipe Sleeves: All piping which will pass through walls, slabs, footings, or beams shall be provided with specified pipe sleeves with annular space sealed or with wall castings. The Contractor shall provide the wall sleeves and castings for insertion in the concrete work covered in SECTION 03300, Cast in Place Concrete, and shall verify their correct setting prior to concrete placement. The sleeve sealant shall be as specified in PART 2 herein. No pipe joint will be allowed to occur in the sleeve. The seal on both ends of the sleeve shall be flush with the concrete surfaces on completion of work and drying of sealant. Caulking and sealing of wall sleeves shall conform to the following requirements:
1. Preparation for Sealing: The annular space between the pipe and sleeve shall be cleaned of all loose particles and contamination, and shall be dry prior to sealing. Tape or other recommended protection shall be applied on the structure surfaces to preclude contamination by the sealant, and any contamination which occurs shall be removed immediately, followed by a thorough washing of the surfaces with solvent. Prepared compound not used during the application time limits designated by the manufacturer of such compound shall be discarded.
 2. Application of Compound Sealant: The sealing shall be performed after any required primer has been applied and backup material placed. The work shall be performed in accordance with the submitted erection drawing detail and procedure, and all grooves shall be solidly filled. The application shall be made in clean, straight lines free of wrinkles, be tooled as required and finished with a convex surface just sufficient to provide the required flush surface upon drying. Work shall not be performed when the air temperature is below 50°F.

3.04 INSTALLATION OF DUCTILE IRON PIPE:

- A. Pipe Laying:
1. Inspection: All pipes shall be carefully inspected by the Engineer for defects before installation. Such inspection shall include light tapping with a hammer while the pipe is suspended in the air. No pipe or fittings

which are cracked or which show defects excluded by the Specifications for such pipe or fittings shall be used. Any injuries to the protective coating of the pipe or fittings shall be carefully repaired by the Contractor.

2. Cleanliness of Material: All pipes, valves, and fittings shall be carefully cleaned before installation. Every open end of a pipe shall be carefully plugged or capped before leaving the work.
 3. Positioning: For bell and spigot pipe, the direction of bells shall normally face upstream of the flow. This direction may be altered with the permission of the Engineer. Bells and spigots must be thoroughly cleaned and free from oil, grease, blisters, and excess coating before spigots are inserted into bells. The spigot end of the pipe shall be brought to true line and grade and be inserted to the full depth of the socket before the joints are made. The inner surface of the pipe shall conform at the joints, and the annular space for the jointing material shall be of uniform width and depth. If any pipe does not allow sufficient space or jointing material, it shall be replaced by one of proper dimensions.
 4. Deflection: The maximum deflection in bell and spigot cast or ductile iron joints shall be no more than half that specified by the manufacturer.
- B. Thrust Restraint: Tie rod harness restraints shall be used above ground where there is a possibility of pulling the joint under pressure. Tie rod restraints are not to be where buried in earth, unless specifically allowed by the Engineer in writing. Instead, concrete thrust blocks are to be used, or when approved by the Engineer Megalug style serrated wedge mechanical restraints as specified may be used as specified.
- C. Piping Through Walls: Where pipes pass through walls or floors, care shall be exercised to ensure joints being watertight. The pipe shall be free of all dirt, incompatible coatings, and grease to secure a tight bond with the concrete.
- D. Push-on or Mechanical Joints: Joints shall conform to AWWA C111. Installation shall be in accordance with the manufacturer's printed recommendations. Gasket seats and rubber gaskets shall be thoroughly cleaned before assembly. The completed joint shall have a uniform contact by the gasket between the outer surface of the spigot and the gasket seat of the bell.
- E. Flanged Joints: Flanged pipe shall be cut true to length. Joints shall be made up square, with even pressure upon the gaskets and shall be perfectly watertight. Gaskets shall fit the inside dimension of the pipe accurately, so that no surplus material projects out into the flow area. The completed joint shall be smooth and properly aligned.

3.05 TESTING AND CLEANUP:

- A. After each of the systems has been installed, the Contractor shall thoroughly clean all parts of the installation. All equipment, piping, valves, and fittings shall be cleaned of grease, metal cuttings, and other debris. Any stoppage, discoloration, or other damage to any of the work due to the Contractor's failure to properly install or to properly clean the systems shall be repaired without cost to the Owner.
- B. Following the cleaning, each system shall be completely tested in the presence of the Engineer and to his satisfaction, and all equipment shall be adjusted to

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operate in the most efficient and satisfactory manner. Only such tests shall be made as will demonstrate that each line will be leak free. Refer to SECTIONS 02520 and 02614 for Testing of Pipe Lines.

- END OF SECTION -

SECTION 15215 – VALVES, METERS AND ACCESSORIES

PART 1 -- GENERAL

1.01 SCOPE:

The work to be performed in accordance with this specification consists of providing and installing all valves, meters and accessories as specified, indicated, and required. See SECTION 15200 for small (3-inch and smaller) valves.

1.02 REFERENCES:

- A. American Society for Testing and Materials (ASTM)
- B. American Water Works Association (AWWA)

1.03 CONTRACTOR SUBMITTALS:

In accordance with SECTION 01300, submit:

- A. Manufacturer's literature and product data sufficient to demonstrate compliance with the specification requirements. Highlight proposed products and features, cross out extraneous information.
- B. Certificates of compliance.
- C. In addition to product data, also submit installation and calibration procedure, manufacturer's recommended upstream and downstream straight piping lengths, operation and maintenance manuals, factory test and field test results, and parts lists for flow meters.
- D. In addition to product data, also submit installation instructions, seating and unseating heads, and shop drawings that include dimensions and anchor bolt pattern for fabricated slide gates.
- E. In addition to product data, submit dimensions, pump curves, electrical requirements, and controls information for the sump pump.

1.04 GENERAL DESCRIPTION:

- A. Valves shall have pressure rating not less than the adjacent piping unless otherwise indicated. Valves shall be provided with pipe supports on either side of the valve. Assemblies of valves, operators, and accessories shall be complete and adequate for the intended purpose and shall include all essential components of equipment together with all mountings and other appurtenances normal and necessary for proper installation, whether or not indicated or specified. Direction of rotation to open each valve shall be to the left (counter-clockwise). Each valve body or operator shall have cast thereon the work "OPEN" and an arrow indicating the direction to open.
- B. Exposed (non-buried) valves shall be hand wheel operator with indicators. Handwheel actuators shall be designed to produce the required torque with a minimum pull of 80 pounds. The handwheel shall be manufactured of cast-iron finish coated with epoxy or enamel.
- C. Buried valves shall be non-rising stem, nut operated with position indicators. Provide valve box and cover.
- D. Meters shall be electromagnetic type flow meter for measurement of raw

sewage.

PART 2 -- PRODUCTS

2.01 PLUG VALVES:

Plug valves shall be the non-lubricated eccentric plug type rectangular body, full port. Valves shall open from fully open to tight closure in one-quarter (90°) turn and shall have an indicator to show plug position. Port area shall be 100% of the cross-sectional area of the connecting pipe. Valve plugs, bearings, and seals shall be easily removable for repair or replacement without removing the valve body from the pipeline in which it is installed. Exposed valve connections shall be 125 lb. ANSI B16.1 flange. Buried valve connections shall be mechanical joint. Flange and mechanical joint assembly hardware shall be as specified in SECTION 15200 based on the installation location. Valve material shall be compatible with sewage and shall be as follows:

Body:	Cast iron,
Coating, Exterior:	Fusion epoxy lined and coated per AWWA C550
Coating, Interior:	Glass lined
Plug:	Cast iron with abrasion resistant neoprene or Viton coating
Bearings:	Type 316 stainless-steel
Seals:	Adjustable "V" type of Buna N
Seating Surface:	Nickel or 316 stainless-steel

Each plug valve shall be supplied with its own worm gear hand wheel operator, unless otherwise noted on the Drawings. Operator extensions shall be provided where required to avoid interference with adjacent equipment, piping, walls, etc. Provide nut operator with valve box and cover for valves that are buried in earth. Covers shall be marked "sewer". The valves shall be Val-Matic Cam-Centric, Milliken, or approved equal.

2.02 FLEXIBLE DISC CHECK VALVES:

Flexible disc check valves shall be of the flanged, full body type with no internal moving parts except for the flexible disc. The flanged ends shall be manufactured in accordance with ANSI B16.1 Class 125. Valves shall be rated to 250 psi for all sizes.

The valve body shall be full flow area equal to nominal pipe diameter at all points through the valve. The 4 in. (100mm) valve shall be capable of passing a 3 in. (75mm) solid. The seating surface shall be on a 45-degree angle to minimize disc travel. A threaded port with pipe plug shall be provided on the bottom of the valve to allow for field installation of a backflow actuator or oil cushion device without special tools or removing the valve from the line.

The top access port shall be full size, allowing removal of the disc without removing the valve from the line. The access cover shall be domed in shape to provide flushing action over the disc for operating in lines containing high solids content. A threaded port with pipe plug shall be provided in the access cover to allow for field installation of a mechanical, disc position indicator.

The disc shall be of one-piece construction, precision molded with an integral O-ring type sealing surface and reinforced with alloy steel. The flex portion of the disc contains nylon reinforcement and shall be warranted for twenty-five years. Non-Slam closing

characteristics shall be provided through a short 35-degree disc stroke and a memory disc return action to provide a cracking pressure of 0.25 psig.

The valve disc shall be Viton and be cycle tested 1,000,000 times in accordance with ANSI/AWWA C508 and show no signs of wear, cracking, or distortion to the valve disc or seat and shall remain drop tight at both high and low pressures.

A screw-type backflow actuator shall be provided to allow opening of the valve during no-flow conditions. Buna-N seals shall be used to seal the stainless-steel stem in a Lead-Free bronze bushing. The backflow device shall be of the rising-stem type to indicate position. A stainless-steel T-handle shall be provided for ease of operation.

A mechanical indicator shall be provided to provide disc position indication on valves 3" (80 mm) and larger. The indicator shall have continuous contact with the disc under all operating conditions to assure accurate disc position indication.

The interior of the valve body shall be glass lined.

The valves shall be Val-Matic Swing-Flex, or approved equal.

2.03 STAINLESS-STEEL SLIDE GATES:

Stainless-steel slide gate shall be furnished complete with stem guides, slide, frame, seals, stems, operators, wall thimbles, wedges, and all appurtenances required to make a complete and properly operational gate as shown on the Drawings and specified. Comply with AWWA C560.

A. Materials of construction:

1. Frame, Slide and Reinforcing Stainless-steel, ASTM A276, Type 316 (Type 304 is not acceptable).
2. Stems Stainless-steel ASTM A276, Type 316 (Type 304 is not acceptable).
3. Fasteners Stainless-steel, ASTM F593/F594, Alloy Group 1 or 2
4. Anchors Stainless-steel, ASTM F593/F594, Alloy Group 1 or 2
5. Rubber Seals Neoprene, ASTM D2000, Grade 1BE625
6. Guides Ultra High Molec
7. Protective coatings: In accordance with the manufacturer's standard for raw sewage and geothermal applications.

Provide non-rising stem with 2-inch operating nut. A maximum of 40 pounds of pull shall be required to operate the gate. Gates shall be Hydro Gate by Mueller, or approved equal.

Wall thimble shall be fabricated stainless-steel with minimum thickness of ¼". The flange shall be flat and plane within 3/16" without machining. Welded studs or threaded holes for screwed in studs shall be provided to match the gate layout. The top of the thimble flange shall be permanently marked top. The thimble shall be set plumb and flat. The gate shall be mounted with hard setting mastic and a ¼" thick rubber gasket

The seating head on the gate shall be equal to the head differential between the surface elevation of the transition manhole structure and gate invert shown on the Drawings. The unseating head on the gate shall be equal to the head differential between the surface elevation of the wet well manhole structure and gate invert shown on the Drawings, acting from within the wet well toward the transition manhole.

2.04 MAGNETIC FLOW METERS:

See SECTION 16900 "Instrumentation and Controls".

2.05 WASTEWATER COMBINATION AIR VALVES:

Wastewater Combination Air Valves shall be automatic float operated valves designed to exhaust large quantities of air during the filling of a piping system and close upon liquid entry. The valve shall open during draining or if a negative pressure occurs. The valve shall also release accumulated air from a piping system while the system is in operation and under pressure. The valve shall perform the functions of both wastewater air release and wastewater air/vacuum valves and furnished as a single body.

1. Pipe connection (valve inlet) size: 2-inches.
2. Pipeline operating pressure is 23 psig, which may drop to less than 5 psig when the pumps are not operating.
3. Rubber compound shall be selected accordingly based on the provided pressures.
4. All internal metallic components shall be Type 316 stainless-steel construction.
5. Valve shall be A.R.I. Model D-025, or approved equal.

PART 3 -- EXECUTION**3.01 INSTALLATION OF EXPOSED VALVES:**

Valves shall be rigidly held in place using supports or hangers on each side of the valve. The stem orientation of valves in elevated piping shall be as approved by the Engineer for operator accessibility. Saddle type valve supports shall be provided for all valves and shall be consistent with Specification 15200. Supports shall be of rugged construction providing at least 120° under-support for the valve, shall be adjustable, and shall be securely anchored to the foundations using anchor bolts of materials specified for hardware in Specification 15200 based on the installation location. Valves shall be operated and adjusted before installation. Valves shall be tested with adjacent piping.

3.02 INSTALLATION OF BURIED VALVES AND VALVE BOXES:

The valves shall be set in true alignment and grade in accordance with the requirements of this specification. Valves shall be operated and all adjustments and operating settings of valves and appurtenances shall be made prior to installation. The valve boxes shall be checked for centering plumb over the operating nut and to ensure that the box cover is flush with the finish grade. Earth backfill shall be carefully tamped around each valve box to prevent displacement.

Provide concrete support under all buried plug valves. Provide a 12-inch minimum width and 8-inch minimum thickness concrete collar at grade around all valve boxes and covers installed in graded areas. Where valves are installed in sidewalk or pavement, valve covers shall be adjusted flush with the finished surface.

3.03 INSTALLATION SPECIFICS FOR PLUG VALVES:

Unless otherwise approved by the Engineer, eccentric plug valves shall be installed with the shaft horizontal with the plug in the upper half of the body, with the seat on the upstream end.

3.04 INSTALLATION SPECIFICS FOR RESILIENT HINGE CHECK VALVES:

Install in strict accordance with the manufacturer's instructions.

3.05 INSTALLATION OF SLIDE GATES:

Install in strict accordance with the manufacturer's instructions. Comply with AWWA C560 and C561.

3.06 INSTALLATION OF METERS:

Meter shall be rigidly held in place with supports on both sides of the meter. Mount the converter and readout in a visible and accessible location near the control panel shown on the Drawings.

Meters shall be field tested against a secondary standard at the expected flow rates of the facility. At their option, Contractor may install a second flow device of known calibration in the line to verify device calibration, or perform fluid capacity tests such as volumetric measurement per unit time.

Submit certificates of compliance from meter manufacturer stating that the meters have been properly installed, tested, and are ready for operation.

3.07 INSTALLATION OF WASTEWATER COMBINATION AIR RELEASE VALVES:

Install in accordance with manufacturer recommendations. The inlet shall be connected to the pipeline utilizing 316 stainless-steel schedule 40 nipples. Provide an isolation plug valve on the inlet. Plumb the valve outlet to discharge to the floor drain leading to the wet well utilizing schedule 40 PVC. Provide a PVC union located near the valve outlet to facilitate disassembly.

- END OF SECTION -

SECTION 15700 – HEATING AND VENTILATION

PART 1 -- GENERAL

1.01 SCOPE:

The work to be performed in accordance with this specification consists of furnishing all materials, equipment, supplies, and accessories required, and of performing all operations needed in connection with furnishing and installing a complete and operable heating and ventilating systems.

The contractor shall secure and pay for all permits, fees, taxes, royalties, licenses, and inspections in connection with the heating and ventilating system. Upon completion of the work, furnish to the Engineer a certificate of inspection and final approval by the local inspection authority.

1.02 REFERENCES:

- A. National Board of Fire Underwriters
- B. All adopted local and state codes and ordinances

1.03 CONTRACTOR SUBMITTALS:

In accordance with Section 01300. Submit certificates of compliance with manufacturer's literature. Manufacturer's literature shall be sufficient to demonstrate compliance with the specified requirements. Submit exhaust fan sizing calculations.

1.04 GENERAL DESCRIPTION:

The Contractor shall provide without extra charge, all incidental items required, as a part of the work, even though not particularly specified or indicated. The installation shall be so made that its several component parts will function together as a workable system, and shall be left in a properly adjusted and working order. The Contractor shall show on a set of plans in red ink all changes from the original plans made during installation of work and file with Engineer when work is complete.

PART 2 -- PRODUCTS

2.01 EXHAUST FAN:

- A. Manufacturer: Greenheck, PO Box 410, Schofield, Wisconsin 54476. Phone (715) 359-6171. Fax (715)355-2399. Website: www.greenheck.com
- B. Belt Drive Roof Downblast Centrifugal Exhaust Fan – Greenheck Model GB-101.
 - 1. General Description:
 - a. Downblast fan shall be for roof mounted applications
 - b. Minimum Performance Capabilities: 960 cubic feet per minute (cfm) and external static pressure to 0.5 inches of water gauge.
 - c. Maximum continuous operating temperature: 180 Fahrenheit (82.2 Celsius)
 - d. Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual serial number.

2. Wheel:
 - a. Constructed of aluminum
 - b. Non-overloading, backward inclined centrifugal
 - c. Statically and dynamically balanced in accordance to AMCA Standard 204-05
 - d. The wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency
3. Motor:
 - a. Variable Frequency Drive.
 - b. Motor enclosures: Explosion resistant enclosure.
 - c. Motor shall be permanently lubricated, heavy duty ball bearing type to match with the fan load and furnished at the specific voltage and phase.
 - d. Mounted on vibration isolators, out of the airstream.
 - e. For motor cooling there shall be fresh air drawn into the motor compartment through an area free of discharge contaminants.
 - f. Accessible for maintenance
4. Shafts and Bearings:
 - a. Fan shaft shall be ground and polished solid steel with an anti-corrosive coating
 - b. Permanently sealed bearings or pillow block ball bearings
 - c. Bearing shall be selected for a minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
 - d. Fan Shaft first critical speed shall be at least 25 percent over maximum operating speed.
5. Housing:
 - a. Motor cover, shroud, curb cap, and lower windband shall be constructed of heavy gauge aluminum.
 - b. Shroud shall have an integral rolled bead for extra strength.
 - c. Shroud shall be drawn from a disc and direct air downward.
 - d. Lower windband shall have a formed edge for added strength.
 - e. Motor cover shall be drawn from a disc.
 - f. All housing components shall have final thicknesses equal to or greater than preformed thickness.
 - g. Curb cap shall have pre-punched mounting holes to ensure correct attachment.
 - h. Rigid internal support structure.

- i. Leak proof
- 6. Housing Supports and Drive Frame:
 - a. Drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators
- 7. Vibration Isolation:
 - a. Double studded or pedestal mount true isolators
 - b. No metal to metal contact
 - c. Sized to match the weight of each fan
- 8. Disconnect Switches:
 - a. NEMA rated: 7 and 9
 - b. Positive electrical shut-off
 - c. Wired from fan motor to junction box installed within motor compartment
- 9. Drive Assembly
 - a. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower
 - b. Belts: Static free and oil resistant
 - c. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts
 - d. The motor pulley shall be adjustable for final system balancing
 - e. Readily accessible for maintenance
- 10. Options/Accessories:
 - a. Auto Belt Tensioner:
 - b. Bird screen: Stainless
 - c. Roof Curbs:
 - 1) Type: GPIIP-For pitched roofs, welded straight side curb with 2-inch flashing flanges and wood nailer
 - 2) Mounted onto roof with fan
 - 3) Material: Aluminum
 - 4) Insulation thickness: 2-inches
 - 5) Coating Type: Powder Coated. Color shall be selected by the Owner.
 - d. Curb Extension:
 - 1) Type: ISB
 - 2) Material Type: Aluminum
 - 3) Coating: Powder Coated. Color shall be selected by the Owner.

- e. Curb Seal: Foam Seal
- f. Dampers: Motorized
- g. Finish: Powder Coated. Color shall be selected by the Owner.
- h. Hinge Kit: Aluminum hinges
- i. Hinge Base: Aluminum hinges
- j. Tie-Down Points: Four heavy gauge aluminum brackets to secure the fan in heavy wind applications
- k. Variable Frequency Drive
 - 1) Factory programed, mounted and wired
 - 2) Input speed control - Potentiometer dial
 - 3) 24VDC damper power output
 - 4) Motor: (VFD Rated) compatible with induction and permanent magnet motors
 - 5) Parameters of acquainted motor shall be set to include voltage, speed, FLA, acceleration/deceleration time, and minimum & maximum motor frequency
 - 6) R³ Filtering for harmonic mitigation
 - 7) LED indication for Power, Run, and Fault
- l.
- m. Power disconnects.
- n. Interior OSHA fan guard.
- o. CERUS BAS-1P starter and thermostat.
- p. Mechanical contractor shall provide Allen Bradley fan starters. Fan to be activated by wall mounted thermostat.
- q. Provide a wall mount SPST thermostat with a temperature range of at least 30-70 degrees F.
- r. Provide interlock controls with actuated intake and exhaust dampers.

2.02 LOUVERS:

- A. Greenheck Series ECD-401-24X24 operable combination louver/damper with drainable style blades and rear blade linkage with dimensions to fit within a 24" x 24" opening in CMU masonry. Extruded aluminum frame and blade thickness shall be 0.081 in. and be mechanically fastened.
 - 1. Finish: 2-coat 70% Kynar 500 or equivalent in accordance with the manufacturer's standard. Color shall be selected by the Owner.
 - 2. Options/Accessories:
 - a. Bird and insect screen in removable aluminum frame.
 - b. Electric Actuator, NEMA housing.

- c. Perimeter Flange and angle clips

2.03 UNIT HEATER:

- A. Unit Heater: One wall mounted electric unit heater shall be installed at the location shown on the Drawings. It shall be equal or similar to a Raywall AFC8340T heater. The heater shall have a 4kW, 208V 3 phase rating. Provide the necessary mounting brackets.

PART 3 -- EXECUTION

3.01 INSTALLATION OF THE WORK:

The Contractor will be held solely responsible for the proper size and location of all anchors, chases, recesses, openings, etc., required for the proper installation of the work. Arrange for the building of anchors, etc., and for the leaving of the required chases, recesses, openings, etc. and do all cutting and patching made necessary caused by failure or neglect to make such arrangements with other trades. Any cutting or patching done by the Contractor shall be subject to the directions of the Engineer and shall not be started until approval has been obtained. Workmanship shall be top quality. The neat and slightly appearance of the finished work shall be of equal importance with its mechanical efficiency. All work shall be done in accordance with good commercial practices.

All mechanical equipment provided under this Contract shall operate without any sound or vibration which is objectionable in the opinion of the Engineer. Objectionable sound or vibration conditions shall be corrected in an approved manner by the Contractor at his expense. Vibration control shall be by means of approved vibration eliminators in a manner as recommended by the manufacturer of the eliminators.

Furnish and install 1/4-inch letter height, engraved, phenolic identification tags for each wall mounted switch or thermostat and equipment. The legend for each tag shall be as approved by the Engineer. Tags shall be fastened to equipment and devices with metal screws.

3.02 CONTROL DESCRIPTION:

Provide temperature controls products and all necessary wiring and accessories in order to achieve the sequences described herein.

- A. The unit heater shall be provided with a thermostat.
- B. Dampers:
 - 1. The interlocked exhaust fan and damper shall be motor operated and controlled by a dedicated thermostat, with a manual override.
 - 2. Dampers shall be normally closed. Dampers shall be interlocked with the exhaust fan and shall be open while the fan is energized.
- C. Exhaust Fan. The Exhaust Fan shall energize above 85 degrees F (adjustable), as sensed by the thermostat, and de-energize below 75 degrees F (adjustable) and shall be provided with override switch and mechanical timer for manual operation.

3.03 POST INSTALLATION INSTRUCTIONS:

Upon completion of the work, the Contractor shall instruct the Owner's personnel in the proper operation of the heating and ventilating equipment. The Contractor shall monitor

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and tabulate the amperage, voltage, and air flow for each fan and heater. Registers having opposed blade dampers shall be adjusted to distribute air evenly throughout and area. Balancing shall be accomplished under the presence of the Engineer by a firm experienced in testing, adjusting and balancing the mechanical equipment. Tabulated data including, at minimum, motor amperage, input voltage, nameplate data, operating speed, and heater capacity shall be provided to the Engineer for his approval. The Contractor shall perform a complete operational test to confirm that the heating and ventilation systems operate according to this specification.

- END OF SECTION -

SECTION 16010 – GENERAL PROVISIONS**PART 1 -- GENERAL****1.01 CONDITIONS**

All work under this SECTION shall be governed by project general conditions, along with all supplements and amendments thereto, as provided by Civil Engineer.

1.02 SCOPE OF WORK

The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies and accessories and of performing all operations needed in connection with all electrical work required by the Drawings and Specifications for all power, and control systems. The work shall also include the performance and installation of such necessary work, and the providing of such necessary material and devices of a minor nature that are neither indicated on the Drawings nor specifically mentioned in the Specification, but which are necessary for the compliance with codes, and for the successful operation of the entire electrical system indicated on the Drawings, and/or described in the Specifications. The Contractor will be allowed no extra compensation because of this requirement.

1.03 GENERAL ELECTRICAL REQUIREMENTS

- A. Materials: All electrical equipment and materials shall comply with the latest standards of National Electrical Manufacturer's Association (NEMA), Underwriter's Laboratories (U.L.), Institute of Electrical Electronic Engineers (IEEE), Insulated Power Cable Engineers' Association (IPCEA), American National Standards Institute (ANSI), American Society of Testing for Materials (ASTM), and National Bureau of Standards (NBS).
- B. All equipment, materials, and installation methods and procedures shall comply with all applicable state and local code requirements and ordinances, and the latest applicable requirements of OSHA and the National Electrical Code of the NFPA, as interpreted by the local inspection authority, and as approved by the Engineer. All equipment and materials shall also comply with all requirements of the utility and telephone companies.
- C. All minor items of electrical apparatus which are furnished with the various items of equipment, but which are neither detailed on the Drawings nor set forth in the Specifications, shall be considered a part of the electrical work.
- D. All electrical materials shall be new and shall not be installed if in a damaged condition.

1.04 CODES AND REGULATIONS

- A. Comply with all applicable state and local codes, regulations and ordinances, and the latest applicable requirements of the National Electrical Code (NEC) of the NFPA, as interpreted by the local inspection authority who shall have final jurisdiction.
- B. Comply also with all OSHA requirements and directives.

1.05 EXAMINATION OF PREMISES

Examine the premises prior to bidding and become fully familiar with existing conditions.

1.06 PERMITS

Secure and pay for all permits, fees, taxes, licenses and inspections in connection with the electrical work.

1.07 DRAWINGS AND SPECIFICATIONS

- A. Drawings are diagrammatic and indicate general arrangement of electrical work. Locations are approximate and shall be subject to minor modifications as directed by Civil Engineer and/or Engineer.
- B. Contractor shall be responsible for exact fitting of all materials, equipment, etc., in building. All dimensions shall be verified on the job.
- C. Refer to Civil Engineer Drawings, Specifications and directives, as part of this set, and be responsible for all information contained therein as it affects the electrical work.
- D. Instructions such as “provide” shall mean “Contractor shall be responsible for the furnishing and installing of new, complete in every respect.”

PART 2 -- PRODUCTS**2.01 STANDARDS**

- A. All material shall be new and shall be listed by Underwriters Laboratories Incorporated (UL listed) for the purpose intended and shall bear the UL label.
- B. Damaged or defective materials shall be replaced. All materials shall comply with the latest NEMA standards.

PART 3 -- EXECUTION**3.01 SHOP DRAWINGS**

- A. Furnish Shop Drawings electronically as unsecured pdf files to Civil Engineer for the following:
 - 1. Distribution Equipment.
 - 2. Starters.
 - 3. Controls and Instrumentation
 - 4. Generator and ATS
 - 5. SPD
- B. All materials and equipment shall be approved prior to beginning work.
- C. Receipt within 30 days after award of contract.
- D. Shop Drawings, including:
 - 1. Catalog data specifically for equipment to be used.
 - 2. Maintenance data.
 - 3. See shop drawing requirements in General Provisions.
 - 4. Reviewed shop drawings will be returned to Contractor as pdf files.
- E. Electrical Contractor shall provide shop drawing approval stamps on all

equipment supplied by them prior to Engineer's shop drawing approval. Electrical Contractor to check for conformance with the design of the project and compliance with the information given in the contract documents. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site, fabrication process and techniques of construction.

3.02 RECORD DRAWINGS

- A. Maintain a complete set of Electrical Drawings at the job site with all changes in the work marked thereon in a contrasting color. Keep the drawings current at all times, and present to Engineer upon completion of work.
- B. Electrical Contractor shall provide Civil Engineer at completion of project a complete set of Record drawings showing all changes in work marked thereon including all system wiring diagrams.

3.03 COORDINATION

Order the progress of the work so as to conform to the progress of other trades. Coordinate all electrical installations and rough-ins as required.

3.04 WORKMANSHIP

Provide a competent foreman on the job at all times. All work shall be accomplished in a manner which is neat, workmanlike, of first quality, and compatible with good industrial practices and standards. Provide competent workmen who are skilled as electricians.

3.05 INSTALLATION

Install all equipment and materials in accordance with information as indicated on Drawings and in full accord with Manufacturer's recommendations.

3.06 CUTTING AND PATCHING

- A. Provide all cutting, channeling, chasing, drilling, etc., operations as may be required for electrical work. In general, all such operations shall be held to a minimum.
- B. All patching and painting shall be done by Contractor.
- C. All work is to be carefully laid out in advance and coordinated with the other trades and building and process equipment so as to minimize any disturbance or damage to the structures, piping or other equipment. Any damage done to the building structure finishes or equipment shall be the responsibility of the Contractor and such damage shall be repaired in a manner approved by the Engineer and at no expense to the Owner.

3.07 CONSTRUCTION POWER AND LIGHTING

Provide construction power and lighting for construction as required. Energy costs, where reasonable and use of existing facilities is sufficient, will be paid by Owner. All temporary facilities where required by contractor – shall be provided and paid for by contractor and shall be properly grounded, shall comply with NEC and OSHA requirements, and shall have ground fault protection.

3.08 TRENCHING AND BACKFILL

- A. Be responsible for all trenching and backfill for electrical work. Backfilling shall be done in accordance with Civil Engineer Specifications. Be responsible for all new and existing buried utilities.

- B. Electrical Contractor shall locate all onsite and offsite utilities prior to any trenching or excavation done by any trade to locate utilities in areas where construction is to be performed.
- C. All trenching for buried cable or conduit shall be backfilled with selected material mechanically tamped into place along the sides of the conduit and up to a level six inches above the top of the conduit in lifts not to exceed six inches. The remaining backfill shall be consolidated by mechanical tamping in 6-inch layers. All trench compaction shall be to not less than 95 percent of the maximum dry density in accordance with ASTM D698 (Standard Proctor). Buried conduit shall have a minimum cover of 30-inches.

3.09 SECONDARY SERVICE

- A. Power for distribution is underground, available from the secondary side of a pad mounted transformer supplied by the local utility company. The service is 3 phase, 4 wire, 208/120-volt, 60 Hertz alternating current. Notify Engineer if characteristics or point of attachment are different than that shown on Drawings.
- B. Electrical Contractor shall coordinate all requirements and submit all necessary documentation required to obtain new service. Owner will pay charges for new service: Electrical Contractor shall coordinate requirements and make all necessary arrangements for installation.

3.10 GUARANTEE: COMPLY WITH CIVIL ENGINEER DIRECTIVES AND GUIDELINES.

Guarantee all materials, labor, workmanship and successful operation of all equipment installed under this contract for a period of two (2) years from date of final acceptance. Repair or replace, at no expense to Owner, all defects which may arise during this time due to inferior or defective materials, equipment, or workmanship.

3.11 SUBSTITUTIONS

- A. Refer to Owner for requirements for purchasing and guarantees.
- B. Where substitutions alter the design, conduit, wiring or space requirements indicated on the Drawings, Contractor shall be responsible for all items of cost for the revised design and construction.

3.12 DELIVERY AND STORAGE OF MATERIALS

- A. Make provisions for delivery and safe storage of all materials and make the required arrangements with other Contractors on the job for the introduction into the building of equipment too large to pass through finished openings.
- B. Where materials are indicated to be furnished by others to Contractor for installation, these materials shall be checked and their delivery properly receipted. Assume full responsibility for the storage and safe keeping of said materials from time of delivery until final acceptance.

- END OF SECTION -

SECTION 16015 – SHORT-CIRCUIT/COORDINATION STUDY/ARC-FLASH ANALYSIS

PART 1 -- GENERAL

1.01 REQUIREMENTS

The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this SECTION.

1.02 SCOPE

- A. The work covered under this SECTION shall include this Contractor providing an engineering analysis and coordination study for the entire electrical distribution system. The analysis shall include a short-circuit analysis with protective device evaluation, a protective device coordination study demonstrating selective coordination where required by code and/or drawings and arc-flash hazard analysis.
- B. The project shall begin at the point of service for the facility down through the system, to all downstream distribution and branch circuit panelboards, and motor control panels, see drawings for additional information.
- C. The project shall include generators and any associated emergency power distribution equipment, including automatic transfer switches and generator ground fault protection, if equipped.

1.03 QUALITY ASSURANCE

- A. The short-circuit and coordination studies and arc-flash hazard analysis shall be conducted by a Registered Professional Electrical Engineer with a minimum of five years' experience who is skilled in performing and interpreting power system studies and who is a full-time employee of a firm experienced in the analysis, evaluation, and coordination of electrical distribution systems, similar to the system for this project. The firm must have at a minimum four (4) year record of successful in-service performance.
- B. The studies shall be prepared in accordance with the latest edition of NETA Std. ATS, NFPA 70E, the "National Electrical Code", ANSI C2 "National Electrical Safety Code", and ANSI/IEEE Guidelines, as well as manufacturer's recommendations.
- C. The firm conducting the study shall have one million dollars worth of Professional Liability Insurance in addition to standard general insurance. Documentation shall be included with submittal process.

1.04 SUBMITTALS

- A. Submittals are required in accordance with SECTION 16010 of these specifications.
- B. The short-circuit and protective device coordination studies shall be submitted to this project's Design Engineer of record prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If formal completion of the studies may cause delay in equipment manufacturing, approval from the Design Engineer of record may be obtained for preliminary submittal of sufficient study data to ensure that the

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selection of device and characteristics will be satisfactory. Generally, shop drawing submittals for equipment effected by the coordination study will not be reviewed until the short-circuit/coordination study has been submitted and successfully reviewed.

- C. The results of the short-circuit, protective device coordination, and arc-flash hazard analysis studies shall be summarized in a final report. Submit copies of the final report with tabbed sections, in the quantities required. Additional copies, where required, shall be provided on CD in PDF format.
- D. The report shall include, but not be limited to, the following sections:
 - 1. One-line diagram showing protective device ampere ratings and associated designations, cable size & lengths, transformer kVA and voltage ratings, motor and generator kVA ratings, switchboard and panelboard designations.
 - 2. Descriptions, purpose, basis and scope of the study.
 - 3. Tabulations of the worst-case calculated short circuit duties as a percentage of the applied device rating (automatic transfer switches, circuit breakers, fuses, etc.); the short circuit duties shall be upward-adjusted for X/R ratios that are above the device design ratings.
 - 4. Protective device time versus current coordination curves with associated one line diagram identifying the plotted devices, tabulations of ANSI protective relay functions and adjustable circuit breaker trip unit settings.
 - 5. Fault study input data, case descriptions, and current calculations including a definition of terms and guide for interpretation of the computer printout.
 - 6. Details of the incident energy and flash protection boundary calculations.
 - 7. Sample of an arc-flash hazard warning label.
 - 8. Comments and recommendations for system improvements, where needed, including extending of feeder or other conductors necessary to lower the fault-current to an acceptable level.
 - 9. Where selective coordination is obtained by use of manufacturer tested combinations, tables or related documentation shall be provided showing combinations used - combinations used shall be clearly identified.
 - 10. Executive summary.

PART 2 -- PRODUCTS

2.01 STUDIES

- A. Contractor shall furnish short-circuit and protective device coordination studies as prepared by the electrical distribution equipment manufacturer or an approved engineering firm.
- B. Contractor shall furnish an Arc-Flash Hazard Analysis Study performed in compliance with the latest edition of IEEE Standard 1584 – “IEEE Guide for Performing Arc-Flash Hazard Calculations” and per NFPA 70E – “Standard for Electrical Safety in the Workplace”, reference Article 130.3 and Annex D,

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prepared by the electrical distribution equipment manufacturer or an approved engineering firm.

2.02 DATA COLLECTION

- A. Contractor shall furnish all field data as required by the power system studies and arc-flash hazard analysis. The Study Preparer shall furnish the Contractor with a listing of required data. The Contractor shall expedite collection of the data to eliminate unnecessary delays and assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.
- B. Source contribution may include present and future utility supply, motors, and generators.
- C. Load data utilized may include existing and proposed loads obtained from Contract Documents provided by Owner or Contractor.
- D. The Contractor shall obtain all information required to satisfy the study requirements.

2.03 SHORT-CIRCUIT ANALYSIS WITH PROTECTIVE DEVICE EVALUATION

- A. Systematically calculate fault currents based on the available fault current at the facility service entrance. Study preparer shall obtain the available fault current from the local utility.
- B. Short-circuit calculations shall be prepared by means of a digital computer utilizing a commercially available software package. Motor contribution shall be incorporated in determining fault levels. Results of short-circuit calculations shall be presented in tabular form and shall include momentary and interrupting fault values for three-phase and phase-to-ground faults.
- C. Analyze the short-circuit currents by preparing a tabulation comparing the fault levels to the device interrupting ratings. Indicate areas in which integrated/series ratings are utilized. The following information shall be included in the tabulation:
 - 1. Bus identification number
 - 2. Location identification
 - 3. Voltage
 - 4. Manufacturer and type of equipment
 - 5. Device rating
 - 6. Calculated short-circuit current

2.04 PROTECTIVE DEVICE COORDINATION STUDY

- A. Prepare coordination time-current characteristic curves to determine the required settings/sizes of the protective devices to maximize selectivity. Where selectivity is code required it shall be required accordingly per the requirements of the AHJ.
- B. The utility upstream protective device feeding the facility shall be maintained as the upper limit for coordination. These settings shall be obtained by the preparer, along with any other protective device setting requirements. The coordination curves shall be prepared on log-log paper and illustrate adequate clearing times between series devices. The curves shall be created through the use of the

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study software package, but must reflect actual protective devices to be installed. Adequate time-current curves shall be generated to depict coordination. In addition, protective device characteristics shall be suitably determined to reflect calculated short-circuit levels at the location.

- C. A narrative analysis shall accompany each coordination curve sheet and describe the coordination and protection in explicit detail. All curve sheets shall be multi- color for improved clarity. Areas lacking complete coordination shall be highlighted and reasons provided for allowing condition to remain or provide solution to resolve situation. The following information shall be provided on all curve sheets:
 - 1. Device identification and associated settings/size
 - 2. Voltage at which curves are plotted
 - 3. Current multiplier
 - 4. ANSI frequent fault damage curve
 - 5. Cable insulation damage curves
 - 6. Transformer inrush point
 - 7. Single-line for the portion of the system
 - 8. Motor starting profiles (where applicable)

2.05 ARC-FLASH HAZARD ANALYSIS

- A. The Arc-Flash Hazard Analysis shall be performed by a computer aided circuit simulation of the distribution system specific to this project. These calculations shall determine the Arc-Flash Incident Energy (AFIE) levels and flash protection boundary distances. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, panelboards, busway, generators, automatic transfer switches, and motor-control centers) where work could be performed on energized parts.
- B. The Arc-Flash Hazard Analysis shall be performed in conjunction with the Short-Circuit/Coordination Study.
- C. Results of the analysis shall be submitted in tabular form and shall include as a minimum the bus name, bolted fault current and arcing fault current level, flash protection boundary distances, personal protective equipment (PPE) hazard risk category and the AFIE levels.
- D. The analysis shall be performed under worst-case Arc-Flash conditions, and the final report shall describe the worst-case conditions when different from worst-case bolted fault conditions.
- E. Arc-Flash Warning Labels:
 - 1. The Contractor of the Arc-Flash Hazard analysis shall provide Arc-Flash Warning labels for all electrical equipment that may be opened or accessed while energized. Labels shall be minimum 3.5-inch x 5-inch thermal transfer type of high adhesion polyester. Labels shall be machine printed, with no field markings.
 - 2. All labels shall be based on recommended overcurrent device settings and shall be provided after the results of the analysis have been

presented to the Owner and after any system changes, upgrades or modifications have been incorporated in the system. The labels shall identify the flash protection boundary, the arc-flash incident energy (AFIE) level, working distances, required personal protective equipment (PPE) hazard risk category, nominal voltage, and engineering report number, revision number and issue date.

2.06 SINGLE-LINE DIAGRAM

- A. The final report shall include a multi-color single-line diagram of the electrical distribution system within the scope of the project. The single-line shall include:
 - 1. Transformer rating, voltage ratio, impedance, and winding connection.
 - 2. Feeder cable phase, neutral and ground sizes, length of cable, conductor material, and conduit size and type.
 - 3. Switchgear, switchboards, panelboards, MCC(s), fuses, circuit breakers, ATS(s) and switches continuous current ratings.
 - 4. Protective relays with appropriate device numbers and CT(s) and PT(s) with associated ratios.
 - 5. Detailed legend indicating device type identification and other significant details.

PART 3 -- EXECUTION

3.01 SUMMARY

The results of the system studies shall be summarized in a final report. One “as-built” copy shall be posted in each main electric room.

3.02 FIELD SETTINGS/ADJUSTMENTS

- A. This Contractor shall engage the equipment manufacturer’s service group or alternately a qualified independent testing firm to perform field adjustments of the protective devices as required for placing the equipment in final operating condition. The settings shall be in accordance with the approved short-circuit study and protective device evaluation/coordination study.
- B. Necessary field settings of devices and adjustments and minor modifications to equipment to accomplish conformance with the approved short-circuit and protective device coordination study, shall be carried out by the equipment manufacturer’s service group or qualified independent testing firm
- C. Notify Owner in writing of any required major equipment modifications.
- D. Additions, deletions, upgrades or major modifications to any part of the electrical distribution system will require re-calculation of the studies and analyses for the portions of the system that has been changed from the original studies. These re-calculations shall be completed by the same engineer or firm that did the original studies, at no additional cost to the Owner.

3.03 ARC-FLASH WARNING LABELS

Apply arc-flash warning labels to equipment. The labels shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of

the equipment.

3.04 ARC-FLASH TRAINING

The Contractor of the Arc-Flash Hazard Analysis shall train the Owner's qualified electrical personnel of the potential arc-flash hazards associated with working on energized equipment (minimum of 4 hours). The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET) or equivalent.

- END OF SECTION -

SECTION 16050 – BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 -- GENERAL

1.01 SUMMARY

- A. This section includes basic electrical requirements for materials and methods applicable to electrical equipment specified under this section and other related sections.
 - 1. Conduit
 - 2. Boxes
 - 3. Duct Bank
 - 4. Wire and Cable
 - 5. Wiring Devices and Device Plates
 - 6. Maintenance Materials
 - 7. Grounding Materials
 - 8. Luminaries
 - 9. Power Panels
 - 10. Separately Enclosed Circuit Breakers
 - 11. Service Entrance Disconnect and Equipment Disconnects
 - 12. Surge Protective Devices
- B. Related Sections:
 - 1. Earthwork – SECTION 02200
 - 2. Concrete – DIVISION 3
 - 3. Painting – SECTION 09900
 - 4. DIVISIONS 1, 8, 10, 11, 13, 14, 15, and 16

1.02 REFERENCES

- A. UL – All applicable standards
- B. IEEE – All applicable standards
- C. IPCEA – All applicable standards
- D. NEMA – All applicable standards
- E. ANSI/NFPA 70 – National Electrical Code
- F. ANSI C2 – National Electrical Safety Code
- G. ANSI/NEMA FB 1 – Fittings and Supports for Conduit and Cable Assemblies
- H. ANSI/NEMA OS 1 – Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports
- I. ANSI/NEMA OS 2 – Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports

- J. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum)

1.03 SUBMITTALS

- A. Information covering all material that is to be used on this project shall be submitted.
- B. Each sheet of descriptive literature shall be clearly marked to identify the material or equipment for which it pertains.
- C. Equipment on submitted sheets that is not for this project shall be crossed out.
- D. As a minimum the following information shall be submitted:
 - 1. Lamp fixture descriptive sheets identified by the fixture schedule letter
 - 2. Equipment sheets shall identify what the equipment refers to by calling out the name of the equipment on the sheet.
 - 3. Schematics and connection diagrams for all electrical equipment shall be submitted.
 - 4. Submit all types of conduit and cables with manufacturer and sizes as well as all appurtenances.

1.04 QUALITY ASSURANCE

- A. Supplier's qualifications
 - 1. The entire system shall be designed, coordinated, and supplied by a qualified Electrical Contractor who is regularly engaged in the business of building electrical systems for water and wastewater projects. The Electrical Contractor shall provide a "Statement of Qualifications" indicating that they have successfully provided similar work for at least 5 years.
- B. Coordination
 - 1. The electrical equipment shall be designed and coordinated for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications. All devices shall be applied in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the instrument or device manufacturer and the manufacturer of related equipment.
 - 2. Installation drawings shall be prepared for interconnecting wiring and piping between the related equipment and the equipment furnished under this section. All interconnecting wiring shall be appropriate for the service and shall result in a properly functioning system.
 - 3. The Contractor shall provide coordination with other contractors and supervision of installation as required during construction.
 - 4. Perform telephone system work in accordance with telephone utility standards.
 - 5. All service entrance work shall be in accordance with the local utility standards.
 - 6. Accurately record actual locations of conduit, duct banks, panels, and accessories.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable Building Code.
- B. Electrical: Conform to NFPA 70.
- C. Coordinate, obtain and pay for all permits, inspections and approvals of authority having jurisdiction.
- D. Comply with local electrical codes in force or in the absence of local electrical code, the latest edition of the National Electrical Code, ANSI C1.

1.06 WARRANTY

- A. The supplier shall warrant the supplied equipment and labor for a period of two (2) years from the date of system acceptance.

PART 2 -- PRODUCTS**2.01 GENERAL REQUIREMENTS.**

- A. All equipment furnished under this section shall be selected by the Contractor for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged, and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.
 - 1. Conduit.
 - a. Minimum Size: $\frac{3}{4}$ -inch unless otherwise specified, or $\frac{1}{2}$ -inch for luminary pendants.
 - b. Underground Installations:
 - 1) More than five feet from foundation wall: Thick wall nonmetallic conduit.
 - 2) Within five feet from foundation wall: Rigid steel conduit
 - 3) Minimum size: 1-inch.
 - c. Outdoor Locations, Above Grade: Rigid steel conduit.
 - d. In Slab Above Grade:
 - 1) Rigid steel conduit for circuits that are 24V or less.
 - 2) Rigid thick wall non-metallic conduit for 120V to 480V circuits.
 - 3) Maximum Size Conduit in Slab: 2-inch, 1-inch for conduits that cross over each other, or with structural engineer's approval.
 - e. In or under slab on grade:
 - 1) Rigid steel conduit for circuits that are 24V or less.
 - 2) Rigid thick wall non-metallic conduit.
 - f. Wet and damp locations: Rigid steel conduit or aluminum conduit.

- g. Dry locations:
 - 1) Concealed: In walls or above ceilings, rigid steel conduit.
 - 2) Exposed: Rigid steel conduit or aluminum conduit.
- h. Rigid Steel Conduit.
 - 1) Rigid steel conduit shall be heavy wall, hot-dipped galvanized, and shall conform to Fed Spec WW-C-581 and ANSI C80.1, and shall be manufactured in accordance with UL 6.
- i. Rigid Nonmetallic Conduit (PVC).
 - 1) PVC conduit shall be heavy wall, schedule 40, shall be UL labeled for aboveground and underground uses.
- j. PVC-Coated Rigid Steel Conduit.
 - 1) The conduit shall be rigid steel and before the PVC coating is applied, the hot-dipped galvanized surfaces shall be coated with a primer to ensure a bond between the steel substrate and the coating. The PVC coating shall be bonded to the primed outer surface of the conduit at a thickness of at least 40 mils. A two-part urethane chemically cured coating shall be applied at a nominal 2 mil thickness to the interior of all conduit and fittings.
 - 2) Manufacturers: Ocal, PermaCote, or Robroy Industries.
- k. Flexible connections
 - 1) Conduit: Moisture proof vinyl jacketed, liquid-tight, hot-dipped galvanized flexible steel and shall be UL labeled.
 - 2) Connectors: Watertight, Appleton Type ST or STB, Crouse-Hinds Type LT or LTC, or equal.
- 2. Outlet Boxes.
 - a. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, Galvanized.
 - 1) Luminaries and equipment supporting boxes: rated for weight of equipment supported.
 - 2) Concealed installations.
 - b. Nonmetallic outlet boxes: ANSI/NEMA OS 2.
 - c. Cast Boxes: NEMA FB 1, Type FD, Cast Ferroalloy.
 - 1) Provide gasketed cover by box manufacturer.
 - 2) Provide threaded hubs.
 - 3) Models VXF, GRFX as manufactured by Crouse-Hinds.
 - 4) Models SHE, JBDX, with mounting lugs as manufactured by Appleton.
- 3. Pull and Junction.

- a. Sheet Metal Boxes: NEMA OS 1, Galvanized Steel.
 - b. Surface-Mounted Cast Metal Box: NEMA 250, Type 4 flat-flanged, surface-mounted junction box.
 - 1) Material: Galvanized cast iron Cast aluminum in corrosive areas.
 - 2) Cover: Furnish with ground flange, neoprene gasket, and stainless-steel cover screws.
 - 3) Model: WCB as manufactured by Crouse-Hinds.
 - c. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting.
 - 1) Material: Galvanized cast iron.
 - 2) Cover: Nonskid cover with neoprene gasket and stainless-steel cover screws.
 - 3) Cover Legend: ELECTRIC.
 - 4) Model: WPD as manufactured by Crouse-Hinds.
4. Large Junction Boxes and Wiring Gutters.
- a. Indoor Locations:
 - 1) Steel, NEMA 12.
 - b. Outdoors:
 - 1) Stainless-steel.
 - 2) Weather-tight NEMA 4.
 - c. Construction.
 - 1) Provide rigid handles for box covers larger than 9 sq. ft. or heavier than 25 lbs.
 - 2) Provide split covers for covers larger than 12 sq. ft.
 - 3) Aluminum boxes in concrete not allowed.
5. Seal Fittings.
- a. Model ESU with Apelco sealing cement and fiber, as manufactured by Appleton.
 - b. Model EZS with Chico X Fiber and Chico A compound as manufactured by Crouse-Hinds.
6. Deflection Fittings.
- a. Locations:
 - 1) Underground conduit runs.
 - 2) Runs between concrete sections subject to relative movement.
 - b. Material:

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- 1) Ferroalloy hubs.
 - 2) Neoprene outer jacket.
 - 3) Stainless-steel jacket clamps.
 - 4) Molded plastic inner sleeve.
 - 5) Tinned copper braid grounding strap.
- c. Model XD as Manufactured by Crouse-Hinds.
7. Flexible Sealing Compound.
 - a. “Duxseal” as Manufactured by Johns-Manville.
 - b. “Permagum” as Manufactured by In mount.
8. Coal Tar Epoxy Paint.
9. Wire and Cable.
 - a. Power, Control, and Lighting Circuits, 600V and below.
 - 1) General Use:
 - a) Conductors: Single, copper, 12 AWG minimum.
 - b) All Conductors to be stranded.
 - c) Insulation: 600V thermoplastic, UL Type THWN/THHN.
 - d) Jacket: Nylon.
 - e) Suitability: Wet or dry locations at 75° C and 90° C copper temperature.
 - f) Or as specified for service entrances.
 - 2) Service entrance and 4 AWG and above:
 - a) Conductors: Single, stranded, copper.
 - b) Insulation: 600V cross-linked polyethylene, UL Type XHHW/USE or THHN.
 - c) Suitability: Wet or dry locations at 75°C and 90° C copper temperature.
 - d) Manufacturers: Okonite “X-Olene” 112-32; Anaconda “Durasheath” XLP; or approved equal.
 - 3) Terminations:
 - a) Lugs, cup washers or pressure type; do not use wire nuts on stranded cable or wrap standard cable around screw type terminals.
 - 4) Telephone and Networking.
 - a) Cable.
 - (1) The cables shall be rated for use in communications circuits.

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- b) The cables shall be rated for riser applications.
- c) The cables shall be rated for 75 degrees Celsius applications.
- d) The cables shall be free of defects and splices.
- e) The cables shall be rated for outdoor applications.
- f) The cables shall be rated for P-MSHA applications.
- g) The cables shall pass a -40-degree Celsius cold bend test per UL 1581.
- h) The cables must be UL third party verified to ANSI/TIA/EIA-586-B.2 Category 5e.
- i) The cable shall be ROHS compliant.
- j) The cable shall be CE compliant.
- k) Conductors.
 - (1) The conductors shall be solid, bare copper per ASTM B-3.
 - (2) The conductors shall be #24 AWG (0.20 sq. mm).
- l) Insulation.
 - (1) The insulation shall be polyolefin.
 - (2) The insulation shall be free of defects and splices.
- m) Pairs.
 - (1) The cable shall contain four pairs.
 - (2) The insulated conductors shall be bonded together down the entire length of the pair.
 - (3) The pairs shall be marked with a permanent, extruded stripe identification of tip and ring insulated conductors.
 - (4) Each pair shall have a unique twist length to minimize pair to pair coupling.
- n) Shielding.
 - (1) Shielding shall be an aluminized foil with the foil facing inward, where required.
 - (2) Unshielded cables shall be acceptable except where shielding is required for the system.
- o) Jacket.
 - (1) All cables shall have a continuous jacket of Polyvinyl Chloride (PVC).
 - (2) Jacket thickness: The jackets shall be .030"

- (.75 mm) nominal thickness.
 - (3) The jackets shall be ultraviolet (UV) radiation and sunlight resistant per UL 1581.
 - (4) The jackets shall be oil resistant per UL 1581 Class 43.
 - p) Manufacturer: Belden “Industrial Data Solutions – 7923A” or approved equal.
 - 5) Millivolt or Milliampere Instrumentation and Control.
 - a) Conductors: 18 AWG stranded copper, 2 or 3 as required.
 - b) Insulation: 15 mils, minimum, 90°C PVC.
 - c) Shield: Mylar aluminum tape with 20 AWG copper drain wire, fully covering conductors.
 - d) Jacket: 20 mils, minimum, 80°C PVC.
 - e) Suitability: Wet or dry steel conduit.
 - f) Manufacturers: Belden “UL Instrumentation Cable – 1032A”, Samuel Moore “Dekoron ICMX” No. 1852-686 and 1862-686, or equal.
 - 6) Arc-Proofing Tape: Irvingon “77 Arc-Proofing Tape”, Slipknot No. 50 or Slipknot No. 3, or approved equal.
- 10. Wiring Devices.
 - a. General:
 - 1) Industrial Specification grade.
 - 2) White.
 - b. Receptacles:
 - 1) 120 V duplex outlets: NEMA 5-20R, 3 wire, grounding, 20A, 125 V, Leviton 5362, or approved equal.
 - 2) 120 V duplex GFCI outlets: NEMA 5-20R, 3 wire, grounding, 20A, 125 V, Leviton 7899, or approved equal.
 - 3) 240 V duplex outlets: NEMA 6-20R, 3 wire, grounding, 20A, 250 V, Leviton 5462, or approved equal.
 - 4) Welding outlets: 50A, 125/250V, 3 pole, 4 wire, grounding, NEMA 14-50R, Leviton 55050, or approved equal.
 - c. Light Switches:
 - 1) 277 V lighting circuits: 20-amp, 120/277 V, Leviton 1221-2W to 1224-2W, or approved equal.
- 11. Device Plates.
 - a. General:
 - 1) Mounting hardware countersunk and finished to match

- plate.
 - 2) Provide over-sized plates where standard plates do not cover wall opening.
 - 3) Provide engraving as indicated on drawings.
 - b. Indoors:
 - 1) Surface mounted devices: Galvanized or cadmium-plated steel.
 - 2) Flush mounted devices in other finished areas: Phenolic plastic, white.
 - 3) All other flush mounted devices: Type 302 stainless-steel.
 - c. Outdoors and Indoors when identified on Drawings as Weatherproof:
 - 1) Weatherproof with spring doors for receptacles and with provisions for padlocking switches on and off.
 - 2) Provide an adaptor plate for flush mounted device plates, Crouse-Hinds FS031, or equal.
12. Grounding and Bonding.
- a. Provide rod electrodes, exothermic connections and mechanical connections.
13. Luminaries.
- a. Furnish products as specified on drawings.
 - b. Install ballasts, lamps, and specified accessories at factory.
 - c. Accessories:
 - 1) Provide swivel-type box covers.
 - 2) Provide threaded conduit pendants.
 - d. Provide all lamps and required mounting hardware.
14. Power Panels
- a. General:
 - 1) Circuit breaker panel board.
 - 2) With neutral.
 - 3) Dead front.
 - b. Enclosure:
 - 1) NEMA 12, surface in unfinished areas, NEMA 1 flush in finished areas or as indicated on the drawings.
 - 2) Door with latch and lock.
 - 3) Typewritten circuit directory.
 - 4) Ground stud bolt through cabinet with removable 1/0 AWG

bond to the panel ground bus and an external clamp connector for a station ground conductor.

- c. Circuit Breakers:
 - 1) Molded case thermal magnetic.
 - 2) Multiple pole breakers shall be common trip.
 - 3) Bolt-in.
 - 4) Individually front replaceable.
 - 5) Indicating “On”, “Off”, and “Tripped”.
 - 6) RMS symmetrical interrupting capacity shall be as indicated on the drawings.
 - 7) Breakers, trip ratings, and number of poles as indicated on the drawings.
- d. Buses:
 - 1) Three phase and neutral bus insulated from cabinet.
 - 2) Ground bus.
 - a) Connected to cabinet.
 - b) Clamp type lug for supply circuit and each load circuit.
 - c) Removable bond to neutral bus.
 - 3) Copper bussing.
 - 4) Ampere and voltage ratings as indicated on the drawings.
 - 5) Bracing coordinated with circuit breakers interrupting capacity.

15. Lighting Panels.

- a. General:
 - 1) Circuit breaker panel board.
 - 2) With neutral.
 - 3) Dead front.
- b. Enclosure:
 - 1) NEMA 1 or as indicated on the drawings.
 - 2) Door with latch and lock.
 - 3) Typewritten circuit directory.
 - 4) Ground stud bolt through cabinet with removable 1/0 AWG bond to the panel ground bus and an external clamp connector for a station ground conductor.
- c. Circuit Breakers:
 - 1) Molded case thermal magnetic.

- 2) Multiple pole breakers shall be common trip.
 - 3) Bolt-in or plug-in.
 - 4) Individually front replaceable.
 - 5) Indicating “On”, “Off”, and “Tripped”.
 - 6) As noted on the drawings interrupting capacity at 240 V.
 - 7) Handle clips to prevent casual operation for circuit breakers indicated on drawings.
 - 8) Ground fault interrupting breakers with a sensitivity of 5Ma for receptacle branch circuit and where indicated on drawings.
 - 9) Breakers, trip ratings, and number of poles as indicated on the drawings.
- d. Buses:
- 1) Two phase and neutral bus insulated from cabinet.
 - 2) Ground bus.
 - a) Connected to cabinet.
 - b) Clamp type lug for supply circuit and each load circuit.
 - c) Removable bond to neutral bus.
 - 3) Copper.
 - 4) Ampere and voltage ratings as indicated on the drawings.
 - 5) Bracing coordinated with circuit breakers interrupting capacity.
16. Dry-Type Specialty Transformers.
- a. Phase, voltage current ratings as indicated on drawings.
 - b. Two 2½% full capacity taps below normal voltage.
 - c. Dry type, wall floor or MCC mounted as indicated on the drawings, enclosed for wiring in conduit.
 - d. Self air-cooled.
 - e. Enclosure rating shall be suitable for the area where it will be installed or as noted on the drawings if a rating is indicated.
 - f. Insulation system and average winding temperature rise for rated KVA as follows:
 - 1) 1-15 KVA: Class 185 with 115°C rise.
 - 2) 16-500 KVA: Class 220 with 115°C rise.
 - g. Sound Levels: NEMA ST20.
 - h. Ground core and coil assembly to enclose by means of a visible flexible copper grounding strap.

- i. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise
- 17. Equipment Disconnects.
 - a. General:
 - 1) Heavy-duty safety switches.
 - 2) Cutler-Hammer, Square D, or equal.
 - b. Enclosure:
 - 1) Indoor dry areas: NEMA 12.
 - 2) Outdoor: NEMA 4X.
 - 3) Corrosive Areas: NEMA 4X.
 - 4) Use above guidelines unless otherwise noted on drawings.
 - 5) Padlocked external operating handle.
 - c. Switch:
 - 1) 10,000 amp symmetrical withstand.
 - 2) Poles to match equipment served.
 - 3) 240 VAC.
 - 4) Continuous current rating not less than the serving branch circuit over current protection.
 - 5) Non-fusible except where fusing is required by the served equipment or as noted on the drawings.
- 18. Separately Enclosed Motor Starters.
 - a. General:
 - 1) Starters shall have a disconnecting means.
 - 2) 3 phase: NEMA size 1 minimum size or as indicated on the drawings.
 - 3) Dry type control power transformer for 120VAC control power sized to handle all loads simultaneously, both primary leads fused and one secondary lead fused and one secondary lead grounded.
 - 4) Two spare NO and NC auxiliary contacts.
 - 5) Pilot devices.
 - 6) Nameplates to identify the starter and all the items in the starter.
 - 7) Cutler Hammer, Square D or equal.
 - b. Enclosure:
 - 1) Indoor dry areas: NEMA 12.
 - 2) Outdoors & corrosive areas: NEMA 4X.

- 3) External operating handle to be interlocked with the door to prevent opening door when handle is in the closed position.
 - 4) Padlocked external operating handle.
 - c. Contactor:
 - 1) 3 phase: NEMA size 1 minimum size or as indicated on the drawings.
 - 2) 1 phase: NEMA size 0 minimum size or as indicated on the drawings.
 - 3) Rated for the voltage being provided.
 - 4) 120 VAC coils.
 - 5) Non-reversing NEMA rated magnetic starters.
 - d. Overloads:
 - 1) One thermal overload relay in each phase.
 - 2) External manually reset push button for reset of the thermal overload relay.
 - 3) Bimetallic overloads shall be provided.
 - e. Disconnecting Device:
 - 1) 3 phase: MCP type disconnect rated at 25KAIC minimum.
 - 2) 1 phase: MCP or fused type disconnect rated at 10KAIC minimum.
- 19. Surge Protective Device (SPD).
 - a. General:
 - 1) SPD units shall be installed as shown on the drawings.
 - 2) SPD units shall be appropriate for the voltages indicated on the drawings.
 - 3) Approved manufacturers: Cutler Hammer, Square D, LEA, or equal.
 - 4) SPD units shall comply with UL 1449 and 1283.
 - 5) SPD units shall comply with IEEE C62.41 and IEEE C62.45.
 - 6) SPD units shall have a 30 amp disconnect directly before the TVSS unit.
 - 7) SPD units shall have indication for trouble alarms and surge count.
 - 8) For assembled equipment the SPD unit shall be of the same manufacturer as the assembled equipment.
 - b. Ratings:

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- 1) Maximum let through voltage shall be:

<u>Mode</u>	<u>120/208</u>	<u>277/480</u>
L-N or L-G	400V	800V
L-L	800V	1800V
- 2) Minimum total surge current capability:

<u>Location</u>	<u>Per Phase</u>	<u>Per Mode</u>
Switchgear	250 KA	125KA
MCC	160KA	80KA
Panelboards	120KA	60KA

2.02 SPARE PARTS

- A. The intent of this Specification is to provide uninterrupted operation for a minimum period of 2 years. To meet this objective, the Supplier shall furnish and deliver any spare parts that are required to meet this time frame.
- B. The following spare parts to be furnished as a minimum:
 1. 25% replacement lamps for lighting fixtures.
 2. 25% replacement lamps for pilot light.
 3. Five (5) replacement caps for each color of pilot light.
 4. Two (2) sets of each type of fuse used in the project.
 5. Two (2) spare ballast of each type specified.
- C. All of the above parts shall be provided as spare parts and shall be packaged new in the original manufacturer's packaging. A list of spare parts shall be provided.

PART 3 -- EXECUTION.**3.01 INSTALLATION REQUIREMENTS**

- A. General Requirements
 1. The instrumentation equipment shall be installed by the Contractor or his subcontractors in accordance with the manufacturers' instructions. The services of the system supplier's technical representative shall be provided as necessary to calibrate, test, and advise others of procedures for adjustment and operation.
- B. Inspection.
 1. Inspect materials and equipment for signs of damage, deterioration or other deleterious effects of storage, transportation, handling, or defects in manufacture or assembly.
 - a. Replace with identical new materials or equipment or repair to like new condition any materials or equipment showing such effects to the satisfaction of the Engineer and Owner.
- C. Equipment Installation.
 1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in

conformity with specification requirements.

- a. Separate sheet metal junction boxes, equipment enclosures, sheet metal raceways, etc., mounted on water or earth-bearing walls or wall-mounted outdoors ¼-inch from wall be corrosion resistant spacer.
- b. Seal the base of all outdoor switchgear, motor control center, and similar equipment with grout.
- c. Screen or seal with flexible sealing compound all openings into outdoor equipment to prevent the entrance of rodents, wasps, and mud-daubers.
- d. Electrical work shall conform to the construction schedule and progress of other trades.
- e. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner.
- f. Perform all work in accordance with manufacturer's instructions.
 - 1) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents.
 - 2) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.
- g. Field Wiring. Field wiring materials and installation shall conform to the requirements of the electrical section.

D. Identification:

1. Conduit. Conduits in manholes, handholes, building entrance pull boxes, junction boxes, and equipment shall be provided with identification tags.
2. Cable. Except for lighting and receptacle circuits, each individual wire in power, control, indication, and instrumentation circuits shall be provided with identification markers at the point of termination. Power wires without individualized identification numbers shall be color coded with electrical tape or colored wire jacket. The wire markers shall be of the heat-shrinkable tube type.
3. Control Stations. Control stations shall be provided with nameplates identifying the related equipment. Pilot controls and indicating lights shall have engraved or etched legends ("start", "stop", etc.) as indicated on the drawings. Nameplates shall be laminated plastic, with 1/8-inch engraved letters, and shall be securely fastened to the control stations.
4. Circuit Breakers. Circuit breakers shall be provided with nameplates identifying related equipment. Nameplates shall be laminated plastic, with 1/8-inch engraved letters, and shall be securely fastened to the circuit breakers.

E. Raceways:

1. General:
 - a. Except as otherwise indicated on drawings, conduit shall be concealed in finished areas and exposed in unfinished areas.
 - b. Rigid steel conduit and aluminum conduit connections and terminations shall be reamed, de-burred, threaded and provided with bushings.
 - c. Securely fasten conduit connections to sheet metal enclosures with locknuts inside and out. Conduit hubs outdoors and in wet locations.
 - d. Provide deflection fittings across structural joints where structural movement is allowed.
 - e. Keep conduit clear of structural openings and indicated future openings.
 - f. Provide flashing and seal watertight conduits through roofs and metal walls.
 - g. Neatly grout conduit into any opening cut into structure.
 - h. Cap or plug conduits during construction to prevent the entrance of trash, dirt and water.
 - i. Minimum conduit size shall be $\frac{3}{4}$ -inch, except $\frac{1}{2}$ -inch for luminary pendants.
 - j. Seal conduits with flexible sealing compound forced to a minimum depth equal to the conduit diameter after cable is installed.
 - 1) At handholes, manholes, and vaults.
 - 2) Building entrance junction boxes.
 - 3) One inch or larger connections to equipment.
 - k. Provide flexible conduit where flexible connections are necessary, including each motor without flexible cord.
 - 1) Keep length to a minimum, not to exceed 6' maximum.
 - 2) No sharp bends.
 - l. Provide suitable pull string in each empty or spare conduit.
2. Conduit exposed in structures:
 - a. Install parallel to structural members and surface.
 - b. Install conduits of the same general routing parallel with symmetrical bends.
 - c. Arrange supports to prevent misalignment during wiring installation.
 - d. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
 - e. Group related conduits; support using conduit rack. Construct rack using steel channel provide space on each for 25 percent

additional conduits.

- f. Install no more than equivalent of three 90° bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2-inch size.
 - g. Provide suitable pull string in each empty conduit except sleeves and nipples.
 - h. Maintain 6-inch clearance to ducts, piping and flues.
 - i. Support rigidly with galvanized or cadmium-plated hardware and framing materials, including nuts and bolts.
 - j. Provide expansion fittings at 100' centers outdoors, 200' centers indoors; in each conduit run longer than 100' outdoors, 200' indoors.
 - k. Provide galvanized pipe caps on conduit stubs for future use.
 - l. Allow 7' headroom for horizontal conduit runs, except along structures, piping equipment or where not possible.
 - m. Except as otherwise indicated, do not install exposed conduit in water chambers.
 - n. Where allowed, coat conduit exposed in water chambers with 2 coats of coal tar paint with paint injuries repaired or use PVC coated conduit.
3. Conduit concealed in structure:
- a. Install between reinforcing steel in slabs with reinforcing in both faces.
 - b. Install under reinforcing steel in slabs where only a single layer is provided.
 - c. Terminate conduit for future use in equipment or by galvanized couplings and conduit plugs flush with structural surfaces. Seal plugs with self-leveling caulk.
 - d. Maximum of two conduits crossing each other in slab.
4. Underground:
- a. One inch minimum.
 - b. Encased in concrete.
 - 1) Two inches between conduits.
 - 2) Three inches over conduit where not reinforced.
 - 3) Three inches over reinforcing.
 - 4) Reinforced at and 5-feet past portion on disturbed earth or subject to traffic.
 - 5) Reinforced within 5-feet of a structure, manhole or vault.
 - 6) Reinforced for entire length and 2-feet beyond each

- adapter to steel conduit if non-metallic is used in duct bank.
- 7) Where capped underground, reinforce the last 2-feet and extend steel and conduit 2-feet past end of duct bank. Paint all unencased metal with 2 coats of coal tar paint.
- 8) Continue encasement on outdoor risers to 3-inches above grade and crown and chamfer top.
- c. Two-foot minimum bend radius at vertical risers, Three foot elsewhere.
- d. Install underground conduit so that it does not drain to cable pulling access in buildings; where necessary, provide a handhole or manhole near or adjacent to building.
- e. Provide 2-foot minimum earth cover.
- f. Install underground conduits through buildings, manhole, handhole and vault walls in box outs as indicated on the drawings.
- g. All steel inside manholes, handholes and vaults shall be galvanized with bared spots treated with zinc rich paint.
- h. Provide 3/4-inch galvanized steel pulling eyes on opposite walls below the centerline of each duct bank.
- i. Provide end bells at wall terminations and adapters for steel conduit continuations for non-metallic duct systems.
- j. Isolate intercommunication and milliamper level instrumentation circuits from all power wiring raceways, conduits, boxes, vaults, manhole and handhole.
- k. Provide a full-size extension for each underground conduit entering a building.
- 5. Junction boxes and wiring gutters:
 - a. Install electrical boxes as shown on drawings and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
 - b. Install pull boxes and junction boxes to maintain headroom and to present neat mechanical appearance.
 - c. Install level and plumb.
 - d. Where indicated, provide a removable side opposite underground duct banks.
 - e. At least code size including space for full size continuation of any conduit not originally continued.
 - f. Arrange conduit for maximum space for future conduits.
 - g. Support boxes independently of conduit except cast box that is connected to rigid metal conduits both supported within 12 inches of box.

F. Wire and Cable**1. General:**

- a. Protect the cable and avoid kinking conductors, cutting or puncturing jackets, contaminating by oil or grease or damaging in any manner.
- b. Terminate stranded cable with lugs, cup washers, or pressure type connectors; do not wrap stranded cable around screw type terminals.
- c. Splice stranded cable with pressure type connectors; do not use wire nut type connectors on stranded cable.
- d. Splice cables only at readily accessible locations.
- e. Do not pull cable tight against bushings or press heavily against enclosures.
- f. Use cable pulling lubricants as recommended by the cable manufacturer.
- g. Use swab to clean conduits and ducts before pulling cables.
- h. Install cable and accessories in accordance with manufacturer's instructions.
- i. Where necessary to prevent heavy loading of cable connectors due to cable weight, support cables in vertical risers with woven cable grips.
- j. Coil and tape spare cable ends.
- k. Support each 250 MCM or larger cable, and each conduit group of smaller cables from manholes, handholes or vault walls.
- l. Use Stranded conductor for feeders and branch circuits.
- m. Use stranded conductors for control circuits.
- n. Use conductor not smaller than 12 AWG for power and lighting circuits.
- o. Use conductor not smaller than 16 AWG for control circuits.
- p. Use 10 AWG conductors for 20 ampere, 120 Volt branch circuits longer than 100-feet.
- q. Pull all conductors into raceway at same time.
- r. Use suitable wire pulling lubricant for building wire 8 AWG and larger.
- s. Protect exposed cable from damage.
- t. Neatly train and lace wiring inside boxes, equipment, and panel boards.
- u. Clean conductor surfaces before installing lugs and connectors.
- v. Make splices, taps, and terminations to carry full ampacity of conductors.

2. Special cables:
 - a. Isolate networking and milliampere level instrumentation cables from all power circuits.
 - b. Isolate telephone cables from all other circuits.
3. Conductor identification:
 - a. Color code all service, feeder, and branch circuit conductors, 277/480 VAC and above as follow:
 - 1) Phase A: Brown
 - 2) Phase B: Orange
 - 3) Phase C: Yellow
 - 4) Neutral: White
 - 5) Ground: Bare or Green
 - b. Color code all feeder, and branch circuit conductors, 120/208 VAC as follows:
 - 1) Phase A: Red.
 - 2) Phase B: Black.
 - 3) Phase C: Blue.
 - 4) Neutral: White.
 - 5) Ground: Bare or Green.
 - c. Identify single control conductors by color coding orange and by labeling each end of conductors by color coding orange and by labeling each end of conductor with heat shrink-tube type wire markers.
 - d. Identify multi-conductor instrumentation and control cables with heat shrink-tube type wire markers.
 - e. Contractor shall establish a control and instrumentation conductor and cable identification system acceptable to Engineer.
- G. Wiring Devices:
 1. Flush mount wiring devices in concealed conduit system.
 2. Surface mount wiring devices in exposed conduit systems.
 3. Provide extension rings to bring outlet boxes flush with finished surface.
 4. Clean debris from outlet boxes.
 5. Install products in accordance with manufacturer's instructions.
 6. Install devices plumb and level.
 7. Install switches with OFF position down.
 8. Install receptacles with grounding pole on bottom.
 9. Connect wiring device grounding terminal to branch circuit equipment

grounding conductor.

10. Connect wiring devices by wrapping conductor around screw terminal.
11. Use jumbo size plates for outlets installed in masonry walls.
12. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
13. Install wall switch 48-inches above finished floor.
14. Install convenience receptacle 24-inches above finished floor.
15. Inspect each wiring device for defects.
16. Operate each wall switch with circuit energized and verify proper operation.
17. Verify that each receptacle device is energized.
18. Test each receptacle device for proper polarity.
19. Test each GFCI receptacle device for proper operation.
20. Adjust devices and wall plates to be flush and level.

H. Grounding Materials:

1. Coordinate installation with other disciplines.
2. Verify that final backfill and compaction has been completed before driving rod electrodes.
3. Install Products in accordance with manufacturer's instructions.
4. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
5. Provide grounding well pipe with cover at each rod location. Install well pipe top flush with finished grade.
6. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing.
7. Provide bonding to meet Regulatory Requirements.
8. Install ground cable through building walls within 3-feet below finish grade and prepare a water stop.
9. Install ground rods and cables as deep in earth as possible and as far from structure as possible, not closer than 6-inches.
10. All branch circuit and feeder circuits to include a copper ground conductor in addition to the conduit ground connection.
11. Connect ground conductors to equipment by ground lugs or clamps.
 - a. If no ground bus or terminal is provided and enclosure is not explosion-proof or submersible provide a clamp type lug under a permanent assembly bolt or by grounding locknuts or bushings.
 - b. If an explosion-proof or submersible enclosure is not provided with grounding means, provide an adjacent junction box with a ground

lug.

- c. Bond grounding system to station piping by connection to the first flange inside the building on either a suction or discharge pipe which will form a good ground connection:
 - 1) Drill and tap the flange.
 - 2) Provide a bolted connection.
 - 3) Bond with a copper bar or strap.
- d. Form ground conductors on equipment to the contours of the equipment.
- e. Install main ground cables with encased underground conduit banks in earth at least 3-inches below 1 corner of the duct bank.
- f. Bond ground cables in underground circuits to main ground cables at each manhole, handhole, and vault.

I. Luminaries.

- 1. Install in the general locations and arrangement indicated on drawings.
- 2. Align luminaries in rows vertically and horizontally except as otherwise required.
- 3. Install clear of pipes, mechanical equipment, structural openings, indicated future equipment and structural openings, and other obstructions.
- 4. Adjust luminary location as required by field conditions.
- 5. Examine each luminary to determine suitability for lamps specified.
- 6. Install in accordance with manufacturer's instructions.
- 7. Install suspended luminaries using pendants supported from swivel hangers. Provide pendant length required to suspend luminaries at indicated height.
- 8. Support luminaries larger than 2x4 foot size independent of ceiling framing.
- 9. Locate recessed ceiling luminaries as indicated on reflected ceiling plan.
- 10. Install surface mounted luminaries and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.
- 11. Install recessed luminaries to permit removal from below.
- 12. Install accessories furnished with each luminaire.
- 13. Bond products and metal accessories to branch circuit equipment grounding conductor.
- 14. Install specified lamps in each luminaire emergency lighting unit and exit sign.
- 15. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

16. Aim and adjust luminaries as directed.
17. Relamp luminaries that have failed lamps at Substantial Completion.
18. Clean electrical parts to remove conductive and deleterious materials.
19. Remove dirt and debris from enclosure.
20. Clean photometric control surfaces as recommended by manufacturer.
21. Clean finishes and touch-up damage.

J. Lighting Panel

1. Wall mount in unfinished areas, flush mount in finished areas.
2. Install lighting panel in accordance with NEMA PB 1.1.
3. Install lighting panel plumb. Provide supports. Height: 6 ft. to top of lighting panel; install lighting panel taller than 6 ft. (2M) with bottom no more than 4-inches above floor.
4. Provide filler plates for unused spaces in lighting panels.
5. Provide typed circuit directory for each branch circuit in lighting panel. Revise directory to reflect circuiting changes required to balance phase loads.
6. Measure steady state load currents at each lighting panel feeder; rearrange circuits in the lighting panel to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.
7. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

K. Dry Type Specialty Transformers

1. 25 Kva and below: Wall mount above associated panel board.
2. 30 Kva and above: Floor mount immediately adjacent to associated panel board.
3. Verify that surfaces are suitable for installing transformer supports.
4. Provide concrete pad.
5. Install products in accordance with manufacturer's written instructions.
6. Set transformer plumb and level.
7. Use flexible conduit, 2-foot minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
8. Mount transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure.
9. Provide grounding and bonding in accordance with NFPA 70.
10. Check for damage and tight connections prior to energizing transformer.
11. Measure primary and secondary voltages and make appropriate tap adjustments.

- L. Networking – EtherNet/IP cabling
 - 1. Install sufficient networking cable, as shown in the contract drawings, to provide a complete networked system.
 - 2. Terminate all wiring with RJ-45 connectors rated for Cat 5e cable transmissions.
 - 3. Test every communication cable, and provide a testing certificate with the results.

3.02 FIELD QUALITY CONTROL

- A. Low Voltage Cable Testing
 - 1. Test 600 V power cables for continuity and freedom from short circuits and ground, except where grounding is intentional immediately after installation.
 - 2. Test all circuits with a 500 V megger or its equivalent.
 - 3. Replace conductors which read less than 1.5 Megohms between conductors and ground.

3.03 PROTECTION AND STORAGE

- A. Protection of equipment during storage:
 - 1. During construction, all electrical equipment shall be protected against absorption of moisture, and metallic components shall be protected against corrosion. This protection shall be provided immediately upon receipt of the equipment and shall be maintained continuously. Any means necessary shall be used to protect the equipment at the contractor's expense.

- END SECTION -

SECTION 16150 – VARIABLE FREQUENCY DRIVES AND CONTROL EQUIPMENT

PART 1 -- GENERAL

1.01 SUMMARY

This section covers the furnishing of variable frequency drives (VFDs) with all associated labor, material, tools, equipment, appurtenances, and service in accordance with the contract documents.

1.02 SUBMITTALS

Submittals shall be required as noted in section 16900.

1.03 QUALITY ASSURANCE

A. Supplier's qualifications

1. Acceptable Manufacturers.
 - a. VFDs on this project shall be Square D "Model 630".
 - b. Where a listed manufacturer's standard product does not meet the requirements of this specification, the standard unit shall be modified to meet all the requirements of this specification.

B. Coordination

1. Verify all motor sizes and specifications from approved mechanical, process, and instrumentation shop drawings, contract drawings, and contract documents. It is the contractor's responsibility to fully coordinate the VFDs with the provided driven equipment. All equipment provided under this section shall comply with the requirements of the general project requirements, section 16050, and section 16900 of these specifications.

1.04 WARRANTY

The supplier shall warrant the hardware for a period of two (2) years from the date of system acceptance.

PART 2 -- PRODUCTS

2.01 GENERAL REQUIREMENTS

- A.** All equipment furnished under this section shall be selected by the system supplier for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.
1. Interchangeability. All VFDs shall be products of the same manufacturer and of the same series or product line.

2.02 MATERIALS AND EQUIPMENT

- A.** The following specifications shall apply to the VFDs.

VARIABLE FREQUENCY DRIVES AND CONTROL EQUIPMENT – SECTION 16150

1. The variable frequency drives shall consist of a 208 V adjustable frequency inverter with integral control, sequence logic, and self-diagnostics as specified herein. The drives shall be of “pulse width modulated inverter” (PWM) type employing semi-conductor technology. The VFD shall limit harmonic distortion reflected onto the system to a voltage and current distortion level as defined by the latest version of IEEE 519 for general system application.
2. The VFDs shall be rated as shown on the drawings, constant torque. The VFDs shall be a microprocessor based static adjustable frequency controller designed to provide continuous speed adjustment of 3 phase motors. The VFDs shall provide energy-efficient, low loss speed control in the range from 4 to 70 Hz.
3. The VFDs shall operate in an ambient temperature range of 10C to 30C at an altitude of 5,800 feet above sea level.
4. The following microprocessor-based, door-mounted operator controls and status indication shall be provided:
 - a. Run/stop selection with LED indication.
 - b. Speed control selection with LED indication.
 - c. Current limit indication.
 - d. Microprocessor fault.
 - e. Reset button.
 - f. Manual speed adjustment.
 - g. Frequency indication.
 - h. Amp-meter.
 - i. Output voltage meter.
 - j. Elapsed time meter.
 - k. Error and Fault log.
 - l. Input line filters of at least 5% to attenuate the harmonics.
5. The following basic control functions and features shall be provided:
 - a. Interface for external hand-off-auto switch and control signals as shown on the drawings.
 - b. Interface for external 4-20Ma speed reference signal.
 - c. 4-20Ma output signal for VFD speed indication.
 - d. Output relays with dry contacts wired to terminals for functions shown on the drawings.
 - e. Control power transformer and power supplies as required.
6. The following standard independent adjustments shall be provided on the VFDs:
 - a. Minimum frequency.

- b. Maximum frequency.
- c. Four preset speeds initiated by contact closures.
- d. Adjustable acceleration times.
- e. Voltage boost.
- f. Volts-to-hertz ratio.
- g. Current limit.
- h. Critical frequency avoidance zones.
- i. Jog input.
- j. Selectable auto restart.

PART 3 -- EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. General Requirements
 - 1. It shall be the SYSTEM SUPPLIER'S responsibility to ensure that the entire electrical equipment is installed in a satisfactory condition per these specifications and the manufacturer's requirements.
- B. Inspection.
 - 1. Inspect materials and equipment for signs of damage, deterioration or other deleterious effects of storage, transportation, handling, or defects in manufacture or assembly.
 - a. Replace with identical new materials or equipment or repair to like new condition any materials or equipment showing such effects to the satisfaction of the Engineer and Owner.
- C. Equipment Installation.
 - 1. The VFDs shall be installed in a custom control panel provided by the SYSTEM SUPPLIER.
- D. Adjustment and Cleaning
 - 1. Perform all required adjustments, tests, operational checks, cleaning and other start-up activities required.
 - 2. Take precautions, as necessary, to properly protect all equipment from damage. Installed equipment to be protected from further construction operations.

3.02 CUSTOMER TRAINING

The SYSTEM SUPPLIER shall provide a qualified representative at the job site to train the Owner's personnel in operating and maintenance of this equipment. The training sessions shall include a technical explanation of the equipment and an actual hands-on demonstration. The training session shall consist of a 2-hour session; the schedule shall be arranged and coordinated with the Engineer.

- END SECTION -

SECTION 16250 – ENGINE GENERATORS: DIESEL

PART 1 -- GENERAL

1.01 SUMMARY

This section covers Engine Generators and associated components as described herein and as indicated in the drawings.

1.02 SYSTEM DESCRIPTION

- A. Provide an engine generator set including, but not necessarily limited to, the following:
 - 1. Engine.
 - 2. Cooling system.
 - 3. Exhaust system.
 - 4. Generator.
 - 5. Control equipment and accessories.
 - 6. Housing.
 - 7. Output circuit breaker.

1.03 REFERENCES

- A. Applicable Standards.
 - 1. National Electrical Manufacturer's Association (NEMA).
 - 2. National Fire Protection Association (NFPA).
 - 3. Underwriter's Laboratories, Inc. (UL).

1.04 SUBMITTALS

- A. Submittals shall be required as noted in section 16900.
- B. Provide a full detail description for performing the required engine testing. Upon completion of engine testing prepare and submit final results along with all new data.
- C. Upon satisfactory completion of startup, secure a written statement from manufacturer that each engine generator is installed in accordance with manufacturer's recommendations, properly started up and is ready for operation by the Owner's personnel. Also certify that required operation and maintenance training has been fully satisfied.
- D. Wiring diagrams for each engine-generator set. Indicate clearly factory versus field wiring connections.
- E. Generator fault current at full rpm and main circuit breaker trip curves and fault interrupting rating.

1.05 QUALITY ASSURANCE

- A. Supplier's qualifications
 - 1. The entire system shall be designed, coordinated, and supplied by an

approved supplier who is regularly engaged in the business of engine generators. The supplier shall meet the following qualifications.

- a. The supplier shall have and shall maintain a qualified technical staff and design office. The qualifications and experience of key project personnel shall be acceptable to the Engineer.
- b. The supplier shall have the physical plant and fabricating personnel to complete the work specified. The supplier's fabrication capabilities and arrangements shall be acceptable to the Engineer.
- c. The supplier shall employ competent service personnel to service the equipment furnished. The geographic location of service personnel for this project shall be acceptable to the Engineer.
- d. The supplier shall provide a "Statement of Qualifications" indicating that they have successfully provided similar work for at least 5 years.

B. Testing

1. Prototype Test: The manufacturer shall have successfully tested a prototype of each engine/generator set series offered. The tests performed shall include the following:
 - a. Maximum power test.
 - b. Maximum motor starting kVA.
 - c. Transient response, steady state governing, and voltage regulation.
 - d. Single step load pick-up per NFPA 110.
 - e. Three-phase short circuit test for mechanical and electrical strength.
 - f. Fuel consumption.
 - g. Cooling system test.
 - h. Endurance run test.
2. Factory Tests: Prior to shipment, each unit shall be factory performance tested under load. Test results shall be certified and documented on a strip chart recorder. The tests shall be performed in accordance with the Manufacturer's standards and NFPA Standard 110. The following tests shall be performed:
 - a. Stepped load test at 1/2, 3/4, and full load for 5 minutes each step.
 - b. Full single step block load.
 - c. Results documented shall include steady-state voltage and frequency analysis, transient response, maximum power analysis, and fuel consumption.
3. Field Tests: Each complete installation shall be tested for compliance with the plans and specifications following completion of all site work. Testing shall be conducted by a representative of the supplier. The Contractor

shall supply fuel, and other equipment required for the test. The Owner and Engineer shall be notified 3 to 4 weeks in advance and shall have the option to witness the tests. The tests shall be repeated until the equipment performs as specified. The tests to be conducted on site shall be as follows:

- a. Cold Start Test: Perform a cold start test on the generator using the generator's actual load as a test load. A power failure shall be simulated by opening the normal power disconnect and the following information shall be recorded:
 - 1) Cranking on time.
 - 2) Time required to come up to speed.
 - 3) Voltage and frequency overshoot.
 - 4) Time to achieve steady state.
 - 5) Voltage, frequency, and amps at standby state.
 - 6) Oil pressure, water temperature, and battery charge rate at 5-minute intervals for the first 15 minutes and at 15-minute intervals thereafter for 2 hours.
- b. Crank Cycle Test: Disable the generator from starting by a method approved by the Manufacturer and test the crank cycle by switching the generator to run.
- c. Safety Shutdowns: Test all the generator safety shutdowns.

1.06 WARRANTY

The supplier shall warrant the hardware for a period of two (2) years from the date of system acceptance.

PART 2 -- PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. All equipment furnished under this section shall be selected by the supplier for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged, and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.
 - 1. Acceptable Manufacturers. Subject to compliance with Contract Documents, the following manufacturers are acceptable.
 - a. MTU Onsite Energy
 - b. Cummins/Onan.
 - c. Kohler.
 - 2. Assure engine, generator, and accessories are provided by the engine manufacturer and its authorized dealer.

3. Assure local availability of service and replacement parts.

2.02 MATERIALS AND EQUIPMENT

- A. Operating Conditions: Provide complete generator sets, controls and accessories rated for the following conditions:
 1. Location: Glenwood Springs, Co.
 2. Altitude: 5,800 FT AMSL.
 3. Fuel: #2 Diesel.
 4. Enclosure rating: Outdoors.
- B. Performance: Establish net rating of each generator set under operating conditions specified when equipped and fully loaded with all necessary operating accessories. Substantiate ratings with manufacturer's standard published curves and data.
 1. Minimum ratings:
 - a. Standby rating (at 0.8 PF): 30kW
 - b. Frequency: 60 Hz
 - c. Voltage and phase: 208-120/3
 - d. Engine speed, max (rpm): 1800
 - e. Maximum voltage dip: 20%
 2. The unit shall be required to maintain the above noted parameters while starting and running the loads shown on the electrical one-line diagrams. The loads may be started simultaneously.
 3. Fuel: Engines requiring special or premium fuel will not be acceptable.
- C. Engine.
 1. Engine Construction: Provide diesel-type engine of heavy-duty construction, full compression ignition diesel, radiator and fan cooled.
 - a. Engines solid-state designed for cold quick start, capable of delivering full load output in 30 seconds.
 - b. Provide exhaust manifolds.
 2. Lubrication:
 - a. Provide pressure-type lubrication system with gear-type oil pump and full flow filters fitted to engines. Provide level indicator or dipstick.
 - b. Locate filter for convenient servicing.
 - c. Oil drain piped to edge of skid with valve or cap.
 3. Air Cleaner:
 - a. Provide one or more dry-type replaceable element air cleaners suitable for high dust load operation.
 - b. Equip each air cleaner with service indicator.

4. Governor:
 - a. Provide a fully enclosed electronic governor.
 - b. Frequency at any constant load shall not deviate more than plus or minus 0.5 percent of rated frequency.
 - c. The governor to provide adjustable frequency regulation from isochronous to 5 percent drop.
 5. Fuel System: Dual replaceable element filter, engine supply and return line, solenoid, shut off valve, and engine driven fuel pump.
- D. Generator
1. Construction: Provide brushless, revolving field type, synchronous generator coupled directly to engine flywheel through a flexible driving disc for positive alignment.
 - a. Bolt generator housing directly to engine flywheel housing.
 - b. Provide volts-per type voltage regulator of solid state 3-phase sensing, construction matching characteristics of each unit. Provide no load to full load regulation within ± 0.5 percent at rated voltage during steady state conditions.
 - c. Provide permanent magnet generator to provide excitation power to the automatic voltage regulator.
 - d. Provide shock-resistant mounting of regulators.
- E. Cooling System
1. Provide unit-mounted radiator cooling system with sufficient capacity for cooling generator set at full rated load and operating conditions specified.
 - a. Equip engine with engine-driven centrifugal-type water circulating pumps and thermostatic valve to maintain coolant temperature below 200° F.
 2. Coolant:
 - a. Flush and drain cooling system.
 - b. Fill with minimum 50 percent ethylene glycol and water solution.
 - c. Assure radiator, engine block and related items protected to minus 50° F.
 - d. Coolant drain piped to edge of skid with valve or cap.
 3. Jacket Water Heaters: Furnish one or more engine mounted thermal circulation type water heaters to maintain engine jacket water at 70° F at minimum ambient temperature specified.
 - a. Include integral thermostatic controls to maintain desired temperatures.
 - b. Rate heaters for 240 VAC, 1 phase, 60 HZ.
- F. Exhaust System
1. Exhaust Silencer. Provide a Critical-grade silencer and related hardware

to include side inlet, standard 125-150 lb. flange connections, companion-flanges; cleanouts, Type E support arrangement, and stainless-steel bellows type flexible exhaust connectors at least 24 inches long.

- a. Ensure silencers and related hardware are properly sized and installed according to the manufacturer's recommendation.
 - b. The silencer shall be mounted horizontally such that its weight is NOT supported by the engine.
 - c. Furnish and install exhaust pipe constructed of schedule 40 steel pipe with standard 125-150 lb. flange connections as shown on the Drawings. Exhaust pipe size shall be sufficient to ensure that measured exhaust back pressure does not exceed 20 inches of water.
2. Install insulation so that it does not interfere with the functioning of the flexible exhaust fitting.
 3. Provide a 20-foot flexible connection hose for connecting the generator exhaust to an outside port when the generator is running in a building.

G. Starting Systems

1. Starting Motors: Provide 24 VDC starting system with solenoid operated positive engagement drive.
2. Batteries: Furnish lead acid batteries with each engine generator with sufficient capacity to crank engines for three 20-second cranking periods with a 30-second rest period between cranks without recharging.
 - a. Provide battery rack appropriately sized for the batteries furnished, painted with alkaline-resistant paint.
 - b. Provide constant voltage, current limiting, full wave rectifier type battery chargers using silicon-controlled rectifiers as the power controlling elements.
 - c. Provide float and equalize charge rates. Rate charger for 120 VAC, 1 phase, 60 HZ with output current rating to recharge the battery from a 70 percent discharged condition to 95 percent charged condition in 12 hours.
 - d. Battery charger shall be provided with a plug so that it can be plugged into a 120V receptacle at the well building.
 - e. Provide malfunction alarm contacts for actuation of alarm in the event of malfunction in the battery charging system.
 - f. Provide DC voltmeter and ammeter, ac input and dc output circuit breakers.
 - g. Provide cables, clamps and all other necessary connections.
 - h. Size main cables to exhibit total circuit resistance of 0.005 ohm or less.
 - i. Starting shall be initiated by a normally open, dry contact closure.

H. Controls

1. Control Panel:
 - a. Provide NEMA 1 enclosed control panel mounted on each generator terminal box with vibration isolators.
 - b. Construct dead front panel with 14 GA steel.
 - c. Include the following devices in panel:
 - 1) Engine coolant temperature gage.
 - 2) Engine lube oil pressure gage.
 - 3) Engine lube oil temperature gage.
 - 4) Engine running hour meter.
 - 5) Battery charging indicators.
 - 6) Voltmeter.
 - 7) Ammeter with true RMS output, supplied by 3 CT's at generator output leads.
 - 8) Ammeter and voltmeter phase selector switch or switches.
 - 9) Frequency meter.
 - 10) Manual and automatic starting controls.
 - 11) Panel illumination lights and switch.
 - 12) Voltage level adjustment rheostat.
 - 13) Fault indicators including low oil pressure, high water temperature, overspeed and overcrank. Provide dry contacts for common annunciation of fault conditions.
 - d. Multifunction digital device incorporating all above functions will be acceptable.
- I. Main Line Circuit Breaker: Provide main circuit breaker for generator set, sized for appropriately to protect the generator.
 1. Breakers are to operate both manually for normal switching function and automatically during overload and short circuit conditions.
 2. The trip unit for each pole of each breaker is to have elements providing inverse time delay during overload conditions and instantaneous magnetic tripping for short circuit protection.
 3. Provide breakers to interrupt bolted 3 PH fault from generator at full rpm at load terminals.
 4. Provide a NEMA 1 enclosure for circuit breakers and mount on generator using suitable vibration isolators.

2.03 SPARE PARTS

- A. The intent of this Specification is to provide uninterrupted operation for a minimum period of 2 years. To meet this objective, the Supplier shall furnish and deliver any spare parts that are required to meet this time frame.
- B. The following spare parts to be furnished as a minimum:

1. One (1) Complete Set of Filters (oil, gas, air, etc.).
 2. One (1) Lot of Oil for a complete oil change.
 3. One (1) Complete Replacement Set of all fuses.
- C. All of the above parts shall be provided as spare parts and shall be packaged new in the original manufacturer's packaging. A list of spare parts shall be provided.

PART 3 -- EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. General Requirements
1. It shall be the SUPPLIER'S responsibility to ensure that the electrical equipment is installed in a satisfactory condition per these specifications and the manufacturer's requirements.
- B. Inspection.
1. Inspect materials and equipment for signs of damage, deterioration or other deleterious effects of storage, transportation, handling, or defects in manufacture or assembly.
 - a. Replace with identical new materials or equipment or repair to like new condition any materials or equipment showing such effects to the satisfaction of the Engineer and Owner.
- C. Equipment Installation.
1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements.
 - a. Separate sheet metal junction boxes, equipment enclosures, sheet metal raceways, etc., mounted on water or earth-bearing walls or wall-mounted outdoors ¼" from wall be corrosion resistant spacer.
 - b. Seal the base of all outdoor switchgear, motor control center, and similar equipment with grout.
 - c. Screen or seal with flexible sealing compound all openings into outdoor equipment to prevent the entrance of rodents, wasps, and mud-daubers.
 - d. Electrical work shall conform to the construction schedule and progress of other trades.
 - e. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner.
 - f. Perform all work in accordance with manufacturer's instructions.
 - 1) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents.

- 2) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.
- g. Field Wiring. Field wiring materials and installation shall conform to the requirements of the electrical section.
- 2. Mounting, Fuel Tank and Enclosure.
 - a. Base: Mount engine, generator and cooling system on a common structural steel subbase capable of maintaining unit alignment suitable for mounting unit on a base fuel tank. Equip subbase with spring-type vibration isolators between subbase and fuel tank.
 - b. Fuel Tank: Provide double-wall welded steel UL listed base tank assembly designed and supplied by the generator manufacturer.
 - 1) Size tank for minimum 24 HRS of continuous engine operation at 3/4 load.
 - 2) Provide mounting and anchoring means suitable for installation on the trailer.
 - 3) Provide double wall construction with leak detection and alarm contact.
 - 4) Provide low fuel level alarm contact.
 - 5) Provide fuel fill spill containment box.
 - 6) Provide overfill prevention valve.
 - 7) Provide liquid tight fill connection system.
 - 8) Provide fuel fill drop tube.
 - c. Flexible Connections: Provide stainless-steel flexible fittings on all engine piping and electrical conduits.
 - 1) Engine control conduit.
 - 2) Fuel connection: Braided metallic.
 - 3) Exhaust connector bellows: Stainless-steel.
 - 4) Coolant water pipes: Braided metallic.
 - d. Enclosure:
 - 1) Equip engine generator set with a factory assembled ventilated sheet steel enclosure.
 - a) Provide weatherproof enclosure with an external critical grade silencer with rain cap.
 - b) The enclosure shall provide sound attenuation to provide no more than 78 dBA under full load at 7 meters.
 - c) Provide housing with hinged side-access doors and a rear control door.
 - d) All access doors to be lockable.

- e) Treat entire enclosure and skid tank assembly with an electro deposition primer process prior to finish painting for maximum durability.
 - f) Equip the set with lifting eye.
- D. Adjustment and Cleaning
 - 1. Perform all required adjustments, tests, operational checks, cleaning and other start-up activities required.
- E. Take precautions, as necessary, to properly protect all equipment from damage. Installed equipment to be protected from further construction operations.

3.02 FIELD QUALITY CONTROL

- A. Employ and pay for services of equipment manufacturer's field service representative(s) to:
 - 1. Inspect equipment covered by these Specifications.
 - 2. Supervise any adjustments and installation checks.
 - 3. Conduct initial startup of equipment and perform operational checks at jobsite. Conduct field tests as specified.
 - 4. Provide instruction to Owner's personnel on training in operation and maintenance of equipment for a 4-hour period.

- END SECTION -

SECTION 16280 – AUTOMATIC TRANSFER SWITCH**PART 1 -- GENERAL****1.01 SUMMARY**

This section covers the furnishing and installation of an automatic transfer switch for the engine generator. This automatic transfer switch (ATS) shall be installed outdoors and therefore shall be enclosed in a NEMA 3R enclosure. Individual ATS rating shall be as noted on the drawings.

1.02 SYSTEM DESCRIPTION

This equipment will be connected to a 208-volt, 3 phase, 4 wire, and solidly grounded system. A fully rated neutral lug shall be included in the ATS enclosure for connection of all the neutral conductors.

1.03 REFERENCES

All equipment to be furnished under this section shall be designed, constructed, and tested in accordance with the latest applicable requirements of the standard specifications and codes of ANSI, NEMA, IEEE, and other such regularly published and accepted standards, as well as state and local codes and the USERC standards required by the local utility.

1.04 SUBMITTALS

Submittals shall be required as noted in section 16900.

1.05 QUALITY ASSURANCE**A. Supplier's qualifications**

1. The entire system shall be designed, coordinated, and supplied by a qualified supplier who is regularly engaged in the business of ATS equipment. The supplier shall meet the following qualifications.
 - a. The supplier shall have and shall maintain a qualified technical staff and design office. The qualifications and experience of key project personnel shall be acceptable to the Engineer.
 - b. The supplier shall have the physical plant and fabricating personnel to complete the work specified.
 - c. The supplier shall employ competent service personnel to service the equipment furnished. The geographic location of service personnel for this project shall be acceptable to the Engineer.
 - d. The supplier shall provide a "Statement of Qualifications" indicating that they have successfully provided similar work for at least 5 years.

1.06 WARRANTY

The supplier shall warrant the hardware for a period of two (2) years from the date of system acceptance.

PART 2 -- PRODUCTS**2.01 GENERAL REQUIREMENTS**

- A. All equipment furnished under this section shall be selected by the system supplier for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.
1. Acceptable Manufacturers. Subject to compliance with Contract Documents, the following manufacturers are acceptable.
 - a. Asco.
 - b. GE Zenith.
 - c. Cummins Power Generation.
 - d. Or approved equal.
 2. The ATS shall be supplied by the engine generator supplier who shall be responsible for the design, manufacture, coordination, and proper installation and operation of the automatic transfer switch.

2.02 MATERIALS AND EQUIPMENT

- A. Automatic Transfer Switch
1. Each automatic transfer switch shall consist of a power transfer module and a control module, interconnected to provide complete automatic operation. The ATS shall be mechanically held and electrically operated by a single solenoid mechanism energized from the source to which the load is to be transferred. The switch shall be rated for continuous duty and be inherently double throw. The switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency.
 2. The automatic transfer switch shall conform to the requirements of NEMA Standard ICS 2-447 and UL's UL 1008 and shall be UL listed for use in standby systems in accordance with Articles 517, 700, 701, and 702 of the NEC.
 3. The automatic transfer switch shall be rated as shown on the drawings.
 4. All main contacts shall be of silver composition. They shall be protected by arcing contacts. The operating transfer time in either direction shall not exceed 1/6 of a second.
- B. Control.
1. The automatic transfer switch shall be controlled by a microprocessor-based programmable controller specifically designed for this function to provide rapid, reliable transfer of power between emergency and normal power conditions. The programmable controller shall be programmable from buttons on the front of the unit with an alphanumeric display for indication of entered values and any fault conditions.

2. Manual operation of the switch and manual lockout shall be possible.
3. The following control shall be incorporated into the transfer switch:
 - a. Voltage sensing shall be provided on all phases. The pickup voltage shall be adjustable from 85% to 100% of nominal, and the dropout voltage shall be adjustable from 75% to 90% of the pickup value. The transfer to the emergency power supply will be initiated upon reduction of normal source to 85% of nominal voltage, and the retransfer to normal shall occur when normal source restores to 90% of nominal.
 - b. A time delay shall be provided to override momentary normal source outages to delay all transfer switch and engine starting signals. The time delay shall be field adjustable from 0.5 to 30 seconds and factory set at 10 seconds.
 - c. A time delay on retransfer to normal source shall be provided. The time delay shall be automatically bypassed if the emergency source fails and normal source is available. The time delay shall be field adjustable from 0 to 30 minutes and factory set at 10 minutes.
 - d. A timer shall be provided for the unloaded running time delay for emergency generator cool down. The time delay shall be field adjustable from 0 to 10 minutes and factory set 5 minutes.
 - e. A contact shall be provided that closes when the normal source fails. This contact is for initiating the engine starting sequence. The contact shall be rated 10 amperes at 32 volts dc.
 - f. A white signal light shall be provided to indicate when the automatic transfer switch is connected to the normal source. A red signal light shall be provided to indicate when the automatic transfer switch is connected to the emergency source.
 - g. Two auxiliary contacts shall be provided that are closed when the automatic transfer switch is connected to normal and two auxiliary contacts shall be provided that are closed when the automatic transfer switch is connected to emergency. Contacts shall be rated 1 ampere, 240 volts, 60 Hz.
 - h. Programmed transition or in-phase monitor controls shall be provided to delay transfer from one active power source to another until the transfer can be done without causing nuisance tripping of circuit breakers and damage to the equipment.
 - i. A selector switch shall be provided for selecting manual or automatic retransfer to normal.
 - j. An engine generator automatic exercising timer shall be provided with the option of selecting to exercise under load or no-load conditions.
- C. Switching Components. The automatic transfer switch shall be rated to withstand the symmetrical short circuit current as noted on the drawings at the automatic transfer switch terminals with the type of overcurrent protection and

voltage as shown on the drawings.

1. Automatic transfer switches utilizing components of molded case circuit breakers, contactors, or parts thereof are not acceptable.

D. Enclosure

1. The ATS shall all be enclosed in a NEMA 3R enclosure.

PART 3 -- EXECUTION

3.01 GENERAL REQUIREMENTS

The Contractor shall ensure that all the electrical equipment is installed in a satisfactory condition per these specifications and the manufacturer's requirements.

3.02 INSPECTION.

- A.** Inspect materials and equipment for signs of damage, deterioration or other deleterious effects of storage, transportation, handling, or defects in manufacture or assembly.

1. Replace with identical new materials or equipment or repair to like new condition any materials or equipment showing such effects to the satisfaction of the Engineer and Owner.

3.03 EQUIPMENT INSTALLATION.

- A.** Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements.

1. Separate sheet metal junction boxes, equipment enclosures, sheet metal raceways, etc., mounted on water or earth-bearing walls or wall-mounted outdoors ¼-inch from wall be corrosion resistant spacer.
2. Seal the base of all outdoor switchgear, motor control center, and similar equipment with grout.
3. Screen or seal with flexible sealing compound all openings into outdoor equipment to prevent the entrance of rodents, wasps, and mud-daubers.
4. Electrical work shall conform to the construction schedule and progress of other trades.
5. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner.
6. Perform all work in accordance with manufacturer's instructions.
 - a. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents.
 - b. Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.
 - c. Field Wiring. Field wiring materials and installation shall conform to the requirements of the electrical section.

3.04 OPERATION AND TRAINING

Step-by-step detailed instructions shall be furnished by the ATS supplier for the operation of the transfer switch. A minimum of 2 hours of training on the operation and maintenance of the ATS shall be provided at the site at a time mutually agreeable to the owner's personnel and the manufacturer during normal business hours.

3.05 FIELD SUPERVISION AND TESTS

The Contractor shall furnish the services of a competent manufacturer's technical representative to check the installation, make all necessary adjustments, and in the presence of the Owner's representative, test the transfer switch to determine whether the equipment conforms to specified requirements and properly controls the engine generator.

- END SECTION -

SECTION 16900 – INSTRUMENTATION AND CONTROLS

PART 1 -- GENERAL

1.01 SUMMARY

- A. This section covers the furnishing and installation of metering and control equipment which shall include the following principal items:
 - 1. Metering and Control Systems. Principal components of the metering and control systems shall be as listed on the "Instrument List" at the end of this section in Appendix A and shall include the PLC system as is shown on the drawings.
 - 2. Miscellaneous. One lot of test equipment, spare parts, and miscellaneous devices as set forth herein. Supplementing this section, the drawings indicate locations and arrangement of panels and instruments and provide functional diagrams and schematics regarding connection and interaction with other equipment.

1.02 REFERENCES

- A. Codes & Permits
 - 1. All work and materials shall comply with the National Electrical Code, the National Electrical Safety Code, and applicable local regulations and ordinances. All panels shall be listed by Underwriters Laboratories or other testing organizations acceptable to the governing authority. The Contractor shall, at his own expense, arrange for and obtain all necessary permits, inspections, and approval by the proper authorities in local jurisdiction of such work.

1.03 SUBMITTALS

- A. Submit as indicated below and as specified in Division 1.
- B. Include the following information:
 - 1. Wiring diagrams with complete termination information indicating all connections.
 - 2. Wiring diagrams shall include all interconnecting wiring between components of the systems furnished and for all interconnecting wiring between the related equipment and the equipment furnished under this section.
 - 3. Specifications, and data covering all the materials used and all the parts, devices, and accessories.
 - 4. Product catalog cut sheets clearly marked to show the applicable model number, operational features, and intended service of the device.
 - 5. A detailed list of any exceptions, functional differences, or discrepancies between the supplier's proposed system and the contract requirements.
 - 6. Complete panel fabrication drawings and details of panel wiring, piping, and painting. Panel and subpanel drawings shall include overall dimensions, metal thickness, door swing, mounting details, and front of

panel arrangement to show general appearance, with spacing and mounting height of instruments and control devices.

7. Complete assembly and installation details.
- C. Submittal data shall be submitted in one complete manual included all of the required information. Individual drawings and data sheets submitted at random intervals will not be accepted for review.
- D. Instrument tag numbers indicated on the contract drawings shall be referenced where applicable.
- E. A total of five (5) copies for the submittal shall be provided.
- F. Submittal data for multifunctional instruments shall include complete descriptions of the intended functions and configurations of the instruments.

1.04 O&M MANUALS

- A. Complete system documentation, in the form of operation and maintenance manuals, shall be provided.
- B. Manuals shall include complete product instruction books for each item of equipment furnished.
 1. Where instruction booklets cover more than one specific model or range of instrument, product data sheets shall be included which indicate the instrument model number, calibrated range, and all other special features.
- C. A complete set of “as-built” wiring, fabrication, and interconnection drawings shall be included in the manuals.
- D. Complete calibration and startup sheets shall be included with the manuals for every instrument.
- E. A copy of all final O&M manuals shall be provided in PDF format in a CD-ROM or DVD. All AutoCAD drawings shall be provided in PDF and DWG formats.
- F. A total of five (5) printed copies, and ten (10) softcopies of final O&M manuals shall be provided.

1.05 QUALITY ASSURANCE

- A. Supplier’s qualifications
 1. The entire system shall be designed, coordinated, and supplied by a qualified system supplier who is regularly engaged in the business of designing and building instrument and control systems for water and wastewater projects. The Contractor’s intended instrumentation supplier shall meet the following qualifications.
 - a. The supplier shall have and shall maintain a qualified technical staff and design office. The qualifications and experience of key project personnel shall be acceptable to the Engineer.
 - b. The supplier shall have the physical plant and fabricating personnel to complete the work specified. The supplier’s fabrication capabilities and arrangements shall be acceptable to the Engineer.
 - c. The supplier shall employ competent service personnel to service

the equipment furnished. The geographic location of service personnel for this project shall be acceptable to the Engineer.

- d. The supplier shall provide a "Statement of Qualifications" indicating that they have successfully provided similar work for at least 5 years.
- e. The system supplier shall be Browns Hill Engineering & Controls, LLC.

B. Coordination.

- 1. Instrument and control systems shall be designed and coordinated for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications. All instruments and control devices shall be applied in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the instrument or device manufactured and the manufacturer of related equipment.
- 2. Installation drawings shall be prepared for interconnecting wiring and piping between the related equipment and the equipment furnished under this section. All interconnecting wiring shall be appropriate for the service and shall result in a properly functioning system.
- 3. The Contractor shall provide coordination with other contractors and supervision of installation as required during construction.

1.06 WARRANTY

- A. All suppliers shall warrant their hardware for a period of two (2) years from the date of system acceptance.

PART 2 -- PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. All equipment furnished under this section shall be selected by the system supplier for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.
 - 1. Power and Instrument Signals. Unless specified otherwise, electrical power supply to the instrumentation equipment will be unregulated 120 VAC at the locations noted on the one-line and functional diagrams. All transmitted electronic analog instrument signals shall be 4-20 mA DC and shall be linear with the measured variable.
 - 2. Metering Accuracy. System metering accuracy, as compared to the actual process value, shall be determined from the value read at the principal readout device such as the recorder or totalizer. System requirements shall not preclude any requirements specified herein for individual devices.

- a. For systems where the primary measuring device, transmitter, and receiver are furnished under this section, the accuracies shall be within the following limits:
 - 1) Level: 1.0% percent of measured span.
 - 2) Flow Rate: magnetic or transit time ultrasonic metering: 1.5 percent of full scale between 1.0 and 100 percent of scale.
3. Appurtenances. Signal converters, signal boosters, amplifiers, special power supplies, special cable, special grounding, and isolation requirements shall be furnished and installed as required for proper performance of the equipment.
4. Interchangeability and Appearance. Instruments used for the same types of functions and services shall be of the same brand and model line insofar as possible. Similar components of different instruments shall be from the same manufacturer to facilitate maintenance and stocking of repair parts. Whenever possible, identical units shall be furnished. Recorders, process indicators, control stations, and similar panel-mounted instruments shall be of the same style and shall be products of the same major instrument manufacturer.
5. Programming Devices. A programming or system configuring device shall be provided for systems that contain any equipment which required such a device for routine calibration, maintenance, and troubleshooting. The programming device shall be complete and in like-new condition and shall be turned over to the Owner at completion of the startup.
6. Device Tag Numbering System. All devices shall be provided with permanent identification tags. The tag numbers shall agree with the instrument device schedules and with the supplier's equipment drawings. All field-mounted transmitters and devices shall have stamped stainless-steel identification tags. Panel, subpanels, and rack-mounted devices shall have laminated plastic identification tags securely fastened to the device. Hand lettered labels or tape labels will not be acceptable.
7. Special Tools and Accessories. Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

2.02 PANEL FABRICATION

- A. All panels shall be UL labeled upon completion or certified by some other third-party certification company that is acceptable to the jurisdiction having authority at the site.
- B. General Fabrication Requirements. All panels furnished hereunder shall conform to the requirements of NEMA ICS-6-1988. The following paragraphs describe general fabrication requirements for the instrument panels, consoles, enclosures, and subpanels:
 1. Wiring.
 - a. All internal instrument and component device wiring shall be as

normally furnished by the manufacturer. With the exception of electronic circuits, all interconnecting wiring and wiring to terminals for external connection shall be stranded copper, insulated for not less than 600 volts, with a moisture-resistant and flame-retardant covering rated for not less than 90°C.

- b. The power entrance to each panel shall be provided with a surge protection device. Surge protectors shall be nominal 120 VAC. Surge protectors shall be of a non-faulting and non-interrupting design, with a response time of not more than 5 nanoseconds. Surge protectors shall be Cutler Hammer AEGIS Powerline Filters, or approved equal.
- c. All panels shall have an uninterruptible power supply (UPS) battery backup power to maintain all panel functions for a minimum of 30 minutes in the event of a power outage. UPS units shall be capable of being removed by unplugging the unit and unplugging the panel feed from the UPS without any hard-wiring required.
- d. All panels with programmable devices in them shall have a convenience receptacle in the panel.
- e. Panels that are over 12 cubic feet in total volume shall have panel lighting above each door of the panel.
- f. Power distribution wiring on the line side of the panel's protective devices shall be minimum 12 AWG. Secondary power distribution wiring shall be minimum 16 AWG. Wiring for control circuits shall be minimum 16 AWG. Electronic analog circuits shall be 18 AWG twisted and shielded pairs rated not less than 300 volts. Analog circuits shall be separated from ac power circuits. Wiring for ac power distribution, dc power distribution, and control circuits shall have different colors and shall agree with the color-coding legend on the system supplier's panel wiring diagrams.
- g. Terminal blocks for external connections shall be suitable for 12 AWG wire and shall be rated 30 amperes at not less than 300 volts. Terminal blocks shall be fabricated complete with a marking strip, covers, and pressure connectors. Terminals shall be labeled to agree with identification shown on the supplier's submittal circuits, plus one ground for each shielded cable. Not less than 8 inches of clearance shall be provided between the terminal strips and the base of vertical panels for conduit and wiring space. Not less than 25% percent spare terminals shall be provided. Each control loop or system shall be individually fused, and all fused or circuit breakers shall be clearly labeled and located for easy maintenance. Terminal block shall be Phoenix Contact UT 4-MTD series.
- h. All wiring shall be grouped or cables and firmly supported inside the panel. Wiring shall be bundled in groups and bound by nylon cable ties or shall be routed in nonmetallic slotted wire duct or similar. Ducts shall be readily accessible within the panel with

removable covers and shall have a space of at least 40 percent of the depth of the duct available for future use after installation is complete and all field wiring installed. Sufficient space shall be provided between cable groups or ducts and terminal blocks for easy installation or removal of cables. Wire duct shall be Thomas & Betts Ty Duct or approved equal.

- i. Where signal or loop wiring must be routed to more than one panel or device, the required circuit routing shall be as indicated on the one-line diagrams.
 - j. The panel fabricator shall provide such additional circuits as may be indicated on the electrical schematic drawings.
 - k. All wires in the panel shall be identified at both ends of the wire. These labels shall agree with the labels shown on the wiring diagrams. The wire labels shall be of the heat-shrink tube type of wire marker as manufactured by Brady thermal labels.
- 2. Nameplates. Nameplates shall be provided on the face of the panel or on the individual device as required. Panel nameplates shall have approximate dimensions and legends, as indicated on the drawings, letters approximately 3/16-inch high extending through the black face into the white layer. Nameplates shall be secured firmly to the panel. Panel face nameplates do not replace the requirement for device identification tags as specified herein under the Device Tag Numbering System paragraph.
 - 3. Painting. Interior and exterior surfaces of all panels shall be thoroughly cleaned and painted with rust-inhibitive primer. The panel interior shall be painted white with the manufacturer's standard coating. All pits and blemishes in the exterior surface shall be filled. Exterior surfaces shall be painted with one or more finish coats of the manufacturer's standard coating. Finish coats shall have a dry film thickness of at least 4 mils.
 - 4. Factory test. Panels shall be factory tested electrically by the panel fabricator before shipment.

2.03 METERING & CONTROL SYSTEMS

- A. Principal components for the metering and control systems are indicated on the "Instrument List" at the end of this specification.

2.04 MATERIALS & EQUIPMENT

- A. Panel Front-Mounted Devices
 - 1. **SELECTOR SWITCHES.** Selector switches shall be a minimum 30 mm, heavy-duty, oil-tight type with gloved-hand or wing lever operators. Position legends shall be engraved on the switch faceplate. Switches for electric circuits shall have silver butting or sliding contacts, rated 10 amperes continuous at 120 volts ac. Contact configuration shall be as indicated on the drawings or as required for the application. Switches used in electronic signal circuits shall have contacts suitable for that duty. Switches shall be Cutler-Hammer "Series 10250T", Square D "Class 9001", or approved equal.

2. INDICATING LIGHTS. Indicating lights shall be a minimum 30 mm, heavy-duty, oil-tight type, Push-to-Test, which uses a low voltage lamp. A built-in transformer shall be used for AC service. Legends shall be engraved on the lens or on a legend faceplate. Lamps shall be easily replaceable from the front of the indicating light. Indicating lights shall be Cutler-Hammer "Series 10250T", Square D "Class 9001", or approved equal.
3. PUSH BUTTONS. Push Buttons shall be a minimum 30 mm, heavy-duty, oil-tight type. Legends shall be engraved on push button faceplate. Contacts shall be rated 10 amperes continuous at 120 VAC. Push buttons shall be Cutler-Hammer "Series 10250T", Square D "Class 9001", or approved equal.
4. RUN TIME METERS. Run Time Meters shall have miniature, rectangular, semi-flush counters. The counter shall contain not less than seven digits, with a nameplate plainly engraved on the face of the counter, or below the counter identifying it as a run time meter. Run time meters shall not reset upon power failure. Run time meters shall be as manufactured by Red Lion "CUB7" series or Action Instruments.

B. Panel Interior-Mounted Devices.

1. POWER SUPPLIES. Regulated DC power supplies for instrument loops shall be provided as needed. Power supplies shall be suitable for input voltage variation of plus or minus 10 percent. The DC power supplies shall be Idec "PS5R Slim line", or Phoenix Contact "Quint".
2. RELAYS. Relays indicated to be provided in panels, enclosures, or systems furnished under this section shall be of the plug-in socket base type with dustproof plastic enclosures unless noted otherwise. Relays shall be UL listed. Relays shall have a minimum rating of 10 amperes at 120 VAC. Time-delay relays shall have dials or switch settings engraved in seconds and shall have timing repeatability of +/- 2.0 percent of setting. Latching and special purpose relays shall be as required for the specific application. Relays shall have a light to indicate when coil is energized. Relays shall be Idec "RH or RTE Series" or approved equal.

C. Flow Instrumentation.

1. MAGNETIC FLOW METERS

- a. The Magnetic Flow Meter shall be a completely unobstructed, in-line flow meter with no constrictions in the flow of fluid through the meter. The meter shall consist of a metallic tube with flanged ends and with grounding rings. Flange diameter and bolt drilling pattern shall comply with ANSI/ASME B16.5, Class 150. Meters shall be suitable for the maximum range of working pressures of the adjacent piping. Electrode materials shall be fully compatible with the process fluid and shall comply with the requirements specified in the instrument device schedules. Each meter shall be factory calibrated, and a copy of the calibration report shall be submitted as part of the operation and maintenance manual submittal.

- b. The meter shall be capable of standing empty for extended periods of time without damage to any components. The meter housing shall be of a splash-proof and drip-proof design
- c. Magnetic Flow Meter Signal Converters
 - 1) Magnetic Flow Meter Signal Converters shall be separately mounted, microprocessor-based signal converters. They shall be provided for the magnetic flow meters. The signal converters shall include output dampening, self-testing, integral digital indicator, built-in calibration capability, and an “empty pipe zero” contact input. The overall accuracy of the magnetic flow meter transmitter and signal converter shall be ± 1.0 percent of actual flow rate for full-scale settings of 0.3 to 30 fps. The signal cable between the converter and the magnetic flow meter shall be furnished by the meter manufacturer. The signal converter shall be housed in NEMA Type 12 housing and shall be suitable for operation over an ambient temperature range of -30° to $+140^{\circ}\text{F}$, and relative humidity of 10 to 100 percent. The converter shall have an analog output of 4-20 mA DC.
 - 2) The signal converter shall have a seven-digit, non-reset totalizer on the face of the enclosure. Local electronic indicators shall be provided. Indicators shall be mounted on or near the flow meter signal converters in weatherproof NEMA Type 4 housings. Indicators shall be four-digit LCD type and shall read in engineering units.
 - 3) Power supply to the meter shall be 120 VAC, 60 Hz, single phase.
- d. Meters shall be Rosemount “8705”, ABB “MFF”, Siemens “Mag 6000”, Endress+Hauser “Promag W 400”, or approved equal.

D. Level Instrumentation

- 1. Hydrostatic Level Transducers
 - a. Each transducer shall be a hydrostatic pressure sensor for level measurement of fresh water and wastewater applications. The sensor shall be a permanently sealed submersible probe and cable combination. The transducer shall be of the two-wire type which requires no direct power connection to the transducer. Transducer output shall be 4-20mA DC. The transducer shall be capable of the ranges and pressures for which the application will require. The sensor shall be mounted as shown on drawings or as required for application. The transducer shall be an Endress-Hauser “Waterpilot FMX21” with flush mounted process isolating diaphragm (42mm/1.65”Ø) and mounting clamp, or approved equal.
- 2. Weighted Float Level Switches
 - a. Each level switch shall consist of a single-pole, double-throw switch, rated not less than 3 amperes AC, sealed and housed in a

chemical-resistant polypropylene casing. The switch assembly shall be weighted and suspended on its own cable. The flexible support cable shall be waterproof, three-conductor, synthetic covered cable with 18AWG conductors, and shall be of sufficient length so that no splice or junction box is required in the wet well. Switches shall be suitable for operation up to 150 volts within an ambient temperature range of 0° to 60° C. Switches shall be suitable for use in a sanitary or wastewater wet well environment. Installation hardware shall be provided as shown on the drawings or as necessary for application. Switches shall be Flygt "Type EMN-10", Siemens Water Technologies "Model 9G-EF", or approved equal.

3. Electrode/Conductance Relay Level Switch

- a. Each level switch shall consist of a single-pole, double-throw relay with contacts rated not less than 5 amperes ac at 120 VAC. The relay primary power shall be 120 VAC. The electrodes shall be flexible wire suspension type with shielded stainless-steel electrode tips. The electrode holder shall be the manufacturer's standard holder appropriate for the application. Electrodes and conductance relay shall be as manufactured by Gems Sensors (B/W Controls) or Ametek (Warrick Controls), or approved equal.

E. Miscellaneous Instrumentation.

1. Limit Switch

- a. The limit switch shall be of the lever operated limit switch type and shall be enclosed in a NEMA 4 housing. The switch shall be furnished with one NO and one NC contacts and screw type wiring terminal. The switch shall be heavy duty, oiltight type. Limit switches shall be Square D model "9007C54B2" with adjustable type roller lever arm "9007HA1" or equal.

2. Magnetic Door Switch

- a. The magnetic door switch shall be a two-piece switch rated 100V ac/dc. Switch shall be Edwards 60 Series or equal.

3. Temperature Switch

- a. Temperature switches shall be constructed with an all metal case. Switches shall have contacts rated 10A at 120VAC. Switches shall be Dayton Model 2E206 or equal.

4. Unmanaged Ethernet Switch.

- a. The unmanaged Ethernet switch will be IEEE 802.3 compliant.
- b. The unmanaged switch, or a combination of multiple switches shall provide as many Ethernet Ports as needed in the application.
- c. Auto-negotiation
 - 1) All Copper TX ports will support auto negotiation. Each TX port will be able to interface to 10/100 Mbps or full/half duplex devices.

- d. Port Status LED's.
 - 1) Link Active: Each port will have a LED indication that there is a proper electrical connection to the attached device.
 - 2) Communications Status: Each port will have a Led indication, of communications activity.
- e. Mounting.
 - 1) The Switch will be din rail mountable out of the box and without the need to add/assemble adaptor or similar mounting plates.
 - 2) All power and alarm connections will be wired using removable connectors.
- f. Redundant 24VDC Power
- g. The switch will be powered by a nominal 24VDC.
 - 1) The Switch will have provision for supporting redundant power inputs. Power supply switchover will not interrupt switch operation.
- h. Temperature & Humidity
 - 1) The Switch will have an operating temperature range of 0 to 55c or greater. For extended application life, the maximum temperature will be a minimum of 10 degrees C lower than the specified operating temperature of the internal switch chips.
 - 2) The switch will withstand a maximum continuous operating humidity of 95% without condensation.
- i. Shock & Vibration
 - 1) The operating shock rating will conform to IEC60068-2-27 and withstand a shock pulse of 25G or more for 11ms.
- j. Agency Certifications
 - 1) The switch will be certified for UL 508, UL 1604 Class1 Div 2 hazardous locations, CE.
- k. Unmanaged Ethernet switch shall be as manufactured by Phoenix Contact "FL SWITCH SFN" series, N-Tron "100" series, or approved equal.

PART 3 -- EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. General Requirements
 - 1. The instrumentation equipment shall be installed by the Contractor or his subcontractors in accordance with the manufacturers' instructions. The services of the system supplier's technical representative shall be provided as necessary to calibrate, test, and advise others of procedures for adjustment and operation.

- B. Inspection.
 - 1. Inspect materials and equipment for signs of damage, deterioration or other deleterious effects of storage, transportation, handling, or defects in manufacture or assembly.
 - a. Replace with identical new materials or equipment or repair to like new condition any materials or equipment showing such effects to the satisfaction of the Engineer and Owner.
- C. Equipment Installation.
 - 1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements.
 - a. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner.
 - b. Perform all work in accordance with manufacturer's instructions.
 - 1) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents.
 - 2) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.
 - c. Field Wiring. Field wiring materials and installation shall conform to the requirements of the electrical section.
 - d. Field Piping. Field piping materials and installation shall conform to the requirements of the miscellaneous piping section.
 - e. Field-Mounted Instruments. Instruments shall be mounted so they may be easily read and serviced, and all appurtenant devices are easily operated. Installation details for some instruments are indicated on the drawings. Unless otherwise indicated on the drawings, instruments which include local indicators shall be mounted approximately 5 feet above the floor and shall be oriented for ease of viewing. Transmitters shall be mounted on corrosion-resistant pipe supports suitable for floor, wall, or bracket mounting.
- D. Systems Check. A technical representative of the system supplier shall participate in the checkout of metering and control systems. If interrelated devices furnished by other suppliers, such as valve actuators, motor controls, chemical feeders, or primary measuring devices, do not perform properly when placed in service, the technical representative shall use suitable test equipment to introduce simulated signals to verify or measure signals from such devices as required to locate the source of trouble or malfunction. A written report stating the results of such tests shall be furnished, if requested by the Owner's Representative, to assign responsibility for corrective measures.
 - 1. Installation Test Equipment. Unless specified otherwise, all test equipment for the calibration and checking of system components shall

INSTRUMENTATION AND CONTROLS – SECTION 16900

be provided by the Contractor for the duration of the testing work. Unless specified otherwise, test equipment will remain the property of the Contractor or the system supplier.

E. Adjustment and Cleaning

1. Perform all required adjustments, tests, operational checks, cleaning and other start-up activities required.
2. Take precautions, as necessary, to properly protect all equipment from damage. Installed equipment to be protected from further construction operations.

3.02 CUSTOMER TRAINING

- A. The coordinating supplier shall provide a qualified representative at the job site to train the Owner's personnel in operating and maintenance of the equipment. The training session shall include a technical explanation of the equipment and an actual hands-on demonstration. The training session shall consist of two consecutive 4-hour working days, and the schedule shall be arranged and coordinated with the Engineer.

<u>INSTRUMENTATION LIST</u>				
<u>TAG #</u>	<u>DESCRIPTION</u>	<u>SERVICE</u>	<u>SCALE</u>	<u>PROVIDED UNDER SPECIFICATION</u>
LSHHH-100	WETWELL HIGH LEVEL ALARM FLOAT	WEIGHTED FLOAT SWITCH		16900
LSHH-100	WETWELL LAG PUMP START FLOAT	WEIGHTED FLOAT SWITCH		16900
LSH-100	WETWELL LEAD PUMP START FLOAT	WEIGHTED FLOAT SWITCH		16900
LSL-100	WETWELL PUMPS STOP FLOAT	WEIGHTED FLOAT SWITCH		16900
LT-200	WETWELL LEVEL TRANSMITTER	HYDROSTATIC LEVEL TRANSDUCER	0-15 ft	16900
LSH-220	WATER-ON-THE-FLOOR SWITCH	CONDUCTANCE RELAY LEVEL SWITCH		16900
FIT/FE 210	STATION DISCHARGE FLOW	MAGNETIC FLOW METER		16900
TSL-230	BUILDING LOW TEMPERATURE ALARM	TEMPERATURE SWITCH		16900

- END SECTION -

SECTION 16950 – PROGRAMMABLE LOGIC CONTROLLERS & SCADA SYSTEMS

PART 1 -- GENERAL

1.01 SUMMARY

- A. This section includes the items listed below and all other components necessary for a complete system as noted herein and indicated on the drawings
 - 1. Programmable Logic Controllers (PLCs)
 - 2. Communication equipment
 - 3. Programming
- B. Related Sections
 - 1. Section 16900

1.02 REFERENCES

- A. ISA 5.1 – Instrumentation Symbols and Identification
- B. NEMA ICS 1 – General Requirements for Industrial Control and Systems
- C. NEMA ICS 2 – Standards for Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated 600 Volts
- D. DEMA ICS 3 – Industrial Control and Systems: Factory Built Assemblies
- E. NEMA ICS 6 – Industrial Controls and Systems: Enclosures

1.03 DESIGN REQUIREMENTS

- A. Discrete input/output signals shall all be 120VAC
- B. Analog input/output signals shall all be 4-20Ma
- C. Analog signal isolators shall be independently powered units capable of driving two 4-20Ma signals
- D. All required buffers, isolators, signal converter, and amplifiers for coordination with other equipment furnished under other sections, and between items of equipment needed for a complete system shall be furnished under this section of the specifications whether indicated on the drawings or not or detailed in these specifications or not

1.04 SYSTEM DESCRIPTION

- A. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by engineer.
 - 1. Drawings. The drawings indicate the number and sizes of PLCs, locations of PLCs, and provide diagrams and schematics regarding connection and interaction with other equipment. All hardware, including power supplies, special cables, and other appurtenant equipment, shall be provided to meet the functional requirements described herein and indicated on the drawings.

2. I/O List. An I/O list is attached at the end of this section
- B. The new PLC shall communicate back to the existing SCADA system over a City provided fiber optic cable network. The system shall communicate via EtherNet/IP. All components required for the network communications from the end of the fiber optic cable to the PLC shall be included in this contract. This shall include Ethernet switches, communication modules, etc. shall be supplied and coordinated by the Contractor.

1.05 SUBMITTALS

- A. Submittals shall be required as noted in SECTION 16900.

1.06 QUALITY ASSURANCE

- A. Supplier's qualifications
 - a. The entire system shall be designed, coordinated, and supplied by the system supplier.
- B. Coordination
 1. The PLCs and PLC system shall be designed and coordinated for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications. All devices shall be applied in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the instrument or device manufacturer and the manufacturer of related equipment.
 2. Installation drawings shall be prepared for interconnecting wiring and piping between the related equipment and the equipment furnished under this section. All interconnecting wiring shall be appropriate for the service and shall result in a properly functioning system.
 3. The Contractor shall provide coordination with other contractors and supervision of installation as required during construction.

1.07 WARRANTY

- A. The supplier shall warrant the hardware, software, and configuration related to the operational performance of the facility for a period of two (2) years from the date of system acceptance. The supplier shall provide a two-year software service agreement to include any and all minor and/or major releases and upgrades, and shall correct any problems or "bugs" which prohibit the SCADA system from performing process operations in accordance with these specifications.

PART 2 -- PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. All equipment furnished under this section shall be selected by the system supplier for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.

1. Interchangeability. All PLC systems shall be products of the same manufacturer and of the same series or product line. Processors, local and remote input/output hardware, communications modules, and specialty modules shall be interchangeable among all I/O panels and systems.
2. Installed I/O requirements. Each PLC shall have I/O modules installed to accommodate requirements shown on drawings and the I/O list at the end of this section, with 20% spare capacity.
3. Acceptable Manufacturers.
 - a. PLC – The PLC shall be Allen-Bradley MicroLogix 1400 without exception.
 - b. Human Machine Interface Software – Is existing.
 - c. PLC Programming Software – Rockwell Automation RS Logix 5000 Enterprise full edition without exception.

2.02 MATERIALS AND EQUIPMENT

A. Programmable Logic Controller (PLC)

1. A complete PLC system shall include, but is not limited to, the following components:
 - a. Controller.
 - 1) The CPU shall be a self-contained unit, and will provide control program execution and support remote or local programming. This device will also supply I/O scanning and inter-processor and peripheral communication functions.
 - 2) The user program and data shall be contained in battery backed memory. The operating system firmware shall be contained in non-volatile memory. The operating system firmware can be updated via a separate update tool to allow for easy field updates.
 - b. Power Supply
 - 1) The Programmable Controller shall operate in compliance with an electrical service of 85 to 265 VAC.
 - c. Communications
 - 1) The Integrated EtherNet/IP interface shall support the following:
 - a) IEEE802.3 Physical and Data Link Standard
 - b) Ethernet TCP/IP protocol suite (Transmission Control Protocol/Internet Protocol), the Ethernet industry standard.
 - c) Common Industrial Protocol (CIP), the protocol that provides real-time I/O messaging and information/peer-to-peer messaging

- d) Programmable controller messaging to peer controllers and workstations
 - e) Full or Half-Duplex communication
 - d. Input/Output Modules
 - 1) Digital Input Modules – shall be Allen Bradley 1762-IA8
 - a) Number of Inputs: 8
 - b) Voltage Category: 120 VAC
 - c) Voltage Range: 89 to 132 VAC
 - d) Digital Filter, On to Off: 20ms
 - e) There shall be 20% installed spare digital inputs
 - 2) Digital Output Modules – shall be Allen Bradley 1762-OW8
 - a) Number of Outputs: 16
 - b) Voltage Category: 120 VAC
 - c) There shall be 20% installed spare digital outputs
 - 3) Analog Input Module – shall be Allen Bradley 1762-IF4
 - a) Number of Inputs: 4
 - b) Signal Range: 4-20 Ma
 - c) Resolution: 16 bits (unipolar)
 - d) There shall be 20% installed spare analog inputs
- B. PLC Programming Software
 - 1. The PLC programming software shall be an IEC 61131-3 compliant software package that offers relay ladder, structured text, function block diagram, and sequential function chart editors to develop application programs.
 - 2. The supplier shall provide all software and hardware necessary to produce a complete system. The software shall NOT be turned over to the owner.
 - 3. All signals shall be programmed into the system to control and monitor all equipment completely through the PLC and HMI. All communications shall be configured and made operational.
 - 4. The PLC program shall be completely annotated to identify all logic functions and all addresses shall be noted for their function.

PART 3 -- EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. General Requirements
 - 1. It shall be the SYSTEM SUPPLIER'S responsibility to ensure that the entire PLC system and HMI system is installed in a satisfactory condition per these specifications and the manufacturer's requirements.

- B. Inspection.
 - 1. Inspect materials and equipment for signs of damage, deterioration or other deleterious effects of storage, transportation, handling, or defects in manufacture or assembly.
 - a. Replace with identical new materials or equipment or repair to like new condition any materials or equipment showing such effects to the satisfaction of the Engineer and Owner.
- C. Equipment Installation.
 - 1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements.
 - a. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner.
 - b. Perform all work in accordance with manufacturer's instructions.
 - 1) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents.
 - 2) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.
- D. Adjustment and Cleaning
 - 1. Perform all required adjustments, tests, operational checks, cleaning and other start-up activities required.
 - 2. Take precautions, as necessary, to properly protect all equipment from damage. Installed equipment to be protected from further construction operations.
- E. PLC and HMI Programming.
 - 1. Refer to "I/O List" at the end of this specification and the contract drawings for a list of hardwire signals.
 - 2. Communication will be via Ethernet/IP protocol.

3.02 CUSTOMER TRAINING

- A. The system supplier shall provide a qualified representative at the job site to train the Owner's personnel in operating and maintenance of the equipment. The training sessions shall include a technical explanation of the equipment and an actual hands-on demonstration. The training session shall consist of two consecutive 4-hour working days, and the schedule shall be arranged and coordinated with the Engineer.

PROGRAMMABLE LOGIC CONTROLLERS & SCADA SYSTEM – SECTION 16950

I/O List							
Tag #	Description	DI	DO	AI	AO	Scale	Notes
JA-10	PLC Panel – UPS power Status	1					
JA-11	PLC Panel – Utility power Available	1					
LSHHH-100	Wet well high-level alarm float status	1					
LSHH-100	Wet well Lag pump start float status	1					
LSH-100	Wet well lead pump start float status	1					
SL-100	Wet well stop pumps float status	1					
JA-100	3-Phase Power Fail	1					
LC-100	Reset of float control		1				
YA-100	Float controls are active	1					
HS-110	Pump #1 – In Auto	1					
M-110	Pump #1 – Running	1					
YA-110	Pump #1 – VFD Fault	1					
TA-110	Pump #1 – Motor Overtemperature	1					
MA-110	Pump #1 – Motor Leak (Moisture)	1					
HC-110	Pump #1 – S/S control		1				
HS-120	Pump #2 – In Auto	1					
M-120	Pump #2 – Running	1					
YA-120	Pump #2 – VFD Fault	1					
TA-120	Pump #2 – Motor Overtemperature	1					
MA-120	Pump #2 – Motor Leak (Moisture)	1					
HC-120	Pump #2 – S/S control		1				
LI-200	Wet well level			1		0-15 ft	
FI-210	Station Discharge Flow			1		0-200 GPM	
FQ-210	Flow Pulse for totalizing	1					
LSH-220	Water-on-the-floor alarm	1					
TSL-230	Building Low Temperature Alarm	1					

- END SECTION -

SECTION 16951 – CONTROLS DESCRIPTIONS**PART 1 -- GENERAL****1.01 SUMMARY**

- A. This section includes the items listed below and all other components necessary for a complete system as noted herein and indicated on the drawings
 - 1. General Programming Requirements
 - 2. PLC Programming
 - 3. HMI Programming
- B. Related Sections
 - 1. Section 16900
 - 2. Section 16950
 - 3. I/O list
- C. PLC programming services shall be provided by a single firm with sufficient experience to complete this scope of work.
- D. HMI programming shall be completed by system integrator (SI) as outlined below.
- E. Scope of work shall also include, but is not limited to:
 - 1. Develop and test new PLC program based on control descriptions provided in this specification section.
 - 2. Add new screens to the existing HMI system.
 - 3. Loop test all PLC input and output points for proper operation. The electrical contractor will terminate I/O points based on control panel drawings.
 - 4. Verify new instrument setup and calibration.
 - 5. Verify Ethernet communication between the new PLC and the existing fiber system.
 - 6. Provide training to City personnel on new system.

1.02 REFERENCES

- A. ISA 5.1 – Instrumentation Symbols and Identification
- B. NEMA ICS 1 – General Requirements for Industrial Control and Systems
- C. NEMA ICS 2 – Standards for Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated 600 Volts

1.03 SYSTEM DESCRIPTION

- A. All the programming performed under this section shall be done in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the software manufacturer, unless exceptions are noted by engineer.

1.04 SUBMITTALS

- A. Submittals shall be required as noted in section 16900.

1.05 QUALITY ASSURANCE

- A. Supplier's qualifications
1. The entire system shall be programmed under this agreement
 2. These control descriptions are provided for informational purposes and for coordination between the system supplier and the programmer.

PART 2 -- PRODUCTS (NOT USED)**PART 3 -- EXECUTION****3.01 GENERAL PROGRAMMING REQUIREMENTS**

- A. Tag database structure and configuration.
1. The process control system tag naming convention shall include the definition of all devices, derived and soft tags, and the required alarm processing and data logging definitions for each tag.
 2. Tag naming convention.
 - a. The tag naming convention shall be as noted on the drawings and on the instrument index and I/O list.
 3. All logic and control shall be done in the PLC
- B. PLC Programming standards.
1. General Considerations
 - a. Program Documentation
 - 1) Documentation for all PLC programs shall include comments, tag/register descriptions, or any other programming tags. All PLC programs shall be documented with comments provided for each subroutine, function and/or section. Use of abbreviations in comments and subroutine/section titles should be avoided. At the completion of the project, copies of programming, I/O list, memory map and communications map shall be provided in both printed and electronic format.
 - b. Motors
 - 1) All motors shall have runtime totalizers and start counters. Both values shall be totalized regardless of whether the motors are in auto and manual control modes.
 - 2) The following signals shall be determined for all motors.
 - a) HOA switch in Auto
 - b) Run Indication
 - c) Fault Indication.

- d) Motor fail to start. PLC calling the motor to run but no run signal report for 20 sec. if the motor is in auto.
 - e) Motor fail to stop. PLC not calling the motor to run but a run signal report for 20 sec. if the motor is in auto.
 - c. Analog signals
 - 1) All analog inputs shall be scaled in Engineering units to be used in the logic.
 - 2) A low-level and high-level alarm shall be generated for each analog signal. Each alarm shall have separate alarm and reset set points that shall be operator programmable from the HMI screen.
 - d. All control to any devices will be stopped if there is a phase failure condition. After a time, delay when the phase failure is normal, then normal operation shall proceed.
- C. Human Machine Interface (HMI) standards.
 - 1. General Considerations
 - a. In general, when the term HMI is used it indicates the local operator terminal displays.
 - b. All alarms will be displayed and logged on the HMI.
 - c. All analog signals will be trended and logged and displayed on the HMI in engineering units.
 - d. Motors
 - 1) All motors shall be displayed on the HMI and have dynamic graphical indication whether they are on or off. The motors shall be green for running and red for off.
 - 2) All motors shall have runtime totalizers and start counters displayed near the motor's graphical display.
 - 3) Every motor that has PLC control shall have the associated set points and control criteria entered at the local operator terminal displays.
 - e. The control signals for all motors shall be displayed on the HMI. They shall include but not limited to:
 - 1) HOA Switch status: "In Auto", "In Hand" or "Off"
 - 2) Run Indication
 - 3) Fault Indication
 - 4) Motor fail to start. PLC calling the motor to run but no run signal report for 20 sec while the HOA is in Auto.
 - 5) Motor fail to stop. PLC not calling the motor to run but a run signal report for 20 sec while the HOA is in Auto.

- f. Alarming
 - 1) All alarms shall be displayed and logged on the HIM screens.
 - 2) All alarms shall be displayed on the local operator terminal at the WWTP.
 - 3) Selected alarms shall have a visual and audible alarm.

3.02 SPECIFIC DEVICE CONTROL CRITERIA

A. Flow Monitoring

- 1. Station Discharge flow shall be monitored on a continuous basis.

B. Pump Control

- 1. The pumps are controlled by individual VFDs for each motor.
 - a. The VFDs are for minimizing water hammer and will be set to run at full speed only with a 45 second ramp up and ramp down time.
- 2. Each pump has an HOA switch
 - a. In Hand the pump runs until turned either to Off or Auto.
 - b. In Off the pump does not run.
 - c. In Auto, the pump runs by PLC control and by the backup float controls.
- 3. In 'Auto' mode the control shall be:
 - a. PLC Control
 - 1) The PLC shall start and stop the pumps based on the wet well level.
 - 2) Operator set points shall start and stop the pumps in a lead/lag scenario.
 - a) There shall be setpoints for:
 - (1) Lead pump start
 - (2) Lag pump start
 - (3) Pumps stop
 - (4) High level alarm
 - 3) The pumps shall alternate every time they run.
 - b. Backup Float Control
 - 1) If for any reason the wet well level reaches the pump start float, the hardwired pump control will start the pumps.
 - 2) When the float control is activated, it will remain active until it is manually reset at the control panel.
 - 3) When in float control the pumps will be controlled based on the float settings.

- 4) The pumps shall operate in a lead/lag scenario and alternated every time they are started.

C. Level Alarming

1. The level in the wet well shall be alarmed from the level of the level transducer based on operator set points.
2. The level transducer signal shall be monitored and if the 4-20Ma signal falls below 3.9 Ma an alarm shall be generated that the transducer has failed.
3. A high-level alarm float (LSHHH-100) shall generate an alarm that the lift station level is high.

D. Emergency Generator

1. Run status, general fault and ATS position shall be monitored and displayed on HMI screen.

E. Site Alarms

1. Water on the floor sensor shall generate an alarm.
2. Building low temperature alarm shall generate an alarm.

- END SECTION -

SECTION 16960 – ELECTRICAL COMPLETION**PART 1 -- GENERAL****1.01 GENERAL**

The entire electrical system shall be left in first-class workable operating condition and all work shall be complete.

PART 2 -- PART 2 - PRODUCTS**2.01 DIRECTORY CARDS**

Provide labels and neatly typed directory cards for all panelboards and load centers. Directory cards shall indicate the general area and type of electrical load served by each circuit.

PART 3 -- PART 3 - EXECUTION**3.01 CLEAN UP**

- A. Remove all materials, scrap, etc., relative to the electrical installation and leave the premises in a clean, orderly condition. Any costs to Owner for clean-up of the site will be charged against Contractor.
- B. Clean all electrical equipment and materials of all foreign matter. Clean all light fixtures using only methods and materials as recommended by Manufacturer.

3.02 TESTING

- A. When the entire electrical systems have been completed, the Contractor shall test the wiring and shall notify the Engineer when such tests are to be performed. The Contractor will be required to furnish apparatus necessary for the testing and shall have the systems in proper condition for service with all circuits suitably identified and tagged. The systems shall be entirely free from unintentional grounds, short circuits, and other defects. After the motors, controls, and all other current consuming devices have been connected to the system, the Contractor shall again go over the systems and satisfy the Engineer as to their proper operation, including the proper rotation of all motors. The grounding system shall be installed and completely tested prior to testing the electrical systems.
- B. The Contractor shall be responsible and coordinate proper phase rotation connections made by the serving utility company prior to energizing main service equipment.

3.03 ACCEPTANCE DEMONSTRATION

- A. Upon completion of the work, at a time to be designated by Civil Engineer/Owner. Contractor shall demonstrate to Owner the operation of the entire electrical installation, including any and all special systems provided under this contract. Provide instruction manuals to owner for all equipment installed on project.
- B. A minimum of three (3) copies of Operations and Maintenance Manuals shall be provided. The information shall include "as-built" detailed wiring diagrams of all

control devices and equipment furnished, as well as configuration data and instrument calibration data/parameters.

3.04 START-UP PROVISIONS.

Electrical Contractor and Controls Contractor are responsible for providing a fully functional system at project completion, carry costs for the assistance of a factory trained engineer, where necessary, to assist with start up to ensure all systems are 100% functional by the project deadlines set forth by the civil engineer.

3.05 TEMPORARY WIRING

Remove all temporary wiring, outlets, etc., complete.

3.06 DRAWINGS

Deliver "Record" Drawings to Owner.

- END OF SECTION -



November 11, 2020

Steve Beckley
Iron Mountain Hot Springs, LLC
51000 Two Rivers Plaza Road
Glenwood Springs, CO 81601

Subject: Final Plans and Specifications for Construction Approval
Site Location Approval No. ES.19.SA.05266
City of Glenwood Springs, Centennial Street Lift Station (LS16000)
Associated Colorado Discharge Permit System (CDPS) No. CO0048852
Garfield County
ES Project No. ES.19.CWPDR.05267

Dear Mr. Beckley:

The Water Quality Control Division (Division), Engineering Section has received and reviewed the Plans and Specifications for the Centennial Street Lift Station (LS16000) replacement with a service area including residential apartments, office spaces, and a hotel. The final plans and specifications, as reviewed, meet the requirements of the *State of Colorado Design Criteria for Domestic Wastewater Treatment Works* (Design Criteria) and are hereby approved as listed below. **The approved maximum month daily average flow of the lift station is 55 gpm and the approved peak hydraulic capacity (peak hour) of the lift station is 100 gpm (firm pumping capacity).**

This lift station approval addresses the following:

- Calculations and associated information included in the lift station Basis of Design Report. Following construction of the lift station by the developer, the lift station will be turned over to be owned and operated by the City of Glenwood Springs.

1) Lift Station

- The lift station replacement will be located within approximately 230 feet of the existing lift station. The lift station will pump through an existing 4-inch force main to existing lift station LS14000 (700 gpm), which pumps across the Colorado River to existing lift station LS13000 (4,800 gpm), which pumps to the City of Glenwood Springs' WWTF.
- Wetwell: Approximately 6,921 gallon sulfate resistant concrete with epoxy coated rebar constructed wetwell (design basis: 8-ft diameter, 18.5-ft depth).
- Pumps: New lift station pumps will be submersible grinder pumps (design basis: 1 duty + 1 standby, self-priming type, 100 gpm via variable frequency drive).
 - o Suction: Each pump equipped with dedicated suction piping.
 - o Solids: Pumps capable of passing 3-inch solids.
 - o Pump Installation/Removal: Sliding guide rail system provided for each pump to facilitate pump removal.
 - o Control: Wetwell level monitored by transducer transmitter. Backup weighted float switches trigger wetwell high level alarm, lead pump start, lag pump start, and pumps stop. Hydrostatic level transducer transmits wetwell level and station discharge flow is monitored with a magnetic flow meter.
 - o Pump appurtenances: Check valves and isolation valves located in the lift station building adjacent to the pump station wetwell.
- Alarms/Telemetry:
 - o Lift station new PLC communicates back to the existing WWTF SCADA system over a City provided fiber optic cable network. Parameters monitored include: lift station discharge flow, wetwell level, emergency generator run status, and general fault and ATS position.
 - o Several alarms including: Wetwell high level (with backup float control), building water-on-the-floor, pump #1 and #2 overload, pump #1 and #2 high temperature, and utility power failure.
 - o Pump control panel equipped with visual alarms.



- Access:
 - o Wetwell: Watertight 48-inch by 30-inch exterior hatch with fall protection grating.
- Force main:
 - o New 4-inch DIP discharge piping (approximately 230 feet) from the new pumps will tie into the existing 4-inch PVC force main (approximately 1,730 feet).
 - o Velocity:
 - Single pump operating at peak hour flow (100 gpm): 2.5 fps.
- Emergency power:
 - o Primary power: Electric transformer for lead and lag pumps and controls.
 - o Secondary power: Diesel-powered generator including automatic transfer switch and ground fault protection.
- Overflow storage:
 - o Approximately 7,362 gallons of overflow storage. At the peak hour flow of 100 gpm this equates to 73 minutes of storage. Storage consists of:
 - Approximately 5,233 gallons available in new wetwell.
 - Approximately 2,129 gallons available in the adjacent 5-foot diameter entry manhole.
 - o Response time is estimated at less than 10 minutes.

Conditions of Approval:

1. **Upon completion of construction and prior to commencement of operation**, a written certification must be submitted to the Division stating that the project facilities were built in accordance with the approved plans, specifications, and change orders. The certification must be signed by the applicant's registered engineer.
2. Any change orders or addenda that change facility capacity, water quality, or processes, must be submitted to this office for review and approval.
3. When construction is estimated to be within 14 days of completion, please notify this office. A representative of this department may schedule a site visit to conduct a final construction inspection before the facility commences operations.
4. Please note that during construction and operation activities, the provisions specified in the Design Criteria Sections 2.2.0, 2.3.17 and 2.3.18, must be implemented and followed. This review does not relieve the owner from compliance with all Federal, State, and local regulations and requirements prior to construction nor from responsibility for proper engineering, construction, and operation of the facility.
5. No point source discharges of water and/or contaminants from this facility to the waters of the state are authorized during construction unless a permit for such discharges has been issued by the Division. If you have any questions regarding permit issues or requirements, please contact the Permits Section at 303-692-3510.
6. The approval of this project is based on the above referenced conditions and upon the engineering design submitted to the Division for pumping wastewater to the City of Glenwood Springs' WWTF.

Facility Classification under Regulation 100:

In accordance with the current Operators Certification Board Regulations, the City of Glenwood Springs' collection system is currently a Class 2 collection system but may be reclassified to a Class 3 collection system on March 1, 2021.

Documents reviewed:

- Site Application for Iron Mountain Hot Springs, LLC dated December 2019.
- Lift Station Basis of Design Report for Iron Mountain Hot Springs, LLC by Boundaries Unlimited, Inc. dated June 2020.
- Lift Station BDR checklist for Iron Mountain Hot Springs, LLC by Boundaries Unlimited, Inc. dated November 2019.
- Final Plans and Specifications for Iron Mountain Hot Springs, LLC by Boundaries Unlimited, Inc. dated

July 2020.

- Miscellaneous correspondence.

The Engineering Section is interested in gaining feedback about your experience during the engineering review process. We would appreciate your time to complete a Quality-of-Service Survey regarding your experience during the engineering review process leading up to issuance of this decision letter. The Engineering Section will use your responses and comments to identify strengths, target areas for improvement, and evaluate process improvements to better serve your needs. Please take a moment to fill out our survey at the following website: <http://fs8.formsite.com/cohealth/form627710151/index.html>.

If you should have any questions please contact Michelle Kemp by phone at 303-692-2876 or by electronic mail at michelle.kemp@state.co.us.

Sincerely,

Michelle Kemp Digitally signed by Michelle
Kemp
Date: 2020.11.11 14:54:16 -07'00'

Michelle Kemp, P.E.
Review Engineer
Engineering Section
Water Quality Control Division
Colorado Department of Public Health and Environment

cc: Deric J. Walter, P.E., Boundaries Unlimited, Inc.
Mike Hoffman, City of Glenwood Springs
Yvonne Long, Garfield County Public Health Agency
Anna Cochran, Garfield County Public Health Agency
Douglas Camrud, WQCD Engineering Section, Unit Manager
Site Application File
Discharge Permit File CO0048852



October 20, 2020

Steve Beckley, Owner
Iron Mountain Hot Springs, LLC
51000 Two Rivers Plaza Road
Glenwood Springs, CO 81601

Subject: Site Location Approval No.: 5266
City of Glenwood Springs Regional WWTF, Centennial Street Lift Station
(LS16000)
Associated WWTF CDPS Permit No.: CO0048852
Garfield County

Dear Mr. Beckley:

The Water Quality Control Division (Division) has received and reviewed the site location application package to replace the existing Centennial Street Lift Station (LS16000) for Iron Mountain Hot Springs, LLC. The facility is to be located as follows: *NW 1/4 of the NW 1/4 of Section 9, Township 6 South, Range 90 West, 6th P.M, Garfield County*. The lift station will discharge to Lift Station LS14000 (700 gpm) which pumps across the Colorado River to Lift Station LS13000 (4,800 gpm) and ultimately to the City of Glenwood Springs WWTF. Treatment Facility which will continue to discharge to segment COLCL01 of the Colorado River.

The site location application has been found to be in conformance with the Water Quality Control Commission's *Site Location and Design Regulations for Domestic Wastewater Treatment Works*, 5 CCR 1002-22 (Regulation No. 22) and is approved. This site location approval addresses the following summary of the proposed design:

1. Based upon application information, Centennial Street Lift Station (LS16000) design will be for:
Lift Station and existing 4-inch, approximately 1,730 linear feet PVC Force Main.
 - Design Capacity – 100 gpm (peak hourly flow)
 - Replacement of a duplex submersible grinder pump lift station that ties into an existing 4-inch, pressurized force main with the following components:
 - o wetwell
 - o duplex submersible pumps
 - o electrical, controls, alarms, notification system, and appurtenances
 - o emergency storage
 - o backup power generator
2. The site location application included documentation of the Iron Mountain Hot Springs's intent to negotiate easements, as necessary, for the final alignment of the lift station and force main. A copy of the easement documentation demonstrating control of the entire force main reach must be submitted to the Division prior to the Division issuing final design approval.



This site location approval does not constitute design approval for construction. In accordance with Regulation No. 22, Section 22.11(1), in addition to approval of the site location application, the applicant must obtain approval of the design of the treatment works from the Division prior to beginning construction.

This site location approval will expire on April 20, 2022. If construction has not commenced by this date, the approval will expire and a new application for site location approval may be required. Construction is defined as entering into a contract for, or for in-house work forces, initiation of any action towards the erection or physical placement of materials, equipment, piping, earthwork or buildings which are to be a part of a domestic wastewater treatment works.

In accordance with Regulation No. 22, Section 22.3(15), this site location approval is subject to appeal pursuant to the State Administrative Procedures Act.

This approval does not relieve the owner from compliance with all local, state, and federal regulations prior to construction nor from responsibility for proper engineering, construction and operation of the facility.

The Engineering Section is interested in gaining feedback about your experience during the engineering review process. We would appreciate your time to complete a Quality-of-Service Survey regarding your experience during the engineering review process leading up to issuance of this decision letter. The Engineering Section will use your responses and comments to identify strengths, target areas for improvement, and evaluate process improvements to better serve your needs. Please take a moment to fill out our survey at the following website: <http://fs8.formsite.com/cohealth/form627710151/index.html>.

If you should have any questions, please contact Michelle Kemp by phone at 303-692-2876 or via electronic mail at michelle.kemp@state.co.us.

Sincerely,

Bret Icenogle Digitally signed by Bret Icenogle
Date: 2020.10.20 13:01:49 -06'00'

Bret Icenogle, P.E.
Engineering Section Manager
Water Quality Control Division
Colorado Department of Public Health and Environment

cc: Deric J. Walter, Boundaries Unlimited Inc.
Steve Beckley, Iron Mountain Hot Springs, LLC
Brad Zachman, City of Glenwood Springs Regional Wastewater Treatment Facility
Yvonne Long, Garfield County Public Health Agency
Site Application File ES.19.SA.05266
Discharge Permit File (CDPS) No. CO0048852 (Glenwood Springs Regional Wastewater Treatment Facility)
Bret Icenogle WQCD ES District Engineer
Doug Camrud, WQCD ES Unit Manager
Michelle Kemp, WQCD ES Reviewer

Iron Mtn Lift Station



P.O. Box 130, Glenwood Springs, CO 81602
 6874 HWY 82, Glenwood Springs, CO 81601
Contact: Dale Merrill/Mark Jr. Gould
Phone: 970-945-7291
Fax: 970-945-8371

Quote To: Glenwood Caverns
Attn: Doug Flentge
Address:
Phone:
Email: dflentge@glenwoodcaverns.com

Job Name: Iron Mtn Lift Station
Date of Plans: 12/30/2020
Proposal Date: 1/26/2021

Use On-Site Material outside - Lift Station.

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
5	Instl Silt fence	155.00	LF	3.95	612.25
15	Salvage Boulder Wall-Demo Fencing & Stairs	50.00	LF	17.00	850.00
20	Demo Force Main SMH-Fill upper 6'	2.00	EA	214.00	428.00
25	Demo Existing Lift Sta/Fill upper Section	1.00	EA	1,086.00	1,086.00
30	Rem & Salvage Electrical Transformer Pads/Equip	4.00	EA	53.40	213.60
35	Rem Existing 6' Wide Asphalt Trail	119.00	LF	6.15	731.85
	Removals Subtotal				\$3,921.70
100	Connect to Existing Sewer Manhole-add 13" Ht to Ex	1.00	EA	2,009.00	2,009.00
105	Instl 10" C 900 PVC Sewer	32.00	LF	356.00	11,392.00
110	Instl 5' Dia Sewer MH-H	1.00	EA	21,270.00	21,270.00
115	Instl 10' Dia Sewer Wet Well	1.00	EA	58,050.00	58,050.00
120	Instl Wet Well Electrical- 5 ea 1" Conduits (Deep)	44.00	LF	36.75	1,617.00
121	Instl Wet-Well Alumumin Ladder	1.00	EA	3,365.00	3,365.00
125	Instl 2-4" DIP & 1-4" PVC Floor drain (LS to WW)	39.00	LF	298.00	11,622.00
127	Instl 2'4" DIP Force Main (LS to FM Vault)	104.00	LF	253.00	26,312.00
130	Instl New Force Main Vault	1.00	EA	31,361.00	31,361.00
131	Wet Well Pumps	2.00	EA	15,465.00	30,930.00
132	Transition MH Canal Gate	1.00	EA	13,658.00	13,658.00
	Sewer & Force Main Subtotal				\$211,586.00
145	Instl Water Service	108.00	LF	187.00	20,196.00
	Water Service to Lift Station Subtotal				\$20,196.00
150	Instl Conc Electric Splice Vault by COG	2.00	EA	1,175.00	2,350.00
155	trenching & Backfill Shallow Conduits	685.00	LF	15.75	10,788.75
160	Instl 2" ETC Conduits	945.00	LF	5.00	4,725.00
165	Instl LP Base (Poles & Lights by Others)	3.00	EA	1,450.00	4,350.00
	Site ETC Subtotal				\$22,213.75
180	Instl 6" Cl 6 @ Maintenance Rd & Site	46.00	TON	49.60	2,281.60
190	Instl 6' Steel Security Fence & 12' Gate	110.00	LF	296.00	32,560.00
195	Instl 6" Bollards	7.00	EA	405.00	2,835.00

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
197	Grade 4' W Swale	48.00	LF	8.90	427.20
	Misc Lift Station Site Work Subtotal				\$38,103.80
300	Excavate & Bkfl Lift Station	1.00	EA	31,425.00	31,425.00
302	Const Retaining Wall @ Lift Station	1,076.00	SF	40.30	43,362.80
305	Concrete Structural Footings & SOG	1.00	EA	18,614.00	18,614.00
310	Instl 8" Split Face cmu	1.00	EA	26,240.00	26,240.00
312	Instl Roof Framing	1.00	LS	12,115.00	12,115.00
315	Instl 22 Ga Roofing	1.00	LS	6,135.00	6,135.00
320	Instl DBL Mtl Frame Door & Hardware	1.00	EA	7,326.00	7,326.00
322	Painting	1.00	LS	6,350.00	6,350.00
325	Electrical @ Lift Station	1.00	LS	32,294.00	32,294.00
330	Lift Station Backflow preventor	1.00	LS	4,590.00	4,590.00
332	Instrument Controls	1.00	LS	84,100.00	84,100.00
335	Lift Station Internal Plumbing	1.00	LS	60,850.00	60,850.00
336	Instl Electrical Vault W/ SS Lid & Conduits	1.00	EA	2,885.00	2,885.00
337	Instl Building Floor Drain	1.00	EA	3,088.00	3,088.00
340	Generator & Concrete Pad	1.00	EA	30,315.00	30,315.00
345	Mechanical- Exhaust Fan & Louver	1.00	EA	14,875.00	14,875.00
	Lift Station Subtotal				\$384,564.80
400	Project Mobilization & General Conditions	1.00	LS	25,100.00	25,100.00
	Project Mobilization & General Conditions				\$25,100.00
	Original Base Contract				\$705,686.05
500	Delete LI # 302- Const Retaining Wall	-1,076.00	SF	40.30	-43,362.80
501	Earthwork Changes to Site Pad	1.00	LS	11,865.00	11,865.00
502	Delete LI # 190-6'Steel Security Fence & Gate	-110.00	LF	296.00	-32,560.00
503	Native embankment vs. gravel (credit)	-1.00	LS	16,984.00	-16,984.00
505	LI # 125,127 Chg FM Pipe from DIP to C900 (credi	283.00	LF	-40.44	-11,444.52
515	Instl 6' Plastic Coated Chain Link Fence w/ Gate	1.00	LS	6,825.00	6,825.00
517	LI # 197 Decrease Grade 4' W Swale	-10.00	LF	8.90	-89.00
520	LI # 145 Decrease Water Service	-13.00	LF	166.00	-2,158.00
522	LI # 180 Decrease Cl 6 @ Maintenance RD & Site	-6.00	TON	49.60	-297.60
530	LI # 325 Electrical Fixtures Manf Change	-1.00	LS	746.00	-746.00
535	Temporary Seeding	7,568.00	SF	0.30	2,270.40
	Value Engineering Savings				-\$86,681.52
540	Lead Time Conflict for Valves & Swap out	13.00	EA	2,407.00	31,291.00
541	Surveying	1.00	LS	10,000.00	10,000.00
542	Site Safety Fencing	200.00	LF	30.00	6,000.00
	Scope Changes Subtotal				\$47,291.00

GRAND TOTAL

\$666,295.53

NOTES:

Qualifications/Notes:

1. Proposal is valid for (30) calendar days.
2. Davis-Bacon and/or prevailing wages are excluded.
3. Any item not specifically mentioned in the scope of work is excluded.

4. Survey/Staking/Engineering is included.
5. Material/Soils testing is excluded.
6. Special Insurance (Can be provided at additional cost).
7. Trench Box Shoring is included.
8. Purchase of construction water is included.
9. Due to market volatility, we reserve the right to adjust pricing for fuel increases.
10. This is a Lump Sum proposal.
11. Permits/Fees are excluded.
12. Winter Conditions will be billed on a T&M basis.
13. Progress billings net 30 days and due 30 days after. A finance charge of 1.5%/month (18%APR) will be charged on unpaid balances.
14. No retention is to be held unless agreed upon in writing.
15. Bond is included in proposal.
16. All Taxes are excluded for purchased materials
17. Boulders/Rock Shelves that can not be excavated with conventional equipment will be billed on a T&M basis.
- 18.
- 19.
20. Subexcavation/stabilization of soft areas is excluded.
21. Gould Construction reserves the right to postpone work progress for ANY unsafe conditions.
22. This proposal is submitted as a package. Any scope shall not be removed without permission of Gould Construction.
23. These bid conditions in their entirety shall become a governing part of any contract or subcontract agreement. This will be accomplished by including a copy of this proposal in the contract.

Centennial Lift Station

Master Budget

Centennial Lift Station - Proj 2020

01/27/21

PROJECT	Contract & Professional Costs	Estimated Additional Costs
Construction Bid (Gould - Exhibit D)	\$666,295.53	\$33,314.78 Contingency
Professional Fees (Engineering, Survey, Soils, Proj. Management)		
Previous to contract signature (see Page 2 Itemized Fees)	\$110,786.80	
Construction Management		\$15,000.00 Est.
Engineering Oversight		\$10,000.00 Est.
Testing (Material & Soils)		\$8,000.00 Est.
Permits (Municipal Fees, building & grading permits, etc)		\$500.00 Est.
Sub-Total CDOT Building Project	<u>\$666,295.53</u>	<u>\$58,814.78</u>
Total CDOT Building Project (with contingency & additional fees)		<u>\$725,110.31</u>

Centennial Lift Station Fees

Itemized

Iron Mountain Hot Springs LLC

Centennial Lift Station - Proj 2020
Submit to COGS

01/27/2021
Accrual Basis

	Type	Date	Num	Name	Memo	Amount
Advanced Underground Construction, LLC.						
	Bill	11/26/2019	1341	Advanced Underground Construction, LLC.	Sewer line mapping	3,840.00
	Bill	01/31/2020	1357	Advanced Underground Construction, LLC.	locate utilities - Pot holing	525.00
Total Advanced Underground Construction, LLC.						4,365.00
Boundaries Unlimited Inc.						
	Bill	03/08/2019	3223	Boundaries Unlimited Inc.	City Lift Station	455.00
	Bill	05/07/2019	3257	Boundaries Unlimited Inc.	City Lift Station	24,760.00
	Bill	06/07/2019	3282	Boundaries Unlimited Inc.	City Lift Station	2,940.00
	Bill	07/01/2019	3294	Boundaries Unlimited Inc.	City Lift Station	6,755.00
	Bill	08/05/2019	3322	Boundaries Unlimited Inc.	City lift station	5,892.00
	Bill	08/05/2019	3321	Boundaries Unlimited Inc.	City lift station	218.50
	Bill	09/09/2019	3334	Boundaries Unlimited Inc.	City lift station	1,330.00
	Bill	11/07/2019	3368	Boundaries Unlimited Inc.	City lift station	931.88
	Bill	11/07/2019	3370	Boundaries Unlimited Inc.	City lift station	11,902.00
	Bill	12/05/2019	3390	Boundaries Unlimited Inc.	meetings with Steve, COGS	1,890.00
	Bill	12/05/2019	3392	Boundaries Unlimited Inc.	sort applications docs for submittal	560.00
	Bill	01/14/2020	3408	Boundaries Unlimited Inc.	CDPHE submittal	198.00
	Bill	01/14/2020	3406	Boundaries Unlimited Inc.	input pothole info, COGS comments	1,885.00
	Bill	04/02/2020	3462	Boundaries Unlimited Inc.	lift station plans	2,730.00
	Bill	05/04/2020	3487	Boundaries Unlimited Inc.	Lift Station	2,840.00
	Bill	06/30/2020	3522	Boundaries Unlimited Inc.	lift station	3,535.00
	Bill	08/04/2020	3557	Boundaries Unlimited Inc.	lift station	1,373.50
	Bill	08/31/2020	3576	Boundaries Unlimited Inc.	Lift Station SUE issues	1,750.00
	Bill	09/30/2020	3610	Boundaries Unlimited Inc.	Lift Station, floodplain, piping	4,760.00
	Bill	10/30/2020	3630	Boundaries Unlimited Inc.	Lift Station, floodplain, design	7,140.00
	Bill	11/30/2020	3655	Boundaries Unlimited Inc.	Lift Station, floodplain, design	184.00
	Bill	12/30/2020	3686	Boundaries Unlimited Inc.	Lift Station, redline and revisions	4,745.00
Total Boundaries Unlimited Inc.						88,774.88
Colorado Department of Public Health						
	Bill	12/11/2019	WUDR201097819	Colorado Department of Public Health	Design reviews for new lift station	1,464.00
	Bill	12/11/2019	WUSA201097818	Colorado Department of Public Health	Site Location application	2,361.00
Total Colorado Department of Public Health						3,825.00
Kumar & Associates, Inc.						
	Bill	12/30/2019	196459	Kumar & Associates, Inc.	Subsoil Study, proposed lift station	941.00
Total Kumar & Associates, Inc.						941.00
Precision Hydrovac and Jetter, Inc.						
	Bill	07/15/2020	1068	Precision Hydrovac and Jetter, Inc.	core and pothole for SUE survey	4,837.50
Total Precision Hydrovac and Jetter, Inc.						4,837.50
SGM						
	Bill	06/29/2020	2014-339.001-45	SGM	SUE survey	6,931.50
Total SGM						6,931.50
Triumph Development West, LLC						
	Bill	08/11/2019	Aug 19	Triumph Development West, LLC	lift station design	437.50
	Bill	08/31/2019	Sept 19	Triumph Development West, LLC	lift station design	424.42
	Bill	10/07/2019	Oct 19	Triumph Development West, LLC	lift station design	250.00
Total Triumph Development West, LLC						1,111.92
TOTAL						110,786.80



City Council
STAFF REPORT
City of Glenwood Springs
February 4, 2021

Agenda Item: Annual Ride Glenwood Operating Agreement with RFTA

Action Requested: Approval for the Mayor to sign the annual operating agreement approved in the 2021 budget.

Department: Engineering

Presented By: Terri Partch, City Engineer

Background Info: The City committed \$1,155,004 to the annual operating contract for Ride Glenwood Springs in the 2021 annual budget.

RFTA is requesting the City's confirmation of the annual agreement. Calculated costs for the year are \$1,145,098, which is within the approved 2021 budget.

Issues: None.

Staff Recommendation: Approval of the Mayor's signature on the annual operating agreement.



January 20, 2021

Debra Figueroa, City Manager
City of Glenwood Springs
101 West 8th Street
Glenwood Springs, Colorado 81601

RE: 2021 Renewal of City of Glenwood Springs Transit Service Agreement

Dear Debra:

Section "IX" of the City of Glenwood Springs Transit Service Agreement allows for the Agreement to automatically renew for successive one-year terms on January 1st each year, provided that such sums as RFTA deems necessary to provide the Glenwood Springs Transit Services are agreed to by RFTA and Glenwood Springs in writing prior to the commencement of each successive one-year term. In such event, the Budgeted Base Transit Fee provided for in Article III, A., and reflected on Exhibit "C-1," shall be modified to reflect the estimated costs for the Glenwood Springs Transit Service for the applicable renewal term.

The attached Excel workbook, Exhibit "C-1," Line "32," Column "O," reflects RFTA's budgeted cost for Glenwood Springs Municipal Transit Services in 2021. For 2021, this cost is **\$1,145,098** net of an estimated \$55,376 in fare revenue. Exhibit's "C-2a & C-2b," reflect the detailed RFTA Operating budget from which RFTA's 2021 Budgeted Cost Factors have been derived. Exhibit "C-3," reflects RTA's asset list from which RFTA's allocated capital costs have been derived.

To the best of my knowledge and belief, no other terms of this agreement or exhibits have been affected as a result of renewing the agreement for 2021. If you find the terms of this renewal acceptable please ask the Mayor to sign below, where indicated, and return a copy of this letter to me.

Please let me know if you have questions.

Sincerely,



Dan Blankenship
Chief Executive Officer

Jonathan Godes, Mayor, City of Glenwood Springs

Date: _____



City Council
STAFF REPORT
City of Glenwood Springs
February 4, 2021

Agenda Item: Planning and Zoning Commission Appointments

Action Requested: Appointment of two Planning and Zoning Commission candidates.

Department: Economic and Community Development

Presented By: Gretchen Ricehill, Assistant Director of Economic and Community Development

Background Info: George Shaver and Amber Wissing currently serve on the Planning and Zoning Commission. Both are eligible for and have reapplied for second terms.

We received a third application, however since applying, the candidate moved outside of the city limits and is no longer eligible to serve on the Commission per the Municipal Code residency requirements for Planning & Zoning Commissioners.

Upon these appointments the Planning and Zoning Commission will include:

- Marco Dehm
- George Shaver
- Carolyn Cipperly
- Beatriz Soto
- Sumner Schachter
- Amber Wissing
- Ben West
- Joy White (alternate)
- Pete Waller (alternate)

Issues: None.

Staff Recommendation: Staff defers to Council.

Respondent



7

Anonymous



38:10

Time to complete



Planning and Zoning Commission Application

Thank you for your interest and time commitment in serving your community. Please complete all questions on this application.

Personal Information

1. Name *

George Shaver

2. Home Address *

1836 Midland Avenue Glenwood Springs CO 81601

3. Mailing Address *

1836 Midland Avenue Glenwood Springs CO 81601

4. Home Phone *

9703791933

5. Work Phone *

9703791933

6. Mobile Phone *

9703791933

7. Email Address *

Georgeslover1836@gmail.com

8. Occupation *

Similar-retired residential general contractor

Personal and Professional Interests

9. Why are you interested in serving on the Planning and Zoning Commission? *

I wish to continue working on the commission. I feel I have I can offer a valuable perspective as a builder as well as a long time resident of our community.

10. What do you view as your role if selected as a member to the Planning and Zoning Commission? *

1) Evaluate applications conformance to the development code and compressive plan and/or variance criteria. 2) Continue the fine tuning of the recently adopted development code. 3) Help in the comprehensive plan re-write.

11. What experience have you had in the land use approval process? *

As a builder, I have often had experience with permitting for construction projects mostly in communities up valley. In Glenwood there was a process required due to the proximity to the river, the requirements of HPOZ on the steepness of the lot and a variance for a retaining wall for our home construction in 2013.

12. Do you have any particular areas of interest or a particular perspective relating to land use development in Glenwood Springs? *

I would like to see Glenwood develop in such a way that it maintains economic vibrancy without losing its small town atmosphere and respects the residents that live here. I don't have a specific vision, only an eye to the long term outcomes.

13. Can you describe an experience making a decision that made people unhappy? *

There have been numerous denials of applications that I have been involved with on this commission as well as my time on the Basalt Sanitation board. I am sure there were people that were unhappy as a result of my vote.

14. Can you separate yourself from personal opinions and represent the City's goals, policies, plans, and the Glenwood Springs Municipal Code in an equitable fashion? *

I have tried to do just that. It is not always easy to do so. On the other hand, I think part of our function on the commission is to help guide those goals, policies, etc.

15. The Planning and Zoning Commission members generally attend two meetings a month and can have extensive packet materials to review in preparation for meetings. Do you have any existing time commitments that will hamper your ability to serve? *

No.

16. Are you aware of and understand the quasi-judicial function of the Planning and Zoning Commission? *

If you were to ask me to explain 'quasi-judicial' in clear and precise terms, I would find that very difficult. I am not a lawyer or educated in that area. However, from a practical perspective and from experience, I have understanding of how it works.

17. What experience do you have working with people on a board, commission, or committee? *

14 years on the Basalt Sanitation board. Appointed alternate 1/2017 and commissioner 5/2019 to this P&Z

18. Please select today's date. *

1/8/2021



19. Have you served on the Planning and Zoning Commission before? *

☐ No

☒ Yes

Reappointment Applicants

20. Why do you think you should be reappointed? *

I think I still have something to offer to the commission. I feel I bring a different perspective than others. From a personal perspective, it is a way for me to be involved with the community and I continue to learn from my fellow commissioners, the city staff and from people who come before us to present their applications.

21. Have you served more than two full terms on the Planning and Zoning Commission? *

I am complicating the remainder of my first.

Powers and Duties of the Planning and Zoning Commission

(as defined in Title 020 of the Glenwood Springs Municipal Code)

Composition of the Planning and Zoning Commission:

a. Seven (7) citizens who are residents of the City.

f. Powers and Duties

The powers and duties of the Planning and Zoning Commission shall be:

(1) To develop and recommend a master plan subject to the approval of the City Council and its environ in accordance with the provisions of this Code and the laws of the State.

(2) To recommend to the City Council boundaries of zone districts and regulations to be enforced therein, in accordance with the provisions of this Code and the laws of the State.

(3) To review proposals relating to subdivision, development and use of land and make decisions or recommendations on such proposals, in accordance with the procedures and provisions set forth in this Code.

(4) To hear and decide appeals wherein there is a question of interpretation of the zone district map, the master plan or related documents and similar questions as they may arise in the administration of this Code.

(5) The Planning and Zoning Commission shall have the duty and power to act on appeals with regard to matters arising from enforcement of provisions of Title 070 of this Code, including:

a. Review of administrative decisions. To hear and decide appeals where it is alleged there is error in any action,

including any order, interpretation, requirement, decision or determination made by an administrative official

of the city in the enforcement of Title 070 of this Code.

b. Variances. To hear and decide requests for variances from the zoning provisions and sign regulation provisions

where there are unique, unnecessary and unreasonable hardships in the way of carrying out the strict letter of said

provisions; and to hear and decide requests for variances to allow deviations from restrictions upon the

construction and placement of buildings and other structures on site. Examples of such variances include, but are

not limited to, modifications of minimum area requirements, building coverage and setback restrictions. Variances

from permitted and special review uses in zone district text shall not be considered.

(6) To perform such other functions as required by the provisions of Title 070.

Appointment, Removal, Term and Vacancies of Boards and Commissions

Glenwood Springs, CO Municipal Code 020.020.040

(a) Appointment and term of members. Except as otherwise provided, all appointments to the boards and commissions shall be by the City Council for terms of three (3) years each, and each member shall serve until his/her successor is appointed and takes office; provided, however, that the initial terms of office may be shortened by the City Council so as to provide overlapping terms of office. Appointments shall expire the day before the first regular meeting of the City Council in each month according to the following schedule:

(1) February:

Planning and Zoning Commission;
Finance Advisory Board;
Tourism Promotion Board;
Building Board of Appeals.

(2) March:

Transportation Commission;
Arts and Culture Board;
Parks and Recreation Commission;
Airport Board;
River Commission.

(3) April:

Local Liquor Licensing Authority;
Victim's Witnesses Assistance and Law Enforcement Board;
Historic Preservation Commission;
Glenwood Springs Housing Commission.

(b) Alternate members. The City Council at its discretion may appoint up to three (3) persons as alternate members for each board or commission. If a regular member of a board or commission is to be absent from a meeting, the presiding officer for the meeting may select an alternate member to fill such absence and to attend and serve at the meeting. The alternate member may exercise all powers at the meeting which the absent regular member could exercise, and the alternate's powers and privileges shall terminate at the end of the meeting attended. The presiding officer may at his/her discretion select the same alternate to serve at successive meetings in the absence of any member.

(c) Limit to term of members. No Board member shall serve more than two (2) terms on the same board or commission.

(d) Removal of members. All appointed members of a board or commission shall be subject to removal, at any time, by the City Council. In the event an appointed member of a board or commission ceases to qualify for membership, his or her appointment is immediately terminated.

(e) Vacancies. The City Council shall fill all vacancies on boards and commissions by appointment

for the unexpired term.

(Code 1971 §§ 2-63, 2-64, 2-67; 6-95 § 1; 10-07 § 2; Ord. No. 9-2018 , § 2, 4-20-2018)

Respondent



8

Anonymous



46:34

Time to complete



Planning and Zoning Commission Application

Thank you for your interest and time commitment in serving your community. Please complete all questions on this application.

Personal Information

1. Name *

Amber Wissing

2. Home Address *

1543 Shepherds Lane Glenwood SP, CO 81601

3. Mailing Address *

1543 Shepherds Lane Glenwood SP, CO 81601

4. Home Phone *

970-948-9774

5. Work Phone *

970-945-9119

6. Mobile Phone *

970-948-9774

7. Email Address *

amberewissing@gmail.com

8. Occupation *

Office Manager

Personal and Professional Interests

9. Why are you interested in serving on the Planning and Zoning Commission? *

I am interested in continuing my service on the P&Z Commission after 3 years. It has been quite the education! It has also provided me with a way to serve my community as well as prepare me for a potential bid for City Council in the future.

10. What do you view as your role if selected as a member to the Planning and Zoning Commission? *

As Ingrid can attest, I view my role as the voice of the common citizen. I bring no expertise in land use or other professionally applicable skills to the table. All I can bring is my heart to do what is fair by the residents of a town I love.

11. What experience have you had in the land use approval process? *

Outside of my P&Z service, the only land use approval process experience I have had is as a Board Member for the Cardiff Glen HOA. I have served on that Board for 12 years. Cardiff Glen has had a long and sortied past in history of it's development. I have been involved with all aspects of the HOA involving that process since becoming a Cardiff Glen owner and resident.

12. Do you have any particular areas of interest or a particular perspective relating to land use development in Glenwood Springs? *

Glenwood Springs is my home town. I am invested in making it the best place to live, work and raise a family. Outside of that perspective, I have no professional interests regarding land use within the city.

13. Can you describe an experience making a decision that made people unhappy? *

A recent decision that I supported was the highly emotional decision for riparian zone set backs. While I understood the concern of the property owners, our rivers are a resource that should be protected at the highest level. Finding a fair balance was challenging and unpopular among some property owners, but I stand by my decision to protect our precious river resource.

14. Can you separate yourself from personal opinions and represent the City's goals, policies, plans, and the Glenwood Springs Municipal Code in an equitable fashion? *

Yes. I believe myself to be a very fair minded decision maker. As the president of our HOA, I have had a lot of practice holding friends and neighbors accountable to our covenants despite relationships and emotions.

15. The Planning and Zoning Commission members generally attend two meetings a month and can have extensive packet materials to review in preparation for meetings. Do you have any existing time commitments that will hamper your ability to serve? *

No.

16. Are you aware of and understand the quasi-judicial function of the Planning and Zoning Commission? *

Yes.

17. What experience do you have working with people on a board, commission, or committee? *

I believe that I have answered this in the previous sections. I also serve on Glenwood Medical's Citizen Advisory Board and the Two Rivers Community Foundation Board.

18. Please select today's date. *

1/12/2021



19. Have you served on the Planning and Zoning Commission before? *

☐ No

☒ Yes

Reappointment Applicants

20. Why do you think you should be reappointed? *

I believe that I am a valuable Commissioner because I come to the table to authentically listen, evaluate, and make a decision that is as fair as possible for all parties involved. I do not take this responsibility lightly. From my time serving on my HOA Board, I know first hand what it is like to stand up in a meeting as a resident trying to protect your community with your nerves shaking, your mind racing, just hoping that you can get your points across to a Commission you hope is listening. Staff, professionals and community members can count on me to do my solid best to serve in this position with integrity.

21. Have you served more than two full terms on the Planning and Zoning Commission? *

My first term expires next month.

Powers and Duties of the Planning and Zoning Commission

(as defined in Title 020 of the Glenwood Springs Municipal Code)

Composition of the Planning and Zoning Commission:

a. Seven (7) citizens who are residents of the City.

f. Powers and Duties

The powers and duties of the Planning and Zoning Commission shall be:

- (1) To develop and recommend a master plan subject to the approval of the City Council and its environ in accordance with the provisions of this Code and the laws of the State.
- (2) To recommend to the City Council boundaries of zone districts and regulations to be enforced therein, in accordance with the provisions of this Code and the laws of the State.
- (3) To review proposals relating to subdivision, development and use of land and make decisions or recommendations on such proposals, in accordance with the procedures and provisions set forth in this Code.
- (4) To hear and decide appeals wherein there is a question of interpretation of the zone district map, the master plan or related documents and similar questions as they may arise in the administration of this Code.
- (5) The Planning and Zoning Commission shall have the duty and power to act on appeals with regard to matters arising from enforcement of provisions of Title 070 of this Code, including:
 - a. Review of administrative decisions. To hear and decide appeals where it is alleged there is error in any action,
 - including any order, interpretation, requirement, decision or determination made by an

administrative official

of the city in the enforcement of Title 070 of this Code.

b. Variances. To hear and decide requests for variances from the zoning provisions and sign regulation provisions

where there are unique, unnecessary and unreasonable hardships in the way of carrying out the strict letter of said

provisions; and to hear and decide requests for variances to allow deviations from restrictions upon the

construction and placement of buildings and other structures on site. Examples of such variances include, but are

not limited to, modifications of minimum area requirements, building coverage and setback restrictions. Variances

from permitted and special review uses in zone district text shall not be considered.

(6) To perform such other functions as required by the provisions of Title 070.

Appointment, Removal, Term and Vacancies of Boards and Commissions

Glenwood Springs, CO Municipal Code 020.020.040

(a) Appointment and term of members. Except as otherwise provided, all appointments to the boards and commissions shall be by the City Council for terms of three (3) years each, and each member shall serve until his/her successor is appointed and takes office; provided, however, that the initial terms of office may be shortened by the City Council so as to provide overlapping terms of office. Appointments shall expire the day before the first regular meeting of the City Council in each month according to the following schedule:

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Finance Advisory Board;

Tourism Promotion Board;

Building Board of Appeals.

(2) March:

Transportation Commission;

Arts and Culture Board;

Parks and Recreation Commission;

Airport Board;

River Commission.

(3) April:

Local Liquor Licensing Authority;

Victim's Witnesses Assistance and Law Enforcement Board;

Historic Preservation Commission;

Glenwood Springs Housing Commission.

(b) Alternate members. The City Council at its discretion may appoint up to three (3) persons as alternate members for each board or commission. If a regular member of a board or commission is to be absent from a meeting, the presiding officer for the meeting may select an alternate member

to fill such absence and to attend and serve at the meeting. The alternate member may exercise all powers at the meeting which the absent regular member could exercise, and the alternate's powers and privileges shall terminate at the end of the meeting attended. The presiding officer may at his/her discretion select the same alternate to serve at successive meetings in the absence of any member.

(c) Limit to term of members. No Board member shall serve more than two (2) terms on the same board or commission.

(d) Removal of members. All appointed members of a board or commission shall be subject to removal, at any time, by the City Council. In the event an appointed member of a board or commission ceases to qualify for membership, his or her appointment is immediately terminated.

(e) Vacancies. The City Council shall fill all vacancies on boards and commissions by appointment for the unexpired term.

(Code 1971 §§ 2-63, 2-64, 2-67; 6-95 § 1; 10-07 § 2; Ord. No. 9-2018 , § 2, 4-20-2018)



City of Glenwood Springs
Office of the City Clerk
101 West 8th Street
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Fax: 970-945-5023
Email: Catherine.mythen@cogs.us

PLANNING AND ZONING COMMISSION APPLICATION

(for Powers and Duties, see page 3)

Section 1 – Name and Address

Name Joy White
Home Address 365 Vista Dr Glenwood Springs ,CO 81601
Mailing Address " "

Section 2 – Contact Information

Home 970-366-9636 Work _____
Fax _____ Mobile 970-366-9636
Email joy@masonmorse.com

Section 3 - Occupation

Occupation Real Estate Broker

Section 4 – Personal and Professional Interests

1. Why are you interested in serving on the Planning and Zoning Commission?

I have a keen interest in being instrumental in the planning and zoning decisions that affect the Glenwood Springs community. I have been a long-term resident in Glenwood and have a heart for the community and a vested interest in positive development outcomes in our beautiful town.

2. What do you view as your role if selected as a member of the Planning and Zoning Commission?

As a professional in the real estate community, a mother of four children growing up in our town and an individual who intends to continue to invest in property in the city limits - I see I can bring industry expertise coupled with a well-rounded community approach to decisions made on the commission. As a new member I intend to learn from the existing commissioners and add a fresh, sound approach as is appropriate.

3. What experience have you had in the land use approval process?

I have collaborated with the Glenwood Springs and Garfield County Community Development Departments on parcel research for development, existing land use guidelines associated with real estate transactions. I thrive in helping my clients navigate the intricacies of land use. There is always more to learn, which is thrilling.



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Glenwood Springs, CO 81601
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Email: Catherine.mythen@cogs.us

PLANNING AND ZONING COMMISSION APPLICATION

(for Powers and Duties, see page 3)

Section 4 – Personal and Professional Interests (Continued)

4. Do you have any particular areas of interest or a particular perspective relating to land use development in Glenwood Springs?

No particular interest.

5. Can you describe an experience making a decision that made people unhappy?

As a real estate broker you are consistently involved in emotionally charged transactions. There are tough negotiations and though you always try to reach amicable solutions it is not always possible. You do your best to represent your client and work hard to that end. There are people are upset but ultimately, if you are kind, professional and hard-working there can be respect for all parties regardless of whether the outcome has been a tough decision.

6. Can you separate yourself from your personal opinions and represent the City's goals, policies, plans and the Glenwood Springs Municipal Code in an equitable fashion?

I have also worked in the non-profit sector prior to my employment in the real estate world and understand that to be successful the well-being of the community, at large, must always be upheld. Goals, policies and plans cannot be made in self-interest but rather should serve all community members, as best as possible.

7. The Planning and Zoning Commission members generally attend two meetings a month and can have extensive packet materials to review in preparation for the meetings. Do you have any existing time commitments that will hamper your ability to serve?

No

8. Are you aware of and understand the quasi-judicial function of the Planning and Zoning Commission?

Yes

9. What experience do you have working with people on a board, commission or committee?

I have served on non-profit committees, work related advisory boards, and am currently on the Andy Zanca Youth Empowerment Board.

Thank you for your interest and time commitment in serving your community

Please complete and submit this application online or
mail to: City Clerk, 101 West 8th Street, Glenwood Springs, CO 81601;
fax to: 970-945-5023;
email: catherine.mythen@cogs.us



City of Glenwood Springs
Office of the City Clerk
101 West 8th Street
Glenwood Springs, CO 81601
Fax: 970-945-5023
Email: Catherine.mythen@cogs.us

PLANNING AND ZONING COMMISSION APPLICATION

(for Powers and Duties, see page 3)

POWERS AND DUTIES OF THE PLANNING AND ZONING COMMISSION

(as defined in Title 020 of the Glenwood Springs Municipal Code)

Composition of the Planning and Zoning Commission:

- a. Seven (7) citizens who are residents of the City.

Powers and Duties:

(f) Powers and Duties of Planning and Zoning Commission. The powers and duties of the Planning and Zoning Commission shall be:

- (1) To develop and recommend a master plan subject to the approval of the City Council and its environ in accordance with the provisions of this Code and the laws of the State.
- (2) To recommend to the City Council boundaries of zone districts and regulations to be enforced therein, in accordance with the provisions of this Code and the laws of the State.
- (3) To review proposals relating to subdivision, development and use of land and make decisions or recommendations on such proposals, in accordance with the procedures and provisions set forth in this Code.
- (4) To hear and decide appeals wherein there is a question of interpretation of the zone district map, the master plan or related documents and similar questions as they may arise in the administration of this Code.
- (5) The Planning and Zoning Commission shall have the duty and power to act on appeals with regard to matters arising from enforcement of provisions of Title 070 of this Code, including:
 - a. Review of administrative decisions. To hear and decide appeals where it is alleged there is error in any action, including any order, interpretation, requirement, decision or determination made by an administrative official of the city in the enforcement of Title 070 of this Code.
 - b. Variances. To hear and decide requests for variances from the zoning provisions and sign regulation provisions where there are unique, unnecessary and unreasonable hardships in the way of carrying out the strict letter of said provisions; and to hear and decide requests for variances to allow deviations from restrictions upon the construction and placement of buildings and other structures on site. Examples of such variances include, but are not limited to, modifications of minimum area requirements, building coverage and setback restrictions. Variances from permitted and special review uses in zone district text shall not be considered.
- (6) To perform such other functions as required by the provisions of Title 070.



City Council
STAFF REPORT
City of Glenwood Springs
February 4, 2021

Agenda Item: Airport Commission Appointments

Action Requested: Airport Commission Appointments

Department: Facilities

Presented By: Brian Smith, Recreation Director

Background Info: The Airport Commission is comprised of 5 seats. Alan Arnold and Rich Backe are continuing their terms. Gregg Rippy and David Brown are term-limited. Dave Merritt's seat is up and he is re-applying for another term. The other applicant is Joel Shute.

Mayor Godes is the Commission liaison and is recommending Mr. Merritt's seat be renewed and Mr. Shute be appointed. The Commission would then consist of:

- Alan Arnold
- Rich Backe
- Dave Merritt
- Joel Shute

Issues:

Staff Recommendation:



City of Glenwood Springs
Office of the City Clerk
101 West 8th Street
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Email: catherine.mythen@cogs.us

AIRPORT BOARD APPLICATION

(for Powers and Duties, see page 3)

Section 1 - Name and Address

Name

Home Address

Mailing Address

Section 2 - Contact Information

Home Work

Fax Mobile

Email

Section 3 - Occupation

Occupation

Section 4 - Personal and Professional Interests

1. Do you have any specific areas of interest relating to the airport? Do you have any particular perspective related to its use or development?

I am a pilot and am interested in the general well being and operations of the airport. I often volunteer for events and for maintenance projects. My perspective for the use and development of the airport, is that it should remain an airport. I believe if it remains an airport and is developed as such it will be the most beneficial use for the community and local economy.

2. What do you view as your role if selected as a member of the Airport Board?

Whatever is needed. I would like to get more involved in the community and I have many skills. I can help with anything from graphic design, to project planning, to land use management. I am versatile and think as a younger member of the committee, I am very aware and respectful of the knowledge and experience of existing board members. However, I also have leadership values, and I am very willing to learn and grow in whatever role is needed.



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AIRPORT BOARD APPLICATION

(for Powers and Duties, see page 3)

Section 4 - Personal and Professional Interests (continued)

3. Do you have any experience working with people on a board, commission, committee, or as part of some other decision-making group?

I do not have experience with direct participation on such a board. However, I used to work as a field botanist, and would regularly submit research and data for such boards for their consideration on mostly land use issues.

I currently work as a data and operations manager for a Natural Gas Utility company and often have to work with a team to make large decisions about short and long term operations. I guess you could consider this as similar to a board or committee, though it is more informal. I have

4. Do you understand that as a member of the Airport Board you would be serving in an advisory role to City Council regarding airport issues?

Yes. I like research and I am not afraid to talk in front of people. I am very comfortable with relaying information and letting you know what I think in a respectful manner.

5. If, as a member of the Airport Board, you had to make a decision that was unpopular with either airport users or residents surrounding the airport, how might you approach that situation?

I would consider all the options in detail and do my best to make an unbiased decision that would be the most beneficial for the community as a whole. I look forward to working as a team with the rest of the board to make an informed decision. I would also make sure that we spend time to bring up any possible decision with all parties involved, and try to make sure that all parties feel heard and their perspectives are considered. I believe there can usually be level headed decisions that can use compromise to make everyone relatively happy.

6. The Airport Board meetings typically occur one morning a month, with other occasional related events, meetings and e-mail contact. Will you be sufficiently available to participate?

I work from home remotely a majority of the time and should be available if I have a date set in advance. I also, live close to downtown and the court house. My schedule is very flexible.

7. Do you have any areas of expertise that could be helpful to the Board's decision-making?

I received my private pilots license Dec. 2018. Between my many jobs over the years, I am very informed and experienced with land use and management as well as construction and planning. I also do work with information technology including GIS mapping, graphic design, and website management. I have a great desire to help and better the world around me, specifically this community in which I reside. I was born and raised here until I was in Middle School, and I have returned here as an adult to raise a family and put down roots. I care deeply about this community

Thank you for your interest and time commitment in serving your community

Please complete this application and forward it to the City Clerk either by mail to: 101 West 8th Street, Glenwood Springs, CO 81601; fax to: 970-945-5023; email: catherine.mythen@cogs.us; or online:

www.cogs.us



City of Glenwood Springs
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AIRPORT BOARD APPLICATION

(for Powers and Duties, see page 3)

POWERS AND DUTIES OF THE AIRPORT BOARD

(as defined in Title 020 of the Glenwood Springs Municipal Code)

Composition of the Airport Board:

(2) Airport Board:

a. Five (5) citizens, at least four (4) who are residents of the City and one (1) who may reside outside of the City but within the 81601 zip code area or own real property or a business within the City.

Powers and Duties:

(b) Powers and Duties of Airport Board. The powers and duties of the Airport Board shall be to investigate, study and report to the City Council all matters concerning the airport facilities of the City and other matters concerning the subject of aviation which may be pertinent to the City as shall be requested of the Airport Board by the City Council; and such Board may investigate, study and report to the City Council on such other matters concerning the Municipal Airport as the Board may deem for the best interests of the City.



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Email: catherine.mythen@cogs.us

AIRPORT BOARD APPLICATION

(for Powers and Duties, see page 3)

Section 1 - Name and Address

Name

Home Address

Mailing Address

Section 2 - Contact Information

Home Work

Fax Mobile

Email

Section 3 - Occupation

Occupation

Section 4 - Personal and Professional Interests

1. Do you have any specific areas of interest relating to the airport? Do you have any particular perspective related to its use or development?

While not a pilot, I have lived near the north end of the runway for the past 35 years. I have seen the airport grow during this period, increasing its value to the community and the professionalism of its operation.

2. What do you view as your role if selected as a member of the Airport Board?

To assist in the policy level aspects of its operations and to serve as a connection between the local community and the airport community.



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AIRPORT BOARD APPLICATION

(for Powers and Duties, see page 3)

Section 4 - Personal and Professional Interests (continued)

3. Do you have any experience working with people on a board, commission, committee, or as part of some other decision-making group?

I have served on many boards and commissions, including the City Council, over my lifetime.

4. Do you understand that as a member of the Airport Board you would be serving in an advisory role to City Council regarding airport issues?

Yes.

5. If, as a member of the Airport Board, you had to make a decision that was unpopular with either airport users or residents surrounding the airport, how might you approach that situation?

As I often have throughout my career, I would pull together both sides and look toward how the adverse impacts to each side could be minimized, I would also keep in mind that any decisions are ultimately recommendations to an elected body, and need to be viewed in that context.

6. The Airport Board meetings typically occur one morning a month, with other occasional related events, meetings and e-mail contact. Will you be sufficiently available to participate?

I have missed very few meetings over my past three years, and take these obligations very seriously.

7. Do you have any areas of expertise that could be helpful to the Board's decision-making?

I have over 40 years of serving as both staff to elected or appointed bodies and serving on those boards and commissions, including many instances as the chair or president. Through that time, I have focused on being both supportive of and challenging to staff, and of listening to all sides of issues before taking action.

Thank you for your interest and time commitment in serving your community

Please complete this application and forward it to the City Clerk either by mail to: 101 West 8th Street, Glenwood Springs, CO 81601; fax to: 970-945-5023; email: catherine.mythen@cogs.us; or online:

www.cogs.us



City of Glenwood Springs
Office of the City Clerk
101 West 8th Street
Glenwood Springs, CO 81601
Fax: 970-945-5023
Email: catherine.mythen@cogs.us

AIRPORT BOARD APPLICATION

(for Powers and Duties, see page 3)

POWERS AND DUTIES OF THE AIRPORT BOARD

(as defined in Title 020 of the Glenwood Springs Municipal Code)

Composition of the Airport Board:

(2) Airport Board:

a. Five (5) citizens, at least four (4) who are residents of the City and one (1) who may reside outside of the City but within the 81601 zip code area or own real property or a business within the City.

Powers and Duties:

(b) Powers and Duties of Airport Board. The powers and duties of the Airport Board shall be to investigate, study and report to the City Council all matters concerning the airport facilities of the City and other matters concerning the subject of aviation which may be pertinent to the City as shall be requested of the Airport Board by the City Council; and such Board may investigate, study and report to the City Council on such other matters concerning the Municipal Airport as the Board may deem for the best interests of the City.



City Council
STAFF REPORT
City of Glenwood Springs
February 4, 2021

Agenda Item: Arts and Culture Board Appointments

Action Requested: Appoint Arts and Culture Board Members

Department: Parks & Recreation

Presented By: Brian Smith, Recreation Director

Background Info: The Arts & Culture Board has 3 vacancies, including the youth member position. In 2020, three new member applications were received and one application for a current member reappointment. In early 2021, one additional reappointment application was received.

Stefanie Davis has re-applied and an application has been received from Laurin Arnold. Mayor Pro Tem Kaup has interviewed both candidates and is recommending them for appointment.

If these appointments are confirmed the Arts and Culture Board would consist of:

- Bryana Starbuck
- Liz Caras
- Stefanie Davis
- Laurin Arnold

Issues: None

Staff Recommendation: Staff defers to Council.



City of Glenwood Springs
Office of the City Clerk
101 West 8th Street
Glenwood Springs, CO 81601
Fax: 970-945-5023
Email: catherine.fletcher@cogs.us

ARTS and CULTURE BOARD APPLICATION

(for Powers and Duties, see page 4)

Section 1 – Name and Address

Name Laurin Arnold
Home Address 729 Bennett Ave
Mailing Address Same

Section 2 – Contact Information

Home: _____ Work: 970-945-5958
Fax: _____ Mobile: 614-678-2371
Email: larnold5@gmail.com

Section 3 – Occupation

Occupation Librarian

Section 4 – Membership Qualifications

MEMBERSHIP QUALIFICATION	Check Here
A. Five (5) citizens who are a resident of the City.	☒
B. Two (2) citizens of which may reside outside of the City, but within 81601 zip code area or own real property or a business within the City.	☐

You must qualify as one of the above to serve on the Arts and Culture Board. Please check the box next to the one that applies to you, and explain here how you are qualified:

Live in downtown Glenwood Springs, 3 years come May 2020.



City of Glenwood Springs
Office of the City Clerk
101 West 8th Street
Glenwood Springs, CO 81601
Fax: 970-945-5023
Email: catherine.fletcher@cogs.us

ARTS and CULTURE BOARD APPLICATION

(for Powers and Duties, see page 4)

Section 5 – Personal and Professional Interests

1. Why are you interested in serving on the Arts and Culture Board?

Growing up with an artist for a mother has, not surprisingly, made art an integral part of my life. I want to give others in my community the opportunity to engage with art and culture whenever they wish to. And I feel this community would appreciate it.

2. What do you view as your role if selected as a member of the Arts and Culture Board?

Providing the perspective of a young professional who, coming from a public service background, can speak to the need of various members of our community.

3. Do you have marketing, advertising or public relations experience or skills?

Yes, from marketing library programs and services.

4. Do you have Arts/Culture experience or skills? (ex. Performing arts, visual arts, public arts, museums arts education)

I grew up around paintings and sculpture and enjoy creating art and crafts myself.

5. Can you describe an experience making a decision based on public opinion?

It's important to me and those in my profession that libraries remain open to all. This has put me at odds with those of the public who believe that a certain type of person should not be given access to the library. When this happens I listen to their concerns with empathy but hold true to my convictions. As a board member I would take public opinion into account while holding true to the duties



City of Glenwood Springs

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101 West 8th Street
Glenwood Springs, CO 81601
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Email: catherine.fletcher@cogs.us

**ARTS and CULTURE BOARD
APPLICATION**

(for Powers and Duties, see page 4)

Section 5 – Personal and Professional Interests (continued)

6. Can you separate yourself from your personal opinions and represent the City's goals, policies, plans and the Glenwood Springs Municipal Code in an equitable fashion?

Yes. As a librarian I am able to separate my opinions from my duty to provide access to information, regardless of my feelings about the information.

7. Do you have any existing time commitments that will hamper your ability to serve?

I work 40 hrs/week and there may be times when I need to step in and close the library at 6pm on a Thursday, though that is rare.

8. What experience do you have working with people on a board, commission or committee?

I have served on the Budget Committee at the library and have presented to the Library Board many times.

Thank you for your interest and time commitment in serving your community

Please complete and submit this application online or
Mail to: City Clerk, 101 West 8th Street, Glenwood Springs, CO 81601;
Fax to: 970-945-5023;
Email: catherine.fletcher@cogs.us



City of Glenwood Springs
Office of the City Clerk
101 West 8th Street
Glenwood Springs, CO 81601
Fax: 970-945-5023
Email: catherine.fletcher@cogs.us

ARTS and CULTURE BOARD APPLICATION

(for Powers and Duties, see page 4)

Powers and Duties of the Arts and Culture Board (GSMC 020.020.030[N]):

(n) Arts and Culture Board. The powers and duties of the Arts and Culture Board shall be:

- 1) To promote awareness, access, and appreciation of the fine, performing, and practical arts for City residents and visitors.
- 2) To advise the City Council in connection with all matters relating to the artistic and cultural development of the City.
- 3) To provide opportunities for cultural and art experience and education for children and adults.
- 4) To promote increased interaction among artists and opportunities for growth and exposure.
- 5) To promote knowledge and appreciation for cultural forms of artistic expression.
- 6) To make recommendations to the City Council with respect to annual budget appropriations for the arts.
- 7) To advise and consult with local arts groups as requested by such groups or by the City Council.

Arts and Culture Board Application

Thank you for your interest and time commitment in serving your community. Please complete all questions on this application.

Personal Information

1. Name *

Stefanie Davis

2. Home Address *

716 Cowdin Dr., Glenwood Springs, CO 81601

3. Mailing Address *

1338 Grand Ave. #352, Glenwood Springs, CO 81601

4. Home Phone *

(805) 705-5766

5. Work Phone *

(970) 945-7758

6. Mobile Phone *

(805) 705-5766

7. Email Address *

stefsalata@gmail.com

8. Occupation *

Office Administrator, Grand River Construction

Personal and Professional Interests

9. Membership Qualification *

- ☒ Five (5) citizens who are a resident of the City.
- ☐ Two (2) citizens of which may reside outside of the City, but within 81601 zip code area or own real property or business within the City.

10. You must qualify as one of the above to serve on the Arts and Culture Board.
Please explain below how you are qualified. *

Resident of Glenwood Springs.

11. Why are you interested in serving on the Arts and Culture Board? *

I have worked in public arts institutions professionally for more than 16 years, and in the public sector generally for more than 25 years. I sought and seek to lend my expertise to this newly-formed board and help the city of Glenwood Springs reach its cultural goals. This board can help the City define its cultural identity and make decisions about public art and education through research and suggestions brought to them via this Board.

12. What do you view as your role if selected as a member of the Arts and Culture Board? *

An enthusiastic and specialized advisor to the City Council. This board should be a feedback source in the field of arts and culture for the Council, as well as a resource for factfinding and best practices.

13. Do you have marketing, advertising, or public relations experience or skills? *

Yes! 30 years--my whole career--has been as a director of public affairs and/or marketing. Put me to work.

14. Do you have Arts/Culture experience or skills? (ex. Performing arts, visual arts, public arts, museums arts, or education? *

Yes; I have worked in substantial capacities for the Los Angeles County Museum of Art (one of the top 10 museums in the country), 8 years; Reagan Presidential Library and Museum, 5 years; and the Museum of Ventura County, 3 years. (Sorry, all California!)

15. Can you describe an experience making a decision based on public opinion? *

There are many, as my career has been almost exclusively in the public sector. However, something specifically has been when working at the Aspen Community Foundation, our donors were adamant about seeing some data before donating further. As the web person, I put forth many facts, charts and figures on our website to show our provable progress. Prior to that, in terms of a huge public uproar, in my capacity of director of marketing at Santa Barbara City College, the public was adamant that Adult Ed classes be free or very low-priced, even though that was busting our budget. We were unable to set 'market prices' for specialized instruction, raising fees somewhat, but backing down mostly. These are institutional situations; if you mean personally, I always seek to incorporate public feedback into policy or procedures, 'we' work for 'them.' Running public institutions comprises a mix of leadership and stewardship; the public's voice is always welcome and considered but not necessarily actionable. It's tough work, what you City leaders do!

16. Can you separate yourself from your personal opinions and represent the City's goals, policies, plans, and the Glenwood Springs Municipal Code in an equitable fashion? *

Yes!

17. Do you have any existing time commitments that will hamper your ability to serve? *

No; I work Monday through Friday, 9-5 consistently, and can work outside that window, or during the day occasionally on City matters.

18. What experience do you have working with people on a board, commission, or committee? *

That started early, in high school and college, and on up through the present. The structure of the nonprofits for which I have worked always has a board of directors or elected officials at the top. Also, privately at my church and as a volunteer. I love collaboration, letting everyone speak, understanding different points of view. I'm no dictator or czar. I have strong opinions, but yield to the group if I'm in the minority.

19. Please select today's date. *

1/6/2021



20. Have you served on the Arts and Culture Board before? *

☐ No

☒ Yes

Reappointment Applicants

21. Why do you think you should be reappointed? *

I enjoy being on this board very much, We are embarking on a large project, setting public art policy for the City, I'd like to see that through to a successful conclusion. I want to help the City Council, who cannot be experts in everything. And I think I have an even-hand and conciliatory spirit that serves this board well.

22. How many terms have you served on the Arts and Culture Board? *

One.

Powers and Duties of the Arts and Culture Board

(as defined in Title 020 of the Glenwood Springs Municipal Code)

- (n) Arts and Culture Board. The powers and duties of the Arts and Culture Board shall be:
- 1) To promote awareness, access, and appreciation of the fine, performing, and practical arts for City residents and visitors.
 - 2) To advise the City Council in connection with all matters relating to the artistic and cultural development of the City.
 - 3) To provide opportunities for cultural and art experience and education for children and adults.
 - 4) To promote increased interaction among artists and opportunities for growth and exposure.
 - 5) To promote knowledge and appreciation for cultural forms of artistic expression.
 - 6) To make recommendations to the City Council with respect to annual budget appropriations for the arts.
 - 7) To advise and consult with local arts groups as requested by such groups or by the City Council.

Appointment, Removal, Term and Vacancies of Boards and Commissions

Glenwood Springs, CO Municipal Code 020.020.040

(a) Appointment and term of members. Except as otherwise provided, all appointments to the boards and commissions shall be by the City Council for terms of three (3) years each, and each member shall serve until his/her successor is appointed and takes office; provided, however, that the initial terms of office may be shortened by the City Council so as to provide overlapping terms of office. Appointments shall expire the day before the first regular meeting of the City Council in each month according to the following schedule:

- (1) February:

Planning and Zoning Commission;
Finance Advisory Board;
Tourism Promotion Board;
Building Board of Appeals.

(2) March:
Transportation Commission;
Arts and Culture Board;
Parks and Recreation Commission;
Airport Board;
River Commission.

(3) April:
Local Liquor Licensing Authority;
Victim's Witnesses Assistance and Law Enforcement Board;
Historic Preservation Commission;
Glenwood Springs Housing Commission.

(b) Alternate members. The City Council at its discretion may appoint up to three (3) persons as alternate members for each board or commission. If a regular member of a board or commission is to be absent from a meeting, the presiding officer for the meeting may select an alternate member to fill such absence and to attend and serve at the meeting. The alternate member may exercise all powers at the meeting which the absent regular member could exercise, and the alternate's powers and privileges shall terminate at the end of the meeting attended. The presiding officer may at his/her discretion select the same alternate to serve at successive meetings in the absence of any member.

(c) Limit to term of members. Unless it is deemed vital by the City Council that an appointed member of a board or commission be retained in office, each member shall be replaced after having served for six (6) years on a board or commission; however, nothing in this subsection shall be construed to prevent the appointment of a member to a new term where, at the expiration of his/her current term, he/she will have served for less than six (6) years.

(d) Removal of members. All appointed members of a board or commission shall be subject to removal, at any time, by the City Council. In the event an appointed member of a board or commission ceases to qualify for membership, his or her appointment is immediately terminated.

(e) Vacancies. The City Council shall fill all vacancies on boards and commissions by appointment for the unexpired term.

(Code 1971 §§ 2-63, 2-64, 2-67; 6-95 § 1; 10-07 § 2; Ord. No. 9-2018 , § 2, 4-20-2018)



City Council
STAFF REPORT
City of Glenwood Springs
February 4, 2021

Agenda Item: Positive Youth Development Proposal

Action Requested: Approve the Roaring Fork School Districts request for \$150,000 in Tobacco Tax Funding for Youth Mental Health Services in partnership with Youth Zone and identify a member of the City of Glenwood Springs Community to participate in an advisory committee.

Department: City Administration

Presented By: Debra Figueroa, City Manager

Background Info: Rob Stein and Anna Cole will present their proposal. It is attached to this agenda item.

Issues: In 2020 the Tobacco Tax Fund received approximately \$900,000 in revenue. Of that amount \$750,000 was appropriated to the General Fund to offset revenue lost as a result of the COVID crisis.

The 2021 Budget reserved \$150,000 from Tobacco Tax funding for a community need. In light of the COVID-19 pandemic and its overwhelming impact on youth mental health, staff supports this request.

Staff Recommendation: Approve the proposal and select a member of City Council or staff to participate in the advisory committee.



**Positive Youth Development in the Roaring Fork Valley:
An integrated school- and community-based mental wellness plan for youth**

Goal:

Ensure every child in our community has access to evidence-based prevention, intervention and treatment/response to strengthen positive youth development and mental well being.

Opportunity for Glenwood Springs:

Invest in a plan that stabilizes funding, strengthens community engagement, bolsters accountability and ensures aligned, integrated, evidence-based best practices for youth mental and behavioral health services.

Implementation:

- Schools provide comprehensive health education, foster safe, inclusive environments; educate students and parents on risk and prevention measures; identify needs for targeted intervention and treatment; provide school-based counseling services and psychological/social work services for students with special needs. **Current status: in progress.**
- Community partners and schools collaborate to provide interventions such as individual and group counseling. Model requires staffing by RFSD (school counseling and mental health teams) and community partners (Mind Springs/Hope Center). **Current status: in progress, current gap at GSES, SES, RVS. Funding expiring for GSHS and GMS 6/2023.**
- Community partners provide targeted or intensive treatment and response, such as therapy and counseling in schools and community-based clinics. Model requires staffing by community partners (Hope Center). **Current status: in progress, current gap at GSES, SES, RVS. Funding expiring for GSHS and GMS 6/2023.**
- All partners collect, manage, and monitor data and work toward common outcomes for positive youth development. **Current status: in development.**
- Strategic leadership, fiscal accountability, and quality improvement provided by a community governing council. **Current status: in development.**
- Fiscal management through the Family Resource Center to ensure equitable allocation of services and resources across all communities. **Current status: in progress.**

Impact:

Mental and behavioral wellness in youth leads to better decision making, stronger academic outcomes, and reduced substance use and abuse. Investment in comprehensive, integrated mental and behavioral wellness has the potential to lower youth substance use rates, to interrupt pathways to substance use and to strengthen healthy skill development.

Estimated Glenwood Springs-focused project budget:

- Approximately \$660,000/year to support community mental/behavioral health provider in each Glenwood Springs school and cover costs of ongoing training, support, and administrative/oversight costs.
- Current funding, \$240,000/year from School Health Professionals Grant for Mind Springs providers at GSHS, GSMS and RVS. Funding expiring 6/23 and 6/22 (RVS) school year. ~\$20,000/year from Family Resource Center and RFSD for administrative, bookkeeping, oversight expenses.

Current request:

- \$120,000/year to support implementation of this project - specifically, to staff a Mind Springs mental/behavioral health therapist at Glenwood Springs Elementary School and Sopris Elementary School.
- \$30,000/year to Youth Zone to increase their services and resources in our GWS schools
- Identify a member of the Town of Glenwood Springs community to participate in our advisory committee.

Additional information:

- Please contact RFSD superintendent, Rob Stein or RFSD Family Services Director, Anna Cole.
- rstein@rfschools.com
- acole@rfschools.com



Glenwood Springs mental/behavioral health programs, staffing and funding status

1.11.21

District-funded programs/initiatives/staffing:

- **Family liaison at each school.** Our bilingual/bicultural family liaisons partner with families, schools and communities to help families identify and work towards goals of self-reliance and sustainability through case management, resource and referral services.
- **School counselor at each school.** School counselors support students through academic scheduling and career counseling and mental/behavioral health services.
- **Nursing/health services.** Health aid at every school, district nurses to coordinate and implement in-school medical services (medication, symptom screening).
- **Special education program school psychologist and social workers.** Students and families involved in our special education program can access services from our district school psychologist and social workers.
- **Crisis intervention services.** Emergency mental/behavioral health services funded by RFSD, provided by Hope Center staff.
- **Social-emotional wellness curriculum.** Crew at every school; curriculum that focuses on belonging and trusting relationships.
- **Health education curriculum.** 2020 Comprehensive Health Education taught by health, science, Crew and classroom teachers.
- **Trauma informed practices.** Evidence-based theories, frameworks and practices that guide our instructional, disciplinary and school culture efforts.

Externally-funded mental/behavioral health programs/staffing:

GSES/SES	RVS	GSMS	GSMS
	Prevention Specialist, staffed by school, funded by CDE/School Health Professional Grant (expires 6/22)*	Prevention Specialist, staffed by school, funded by CDE/School Health Professional Grant (expires 6/23)*	Prevention Specialist, staffed by school, funded by CDE/School Health Professional Grant (expires 6/23)*
		Mental Health Provider, staffed by Mind Springs CDE/School Health Professional Grant (expires 6/23)*	Mental Health Provider, staffed by Hope Center CDE/School Health Professional Grant (expires 6/23)*
Family-focused District Social Worker, staffed by Mountain Family Health Center/School-based Health Center, funded by MFHC and direct patient billing			

**Family Resource Center at the Roaring Fork Schools coordinates grants, contracts and partnerships. FRC acts as fiscal sponsor, passing through funding from Eagle County and CDE to support internal staff salaries and external contracts (Hope Center).*



Positive Youth Development in the Roaring Fork Valley

An integrated school- and community-based mental wellness plan for youth

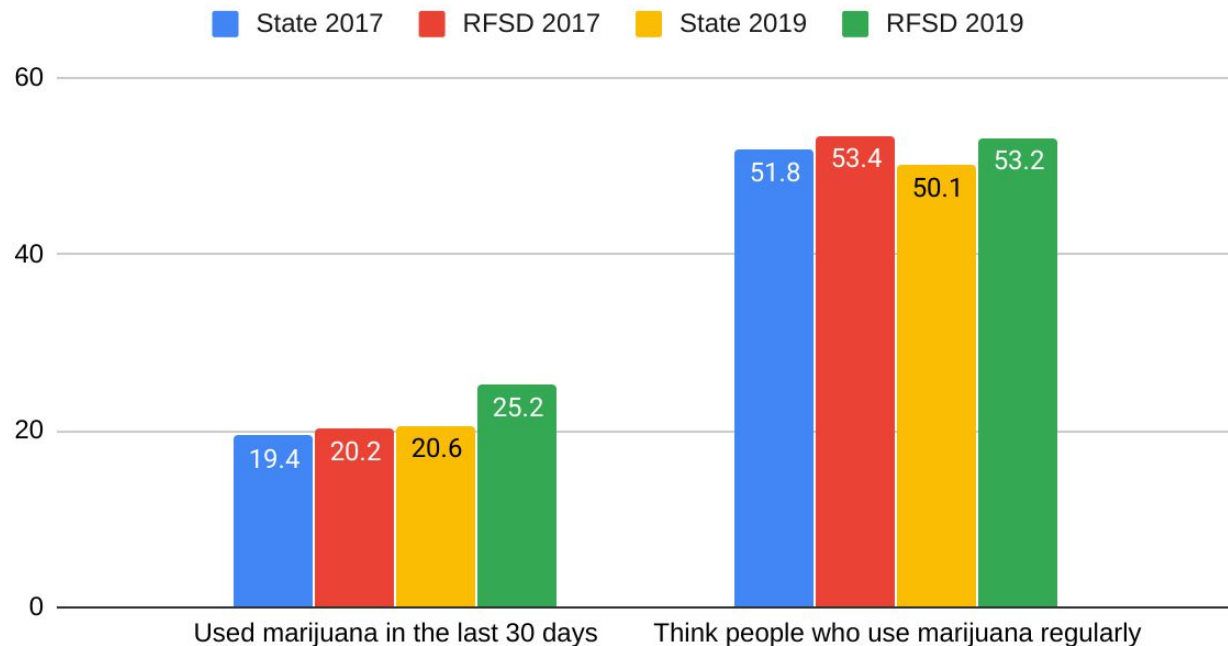


Vision

Every child in our communities has access to evidence-based prevention, intervention and treatment/response to strengthen positive youth development and mental well-being.

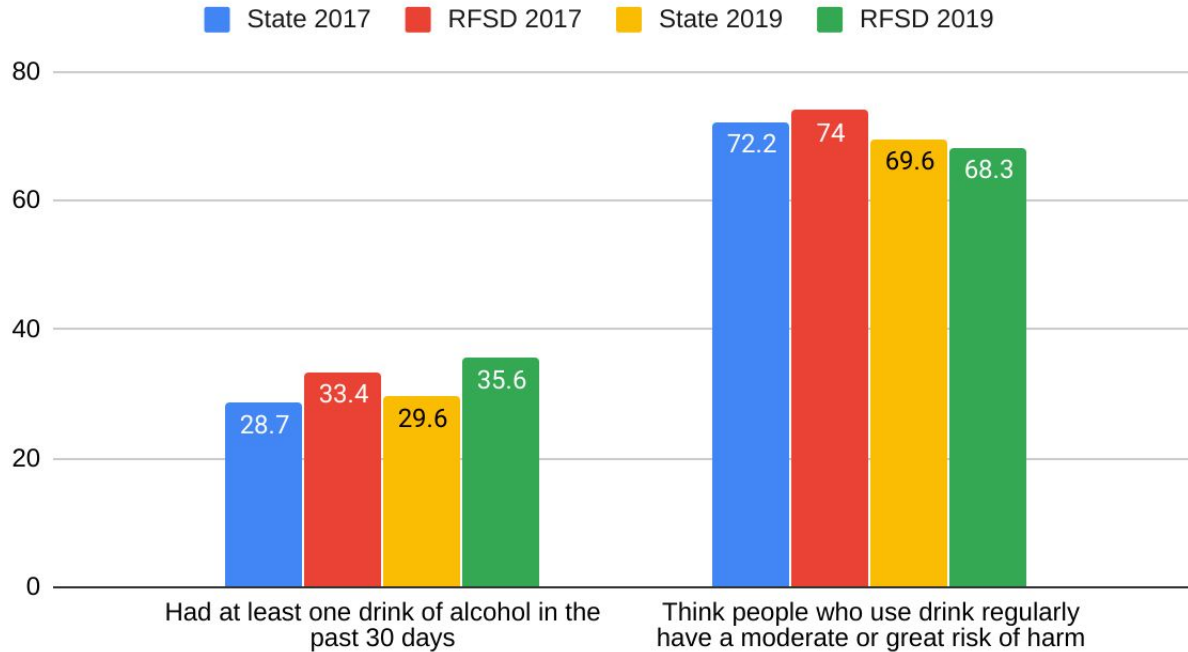
Marijuana use increased

Marijuana Use



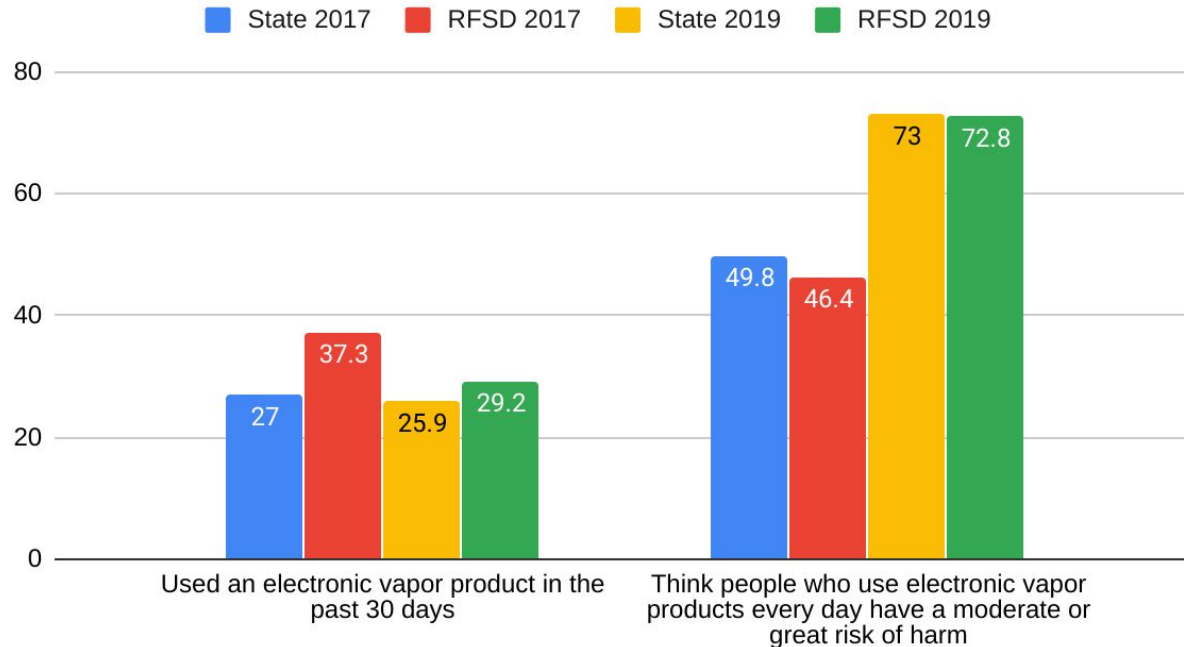
Alcohol use slightly increased while perception of risk decreased.

Alcohol Use



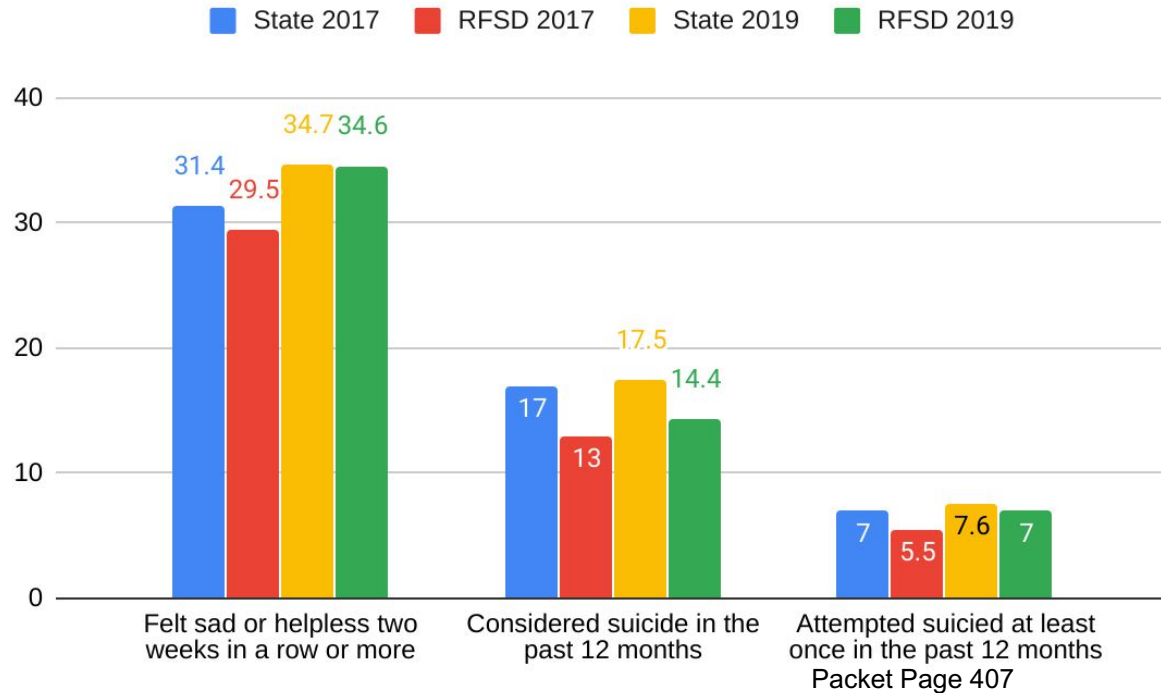
Vaping decreased and perception of risk increased dramatically.

Vaping



Signs of depression and suicidal thoughts increased

Depression and Suicide



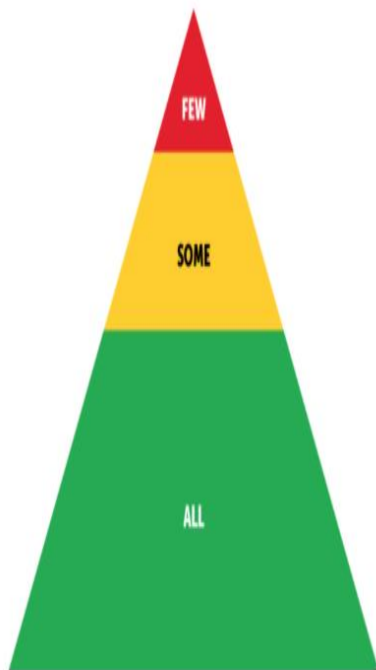


Positive Youth Development Project Proposal

Every child in our communities has access to evidence-based prevention, intervention and treatment/response to strengthen positive youth development and mental well being.

- **Schools** are hubs of prevention education, identification;
- **Schools+communities** collaborate on intervention, data management, monitoring;
- **Community partners** provide treatment and therapeutic services;
- **Community governing council** provides strategic leadership, fiscal accountability, and quality improvement;
- **RFSD Family Resource Center** provides fiscal management and coordination.

Current program



District Funded Services (Ongoing)	Current Partner Funded
• 1 School Psychologist • 2 Special Education Social Workers • Crisis intervention contract with Hope Center	• Community mental health providers in high schools and some middle schools
• District Mental Health Team • Crisis plan and professional development • Counselor-led student support groups	• Community mental health providers in high schools and some middle schools • Community mental health provider-led student support groups
• Counselors in every school • Family Liaison in every school • Social-emotional wellness curriculum • Crew program • Health education curriculum • Nursing/health services • Trauma informed practices	• Parent education partnerships

Current external funding

Sources	Uses	Expires
Eagle County Marijuana Tax	2 Basalt Mental Health Providers	HS, June 2021; MS, June 2022
Town of Basalt	1 Mental Health Provider at BES	December, 2023
Town of Carbondale Marijuana Tax	50% RFHS Mental Health Provider	Request annually
Hope Center Fundraising	50% RFHS Mental Health Provider	Requests ongoing
Glenwood Springs Marijuana Tax	Itinerant Glenwood Springs Mental Health Services	Expired
Colorado Department of Education School Professional Grants	1 Mental Health Provider in all middle and high schools	3 positions expire June 2022 7 positions expire June 2023

Proposed program

District Funded Services (Ongoing)	Current Partner Funded	Desired Partner Funded
• 1 School Psychologist • 2 Special Education Social Workers • Crisis intervention contract with Hope Center	• Community mental health providers in high schools and some middle schools	• Community mental health providers in all RFSD and charter schools: elementary, middle and high
• District Mental Health Team • Crisis plan and professional development • Counselor-led student support groups	• Community mental health providers in high schools and some middle schools • Community mental health provider-led student support groups	• Community mental health providers in all RFSD and charter schools: elementary, middle and high • Community mental health provider-led student support groups
• Counselors in every school • Family Liaison in every school • Social-emotional wellness curriculum • Crew program • Health education curriculum • Nursing/health services • Trauma informed practices	• Parent education partnerships	• Parent education partnerships • Enhanced community accountability through governing board



City Council
STAFF REPORT
City of Glenwood Springs
February 4, 2021

Agenda Item: City Council Meeting Interpretation

Action Requested: Direct staff on type of interpretation services City Council would like to include for City Council meetings, special meetings, and work sessions.

Department: City Administration

Presented By: Debra Figueroa, City Manager

Background Info: City Council requested that staff bring back options for City Council to consider to ensure language equity and access at City Council meetings. This can generally be done either through interpretation after the meeting or simultaneous interpretation during the meeting. Simultaneous interpretation is more expensive per hour since it requires multiple individuals translating from English into Spanish and vice versa. Staff has held several listening sessions that use simultaneous interpretation. The latest example would be the listening session with Chief Deras on December 16, 2020.

Staff reached out and received quotes from several local translation services that are summarized here:

Translation Company	Cost Per Hour for Translation	Cost for Simultaneous Translation
Aide Muñoz	\$30	NA
Astrid Recinos	\$35	NA
Trinity Stebleton	\$40	NA
Jen Quevedo	\$50	NA
Natalia Lupi-Peate	NA	\$130
Catalina Johnson-Aquino / Elizabeth Velasco	NA	\$65

These quotes are by the hour and range from \$30 per hour for interpretation to \$130 an hour for simultaneous interpretation. Staff will negotiate for a final price based upon the hours and types of meetings that City Council would like to include.

Using both the lowest and highest quote, the range of expenses would be as follows:

City Council Meetings from 6:00 PM to 10 PM:

Interpretation at \$30 per hour would be \$2,880 per year

Simultaneous Interpretation at \$130 an hour would be \$12,480 per year

If work sessions are added to this total it would generally be from 3:15 PM to 5:45 PM:

Interpretation at \$30 per hour would be \$1,800 per year

Simultaneous Interpretation at \$130 an hour would be \$7,800 per year

For an estimation on Special meetings, staff will assume that City Council will have one special meeting a month that will last up to four hours. Using the same method to estimate expenses:

Interpretations at \$30 an hour would be \$1,440

Simultaneous Interpretation at \$130 an hour would be \$6,240

Issues:

The attached quotes would change somewhat based upon the services requested by City Council and staff will reach back out to each company based upon City Council's decision. At this point, staff is using them to highlight the different services and estimated prices points.

These costs are not included in the 2021 budget. However, funding for this service can be pulled from General Fund Reserves and then budgeted in 2022 pending the decision of City Council.

Additional considerations for the future would include whether the city would want to ensure headsets for simultaneous interpretation for in-person meetings.

Staff Recommendation:

Staff recommends that City Council pursue simultaneous interpretation for 2021.



City Council
STAFF REPORT
City of Glenwood Springs
February 4, 2021

Agenda Item: Inclusionary Housing Update

Action Requested: NA

Department: Attorney

Presented By: Glenwood Springs Legal, Legal

Background Info: The Planning and Zoning Commission reviewed the proposed Inclusionary Housing Ordinance at their regularly scheduled January 26, 2021 meeting. The discussion included recommendations for revisions to process, implementation, and financial qualification. Staff is working to incorporate these items into a revised ordinance.

Code Amendments require public hearings before the Planning and Zoning Commission and City Council. Staff expects to bring the revised Ordinance for a public hearing before Council at the February 18, 2021 meeting for initial review and approval.

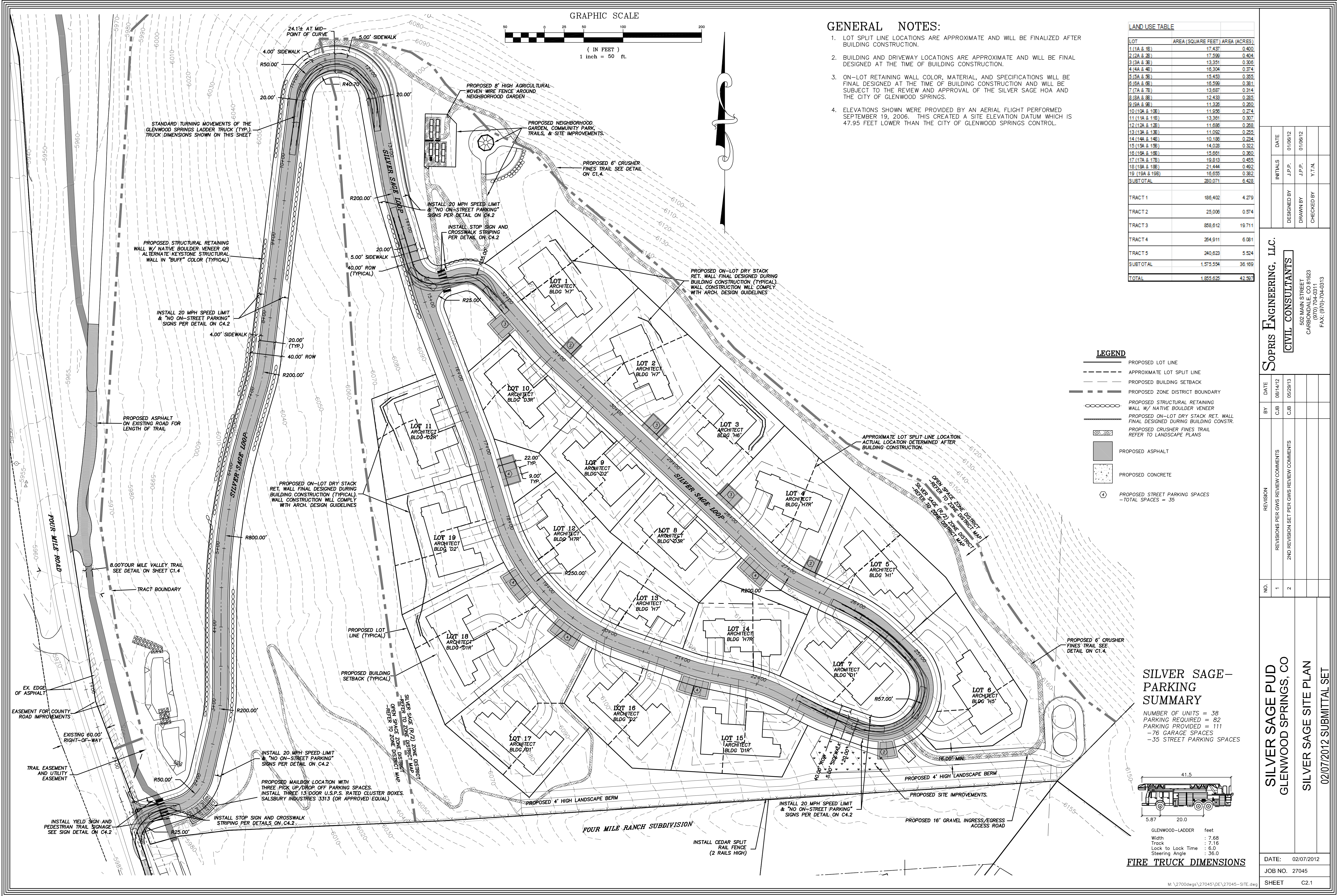
Issues: NA

Staff Recommendation: NA



City Council
STAFF REPORT
City of Glenwood Springs
February 4, 2021

Agenda Item:	Conservation Easement at Silver Sage Preserve
Action Requested:	Consideration of a 45 acre conservation easement gift from Glenwood Land Company known as the Silver Sage Preserve generally located South-West of 101 Airport Road at parcels 218527235007 and 218527400049.
Department:	Parks & Recreation
Presented By:	Brian Smith, Recreation Director
Background Info:	Glenwood Land Company, LLC (GLC) has worked with city staff in investigating granting extensive public access on a 32 acre parcel known as Silver Sage Preserve that is fully entitled and vested for the development of 38 duplex units. The 32 acre parcel shares nearly a half mile boundary with land that was previously dedicated to the City of Glenwood Springs for water storage facilities and trail use. In addition to the 32 acre site, GLC holds an adjacent 18 acre site currently located in Garfield County. Both sites have long established and heavily used "social trails" with great views. As part of the conservation of these parcels, the plan proposes to facilitate the extension of the existing trail down to Airport Road to create a 1.76 mile hiking loop trail. City staff met with GLC and RFOV on site to evaluate the conservation easement, facilitating trail improvements, and logistics for the proposed extension down to Airport Road. The City's Parks & Recreation Commission has reviewed the proposal for the trail easement on these parcels and how the City of Glenwood Springs might participate in preserving this land for public use and indicated it would be supportive of the City accepting a trail easement and a gift of the Conservation Easement encumbered Silver Sage property. Parks, Engineering and Community Development are working to integrate the proposal and trail connections into the South Bridge - Midland corridor as well as a City owned adjacent property for affordable housing development.
Issues:	While annexation of the property located within unincorporated Garfield County is not a requirement for the Conservation Easement Agreement, City Staff and in conferring with the City Attorney recommend that the County parcel should be annexed.
Staff Recommendation:	Staff is lookin for Council direction and comment on the proposed Conservation Easement Agreement and annexation of the parcel. With Council's direction the documented agreement will come before Council at the next regular meeting for consideration and approval.



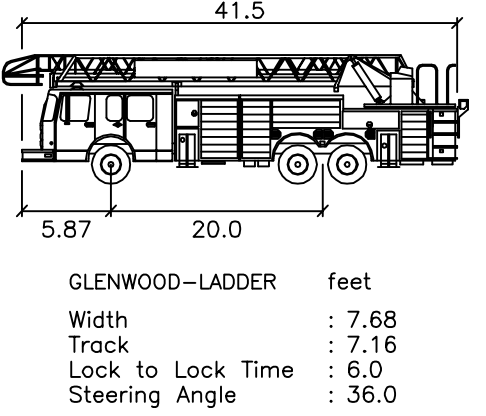
- GENERAL NOTES:**
1. LOT SPLIT LINE LOCATIONS ARE APPROXIMATE AND WILL BE FINALIZED AFTER BUILDING CONSTRUCTION.
 2. BUILDING AND DRIVEWAY LOCATIONS ARE APPROXIMATE AND WILL BE FINAL DESIGNED AT THE TIME OF BUILDING CONSTRUCTION.
 3. ON-LOT RETAINING WALL COLOR, MATERIAL, AND SPECIFICATIONS WILL BE FINAL DESIGNED AT THE TIME OF BUILDING CONSTRUCTION AND WILL BE SUBJECT TO THE REVIEW AND APPROVAL OF THE SILVER SAGE HOA AND THE CITY OF GLENWOOD SPRINGS.
 4. ELEVATIONS SHOWN WERE PROVIDED BY AN AERIAL FLIGHT PERFORMED SEPTEMBER 19, 2006. THIS CREATED A SITE ELEVATION DATUM WHICH IS 47.95 FEET LOWER THAN THE CITY OF GLENWOOD SPRINGS CONTROL.

LAND USE TABLE		
LOT	AREA (SQUARE FEET)	AREA (ACRES)
1 (1A & 1B)	17,437	0.400
2 (2A & 2B)	17,590	0.404
3 (3A & 3B)	13,351	0.306
4 (4A & 4B)	16,304	0.374
5 (5A & 5B)	15,453	0.355
6 (6A & 6B)	16,599	0.381
7 (7A & 7B)	13,687	0.314
8 (8A & 8B)	12,433	0.285
9 (9A & 9B)	11,326	0.260
10 (10A & 10B)	11,956	0.274
11 (11A & 11B)	13,361	0.307
12 (12A & 12B)	11,686	0.268
13 (13A & 13B)	11,092	0.255
14 (14A & 14B)	10,186	0.234
15 (15A & 15B)	14,038	0.322
16 (16A & 16B)	15,661	0.360
17 (17A & 17B)	19,813	0.455
18 (18A & 18B)	21,444	0.492
19 (19A & 19B)	16,655	0.382
SUBTOTAL	280,071	6.428
TRACT 1	186,402	4.279
TRACT 2	25,006	0.574
TRACT 3	858,612	19.711
TRACT 4	264,911	6.081
TRACT 5	240,623	5.524
SUBTOTAL	1,575,554	36.169
TOTAL	1,855,625	42.597

- LEGEND**
- PROPOSED LOT LINE
 - APPROXIMATE LOT SPLIT LINE
 - PROPOSED BUILDING SETBACK
 - PROPOSED ZONE DISTRICT BOUNDARY
 - PROPOSED STRUCTURAL RETAINING WALL W/ NATIVE BOULDER VENEER
 - PROPOSED ON-LOT DRY STACK RET. WALL FINAL DESIGNED DURING BUILDING CONSTRUCTION
 - PROPOSED CRUSHER FINES TRAIL REFER TO LANDSCAPE PLANS
 - PROPOSED ASPHALT
 - PROPOSED CONCRETE
 - PROPOSED STREET PARKING SPACES - TOTAL SPACES = 35

SILVER SAGE- PARKING SUMMARY

NUMBER OF UNITS = 38
PARKING REQUIRED = 82
PARKING PROVIDED = 111
- 76 GARAGE SPACES
- 35 STREET PARKING SPACES



FIRE TRUCK DIMENSIONS

SILVER SAGE PUD
GLENWOOD SPRINGS, CO

SILVER SAGE SITE PLAN

02/07/2012 SUBMITTAL SET

DATE: 02/07/2012

JOB NO. 27045

SHEET C2.1

NO. 1

2

REVISIONS PER GWS REVIEW COMMENTS

2ND REVISION SET PER GWS REVIEW COMMENTS

BY CUB

CUB

DATE 08/14/12

05/28/13

INITIALS

J.P.P.

J.P.P.

Y.T.N.

DESIGNED BY

DRAWN BY

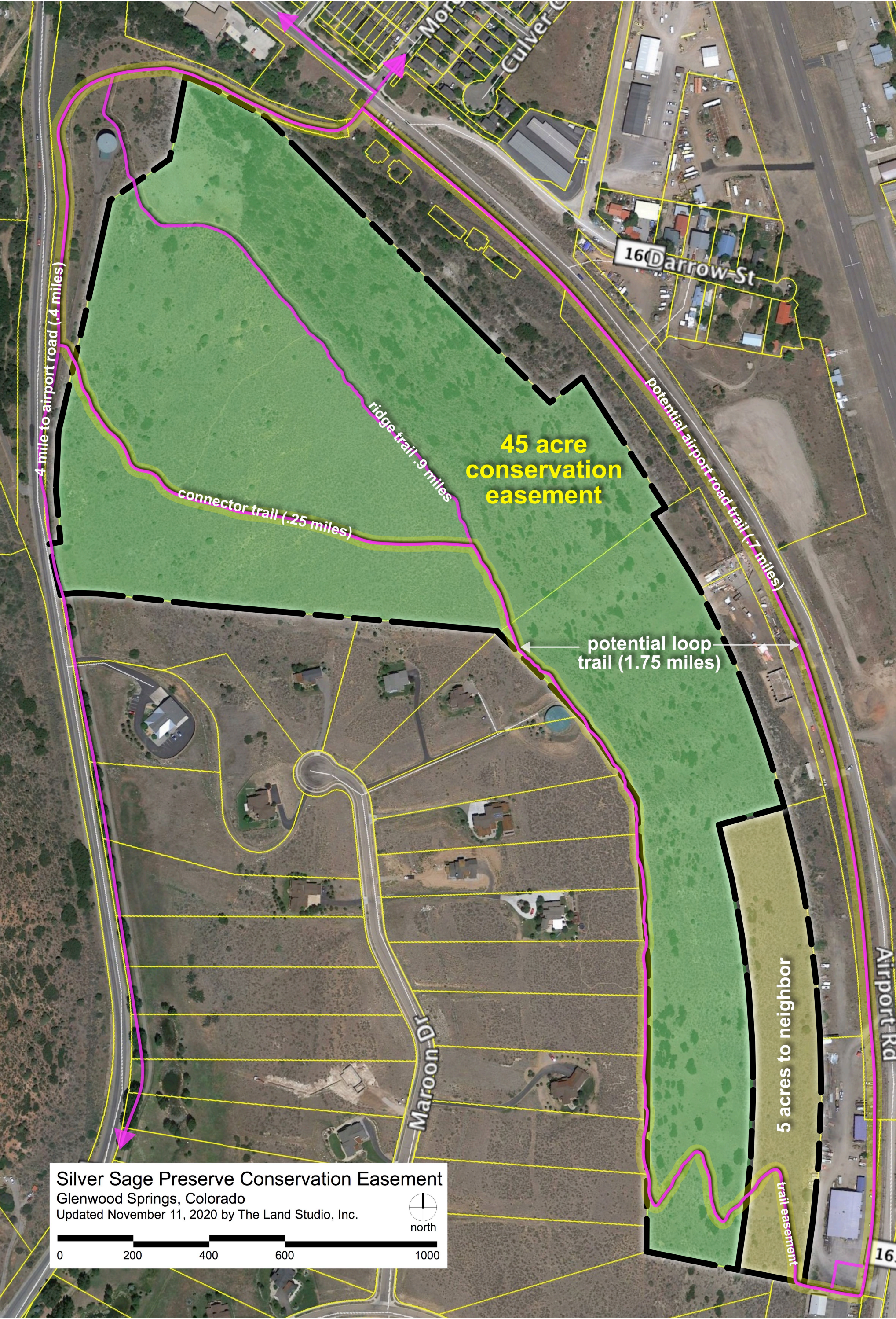
CHECKED BY

SOPRIS ENGINEERING, LLC.

CIVIL CONSULTANTS

502 MAIN STREET
CARBONDALE, CO 81623
FAX: (970) 704-0311

Packet Page 416





City Council
STAFF REPORT
City of Glenwood Springs
February 4, 2021

Agenda Item: Blake Street Configuration

Action Requested: Review and approval of an option for Blake.

Department: Engineering

Presented By: Terri Partch, City Engineer

Background Info: In 2010, the City Council and the Colorado State Transportation Commission approved the recommendations of a study that evaluated reducing congestion on SH 82. One of the many recommendations was to open Blake Gate to allow local traffic to use the City street network instead of getting on SH 82.

Many residents on Blake fear that opening Blake Gate will lead to additional traffic on their street. It is true that particularly in the afternoons, traffic on SH 82 will try to get off of the road and find a faster way to I-70.

With the development of the new multi-family housing at Blake and Palmer, the traffic study done for the project modeled the gate as open, to split the traffic impact of the new development between 27th and the Blake intersection on SH 82. At the time, the Council directed that the gate be opened for construction purposes, and then permanently opened with the occupancy of the development.

The development was sold and re-entitled. Council in October voted to delay the opening of the Gate until the issuance of a certificate of occupancy or temporary certificate of occupancy for any building part of the Triumph-Bell Rippy development.

Staff met with the new developer, groups of residents and held another public meeting to get input on the gate opening, and options for controlling speed and cut-through on Blake.

The neighborhood is still concerned about the possibility of cut-through traffic and pedestrian safety, and would prefer a one-way southbound orientation on Blake between 26th and 27th to prevent traffic coming off of SH 82 and avoid congestion. This is also the recommendation of the Transportation Commission.

Issues: Changing the road configuration to one way changes existing traffic patterns, increases traffic on other roads that weren't previously affected and creates "dead end" streets where a turn around would be needed. One way roads also reduce the City's circulation and emergency response.

The Community Development Department has received construction drawings for approval for the Bell Rippy project and will be negotiating the development agreement as part of the final land use approval, before the building permit submittal, in the next month to six weeks.

Staff Recommendation: Staff recommends keeping all roads with a two way configuration, but adding traffic calming elements outlined in the presentation or advisory bike lanes to slow cut through and neighborhood traffic.

Blake Avenue Improvements

City Council Meeting

February 4, 2021



Agenda

- **Alternative Overview**
 - Alternate A: Replace in kind
 - Alternate B: One-Way
 - Alternate C: Advisory Bike Lane
 - Alternate D: Two-Way with Raised Path
- **Questions**



February 4, 2021

Blake Avenue Alternative A: Replace in kind only



February 4, 2021

26th Street Alternative A: Replace in kind only



February 4, 2021

Evaluation of Alternative A: Replace Existing Condition

Benefits:

- Lowest cost option
 - 1.0 Cost Magnitude
 - Assumed with no traffic calming, roadway improvements (curb, gutter, striping, etc)
 - Facilitated within existing Right of Way
 - Minimal materials
- Maintains city circulation
- Low impact to neighbors

Drawbacks:

- No curb and gutter
- Does not provide pedestrian facilities (sidewalk)
- Does not provide bicycle facilities (bike lanes, sharrows may be accommodated)
- No traffic calming
- No improvements to Palmer Avenue
- Could lead to congestion during peak hours

February 4, 2021



Blake Avenue Alternative B: One-Way

Neighborhood traffic heading NB on SH 82

- Forced to 24th Street or 23rd Street

One way SB from 23rd Street to 26th Street

- NB traffic is forced to Palmer Avenue at 26th Street

One way SB from 26th Street to 27th Street

- Blake Avenue traffic NB is forced to the SH 82 Intersection
 - Potentially lower LOS at 27th, 29th, and Blake Avenue intersections with SH82
 - CDOT will not allow more time at the signals, may require improvements
 - Road length is less than 190 feet at 27th Street
 - Current AM/PM LOS D @ 27th Street/SH 82 Intersection
 - Approximately 26-31 seconds is allotted to clear the west-bound leg
 - Significant cost Acquisition of Right of Way (Carpet One)
- More traffic at 27th Street could limit RFTA exiting traffic
- Could increase *standing traffic* in the Blake Avenue neighborhood during high traffic times or delays
- People may ignore one way

SB through the old Blake Gate Location

- Narrow road section (10') EMS does not currently access through this location. If they needed to, they could go the wrong direction
 - Potentially lower LOS at 29th Street and Blake Avenue intersections with SH82.
 - Increase turn arounds at Wal-Mart, potential unsafe movements if people elect to travel the wrong direction through this location

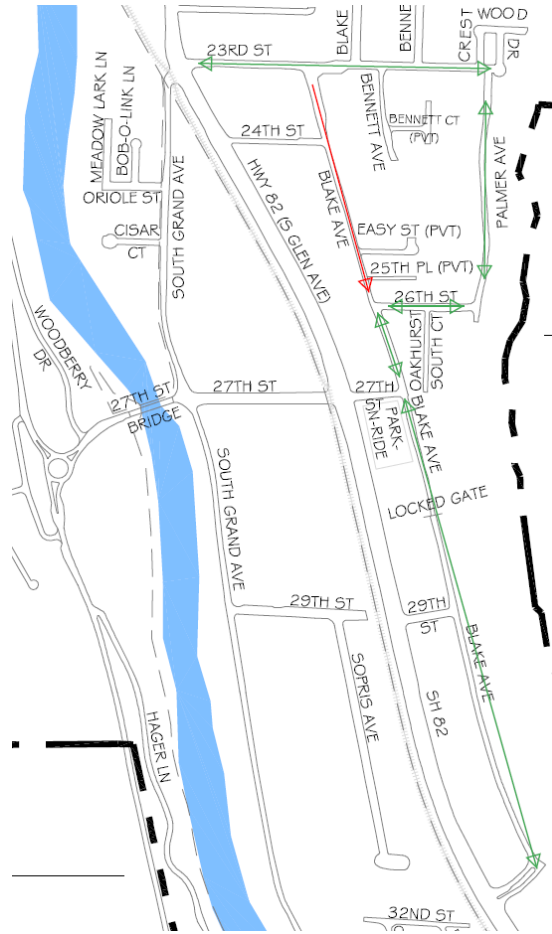
February 4, 2021



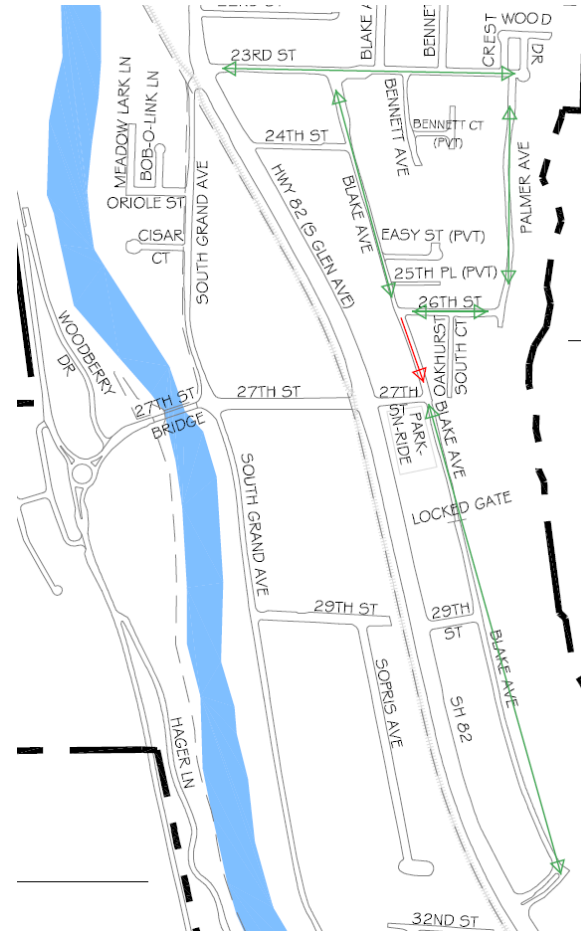
Blake Avenue Alternative B: One-Way

Similar to Alternative A/1

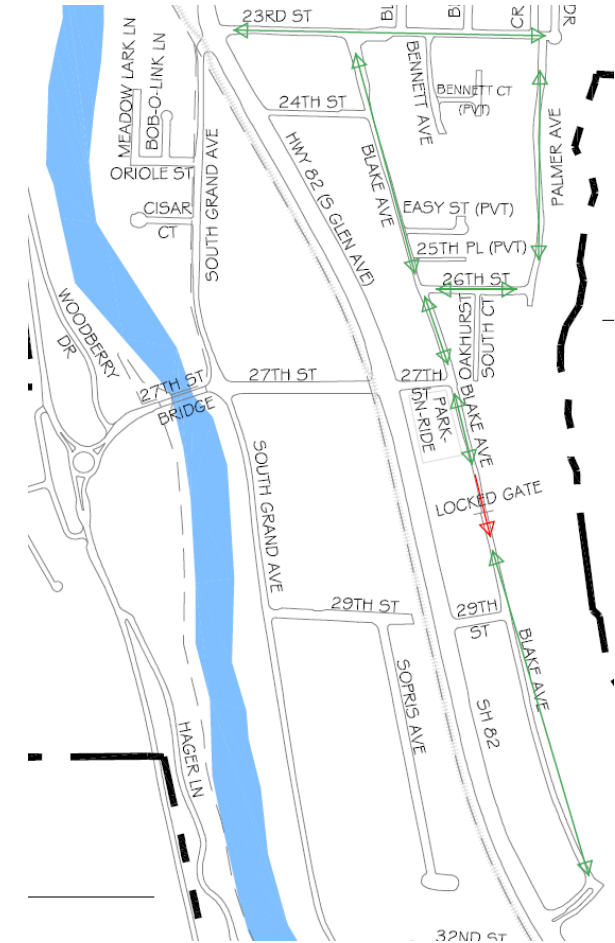
- Minimum width of 20' for emergency response, but could be less at current gate location.



SB from 23rd Street to 26th Street



SB from 26th Street to 27th Street



SB through the old Blake Gate Location

February 4, 2021

Evaluation of Alternative B: Blake Avenue One-Way

Benefits:

- **Southbound movement**
 - Lowers volumes
 - Discourages SH 82 traffic from taking Blake Avenue
- **Lower cost option**
 - Cost Magnitude varies (1.2-1.7)
 - Dependent on traffic calming options used, the location of the one-way and the length of the one-way
 - Facilitated within existing Right of Way
 - Minimal materials
- **Could facilitate a separate pedestrian facility (with added costs)**
- **Easily converted to another design if not successful**
- **Low impact to neighbors**

Drawbacks:

- **No curb and gutter**
 - Does not consider drainage (currently)
- **Bicycle traffic would oppose vehicular traffic**
- **Physical barriers and signage necessary**
 - Some neighbors and commuters will choose to go the wrong direction rather than drive out of direction/take the long way
- **Lower city circulation**
 - Less options
- **Increase Palmer Avenue traffic during periods of congestion**
- **Increased backups in the neighborhood**
- **Would limit RFTA Access**
- **Lowers LOS across multiple SH82 accesses**
 - 29th is slated for a $\frac{3}{4}$ movement (no SB 82 Access)

February 4, 2021



Public Feedback

My concerns about a one-way Blake Avenue configuration (select all that apply)

	TOTAL	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7	Person 8	Person 9	Person 10	Person 11	Person 12
I do not have concerns	2	1								1			
One way would make travel difficult for the neighborhood	5		1			1	1				1		1
Engineering has concerns about circulation needs for the city as a whole	3		1				1				1		
One way south bound would force afternoon back up traffic onto Palmer	6		1	1		1			1		1		1
This could delay traffic more in the event of an evacuation	2		1			1							
Other	4		1	1			1	1					

Other comments:

- Blake Ave one-way southbound from 24th to 26th Streets will be the most definitive solution for keeping drive-off commuter traffic from utilizing Blake Ave ALL the way through town from McDonalds to 8th or 9th Street. It would also maintain this NARROW section of Blake as a neighborhood street rather than a highway 82 bypass. Palmer Ave gets an assortment of traffic discouraging and calming measures.
- This gate/traffic issue has been uncomfortable for us as the one-way issue seemed to put some of us at odds, when for years we have been of one mind about most shared issues
- It will not be in anyway fair to add the traffic from the residents that live on Blake Avenue to have to travel around the block, up 26th and down Palmer just to get to the grocery store or town core.
- I think one way between 26th and 27th on Blake is a great idea. We are talking about cut through traffic and it is not tourists, it is locals that do it every day. This stops it. I do not think this puts much more pressure on the 27th and Blake intersection. You have 29th and the McDonalds to get on 82 north bound
- I would most like to see Blake Street one way from 26th to 27th if not permanently than at least until ALL discussed improvements are completed. Planters could be put on both side of Blake at the top of 27th to discourage drivers from going the wrong way on Blake.
- Feedback would say the idea of one way south of Blake between 26th - 27th should receive consideration. This includes input from residents of OakHurst, as it seems it will affect their access the most.

February 4, 2021





Alternative C: Advisory Bike Lanes

FHWA Guidance:

- Low-volume roads
 - 6,000 ADT or less
 - 3,000 ADT or less preferred
- Low-speed roads
 - 35 mph or less
 - 25 mph or less preferred
- Two-lane roads
- No centerline striping
- Roads with adequate sight distance
- Locations with constrained connections between biking and walking facilities
- Avoidance of bus or truck routes preferred
- Roads that are too narrow for typical biking facilities

Current Condition:

- Blake Avenue and Palmer Avenue have a combined ADT of less than 1500.
 - Counts were taken during significant congestion on SH 82, week of South Canyon Fire.
- Busses and trucks remain on SH 82

Blake Avenue:

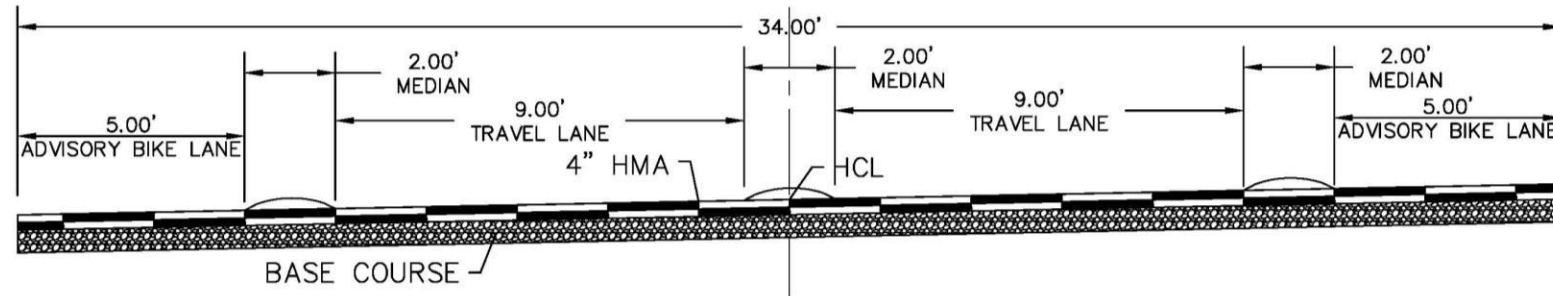
- 15 MPH (23rd – 27th Street)
- Not striped
- Adequate sight distances
- Identified bike route in the Long-Range Transportation Plan
- Narrow Right of Way
 - Down to 26.5 feet, averages 30-35 feet

Palmer Avenue:

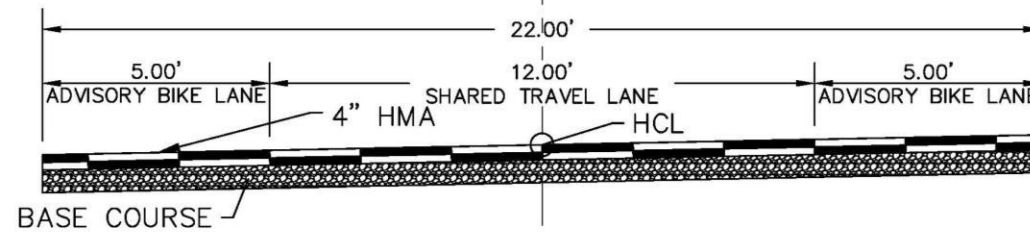
- 25 MPH, not signed
- Not striped
- Adequate sight distances

February 4, 2021

Blake Avenue Alternative C: Advisory Bike Lane



TWO WAY AT INTERSECTION
SCALE: 1" = 5'



TWO WAY BLAKE AVENUE ADVISORY BIKE LANE
SCALE: 1" = 5'

NOTE:

1. BLAKE AVENUE WAS SURVEYED FROM 23RD STREET TO 26TH STREET. REMAINING RIGHT OF WAY LINES AND PROPERTY LINES ARE APPROXIMATE AND NOT SURVEY ACCURATE. THEY ARE FOR INFORMATION PURPOSES ONLY.

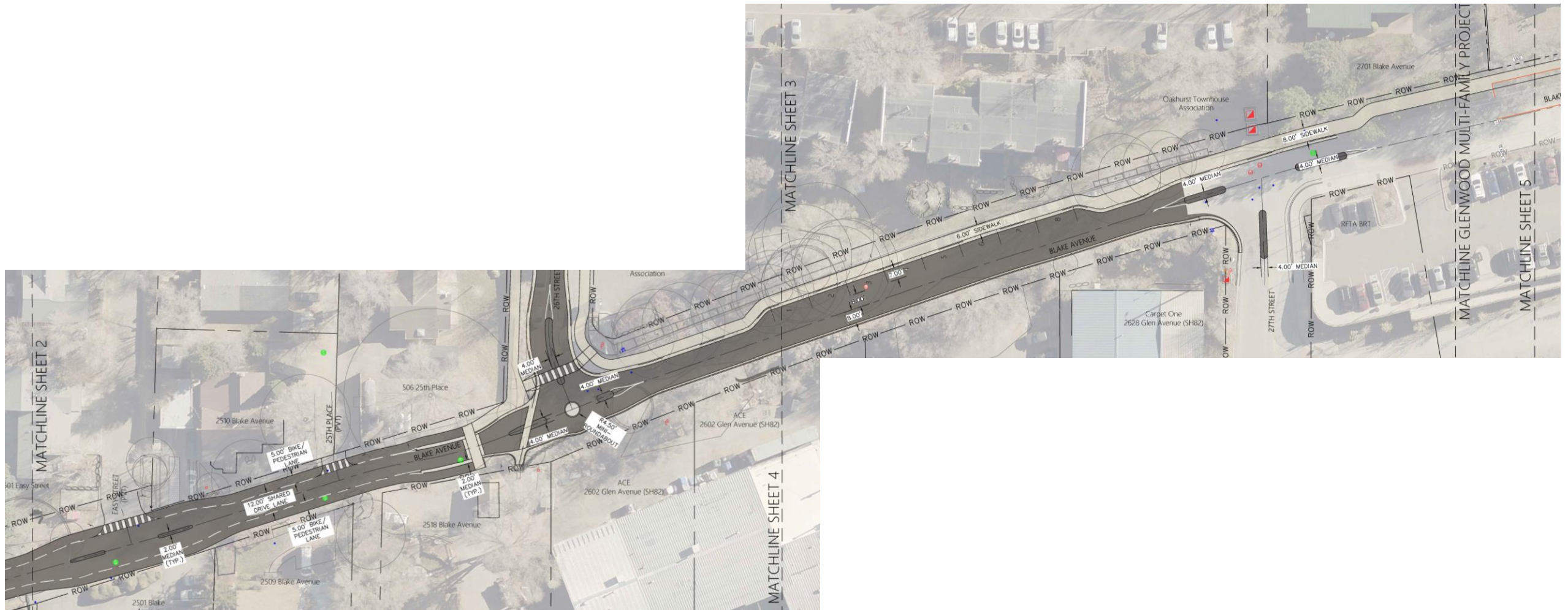
February 4, 2021

Blake Avenue Alternative C: Advisory Bike Lane Sketch



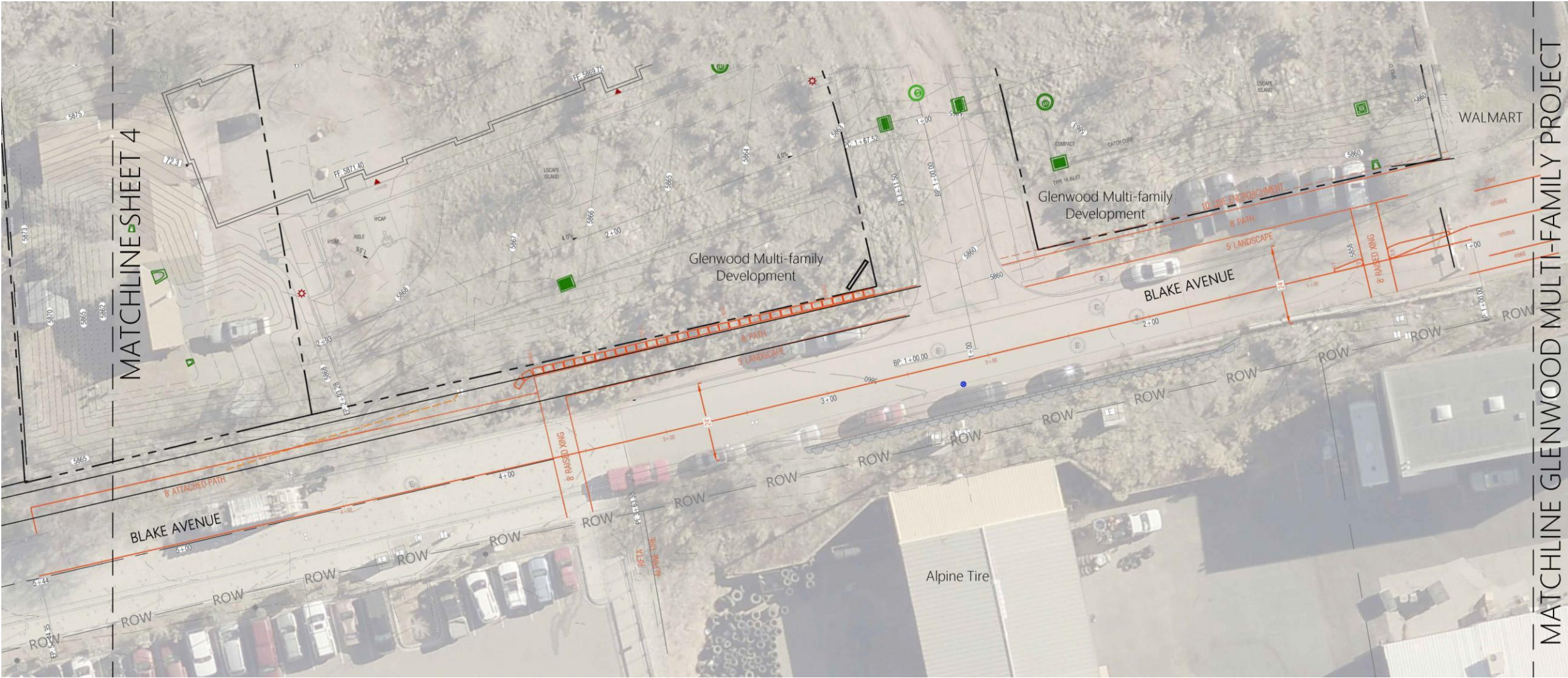
February 4, 2021

Blake Avenue Alternative C: Advisory Bike Lane Sketch



February 4, 2021

Blake Avenue Alternative C: Advisory Bike Lane Sketch



February 4, 2021



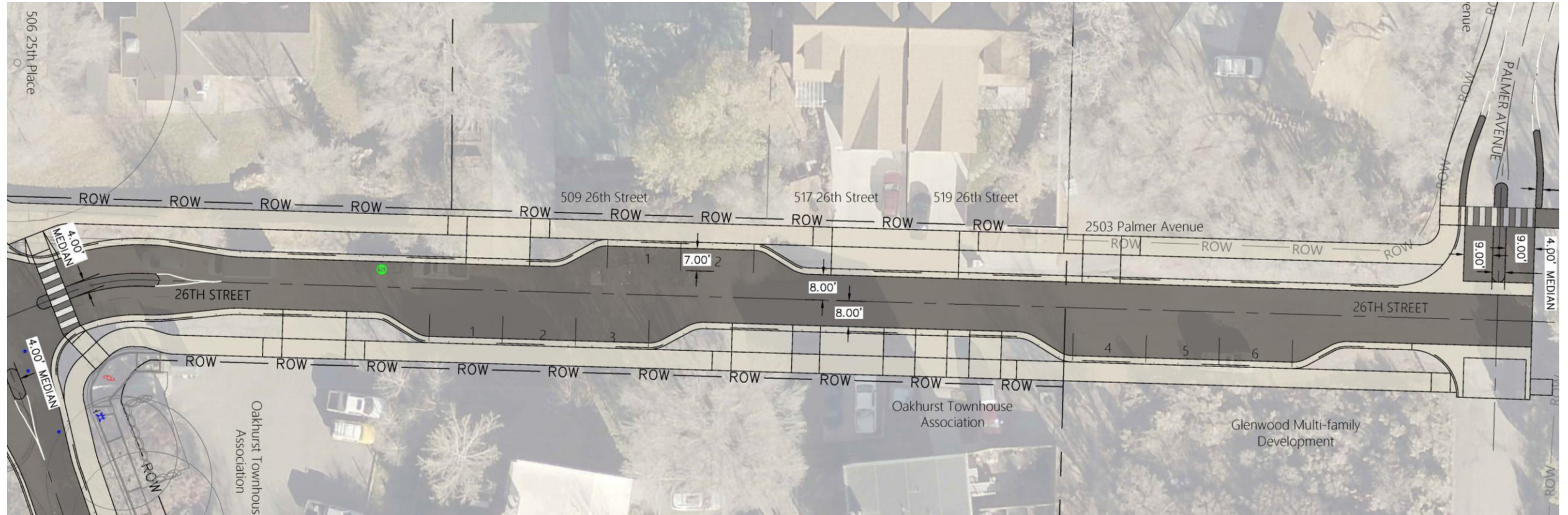
February 4, 2021

Palmer Avenue Alternative C: Advisory Bike Lane Sketch



February 4, 2021

26th Street: Connection to Advisory Bike Lane Sketch



February 4, 2021

Evaluation of Alternative C: Advisory Bike Lanes

Benefits:

- **Prioritizes Bicycles and Pedestrians**
 - Equal users
- **Lower cost option**
 - Cost Magnitude (1.3)
 - Assumed colored pavement and striping
 - Not considered: curb and gutter, traffic calming
 - Facilitated within existing Right of Way
 - Minimal materials
- **Maintains city circulation**
- **Facilitates the missing bike connection outlined in the Long Range Transportation Plan**
- **Easily converted to another design if not successful**
- **Low impact to neighbors**

Drawbacks:

- **No curb and gutter**
 - Does not consider drainage (currently)
- **Does not provide pedestrians a separate (protected) space**
- **No on street parking**
- **Education is required for success**
 - Signage
- **Could lead to congestion during peak hours**

February 4, 2021



Feedback

Option A – Advisory Bike Lane – Two-way traffic in a shared middle lane, with vulnerable road users utilizing a path on the edge of either side of the roads.

My concerns about Option A are (select all that apply)

	TOTAL	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7	Person 8	Person 9	Person 10	Person 11	Person 12
I do not have any concerns about this approach	4		1			1	1						1
Traffic volumes are too high for this to work well	4	1		1				1				1	
Problematic during backups on Highway 82	6	1		1					1	1	1	1	
It will require a lot of education for this configuration and could be dangerous as people learn to use it	2			1						1			
Could be difficult during inclement weather	4			1			1		1	1			
Other	2			1					1				

I like the Advisory Bike Lane because

	TOTAL	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7	Person 8	Person 9	Person 10	Person 11	Person 12
I do not like this approach	1	1											
It would not require expansion of the roadway platform for a sidewalk/curb and gutter (which would impact houses along the road)	6	1					1		1	1		1	1
It offers a lower cost solution that could be implemented for a longer stretch of road initially	4		1				1		1	1			
The guidance says that an Advisory Bike Lane makes it easier to remove snow	3		1							1			1
It prioritizes vulnerable road users (cyclists and pedestrians)	6		1	1				1	1	1	1		
This approach will slow traffic down	7			1		1	1		1	1	1		1

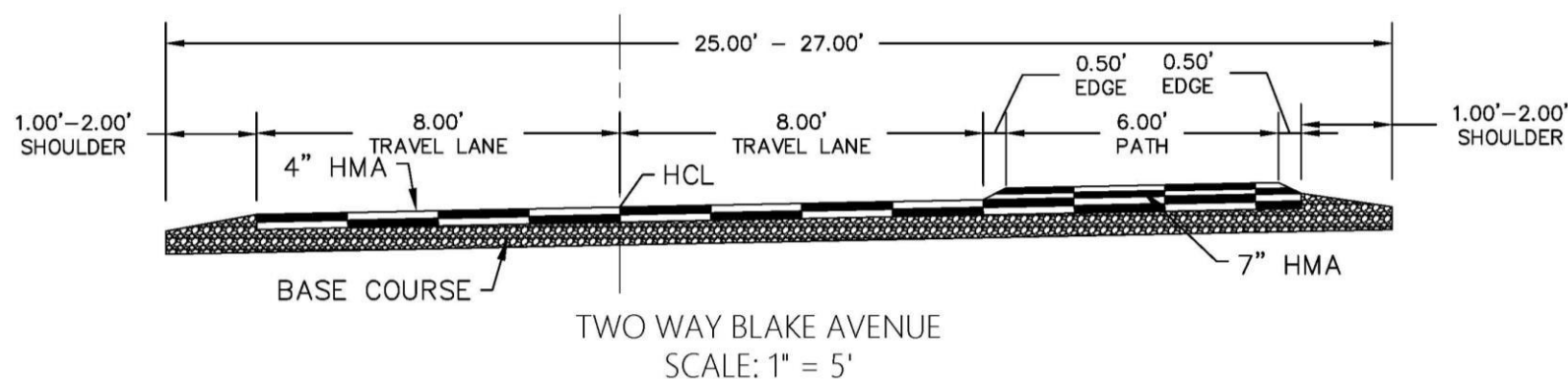
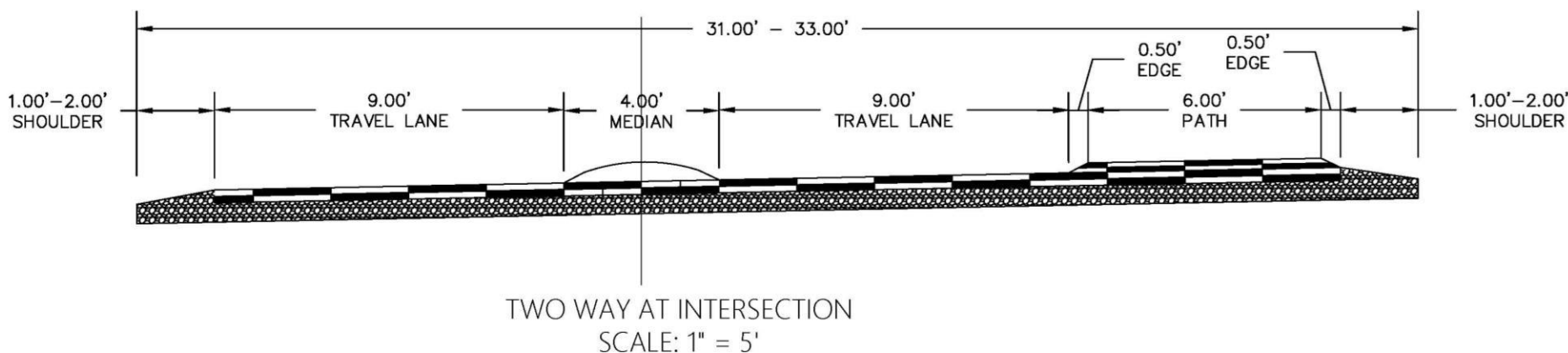
Other comments:

- I'd like to commend the staff for some "out of the box" thinking. Out of all that was presented, I like the advisory bike lanes. I would strongly urge colored asphalt be used rather than paint to make the paths pop out more and for more durability as well as traffic tables or speed humps with a gap in the middle to facilitate drainage.

February 4, 2021



Blake Avenue Alternative D: Two-Way with Raised Path



NOTE:

1. BLAKE AVENUE WAS SURVEYED FROM 23RD STREET TO 26TH STREET. REMAINING RIGHT OF WAY LINES AND PROPERTY LINES ARE APPROXIMATE AND NOT SURVEY ACCURATE. THEY ARE FOR INFORMATION PURPOSES ONLY.

Blake Avenue Alternative D: Two-Way with Raised Path



February 4, 2021

Blake Avenue Alternative D: Two-Way with Raised Path

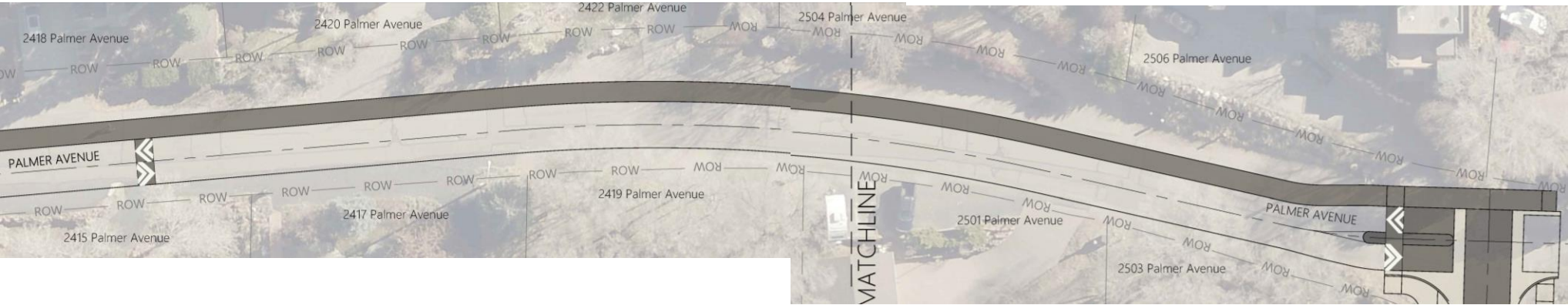


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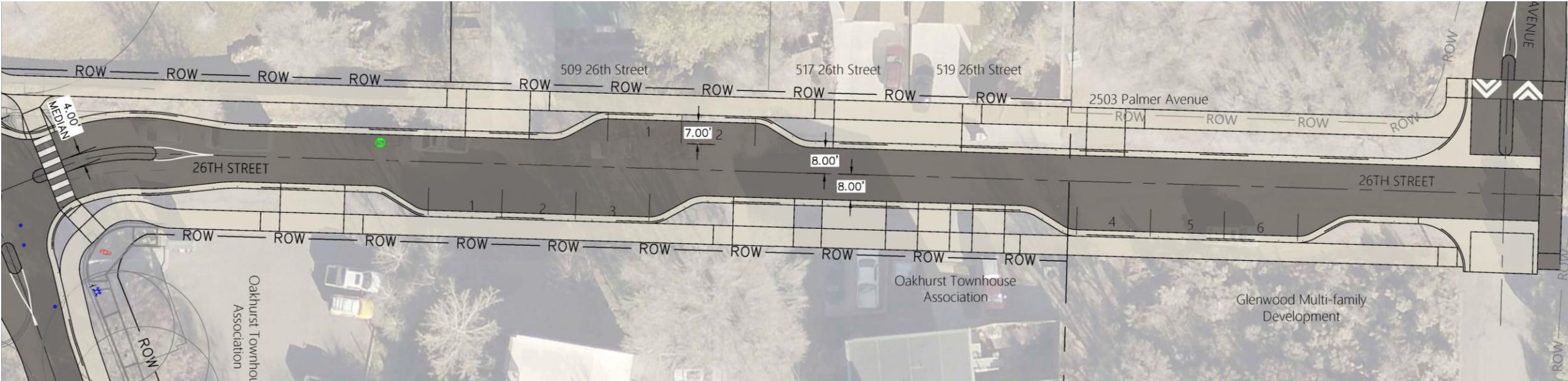


February 4, 2021

Palmer Avenue Alternative D: Two-Way with Raised Path



26th Street: Connection to Two-Way with Raised Path



Evaluation of Alternative D: Two-Way with Raised Path

Benefits:

- Separates pedestrians
 - Physical (vertical) separation
- Separation is mountable
 - Gives Cyclists the option to be on the path or in the roadway
- Lower cost option
 - Cost Magnitude (1.3)
 - Not considered: colored pavement, striping, curb and gutter, traffic calming
 - Facilitated within existing Right of Way
 - Minimal materials
- Maintains city circulation
- Facilitates the missing bike connection outlined in the Long Range Transportation Plan

Drawbacks:

- Separation is mountable
- Drainage will need to be considered
 - Potential pavement increase
 - May need curb and Gutter
- No on street parking
- Could lead to congestion during peak hours
- Harder to convert if not successful, but could mill and re-configure

February 4, 2021



Public Feedback

My concerns about two-way traffic with a path on the east side of Blake Avenue (select all that apply)

	TOTAL	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7	Person 8	Person 9	Person 10	Person 11	Person 12
I do not have any concerns about this approach	2		1										1
An improved road with two-way circulation will encourage cut-through traffic	7	1		1			1		1	1	1	1	
It will take the city too long to get through all of the phases	3			1					1	1			
People might park on the roadway or on the path	3			1			1				1		
Not enough rooms for pedestrians/cyclists	5					1		1	1	1	1		

I like two-way traffic with a path on the east side of Blake Avenue because (select all that apply)

	TOTAL	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7	Person 8	Person 9	Person 10	Person 11	Person 12
I do not like this approach	8	1				1	1	1	1	1	1	1	
There is a path created for pedestrians/cyclists	3		1	1						1			
An improved road with two-way circulation will encourage cut-through traffic	1		1										
This is a narrower section that will have less impacts to my property (neighboring properties)	1		1										
This is a narrower section that will slow traffic down	3		1	1									1

Other comments:

- No direct comments about this configuration, however it is obvious that this was the least liked configuration

February 4, 2021

Final Conclusions/Recommendations

- Neighborhood would prefer a one-way SB from 26th Street to 27th Street.
- Transportation Commission recommends one-way SB from 26th Street to 27th Street.
- City Staff does not support this configuration.
 - In a one-way SB configuration from 26th Street to 27th Street NB evening traffic entering the Blake or Palmer Neighborhood (including the Oakhurst Townhomes) will be forced up to 23rd Street or 24th Street, potentially causing congestion.
 - Without accurate analysis and counts, it is likely to cause a traffic overload at the 27th Street/SH 82 intersection during peak traffic hours.
 - NB traffic may ignore signage or other restrictions and still elect to make movements NB between 26th Street and 27th Street.
 - SB traffic looking to avoid the 27th Street/SH 82 intersection will continue south on Blake Avenue. If the Blake Avenue/SH 82 intersection is also backed up, traffic could head to 29th Street, which is slated to be a $\frac{3}{4}$ movement intersection. Impatience with traffic could lead to riskier movements by the travelling public and potentially lead to more traffic incidents.
- If one way on Blake Avenue is considered, Staff recommends a restricted movement with a 10' asphalt section from the Wal-Mart entrance to the New Palmer Avenue connection.
 - EMS currently does not access through the gate at this location, so a restricted roadway section will not hinder their response.
- City Staff supports maintaining full function of all public roads with two-way traffic and a raised sidewalk or advisory bike lanes.

February 4, 2021





Questions?

February 4, 2021

Review

- Options:

- Replace in kind (Alternative A)
 - 1.0 Cost Magnitude
 - Assumed with no traffic calming, roadway improvements (curb, gutter, striping, etc)
 - revised from last meeting, previously 16' section
 - 20' minimum for fire access
- Replace with a one way (Alternative B)
 - Cost Magnitude varies (1.2-1.7)
 - Dependent on traffic calming options used, the location of the one-way and the length of the one-way
 - Cost Magnitude varies due to location and length of One-Way
 - Still requires 20' for fire access
- Replace with an Advisory Bike lane (Alternative C)
 - Cost Magnitude (1.3)
 - Assumed colored pavement and striping.
 - Not considered: curb and gutter, traffic calming
 - 12' shared lane, 5' bike/pedestrian lanes
- Replace with two way and raised asphalt path (Alternative D)
 - Cost Magnitude (1.3)
 - Not considered: colored pavement, striping, curb and gutter, traffic calming
 - 16' travel lanes with a 6' path
- Replace with upgraded section, two-way traffic (Would need significant funding and planning)
 - 2.5 Cost Magnitude
 - 20' asphalt, curb and gutter, and 4' sidewalk
 - Will require ROW acquisition

February 4, 2021





MINUTES
CITY OF GLENWOOD SPRINGS
SPECIAL
CITY COUNCIL MEETING
July 23, 2020
101 W. 8TH STREET
7:00 P.M.

2. Roll Call

Mayor Jonathan Godes called the meeting to order at 7:00 PM. Present at roll call: Charlie Willman, Rick Voorhees, Tony Hershey, Jonathan Godes, Shelley Kaup, Paula Stepp and Steve Davis.

Also present were Debra Figueroa; City Manager, Karl Hanlon; City Attorney, Catherine Fletcher; City Clerk, Jenn Ooton; Assistant City Manager, Steve Boyd, COO; Yvette Gustad; Finance Director, Terri Partch; City Engineer, Matt Langhorst; Public Works Director, and Gretchen Ricehill; Assistant Director for Economic and Community Development.

3. Pledge of Allegiance

Mayor Godes led in the Pledge of Allegiance.

ACTIONS AND/OR PRESENTATIONS

4. CONTINUED FROM JULY 16 REGULAR CITY COUNCIL MEETING

Planning Item 04-20 Consideration of a Major Site/Architectural Plan Review, Rezoning from RH Residential High-Density to RT Residential Transitional for the construction of 100 Multifamily multi-family apartment and duplex units on approximately 5.74 acres (PIN 2185-153-04-001, 2185-153-02-008, and 2185-211-00-002)

All members of City Council acknowledged they had reviewed all written comments that came in and were part of the packet, which was supplemented up to and including the last set of comments at 6:33 PM.

Trent Hyatt, Senior Planner – Presented additional information addressing questions from City Council.

Councilor Davis, seconded by Mayor Godes moved to open Blake Gate in 2020 pending community outreach meetings and staff recommendations; to bring the decision back to Council as to whether it's a one way or two-way street.

Ayes: Voorhees, Davis, Godes, Hershey

Nays: Willman, Kaup, Stepp

Mayor Pro Tem Kaup, seconded by Councilor Voorhees moved to uphold the recommendation of the Planning and Zoning Commission and approve Planning Item 04-20 Consideration of a Major Site/Architectural Plan Review, Rezoning from RH Residential High-Density to RT Residential Transitional for the construction of 100 Multifamily multi-family apartment and duplex units on approximately 5.74 acres (PIN 2185-153-04-001, 2185-153-02-008, and 2185-211-00-002) as amended in Option C with the findings and conditions outlined on pages 1-3 of July 23, 2020 suggested motions If determined as necessary by City Council after study of the Blake Gate reopening; to include the two conditions presented by Trent Hyatt regarding parking management and emergency access to the adjacent property.

Ayes: Hershey, Godes, Davis, Kaup, Willman, Voorhees

Nays: Stepp

Motion passed.

5. CONTINUED FROM JULY 16 REGULAR CITY COUNCIL MEETING

Ordinance No. 20, Series of 2020; An Ordinance of the City Council of the City of Glenwood Springs, Colorado, Rezoning Property Owned by Bell Rippy Glenwood, LLC Known as 2710 Blake Avenue, Glenwood Springs Colorado, from Residential High-Density(RH) to Residential Transitional (RT) Zoning (FIRST READING)

Councilor Willman, seconded by Mayor Pro Tem Kaup moved to approve Ordinance No. 20, Series of 2020; An Ordinance of the City Council of the City of Glenwood Springs, Colorado, Rezoning Property Owned by Bell Rippy Glenwood, LLC Known as 2710 Blake Avenue, Glenwood Springs Colorado, from Residential High-Density(RH) to Residential Transitional (RT) Zoning (FIRST READING) and uphold the recommendations of the Planning and Zoning Commission, and approve the rezoning subject to the findings and conditions outlined on page one of the July 23, 2020 suggested motions included in the staff report packet.

Motion passed unanimously.

6. Adjournment

Adjournment at 8:08 PM.



MAYORS AGENDA
CITY OF GLENWOOD SPRINGS
REGULAR CITY COUNCIL MEETING
OCTOBER 1, 2020
101 W. 8TH STREET
6:15 PM

REGULAR SESSION

5. Roll Call

Mayor Jonathan Godes called the meeting to order at 6:15 PM. Present at roll call: Charlie Willman, Rick Voorhees, Shelley Kaup, Jonathan Godes, Steve Davis, Paula Stepp, and Tony Hershey.

Also present were Debra Figueroa; City Manager, Karl Hanlon; City Attorney, Catherine Fletcher; City Clerk, Jenn Ooton; Assistant City Manager, Steve Boyd, COO; Yvette Gustad; Finance Director, Terri Partch; City Engineer, Matt Langhorst; Public Works Director, Brian Smith; Parks and Recreation Director, and Gretchen Ricehill; Assistant Director for Economic and Community Development, and Lieutenant Bill Kimminau.

6. Pledge of Allegiance

Mayor Godes led in the pledge of allegiance.

7. Agenda Changes & Conflicts

Item 11 was a work session item that was moved to the regular agenda after the initial publication.

8. Citizens Appearing Before Council (for items not on the Agenda-comments limited to 3 minutes)

Cassandra Irving, Executive Director of Game on Camps, asked for a permit to use Sayer Park for their championship basketball tournament next weekend and that their athletes may be mask free.

Cindy gave her support to the Game on Camps request.

Ann O'Brien gave her support to the Game on Camps request.

City Manager, Debra Figueroa, said that the State discourages youth not to wear masks during contact sports, the County Health Department does not support or recommend this request. The staff recommends following the State and County guidelines and does not support this request as well.

Council agrees with staff.

9. Council Comments

Councilor Voorhees announced that tonight would be his last meeting.

Mayor Pro Tem Kaup encouraged the community to hang in there with the mask mandate.

Councilor Willman wanted to extend exemptions of sections of the sign code to help our local businesses. He also brought up the uncertainty of Halloween for discussion

Parks and Recreation Director, Brian Smith, said the City is working on a Halloween Spectacular that would include a Downtown pumpkin scavenger hunt with participating businesses and a festive event at the Community Center

that will include movies.

10. Consent Agenda

- A. Award of FFTP Wholesale Voice Provider Service per Bid 2020-024 to Momentum Telecom
- B. Resolution 2020-30; A Resolution of the City Council of the City of Glenwood Springs, Colorado Adjusting Community Broadband Network Rates for Telephone Services
- C. Pre-Annexation Agreement for water service to a mixed-use building located at 172 Darrow Road in unincorporated Garfield County per the requirements of Municipal Code Section 080.040.030(c)
- D. Resolution 2020-31; A Resolution of the City Council of the City of Glenwood Springs, Colorado Supporting the Colorado River Water Conservation District's Ballot Issue 7A
- E. July 16 Regular Minutes, July 22 and July 23 Special Meeting Minutes

Councilor Willman, seconded by Councilor Stepp moved to approve the consent agenda.

Motion passed unanimously

11. Aspen Valley Land Trust Presentation

Garfield County Commissioner Tom Jankovsky, Erin Quinn, Aspen Valley Land Trust, Laura Speck, Parks and Rec Commission, and Ron Rash, Roaring Fork Outdoor Volunteers, presented.

Tom Jankovsky asked if there is anything that can be done about the extensive trash on the land East of Bell Rippy and East of Walmart. He also said that the landowner wanted to donate the land to either the County or the City to use as an open space. The county did not have a use for the land.

Erin Quinn said this is a great opportunity to use this property as a recreation spot. She does recognize the property is currently a health and fire hazard and needs work and the cost that involves. She said the Aspen Valley Land Trust is willing to help with this cost. She stated that they are trying to apply for a \$150,000 grant that would cover some of the cost but in order to apply it would require the property being under long term ownership.

Ron Rash stated that their organization was willing and could build trails, benches, and picnic tables. They would also be able to help remove the trash once the hazardous material is removed.

Parks and Recreation Director, Brian Smith recommends letting this proposal go to the Parks and Rec Commission first. He also states that the main issue is the homeless encampment.

Lieutenant Bill Kimminau said there would be enforcement issues both legally and logistically.

Mayor Godes opened the item for public comment.

No comments were made.

Mayor Godes closed the item for public comment.

Council requested that Aspen Valley Land Trust apply for the grant and had the support of the council. They also took staff's recommendation.

12. CONTINUED FROM SEPTEMBER 17, 2020 MEETING Appointments to Boards and Commissions
-Historical Preservation Commission

Councilor Willman, seconded by Mayor Pro Tem Kaup, moved to table item 12 until a later point in the meeting.

Motion passed unanimously

13. Budget 2021 Discussion

Debra Figueroa, City Manager, and Steve Boyd, COO, presented.

Mayor Pro Tem Kaup, seconded by Mayor Godes, moved to authorize staff to publish the draft 2021 budget for the public to view.

Motion passed unanimously

14. RWAPA IGA and Bylaws

Councilor Willman, seconded by Councilor Davis, moved to table item 14 until the next Council meeting.

Motion passed unanimously

15. GoEV City

Stefan Johnson, Transportation Program Manager with CLEER, presented the GoEV City initiative. This initiative requests that the city fleet would become electric as well as working with RFSD and RFTA to have them transition their buses to electric. Also, it asks that the City make it convenient for citizens to own electric vehicles.

Council directs staff to work with Stefan for further analysis and information.

16. Blake Gate

Councilor Davis, seconded by Mayor Godes, moved to accept, without a presentation, staff's recommendation in the report to open the Blake Gate at that time in the future.

Motion passed unanimously

17. IGA Agreement Approval with NWCCOG for Co-located Rack Space within the 910 Telecom Internet Leasing Location in Denver, Colorado

Matt Langhorst, Public Works Director, presented that Denver wanted to share a location with us. This will cut costs on the City's broadband.

Councilor Davis, seconded by Councilor Willman, moved to approve the IGA Agreement Approval with NWCCOG for Co-located Rack Space within the 910 Telecom Internet Leasing Location in Denver, Colorado.

Ayes: Kaup, Stepp, Voorhees, Godes, Davis, Willman

Nays: Hershey

Motion passed.

18. Award of Bid BD2020-031 for Networking Equipment and Associated Accessories to One Technology Corporation

Matt Langhorst, Public Works Director, presented that this item is regarding the router that is going to be put in the Denver location.

Councilor Davis, seconded by Councilor Willman, moved to approve the Award of Bid BD2020-031 for Networking Equipment and Associated Accessories to One Technology Corporation.

Ayes: Kaup, Stepp, Voorhees, Godes, Davis, Willman

Nays: Hershey

Motion passed.

CONTINUED FROM SEPTEMBER 17, 2020 MEETING Appointments to Boards and Commissions
-Historical Preservation Commission

19.

Councilor Hershey, seconded by Councilor Willman, moved to table Appointments to Boards and Commissions-Historical Preservation Commission- until the next Council meeting.

Motion passed unanimously

20. Report from City Administration

- A. City Manager
- South Midland Construction Bidding Update

Terri Partch, City Engineer, reported that the South Midland construction bid went out yesterday and the City expects the bids to come back by October 30th. Also, South Bridge is on the verge of being signed by CDOT and FHWA.

- B. City Attorney

- C. Correspondence Incoming/Outgoing

21. Adjournment

Meeting adjourned at 9:50 PM.