



Transmittal

Transmittal No. 1

We are sending you the following items:

- Attached
- Originals
- Contracts
- Specifications
- Change Order
- Payment Request
- Under separate cover, via
- Shop Drawings
- Samples
- Prints
- CD or Memory Stick
- Other

To:

Board of Adjustments
 Community Development Dept, Planning Div.
 316 N. Park Ave., Room 445
 Helena, MT 59623

Project Number:

70-41-03 Carroll College Nelson Stadium lights
 and turf project

Date: 11/1/2023			For Review	Information	For Your Files	No Exception Taken	Rejected	Revise and Resubmit	Submit Specified Item
Project Title: Carroll College Nelson Stadium Variance Application for Light Pole Height									
1	<i>Copies of</i>	Variance Application	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electronic	<i>Copies of</i>	2022 Property Tax Payments	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electronic	<i>Copies of</i>	Property Record Card	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electronic	<i>Copies of</i>	Bid Drawings and Specs	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<i>Copies of</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<i>Copies of</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<i>Copies of</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<i>Copies of</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



(406) 443-2340

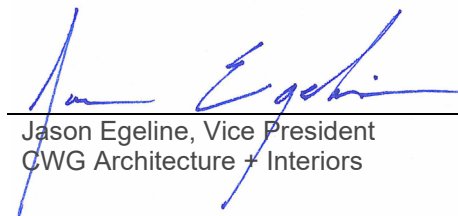
650 Power St
 P.O. Box 1198
 Helena, MT 59624

cwg-architects.com

Remarks:

Copy to:

By:


 Jason Egeline, Vice President
 CWG Architecture + Interiors



BOARD OF ADJUSTMENT VARIANCE APPLICATION

Community Development Department, Planning Division
316 North Park Avenue, Room 445, Helena, MT 59623
406-447-8490; citycommunitydevelopment@helenamt.gov

Date received:

APPLICATION FEE: \$125.00
(PAYABLE TO THE CITY OF HELENA)
ALL FEES ARE NON-REFUNDABLE

PROPERTY OWNER: *Primary Contact?*

Name: Carroll College Primary Number: (406) 447-5432
Address: 1601 North Benton Ave., Helena, MT Other Phone: N/A
Email: (See representative below)

APPLICANT (If different from property owner): *Primary Contact?*

Name: Jason Egeline Primary Number: (406) 443-2340
Address: 650 Power Street, Helena, MT Other Phone: N/A
Email: jason@cwg-architects.com Company: CWG Architecture

AUTHORIZED REPRESENTATIVE: *Primary Contact?*

Name: Lori Peterson, VP Finance Primary Number: (406) 447-5432
Address: 1601 N. Benton Ave. Helena, MT Other Phone: N/A
Email: lpeterso@carroll.edu Company: Carroll College

Section A: PLEASE PROVIDE THE INFORMATION REQUESTED BELOW.

- Address of Property 1857 North Benton Avenue, Helena, MT 59601

Address	City	State	Zip Code
---------	------	-------	----------
- Legal Description (Block & Lots, Subdivision, COS#) S19, T10 N, R03 W, C.O.S. 619517, ACRES 25.519, TRACT #
- Geocode 05-1888-19-3-01-06-0000
- The most recent deed for impacted property
- Lot or Parcel Size (square feet) 25.519 Acres
- Current and proposed use of structure or property: Football Stadium and sports field
- Current Zoning District PLI - Public Lands & Institutions Dsitric
- Are there other related Land Use Applications being submitted: Yes No
- Submit proof of current paid taxes
- 1 copy of a scaled site plan and supporting data/documents. The site plan must clearly show the existing standard and the proposed variance to the standard.

Section B: INDICATE WHICH VARIANCE(S) IS (ARE) BEING REQUESTED AND THE EXTENT OF THE VARIANCE.

EXAMPLE: [X] Reduce Front Lot Line Setback: *From the required 10 feet to 3 feet.*

Please provide all the information requested in the Application. An incomplete application may delay the review of your request. Please note: "N/A" is not an acceptable answer alone and requires an explanation if used.

Dimensional Criteria:

- Reduce front lot line setback: N/A
- Front lot line setback #2 (corner lot): N/A
- Reduce garage entrance setback: N/A
- Reduce side lot line setback: N/A
- Reduce rear lot line setback: N/A
- Exceed building height limitation: PLI zoned for 65'. Light poles are 110' above grade

Lot Coverage/Area Criteria:

- Lot coverage percentage: N/A
- Front porch lot coverage percentage: N/A
- Lot area per dwelling unit: N/A

Landscaping Criteria:

- Reduce or eliminate landscaping area: N/A
- Reduce or eliminate screening: N/A

Parking Criteria:

- Exceed the maximum parking spaces allowed: N/A
- Reduce the amount of required on-site parking spaces: N/A
- Reduce or eliminate loading berths: N/A
- Reduce or eliminate required bicycle spaces: N/A
- Reduce size of parking space: N/A

Sign Criteria:

- Sign area (square footage): N/A
- Sign height: N/A
- Sign location: N/A
- Number of signs: N/A

Other: N/A

Section C: BOARD OF ADJUSTMENTS VARIANCE REVIEW CRITERIA.

To approve a requested variance for a new building or portion thereof, the Board of Adjustment shall consider the following standards in section 11-5-5 of the Helena City Code and find as follows:

1. The variance will not create a significant risk to the public health, safety, or general welfare;
2. The variance will not significantly reduce or impair the peaceful use of existing property or improvements in the vicinity and the zoning district in which the subject property is located; and
3. Excluding monetary hardship, strict compliance with the provisions of this title would create unnecessary hardship or practical difficulty.

These are the standards your application for variance will be judged on. Your answers in section D should speak to the review criteria.

It is the applicant's burden of proof to show that a variance should be granted. As part of your application, you are required to provide information for each of the following factors including all alternatives considered. Failure to provide adequate responses or requested documentation may result in a returned application.

Section D: EVALUATION FACTORS

- 1. **Special conditions and circumstances that are unique to the applicant's site, including the size of the property, unusual or extreme topography, or unusual shape of the property.**

If the above condition applies, state the specific factors and provide supporting documentation. For example, if the variance request is due to an abnormal lot configuration, provide a survey of the lot that specifically demonstrates the issue.

See Attached

- 2. **The height, location, or dimensions of existing structures located on the site or in the vicinity of the site.**

Ex: How is the proposed variance compatible with the other structures located on the site or in the vicinity of the site? On the site plan you provide, please represent accurately and to scale the height, location, and dimensions of existing structures.

See Attached

- 3. **Whether there is a prevalence of nonconformities in the vicinity of the site that are similar to the variance requested.**

If so, what are those nonconformities and provide supporting documentation.

See Attached

- 4. **The subsequent imposition of zoning restrictions creating nonconforming lots or parcels, and governmental actions beyond the applicant's control.**

Is the need for a variance request a result of government action? For example, the front yard setbacks were increased after construction of the structure, thereby creating the non-conformity. Explain.

See Attached

- 5. **Whether a literal interpretation of the provisions of this title would deprive the property owner of rights commonly enjoyed by other properties similarly situated in the same district under the terms of this title.**

For example, would the denial of the variance deny the property owner the right to safe placement of a garage where garages are typical? If so, explain.

See Attached

6. The extent to which the hardship or difficulty results from the actions of the applicant.

Explain the extent of the circumstances that are creating hardship or difficulty in compliance with the City Code and list alternatives and options considered by the applicant. Provide supporting documentation.

See Attached

7. Whether granting the variance requested will confer an unreasonable special privilege to the subject property that is not available to other properties similarly located in the same zoning district.

See Attached

8. Do you think a rebuttable presumption, as identified in City Code Section 11-5-5(E), should apply to your property, yes or no? For example, do you have an existing non-conforming structure that you wish to rebuild in the same location? If yes, show the original footprint of the building. Provide documentation that proves the existence of the prior nonconformity. Document that the nonconformity can be in compliance with building and fire codes.


See Attached

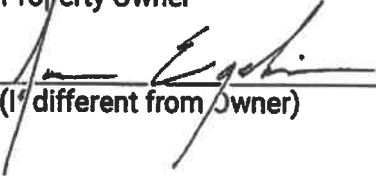
9. Provide any additional information you would like the Board to consider.

See Attached

IT IS THE POLICY OF THE CITY OF HELENA'S BOARD OF ADJUSTMENT TO NOT ACT ON A PROPOSAL IF THE APPLICANT/PROPERTY OWNER OR REPRESENTATIVE IS NOT PRESENT AT THE BOARD OF ADJUSTMENTS HEARING. CITY STAFF REPRESENT THE CITY AND CANNOT ANSWER QUESTIONS ON BEHALF OF THE APPLICANT AT THE BOARD OF ADJUSTMENT HEARINGS.

I HEREBY CERTIFY AND ACKNOWLEDGE THE STATEMENTS IN THIS APPLICATION AND ANY ATTACHED INFORMATION ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE.

Signed:  Date: October 31, 2023
Property Owner

Applicant:  Date: October 31, 2023
(If different from Owner)

(Property owner must sign application)

It is recommended that the applicant contact neighbors to inform them of proposal and identify any concerns that the applicant may be able to address.

City Planning Staff represents the City; staff cannot answer questions for the applicant.

Carroll College Variance Request

Criteria for Approval:

1. The variance will not create a significant risk to the public health, safety, or general welfare;
2. The variance will not significantly reduce or impair the peaceful use of existing property or improvements in the vicinity and the zoning district in which the subject property is located; and
3. Excluding monetary hardship, strict compliance with the provisions of this title would create unnecessary hardship or practical difficulty.

Evaluation Factors

1. Special conditions and circumstances that are unique to the applicant's site, including the size of the property, unusual or extreme topography, or unusual shape of the property.

If the above condition applies, state the specific factors and provide supporting documentation. For example, if the variance request is due to an abnormal lot configuration, provide a survey of the lot that specifically demonstrates the issue.

The current campus playing field needs repair and improvement. This includes addition of lights which providing for both safer play in evening games, but also greatly extends the time which the fields can be utilized. However, to meet NCAA requirements of Night play as well as night filming of games there are standards for light levels that dictate pole height and fixture size which we cannot deviate from. Basically, lowering the poles to meet the PLI Zones 60'-0" minimum would make lighting unfeasible. A lower pole option prevents even lighting across the field and can interfere with visual safety of players as well as preventing the College from meeting NCAA lighting requirements for filming uses at this facility, further limiting their feasibility if not constructed as designed.

The current field is already depressed about 8'-0" below adjacent grade thus allowing for the lowest possible light pole heights at this site. Lowering it further would be an infeasible solution that would create other issues with sight lines from bleachers, water issues due to existing soils as well as being utterly infeasible due to massive amount of cost comparative to the overall project.

2. The height, location, or dimensions of existing structures located on the site or in the vicinity of the site.

Ex: How is the proposed variance compatible with the other structures located on the site or in the vicinity of the site? On the site plan you provide, please represent accurately and to scale the height, location, and dimensions of existing structures.

The new light poles are generally compatible with adjacent Carroll College structures as there are a number of tall buildings in it's vicinity.

The existing stadium bleachers and penthouse structure directly north of the field is an existing impediment to proper lighting of the field as the peak is 61'-6". This makes lower lighting solutions infeasible.

3. Whether there is a prevalence of nonconformities in the vicinity of the site that are similar to the variance requested.

If so, what are those nonconformities and provide supporting documentation.

The current stadium seating has a roof peak of 61'-6", this is over the current zoning allowance

Saint Charles hall has a roof peak of approximately 88'-0", well over the current zoning allowance

Due to existing topography the Nelson Library and the All Saints chapel are both taller than the stadium facility (they sit higher up on the adjacent hill).

The elevation of the grade at the light poles is about 3,980 feet above sea level – this puts our new light poles at about 4,090 above sea level. the grade at St. Charles Hall is 4,052', so the peak of that building is about 4,140 feet above sea level (a full 50'-0" higher the new lights).

All Saints Chapel sits about 4,040' above sea level, and at about 50'-0" to the peak of the building, the peak is 4,190' feet above sea level (thus matching the height of the newly proposed lights).

Essentially there are a number of adjacent non-conforming buildings and with their position on the hill the newly proposed lights will blend in with most adjacent structures.

4. The subsequent imposition of zoning restrictions creating nonconforming lots or parcels, and governmental actions beyond the applicant's control.

Is the need for a variance request a result of government action? For example, the front yard setbacks were increased after construction of the structure, thereby creating the non- conformity. Explain.

This does not apply to the Nelson Stadium project

5. Whether a literal interpretation of the provisions of this title would deprive the property owner of rights commonly enjoyed by other properties similarly situated in the same district under the terms of this title.

For example, would the denial of the variance deny the property owner the right to safe placement of a garage where garages are typical? If so, explain.

Denial of this variance would prevent the owner being able to add lighting which would meet collegiate regulations, to this new stadium project. This would, at a very minimum be unreasonable, as other much smaller schools here in Helena have adequate lighting (such as Helena Middle School, which hosts high school games).

6. The extent to which the hardship or difficulty results from the actions of the applicant.

Explain the extent of the circumstances that are creating hardship or difficulty in compliance with the City Code and list alternatives and options considered by the applicant. Provide supporting documentation.

Due to NCAA lighting standards and the difficulty of designing lights lower than adjacent bleachers we would not effectively be able to include a proper and safe lighting design and still meet the 60'-0" limit.

Whether granting the variance requested will confer an unreasonable special privilege to the subject property that is not available to other properties similarly located in the same zoning district.

This does not apply to the Nelson Stadium project. Other schools in town have lighting that's appropriate to their needs.

7. Do you think a rebuttable presumption, as identified in City Code Section 11-5-5(E), should apply to your property, yes or no? For example, do you have an existing non-conforming structure that you wish to rebuild in the same location? If yes, show the original footprint of the building. Provide documentation that proves the existence of the prior nonconformity. Document that the nonconformity can be in compliance with building and firecodes.

This does not apply to the Nelson Stadium project as this work is new construction and not fixing/replacing an existing facility.

8. Provide any additional information you would like the Board to consider.

FAA requires an additional variance due to lighting height in relation to flight paths. This variance was granted with approval by the FAA in 2011 so they were in support of the project as designed. The Helena Regional Airport also has grant support. Both the airport letter and the past 2011 FAA approval are attached for reference. We also received an approved building permit back in 2011 so this process is a duplication with nearly the same exact design as that of 2011.

OC

CARROLL COLLEGE 1601 N Benton Ave., Helena, MT 59625-0002 (406) 447-4300

0176184

Date	Invoice #	Description	Net Amount
05/31/23	24730	Property ID 24730	39,087.38
05/31/23	24668	Property ID 24668	431.50
05/31/23	24755	Property ID 24755	9,514.44
05/31/23	38582	Property ID 38582	36,675.63
05/31/23	23653	Property ID 23653	236.92
05/31/23	26019	Property ID 26019	218.68
05/31/23	3702	Property ID 3702	1,487.99
05/31/23	3701	Property ID 3701	1,172.82
05/31/23	3418	Property ID 3418	280.22
05/31/23	4954	Property ID 4954	266.66
05/31/23	4955	Property ID 4955	1,433.17
05/31/23	3898	Property ID 3898	1,151.33
05/31/23	1013	Property ID 1013	485.96
05/31/23	1022	Property ID 1022	6,269.64
05/31/23	4414	Property ID 4414	470.28
05/18/23	AP 0176184		131,954.12



CARROLL COLLEGE
1601 N Benton Ave.
Helena, MT 59625-0002
(406) 447-4300

Helena, MT 59601

Check #
0176184

93-38
929

Date	Amount
05/18/23	\$***131,954.12

PAY: \$131,954.12

TO THE ORDER OF: Lewis & Clark County Treasurer
316 North Park Ave, Rm 113
Helena MT 59623

AUTHORIZED SIGNATURE



CARROLL COLLEGE
1601 N Benton Ave.
Helena, MT 59625-0002
(406) 447-4300

Lewis & Clark County Treasurer
316 North Park Ave, Rm 113
Helena MT 59623

May 18 2023

Check Overflow Advices

For Check: 0176184

05/31/23 Property ID 726 ✓
05/31/23 Property ID 24732 ✓
05/31/23 Property ID 5276 ✓
05/31/23 Property ID 31450 ✓
05/31/23 Property ID 24669 ✓
05/31/23 Property ID 35929 ✓
05/31/23 Property ID 1153 ✓
05/31/23 Property ID 7279 ✓

726 ✓
24732 ✓
5276 ✓
31450 ✓
24669 ✓
35929 ✓
1153 ✓
7279 ✓

178.60 ✓
342.59 ✓
266.65 ✓
6,675.95 ✓
705.71 ✓
4,146.94 ✓
15,921.01 ✓
4,534.05 ✓



Amy Reeves
Lewis & Clark County Treasurer
316 N. Park Ave Rm 113
Helena, MT 59623
Phone: (406) 447-8329

YEAR 2022 REAL ESTATE STATEMENT OF TAXES PAYABLE

PROPERTY ID NO.: 38582
01-02: Tax District 01
SEC-TWN-RGE: 30-10 N-03 W

For internet payments
please log on to:
<https://tax.ledetech.com/LewisAndClarkMT/>

For payments using
credit cards, dial toll free
1-833-272-9329.
You will be asked for a
jurisdiction Number. This
number is 3602. You will
then be prompted for
payment information.

Property Location: 1601 N BENTON AVE
Legal Description: S30, T10 N, R03 W, M & B TR IN NW4NW4

Valuation Type	Market Value	Taxable Value
Real Estate	1,505,758.00	0.00
Improvements	35,373,110.00	0.00
Personal Property	0.00	0.00
	36,878,868.00	0.00
County Mill Value:	165,110	

DELINQUENT TAXES
Total Prior Year(s)
Delinquent Tax Including
Penalty and Interest:

If Paid By*:

* Additional Penalty and
Interest shall be added if
not paid by above date.

Questions?
Call 406-447-8329.

Taxpayers may pay taxes that
are delinquent at anytime if
they pay the full amount of
the delinquency. If taxpayer
wants to pay only part of their
delinquent taxes, then the
current year has to be paid
in full before they can pay a
delinquent year. Delinquent
payments must be credited to
the oldest year first.

Please review the
back of the tax bill for
Dist. Breakdown and
further information.

GENERAL TAX DETAIL

Levy Description Amount

Levy Description (Continued) Amount

VO146793 BQ
5/14/23

Total Mill Levy: 804.14

Total General Taxes 0.00

SPECIAL ASSESSMENTS

Description	Code	1st Half	2nd Half
STREET MAINT #1	0001	27,678.03	27,678.02
WATER QUAL/COMM/CITY	8042C	87.89	87.89
LIGHT DISTRICT #357	0357	277.93	277.92
LANDFILL MONITORING	0016	75.35	75.35
URBAN FOREST MGMT	0061	19.50	19.50
OPEN SPACE MAINT	0070	1,448.83	1,448.82
STORM WATER UTL	0008	7,088.13	7,088.13

TOTAL	36,675.66	36,675.63
Total Taxes Due Current Year	36,675.66	36,675.63

Please fold on perforation BEFORE tearing

2022 2ND HALF PAYMENT STUB

Second Half Amount Due:

\$36,675.63

Property ID Number: 38582

DUE ON OR BEFORE: 05/31/2023

Property Tax Assistance eligibility reflected in amount due for current tax year

This property may qualify for a Property Tax Assistance Program. This may include: Property Tax Assistance, Disabled or Deceased Veterans' Residential Exemption, and/or Elderly Homeowner's Tax Credit. Contact the Local Department of Revenue at 406-444-4000 for further information.

If your mailing address has changed, please fill out the form on the back of your payment coupon!

CARROLL COLLEGE
1601 N BENTON AVE
HELENA MT 59625-0001



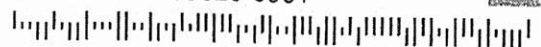
eNoticesOnline.com
Go Paperless

AUTHORIZATION CODE

LCC-K89DYFRT

RETURN THIS STUB WITH YOUR SECOND HALF PAYMENT TO:

LEWIS & CLARK COUNTY TREASURER
316 N. PARK AVE RM 113
HELENA MT 59623-0001



Date	Invoice #	Description	Net Amount
Check Date	Check #		Total
11/17/22	AP 0174699		131,954.64



CARROLL COLLEGE
 1601 N Benton Ave.
 Helena, MT 59625-0002
 (406) 447-4300

Helena, MT 59601

Check #
0174699

93-38
 929

<u>Date</u>	<u>Amount</u>
11/17/22	\$***131,954.64

PAY: \$131,954.64

TO THE ORDER OF: Lewis & Clark County Treasurer
 316 North Park Ave, Rm 113
 Helena MT 59623

Spi Peterson

AUTHORIZED SIGNATURE

⑈0174699⑈ ⑆092900383⑆ 156010973055⑈



CARROLL COLLEGE
 1601 N Benton Ave.
 Helena, MT 59625-0002
 (406) 447-4300

Lewis & Clark County Treasurer
 316 North Park Ave, Rm 113
 Helena MT 59623

November 17 2022

Check Overflow Advices

For Check: 0174699

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11/30/22 Prop ID 5276 ✓
11/30/22 Prop ID 31450 ✓
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24669 ✓	705.73 ✓
35929 ✓	4,146.95 ✓
1153 ✓	15,921.08 ✓
7279 ✓	4,534.06 ✓

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Amy Reeves
Lewis & Clark County Treasurer
316 N. Park Ave Rm 113
Helena, MT 59623
Phone: (406) 447-8329

ACCOUNTS PAYABLE

NOV 02 2022

29518**114**G50**1.2815**5/6*****AUTOALL FOR AADC 590
CARROLL COLLEGE
1601 N BENTON AVE
HELENA MT 59625-0001

PROPERTY ID NO.: 38582 ✓
01-02: Tax District 01
SEC-TWN-RGE: 30-10 N-03 W

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LewisAndClarkMT

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County Mill Value:	165,110	

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Total Prior Year(s)
Delinquent Tax Including
Penalty and Interest:

If Paid By*:

* Additional Penalty and
Interest shall be added if
not paid by above date.

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the delinquency. If taxpayer
wants to pay only part of their
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current year has to be paid
in full before they can pay a
delinquent year. Delinquent
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the oldest year first.

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Dist. Breakdown and
further information.

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STORM WATER UTL	0008	7,088.13	7,088.13

TOTAL			
Total Taxes Due Current Year	36,675.66 ✓	36,675.63	36,675.63

V0143610 BQ 11/11/22

-Voted In **Voted to increase ***Voted to exceed Statutory Authority

Property Record Card

Summary

Primary Information

Property Category: RP **Subcategory:** Commercial Property
Geocode: 05-1888-19-3-01-06-0000 **Assessment Code:** 0000024730
Primary Owner: **PropertyAddress:** 1755 BISHOP CARROLL DR
 CARROLL COLLEGE HELENA, MT 59625
 1601 N BENTON AVE **COS Parcel:**
 HELENA, MT 59625-0001
NOTE: See the Owner tab for all owner information

Certificate of Survey: 619517

Subdivision:

Legal Description:

S19, T10 N, R03 W, C.O.S. 619517, ACRES 25.519, TRACT C-1, IN G.LOT 4

Last Modified: 10/23/2023 7:38:04 PM

General Property Information

Neighborhood: 205.202.C **Property Type:** EP - Exempt Property
Living Units: 0 **Levy District:** 05-048702-0102
Zoning: **Ownership %:** 100
Linked Property:

No linked properties exist for this property

Exemptions:

No exemptions exist for this property

Condo Ownership:

General: 0 **Limited:** 0

Property Factors

Topography: **Fronting:**
Utilities: **Parking Type:**
Access: **Parking Quantity:**
Location: **Parking Proximity:**

Land Summary

<u>Land Type</u>	<u>Acres</u>	<u>Value</u>
Grazing	0.000	00.00
Fallow	0.000	00.00
Irrigated	0.000	00.00
Continuous Crop	0.000	00.00
Wild Hay	0.000	00.00
Farmsite	0.000	00.00
ROW	0.000	00.00
NonQual Land	0.000	00.00
Total Ag Land	0.000	00.00
Total Forest Land	0.000	00.00
Total Market Land	25.519	596,495.00

Deed Information:

Deed Date	Book	Page	Recorded Date	Document Number	Document Type
3/31/1994	M15	*7442			

Owners

Party #1

Default Information: [CARROLL COLLEGE](#)
[1601 N BENTON AVE](#)

Ownership %: 100

Primary Owner: "Yes"

Interest Type: [Conversion](#)

Last Modified: 11/15/2007 12:06:31 AM

Other Names

Other Addresses

Name

Type

Appraisals

Appraisal History

Tax Year	Land Value	Building Value	Total Value	Method
2023	596495	33843340	34439835	COST
2022	1698657	26706050	28404707	COST
2021	1698657	26706050	28404707	COST

Market Land

Market Land Item #1

Method: [Acre](#)

Type: [Primary Site](#)

Width:

Depth:

Square Feet: 00

Acres: 25.519

Valuation

Class Code: 2153

Value: 596495

Dwellings

Existing Dwellings

No dwellings exist for this parcel

Other Buildings/Improvements

Outbuilding/Yard Improvement #1

Type: [CommRes](#)

Description: [CPA1 - Paving, asphalt](#)

Quantity: 1

Year Built: 1965

Grade: A

Condition:

Functional:

Class Code: 3150

Dimensions

Width/Diameter:

Length:

Size/Area: 49818

Height:

Bushels:

Circumference:

Outbuilding/Yard Improvement #2

Type: [Commercial](#)

Description: [CPA1 - Paving, asphalt](#)

Quantity: 1

Year Built: 1979

Grade: A

Condition:

Functional:

Class Code: 3150

Dimensions

Width/Diameter:

Length:

Size/Area: 8182

Height:

Bushels:

Circumference:

Outbuilding/Yard Improvement #3

Type: Commercial **Description:** CPA1 - Paving, asphalt
Quantity: 1 **Year Built:** 1970 **Grade:** A
Condition: **Functional:** **Class Code:** 3150

Dimensions

Width/Diameter: **Length:** **Size/Area:** 69446
Height: **Bushels:** **Circumference:**

Commercial

Existing Commercial Buildings

Building Number	Building Name	Structure Type	Units/Bldg	Year Built	
1	GUADALUPE HALL (ST. JOE'S)	613 - Dormitory	1	1961	View
2	GUADALUPE HALL (ST. MARY'S)	613 - Dormitory	1	1964	View
3	CORETTE LIBRARY	610 - Library	1	1979	View
4	NELSON STADIUM	612 - College/University	1	2000	View
1	PE CENTER	612 - College/University	1	1970	View
1	HUNTHAUSEN ACTIVITY CENTER	612 - College/University	1	2017	View

General Building Information

Building Number: 1 **Building Name:** GUADALUPE HALL (ST. JOE'S) **Structure Type:** 613 - Dormitory
Units/Building: 1 **Identical Units:** 1
Grade: G **Year Built:** 1961 **Year Remodeled:** 0
Class Code: 3150 **Effective Year:** 0 **Percent Complete:** 0

Interior/Exterior Data Section #1

Level From: 01 **Level To:** 01 **Use Type:** 055 - School

Dimensions

Area: 2,080 **Use SK Area:** 1
Perimeter: 228 **Wall Height:** 10

Features

Exterior Wall Desc: 01 - Brick or Stone **Construction:** 1-Wood Frame/Joist/Beam **Economic Life:** 40
% Interior Finished: 100 **Partitions:** 2-Normal **Heat Type:** 2-Hot Water or Steam
AC Type: 0-None **Plumbing:** 2-Normal
Physical Condition: 3-Normal **Functional Utility:** 3-Normal

Building Other Features

Description	Qty	Width	Length	Height	Area	Calculated Value	Unadjusted Value
RT2 - Patio, concrete	1	17	32	0	544	2856.084443	2856
PP1 - Porch, open	1	09	23	0	207	11287.71	11288
PP1 - Porch, open	1	16	16	0	256	13959.68	13960
EE1 - Enclosed Entry	1	16	16	0	256	18012.16	18012
PP1 - Porch, open	1	16	39	0	624	34026.72	34027
PP1 - Porch, open	1	23	23	0	529	28846.37	28846
PP1 - Porch, open	1	20	20	0	400	21812	21812
PP1 - Porch, open	1	20	21	0	417	22739.01	22739
RT2 - Patio, concrete	1	17	32	0	544	2856.084443	2856
PP1 - Porch, open	1	09	23	0	207	11287.71	11288
PP1 - Porch, open	1	16	16	0	256	13959.68	13960
EE1 - Enclosed Entry	1	16	16	0	256	18012.16	18012
PP1 - Porch, open	1	16	39	0	624	34026.72	34027

PP1 - Porch, open	1	23	23	0	529	28846.37	28846
PP1 - Porch, open	1	20	20	0	400	21812	21812
PP1 - Porch, open	1	20	21	0	417	22739.01	22739
RT2 - Patio, concrete	1	17	32	0	544	2856.084443	2856
PP1 - Porch, open	1	09	23	0	207	11287.71	11288
PP1 - Porch, open	1	16	16	0	256	13959.68	13960
EE1 - Enclosed Entry	1	16	16	0	256	18012.16	18012
PP1 - Porch, open	1	16	39	0	624	34026.72	34027
PP1 - Porch, open	1	23	23	0	529	28846.37	28846
PP1 - Porch, open	1	20	20	0	400	21812	21812
PP1 - Porch, open	1	20	21	0	417	22739.01	22739
RT2 - Patio, concrete	1	17	32	0	544	2856.084443	2856
PP1 - Porch, open	1	09	23	0	207	11287.71	11288
PP1 - Porch, open	1	16	16	0	256	13959.68	13960
EE1 - Enclosed Entry	1	16	16	0	256	18012.16	18012
PP1 - Porch, open	1	16	39	0	624	34026.72	34027
PP1 - Porch, open	1	23	23	0	529	28846.37	28846
PP1 - Porch, open	1	20	20	0	400	21812	21812
PP1 - Porch, open	1	20	21	0	417	22739.01	22739

Interior/Exterior Data Section #2

Level From: 02 **Level To:** 02 **Use Type:** 021 - Dormitory

Dimensions

Area: 9,341 **Use SK Area:** 1
Perimeter: 562 **Wall Height:** 10

Features

Exterior Wall Desc: 01 - Brick or Stone **Construction:** 1-Wood Frame/Joist/Beam **Economic Life:** 40
% Interior Finished: 100 **Partitions:** 2-Normal **Heat Type:** 2-Hot Water or Steam
AC Type: 0-None **Plumbing:** 2-Normal
Physical Condition: 3-Normal **Functional Utility:** 3-Normal

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #3

Level From: B1 **Level To:** B1 **Use Type:** 055 - School

Dimensions

Area: 10,800 **Use SK Area:** 0
Perimeter: 581 **Wall Height:** 10

Features

Exterior Wall Desc: 01 - Brick or Stone **Construction:** 1-Wood Frame/Joist/Beam **Economic Life:** 40
% Interior Finished: 100 **Partitions:** 2-Normal **Heat Type:** 2-Hot Water or Steam
AC Type: 0-None **Plumbing:** 2-Normal
Physical Condition: 3-Normal **Functional Utility:** 3-Normal

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #4

Level From: 01 **Level To:** 01 **Use Type:** 021 - Dormitory

Dimensions

Area: 9,341 **Use SK Area:** 0
Perimeter: 9273 **Wall Height:** 10

Features

Exterior Wall Desc: 01 - Brick or Stone **Construction:** 1-Wood Frame/Joist/Beam **Economic Life:** 40
% Interior Finished: 100 **Partitions:** 2-Normal **Heat Type:** 2-Hot Water or Steam
AC Type: 0-None **Plumbing:** 2-Normal
Physical Condition: 3-Normal **Functional Utility:** 3-Normal

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #5

Level From: 03 Level To: 03 Use Type: 021 - Dormitory

Dimensions

Area: 9,341 Use SK Area: 1
Perimeter: 562 Wall Height: 10

Features

Exterior Wall Desc: 01 - Brick or Stone Construction: 1-Wood Frame/Joist/Beam Economic Life: 40
% Interior Finished: 100 Partitions: 2-Normal Heat Type: 2-Hot Water or Steam
AC Type: 0-None Plumbing: 2-Normal
Physical Condition: 3-Normal Functional Utility: 3-Normal

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #6

Level From: B1 Level To: B1 Use Type: 086 - Support Area

Dimensions

Area: 621 Use SK Area: 1
Perimeter: 100 Wall Height: 10

Features

Exterior Wall Desc: 01 - Brick or Stone Construction: 1-Wood Frame/Joist/Beam Economic Life: 40
% Interior Finished: 0 Partitions: 0-None Heat Type: 0-None
AC Type: 0-None Plumbing: 0-None
Physical Condition: 3-Normal Functional Utility: 3-Normal

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #7

Level From: 03 Level To: 03 Use Type: 021 - Dormitory

Dimensions

Area: 8,412 Use SK Area: 1
Perimeter: 512 Wall Height: 10

Features

Exterior Wall Desc: 01 - Brick or Stone Construction: 1-Wood Frame/Joist/Beam Economic Life: 40
% Interior Finished: 100 Partitions: 2-Normal Heat Type: 2-Hot Water or Steam
AC Type: 0-None Plumbing: 2-Normal
Physical Condition: 3-Normal Functional Utility: 3-Normal

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #8

Level From: B1 Level To: B1 Use Type: 021 - Dormitory

Dimensions

Area: 8,412 Use SK Area: 1
Perimeter: 512 Wall Height: 10

Features

Exterior Wall Desc: 01 - Brick or Stone Construction: 1-Wood Frame/Joist/Beam Economic Life: 40
% Interior Finished: 100 Partitions: 2-Normal Heat Type: 2-Hot Water or Steam
AC Type: 0-None Plumbing: 2-Normal
Physical Condition: 3-Normal Functional Utility: 3-Normal

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #9

Level From: 02 Level To: 02 Use Type: 021 - Dormitory

Dimensions

Area: 8,412 Use SK Area: 1
Perimeter: 512 Wall Height: 10

Features

Exterior Wall Desc: 01 - Brick or Stone Construction: 1-Wood Frame/Joist/Beam Economic Life: 40
% Interior Finished: 100 Partitions: 2-Normal Heat Type: 2-Hot Water or Steam
AC Type: 0-None Plumbing: 2-Normal
Physical Condition: 3-Normal Functional Utility: 3-Normal

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #10

Level From: 01 Level To: 01 Use Type: 021 - Dormitory

Dimensions

Area: 8,412 Use SK Area: 1
Perimeter: 512 Wall Height: 10

Features

Exterior Wall Desc: 01 - Brick or Stone Construction: 1-Wood Frame/Joist/Beam Economic Life: 40
% Interior Finished: 100 Partitions: 2-Normal Heat Type: 2-Hot Water or Steam
AC Type: 0-None Plumbing: 2-Normal
Physical Condition: 3-Normal Functional Utility: 3-Normal

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #11

Level From: B1 Level To: B1 Use Type: 057 - Library

Dimensions

Area: 17,160 Use SK Area: 1
Perimeter: 532 Wall Height: 14

Features

Exterior Wall Desc: 00 - None Construction: 1-Wood Frame/Joist/Beam Economic Life: 45
% Interior Finished: 100 Partitions: 2-Normal Heat Type: 2-Hot Water or Steam
AC Type: 0-None Plumbing: 2-Normal
Physical Condition: 3-Normal Functional Utility: 3-Normal

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #12

Level From: 01 Level To: 01 Use Type: 057 - Library

Dimensions

Area: 17,860 Use SK Area: 1
Perimeter: 592 Wall Height: 14

Features

Exterior Wall Desc: 01 - Brick or Stone Construction: 1-Wood Frame/Joist/Beam Economic Life: 45
% Interior Finished: 100 Partitions: 2-Normal Heat Type: 2-Hot Water or Steam
AC Type: 0-None Plumbing: 2-Normal

Physical Condition: 3-Normal Functional Utility: 3-Normal

Building Other Features

Description	Qty	Width	Length	Height	Area	Calculated Value	Unadjusted Value
RT2 - Patio, concrete	1	17	32	0	544	2856.084443	2856
PP1 - Porch, open	1	09	23	0	207	11287.71	11288
PP1 - Porch, open	1	16	16	0	256	13959.68	13960
EE1 - Enclosed Entry	1	16	16	0	256	18012.16	18012
PP1 - Porch, open	1	16	39	0	624	34026.72	34027
PP1 - Porch, open	1	23	23	0	529	28846.37	28846
PP1 - Porch, open	1	20	20	0	400	21812	21812
PP1 - Porch, open	1	20	21	0	417	22739.01	22739
RT2 - Patio, concrete	1	17	32	0	544	2856.084443	2856
PP1 - Porch, open	1	09	23	0	207	11287.71	11288
PP1 - Porch, open	1	16	16	0	256	13959.68	13960
EE1 - Enclosed Entry	1	16	16	0	256	18012.16	18012
PP1 - Porch, open	1	16	39	0	624	34026.72	34027
PP1 - Porch, open	1	23	23	0	529	28846.37	28846
PP1 - Porch, open	1	20	20	0	400	21812	21812
PP1 - Porch, open	1	20	21	0	417	22739.01	22739
RT2 - Patio, concrete	1	17	32	0	544	2856.084443	2856
PP1 - Porch, open	1	09	23	0	207	11287.71	11288
PP1 - Porch, open	1	16	16	0	256	13959.68	13960
EE1 - Enclosed Entry	1	16	16	0	256	18012.16	18012
PP1 - Porch, open	1	16	39	0	624	34026.72	34027
PP1 - Porch, open	1	23	23	0	529	28846.37	28846
PP1 - Porch, open	1	20	20	0	400	21812	21812
PP1 - Porch, open	1	20	21	0	417	22739.01	22739
RT2 - Patio, concrete	1	17	32	0	544	2856.084443	2856
PP1 - Porch, open	1	09	23	0	207	11287.71	11288
PP1 - Porch, open	1	16	16	0	256	13959.68	13960
EE1 - Enclosed Entry	1	16	16	0	256	18012.16	18012
PP1 - Porch, open	1	16	39	0	624	34026.72	34027
PP1 - Porch, open	1	23	23	0	529	28846.37	28846
PP1 - Porch, open	1	20	20	0	400	21812	21812
PP1 - Porch, open	1	20	21	0	417	22739.01	22739

Interior/Exterior Data Section #13

Level From: 01 Level To: 01 Use Type: 055 - School

Dimensions

Area: 8,410 Use SK Area: 1
Perimeter: 714 Wall Height: 12

Features

Exterior Wall Desc: 02 - Frame Construction: 1-Wood Frame/Joist/Beam Economic Life: 40
% Interior Finished: 100 Partitions: 2-Normal Heat Type: 1-Hot Air
AC Type: 0-None Plumbing: 2-Normal
Physical Condition: 3-Normal Functional Utility: 3-Normal

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #14

Level From: 04 Level To: 04 Use Type: 055 - School

Dimensions

Area: 1,818 Use SK Area: 1
Perimeter: 238 Wall Height: 12

Features

Exterior Wall Desc: 02 - Frame Construction: 1-Wood Frame/Joist/Beam Economic Life: 40
% Interior Finished: 100 Partitions: 2-Normal Heat Type: 1-Hot Air
AC Type: 0-None Plumbing: 2-Normal
Physical Condition: 3-Normal Functional Utility: 3-Normal

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #15

Level From: 02 **Level To:** 02 **Use Type:** 055 - School

Dimensions

Area: 1,212 **Use SK Area:** 1
Perimeter: 226 **Wall Height:** 12

Features

Exterior Wall Desc: 02 - Frame **Construction:** 1-Wood Frame/Joist/Beam **Economic Life:** 40
% Interior Finished: 100 **Partitions:** 2-Normal **Heat Type:** 1-Hot Air
AC Type: 0-None **Plumbing:** 0-None
Physical Condition: 3-Normal **Functional Utility:** 3-Normal

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #16

Level From: 03 **Level To:** 03 **Use Type:** 055 - School

Dimensions

Area: 1,818 **Use SK Area:** 1
Perimeter: 238 **Wall Height:** 12

Features

Exterior Wall Desc: 02 - Frame **Construction:** 1-Wood Frame/Joist/Beam **Economic Life:** 40
% Interior Finished: 100 **Partitions:** 2-Normal **Heat Type:** 1-Hot Air
AC Type: 0-None **Plumbing:** 2-Normal
Physical Condition: 3-Normal **Functional Utility:** 3-Normal

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #17

Level From: B1 **Level To:** B1 **Use Type:** 086 - Support Area

Dimensions

Area: 3,600 **Use SK Area:** 1
Perimeter: 240 **Wall Height:** 15

Features

Exterior Wall Desc: 02 - Frame **Construction:** 1-Wood Frame/Joist/Beam **Economic Life:** 40
% Interior Finished: 100 **Partitions:** 2-Normal **Heat Type:** 2-Hot Water or Steam
AC Type: 0-None **Plumbing:** 0-None
Physical Condition: 3-Normal **Functional Utility:** 3-Normal

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #18

Level From: 01 **Level To:** 01 **Use Type:** 055 - School

Dimensions

Area: 28,421 **Use SK Area:** 0
Perimeter: 673 **Wall Height:** 40

Features

Exterior Wall Desc: 02 - Frame **Construction:** 1-Wood Frame/Joist/Beam **Economic Life:** 40
% Interior Finished: 100 **Partitions:** 2-Normal **Heat Type:** 2-Hot Water or Steam
AC Type: 0-None **Plumbing:** 2-Normal
Physical Condition: 3-Normal **Functional Utility:** 3-Normal

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #19

Level From: 02 **Level To:** 02 **Use Type:** 055 - School

Dimensions

Area: 7,320
Perimeter: 320

Use SK Area: 0
Wall Height: 14

Features

Exterior Wall Desc: 02 - Frame

Construction: 1-Wood Frame/Joist/Beam

Economic Life: 40

% Interior Finished: 100

Partitions: 2-Normal

Heat Type: 2-Hot Water or Steam

AC Type: 0-None

Plumbing: 2-Normal

Physical Condition: 3-Normal

Functional Utility: 3-Normal

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #20

Level From: 01

Level To: 01

Use Type: 055 - School

Dimensions

Area: 15,594
Perimeter: 638

Use SK Area: 1
Wall Height: 12

Features

Exterior Wall Desc: 02 - Frame

Construction: 1-Wood Frame/Joist/Beam

Economic Life: 40

% Interior Finished: 100

Partitions: 2-Normal

Heat Type: 2-Hot Water or Steam

AC Type: 0-None

Plumbing: 2-Normal

Physical Condition: 3-Normal

Functional Utility: 3-Normal

Building Other Features

Description	Qty	Width	Length	Height	Area	Calculated Value	Unadjusted Value
RT2 - Patio, concrete	1	17	32	0	544	2856.084443	2856
PP1 - Porch, open	1	09	23	0	207	11287.71	11288
PP1 - Porch, open	1	16	16	0	256	13959.68	13960
EE1 - Enclosed Entry	1	16	16	0	256	18012.16	18012
PP1 - Porch, open	1	16	39	0	624	34026.72	34027
PP1 - Porch, open	1	23	23	0	529	28846.37	28846
PP1 - Porch, open	1	20	20	0	400	21812	21812
PP1 - Porch, open	1	20	21	0	417	22739.01	22739
RT2 - Patio, concrete	1	17	32	0	544	2856.084443	2856
PP1 - Porch, open	1	09	23	0	207	11287.71	11288
PP1 - Porch, open	1	16	16	0	256	13959.68	13960
EE1 - Enclosed Entry	1	16	16	0	256	18012.16	18012
PP1 - Porch, open	1	16	39	0	624	34026.72	34027
PP1 - Porch, open	1	23	23	0	529	28846.37	28846
PP1 - Porch, open	1	20	20	0	400	21812	21812
PP1 - Porch, open	1	20	21	0	417	22739.01	22739
RT2 - Patio, concrete	1	17	32	0	544	2856.084443	2856
PP1 - Porch, open	1	09	23	0	207	11287.71	11288
PP1 - Porch, open	1	16	16	0	256	13959.68	13960
EE1 - Enclosed Entry	1	16	16	0	256	18012.16	18012
PP1 - Porch, open	1	16	39	0	624	34026.72	34027
PP1 - Porch, open	1	23	23	0	529	28846.37	28846
PP1 - Porch, open	1	20	20	0	400	21812	21812
PP1 - Porch, open	1	20	21	0	417	22739.01	22739
RT2 - Patio, concrete	1	17	32	0	544	2856.084443	2856
PP1 - Porch, open	1	09	23	0	207	11287.71	11288
PP1 - Porch, open	1	16	16	0	256	13959.68	13960
EE1 - Enclosed Entry	1	16	16	0	256	18012.16	18012
PP1 - Porch, open	1	16	39	0	624	34026.72	34027
PP1 - Porch, open	1	23	23	0	529	28846.37	28846
PP1 - Porch, open	1	20	20	0	400	21812	21812
PP1 - Porch, open	1	20	21	0	417	22739.01	22739

Interior/Exterior Data Section #21

Level From: 03 **Level To: 03** **Use Type: 055 - School**

Dimensions

Area: 1,800 **Use SK Area: 0**
Perimeter: 136 **Wall Height: 14**

Features

Exterior Wall Desc: 02 - Frame **Construction: 1-Wood Frame/Joist/Beam** **Economic Life: 40**
% Interior Finished: 100 **Partitions: 2-Normal** **Heat Type: 2-Hot Water or Steam**
AC Type: 0-None **Plumbing: 2-Normal**
Physical Condition: 3-Normal **Functional Utility: 3-Normal**

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #22

Level From: 01 **Level To: 01** **Use Type: 055 - School**

Dimensions

Area: 17,212 **Use SK Area: 0**
Perimeter: 542 **Wall Height: 20**

Features

Exterior Wall Desc: 02 - Frame **Construction: 1-Wood Frame/Joist/Beam** **Economic Life: 40**
% Interior Finished: 100 **Partitions: 2-Normal** **Heat Type: 2-Hot Water or Steam**
AC Type: 1-Central **Plumbing: 2-Normal**
Physical Condition: 5-Excellent **Functional Utility: 4-Good**

Building Other Features

Description	Qty	Width	Length	Height	Area	Calculated Value	Unadjusted Value
RT2 - Patio, concrete	1	17	32	0	544	2856.084443	2856
PP1 - Porch, open	1	09	23	0	207	11287.71	11288
PP1 - Porch, open	1	16	16	0	256	13959.68	13960
EE1 - Enclosed Entry	1	16	16	0	256	18012.16	18012
PP1 - Porch, open	1	16	39	0	624	34026.72	34027
PP1 - Porch, open	1	23	23	0	529	28846.37	28846
PP1 - Porch, open	1	20	20	0	400	21812	21812
PP1 - Porch, open	1	20	21	0	417	22739.01	22739
RT2 - Patio, concrete	1	17	32	0	544	2856.084443	2856
PP1 - Porch, open	1	09	23	0	207	11287.71	11288
PP1 - Porch, open	1	16	16	0	256	13959.68	13960
EE1 - Enclosed Entry	1	16	16	0	256	18012.16	18012
PP1 - Porch, open	1	16	39	0	624	34026.72	34027
PP1 - Porch, open	1	23	23	0	529	28846.37	28846
PP1 - Porch, open	1	20	20	0	400	21812	21812
PP1 - Porch, open	1	20	21	0	417	22739.01	22739
RT2 - Patio, concrete	1	17	32	0	544	2856.084443	2856
PP1 - Porch, open	1	09	23	0	207	11287.71	11288
PP1 - Porch, open	1	16	16	0	256	13959.68	13960
EE1 - Enclosed Entry	1	16	16	0	256	18012.16	18012
PP1 - Porch, open	1	16	39	0	624	34026.72	34027
PP1 - Porch, open	1	23	23	0	529	28846.37	28846
PP1 - Porch, open	1	20	20	0	400	21812	21812
PP1 - Porch, open	1	20	21	0	417	22739.01	22739
RT2 - Patio, concrete	1	17	32	0	544	2856.084443	2856
PP1 - Porch, open	1	09	23	0	207	11287.71	11288
PP1 - Porch, open	1	16	16	0	256	13959.68	13960
EE1 - Enclosed Entry	1	16	16	0	256	18012.16	18012
PP1 - Porch, open	1	16	39	0	624	34026.72	34027
PP1 - Porch, open	1	23	23	0	529	28846.37	28846
PP1 - Porch, open	1	20	20	0	400	21812	21812

PP1 - Porch, open	1	20	21	0	417	22739.01	22739
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Interior/Exterior Data Section #23

Level From: 01 Level To: 01 Use Type: 055 - School

Dimensions

Area: 783 Use SK Area: 1
Perimeter: 112 Wall Height: 41

Features

Exterior Wall Desc: 02 - Frame Construction: 1-Wood Frame/Joist/Beam Economic Life: 40
% Interior Finished: 100 Partitions: 2-Normal Heat Type: 2-Hot Water or Steam
AC Type: 1-Central Plumbing: 2-Normal
Physical Condition: 5-Excellent Functional Utility: 4-Good

Building Other Features

No other features exist for this interior/exterior detail

Interior/Exterior Data Section #24

Level From: 01 Level To: 01 Use Type: 055 - School

Dimensions

Area: 4,682 Use SK Area: 0
Perimeter: 260 Wall Height: 30

Features

Exterior Wall Desc: 02 - Frame Construction: 1-Wood Frame/Joist/Beam Economic Life: 40
% Interior Finished: 100 Partitions: 2-Normal Heat Type: 2-Hot Water or Steam
AC Type: 1-Central Plumbing: 2-Normal
Physical Condition: 5-Excellent Functional Utility: 4-Good

Building Other Features

No other features exist for this interior/exterior detail

Elevators and Escalators

No elevators or escalators exist for this building

Ag/Forest Land

Ag/Forest Land

No ag/forest land exists for this parcel

SECTION 11 68 24
OUTDOOR ATHLETIC EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY OF WORK

- A. The work consists solely of the supply, shipping, technical support, and warranty service of various athletic equipment components as further specified and approved.
- B. Where specifically stated, it is the responsibility of the vendor to certify that the products or assemblies supplied meet or exceed the reference standards when installed per the manufacturers printed instructions, previously provided as a condition of approval.
- C. The supplier is responsible for shipping all equipment to the Contract site in a new condition. Products received in a condition that is in any way deficient shall be replaced by the vendor in a timely manner, generally shipping within 72 hours of notice by any means.
- D. The vendor shall provide technical support to the Contractor where necessary and as requested.
- E. Equipment includes the following, as further described elsewhere;

Football

- 1. (2) Hinged Goal Post
- 2. (2) Ground Kit
- 3. (2) Goal post pad
- 4. (12) pylons

Soccer

- 1. (2) Portable Soccer Goals
- 2. (4) Ground Anchor Kits
- 3. (4) Corner flags

1.02 REFERENCE STANDARDS

NCAA Football Rules (Latest edition)
NCAA Soccer Rules (Latest edition)

1.03 QUALITY ASSURANCE

- A. Equipment supplied must be as previously approved. Inclusion of product data in the formal proposal shall constitute a product submittal. Execution of a qualified purchase order shall qualify as approval of the submittal.
- B. Dimensional Accuracy
 - 1. It is the Vendors responsibility to insure that the dimensions of any product supplied meet those required by the Reference Standard claimed.
 - 2. Unit Conversion

Where not otherwise stated, 1 meter shall be converted as 3.280839'.

- C. Products must be received in a like new condition. Any materials that are scratched, dented, misshapen, missing parts or otherwise deficient upon unpacking shall be replaced by the vendor within 72 hours of notice by the Contractor.

PART 2 - PRODUCTS

2.01 FOOTBALL GOAL POSTS

- A. Mounting Style: Rotating and Hinged Base Plate Mounting Style
- B. Anchor Plate: The anchor plate shall consist of four (4) "J" hook anchor bolts with anchor plate welded to main standard.
- C. Main Standard (Gooseneck): The main standard shall be constructed from 6 inch outside diameter Schedule 40, 6061-T6 aluminum or Schedule 40 steel pipe. The pipe shall be curved to provide an 8 foot horizontal offset from the ground sleeve to the crossbar with a 5 foot radius bend.
- D. Crossbars: The crossbar shall be constructed from minimum 6 inch outside diameter Schedule 40 6061-T6 aluminum pipe. The crossbar shall extend 18'-6" in accordance with NCAA requirements.
- E. Uprights: The upright shall be constructed from minimum 4 inch outside diameter Schedule 40 6061-T6 aluminum pipe. The uprights shall extend 30 feet above the crossbar.
- F. Provide two (2) round post protector pads for 6" diameter posts. Pads to be 6" thick cylindrically high-density polyurethane foam with rear cut out for fitting onto post. A minimum nylon reinforced vinyl covert is to be provided to completely enclose foam pad with Velcro closure. Pads to be 6' high. Color shall be as selected by Owner from the approved manufacturers standard color range, to include contrasting 9" vinyl lettering arranged vertically, verbiage to be determined.
- G. Posts, crossbars and uprights to have two-coat catalyzed polyurethane finish. Color to be selected by Owner. Manufacturer Reference:

Football Goal Posts to be Sportsfield Specialties Inc. GP830ADJRGH, with anchors, and GP4570RH Access Frame Kit, or equal.

2.02 PORTABLE SOCCER GOALS

- A. General: Soccer goals to be in full compliance with NCAA regulations in all respects. Goals to provide an 8' x 24' front inside opening. Goals to be portable.
- B. Crossbar and Uprights: The crossbars and uprights shall consist of a single length of 4.5 inch OD 6063 T-5 aluminum D shaped tubing or 4-3/8 inch OD Rams Aluminum tubing.
- C. The goal frame and supports shall be finished with a white polyester powder coat finish.
- D. Each goal shall have a wheel kit.
- E. All hardware and fasteners shall be stainless steel.
- F. The goals shall include white 4mm polyethylene or polypropylene twine nets.
- G. Warranty: Goals to be warranted by manufacturer for a minimum period of 5 years.

H. Manufacturer Reference:

Kwik Goal 2B3406SW EVO 2.1.
Sportsfield Specialties Model SG4950.
Or approved equal.

2.03 SOCCER GOAL ANCHOR

- A. Unit shall be pre-manufactured unit consisting of an access box, cover and tethering assembly suitable for securing the backbar/backstay of a soccer goal unit. Provide two per goal.
- B. Access box to be fabricated of .125" aluminum and 16 ga. stainless steel.
- C. Cover to be fabricated of .25" aluminum and 3/4" marine plywood.
- D. Tethering to be coated aircraft cable.
- E. All connections to be welded or secured with stainless steel hardware.
- F. Manufacturer Reference: Soccer Goal Anchor shall be Aluminum Athletic Equipment or approved equal.
- G. Synthetic Turf Cover to identically match synthetic turf system used for field surfaces.

2.04 PYLON MARKERS

- A. Furnish at each corner of football field end zone and at the inbounds locations, a total of twelve (12) pylons required. The pylon markers furnished shall be weighted base, portable type which will topple over on impact. The pylons to be 4" x 4" x 18" high covered with red-orange vinyl.
- B. Furnish at each corner of soccer field, four (4) weighted soccer flags. The soccer flags shall be weighted base, portable type which will topple over on impact. The soccer flags shall be 70" high and shall meet NCAA requirements.
- C. Football pylons to be Gilman WP12, or approved equal.
- D. Soccer pylons to be Gilman WSF, or approved equal.

PART 3 - EXECUTION

3.01 SHIPPING

- A. Unless negotiated otherwise, the supplier is responsible for shipping directly to the project site.
- B. All products must be received in their original manufacturers shipping packaging, in new condition. Products received scratched, dented, marred, discolored, or otherwise defective shall be re-shipped within 72 hours of notice by the Contractor.
- C. Return shipping of defective items will be paid for by the supplier.

3.02 WARRANTY

- A. All products shall be covered by a 1-year warranty covering replacement and shipping.

3.03 INSTALLATION

- A. Installation of all elements shall be in accordance with the manufacturer's instructions and as shown in the details.

END OF SECTION

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SECTION 31 22 16
FIELD SUBGRADE ESTABLISHMENT

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, material and equipment for the earthwork related to establishment of a finished subgrade for the synthetic turf field area. Work includes but is not limited to the following:
 - 1. Layout and engineering;
 - 2. Management of the construction sequencing and scheduling relative to soil moisture content and the use of onsite material as fill;
 - 3. Excavation, filling, back filling and compacting;
 - 4. Subgrade scarification, drying, and re-compaction as required;
 - 5. Compaction, compaction testing, and establishment of subgrade;
 - 6. Verification of compliance with the specified planarity tolerances.

1.02 EXISTING SITE CONDITIONS

- A. Refer to drawings for topographical and existing condition information and the geotechnical report for site soil conditions.
- B. Carefully maintain benchmarks, monuments and other reference points. If disturbed or destroyed, replace as directed. It is the responsibility of the Contractor to familiarize themselves with all records of existing utilities in area of site work.
- C. The Contractor shall contact the appropriate utility agencies for identification of underground utility location.

1.03 TEMPORARY EROSION AND SILTATION CONTROL

- A. All work shall conform to the erosion and sedimentation control requirements of the local jurisdiction including installation of siltation control such as filter fabric fences, check dams, sedimentation basins, etc.

1.04 EXISTING UTILITIES

- A. The Contractor shall coordinate all existing utilities prior to proceeding with demolition and earthwork activity. Protect any active pipes encountered.

1.05 DUST CONTROL

- A. Protect persons and property from damage and discomfort caused by dust. Water as necessary to quell dust.

1.06 ROADWAY PROTECTION

- A. Provide wheel-cleaning stations to clean wheels and undercarriage of trucks before leaving site, as necessary to prevent dirt from being carried onto public streets. If streets are fouled, they must be cleaned immediately in conformance with the requirements of the local jurisdiction as applicable. This requirement applies to all vehicle movements for the entire period of construction.

1.07 TRAFFIC REGULATION

- A. Conduct operations in such a manner to avoid unnecessary interference to existing traffic. Minimize heavy vehicle traffic to and from site during peak traffic hours. Do not park vehicles in traffic lanes. Provide flagmen as required. Conform to traffic control requirements of the local jurisdiction.
- B. Contractor shall be responsible for all traffic control and emergency call outs resulting from Contractor operations.
- C. Maintain fire lanes, roadways and alleys to existing buildings continuously, as required by the fire department having jurisdiction.
- D. Existing walkways and roadways leading past the construction shall remain clear and safe at all times. Provide barriers, flashing lights, walkways, guardrails and night lighting as required for safety and control.

1.08 RELATED WORK IN OTHER SECTIONS

Refer to Earthwork for general site grading requirements.
33 46 16 Field Subsurface Drainage
33 46 23 Field Permeable Aggregate

PART 2 - PRODUCTS

Not Applicable

PART 3 – EXECUTION

3.01 FIELD LAYOUT AND ENGINEERING

- A. The General Contractor shall be responsible for the vertical and horizontal layout of all work and control points required to construct all work in accordance with the drawings and specifications.

3.02 SEQUENCING AND SCHEDULING

- A. All new cut and fill areas shall be seal rolled at the end of each day to minimize moisture penetration.

3.03 EXCAVATED MATERIALS

- A. Suitable excavated material may be utilized as fill. Any excess material is to be disposed of offsite.

3.04 FIELD SUBGRADE AREAS

- A. All areas are to be compacted to 95% of maximum density by mechanical means. The Contractor shall be responsible for maintaining appropriate soil moisture prior to and during compaction activities, the cost of which is to be included in the contract price.
- B. Care must be exercised during grading of the subgrade so as to achieve a uniform, true surface relative to finish grade.
- C. Fill must be select material to be free of organic matter, clay, concrete and other extraneous

material, compactable to a minimum of 95% density. Fill shall be placed and compacted in lifts of 12" maximum loose depth.

- D. Finish subgrade for the synthetic turf field_areas shall be compacted to a 95% maximum density. Subgrade shall be established to within the tolerance of +0.00' or - 0.10' of the design subgrade elevation for these areas.
- E. Upon completion of the subgrade establishment and Contractor confirmation for conformance with the tolerance, the Contractor shall notify the Engineer and schedule an inspection for approval. The Contractor shall have a laser plane system with slope control available to the Engineer for the inspections. The Contractor shall not be authorized to install the subsurface drainage system until the subgrade has been inspected and approved by the Engineer.

END OF SECTION

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SECTION 32 18 23
SYNTHETIC TURF SURFACING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Scope of work to include all labor, material, equipment, transportation and services to install complete new vertically draining in-filled synthetic turf surfacing system as shown and described. System to be as herein specified including, but not specifically limited to the following:

Base Proposal:

1. The field shall be manufactured from a combination of long parallel slit film and monofilament.
2. Markings shall include football, soccer, softball, as well as a mid-field logo, checkered end zones, and sideline lettering as shown on the approved shop drawings.
3. Field Infill System shall consist of a combination of sand and SBR rubber.

Proposal Additive Alternate:

4. Installation of field underlayment/supplemental pad system consisting of either a 23mm polypropylene panels or a 25mm paved in place elastic layer pad at the field area.

- B. Other requirements of synthetic turf surfacing system shall include:

1. Product submittals including samples, technical data, shop drawings etc.
2. Independent testing of the synthetic turf materials prior to shipment to the project site;
3. Delivery of the synthetic turf materials (not including infill) a minimum of 1 week prior to the scheduled installation of the materials;
4. Review and acceptance or certification of the existing permeable aggregate as it applies to installation of turf system, permeability and warranty implementation;
5. Installation of complete vertical draining synthetic turf surfacing system.
6. Installation of tufted and inlaid field lines and markings as indicated on the drawings.
7. Provide extra turf materials to the Owner for future repair and protective purposes.
8. Provide all appropriate maintenance and repair manuals and warranty package to Owner.
9. Provide warranty package to Owner. Warranty shall include a pre-paid insurance policy in support of the warranty required for the field, for the entire warranty period from an A-rated domestic insurance carrier.

1.02 SYNTHETIC TURF SURFACING PERFORMANCE & PAYMENT BOND

- A. The Synthetic Turf Contractor shall provide a performance and payment bond to the General Contractor for the full subcontract amount of the synthetic turf surfacing system including materials, assembly, shipping, and installation. A copy of the performance and payment bond must be provided to the Owner within 14 days of the issuance of the notice to proceed.
- B. The performance and payment bond must be provided in the name of the same corporate entity that provides the warranty for the synthetic turf surfacing system to the Owner.

1.03 SYNTHETIC TURF SURFACING PRODUCTS

- A. The following vendors and corresponding products are pre-approved for the Synthetic Turf Field surface: Shaw Game On or pre-approved equal

- B. All vendors that are not included as a pre-approved product shall submit a request. The request must be submitted a minimum of 6 business days prior to the submittal date for the Synthetic Turf Surfacing proposals. Requests must include the following information for evaluation :
1. Vendor Background and Experience: Describe your firm's history. Include information identifying the firm's annual volume and the firm's stability in the marketplace. Also include the firm's record relating to installation schedules and performance.
 2. Provide information regarding local representation, and post-installation support.
 3. Provide proof of bondability.
 4. Product Manufacturer Background and Experience: Describe the history and experience of the product manufacturer with this specific product including years of experience and a count and listing of North American and worldwide synthetic turf field installations. The list shall include field locations, client, client contact names, address, telephone, material installed, date of installation, and general contractor (if any).
 5. Product Installer Background and Experience: Describe the history and experience of the product installer with this specific product including years of experience and a count and listing of field installations. The list shall include field locations, client, client contact names, address, telephone, material installed, date of installation, and general contractor (if any). If the installer is not the manufacturer or vendor of the product, describe the experience the installer has with this specific product.
 6. Product Samples: Provide the following samples with the substitution request.
Two 8"x 12" samples each of green turf without infill material showing backing with perforations.
Two 8" x 12" samples each of turf with the infill material.
Two samples of the proposed in-fill material.
 7. Product Specification: Provide specification for the proposed synthetic turf product.
 8. Product Performance: The samples submitted with the proposal will be reviewed and evaluated. As a supplement to the samples, provide a written description of the following performance criteria for the proposed synthetic turf surfacing system:
 - a. Abrasive characteristics
 - b. Weekly, Monthly, and Annual Maintenance Requirements
 - c. Playability for Football and Soccer
 - d. Wet and Dry Traction
 9. References: Supply a minimum of ten references, including contact name and telephone number, for other installations of this product.

1.04 APPROVED FIBER MANUFACTURERS

- A. The following fiber manufacturers are pre-approved for the In-filled Synthetic Turf Systems:
- Shaw, Tencate
- B. The synthetic turf vendor shall provide written documentation in the form of a signed affidavit certifying the source of the fiber used for the field including both green and any other colors used for the lines and markings.
- C. Fiber shall be certified in writing to have less than 50 ppm or less of lead from both the fiber supplier and the turf vendor.

1.05 MINIMUM QUALIFICATIONS FOR SYNTHETIC TURF SYSTEM

- A. Approved Synthetic Turf System shall be manufactured, sold, and warranted by a single vendor. Manufacture of the system shall include, at a minimum, assembly of the constituent components, i.e. tufting, of the specified fiber into an approved backing.

- B. The manufacturer of the synthetic turf system must have produced a minimum of fifty (50) successful in-filled fields of full size and outdoors within the past two (2) years.
- C. Installer of the synthetic turf system must have installed either a minimum of ten (10) successful in-filled synthetic turf football or soccer fields of full size within the past two (2) years or a minimum of twenty (20) successful in-filled synthetic turf football or soccer fields of full size within the past five (5) years. The installer shall have installed a minimum of five (5) successful in-filled synthetic turf football or soccer fields of full size with the product vendor.

1.06 RELATED WORK SPECIFIED IN OTHER SECTIONS

33 46 23 Field Permeable Aggregate

1.07 STANDARD SPECIFICATIONS

American Society for Testing Materials (ASTM), (latest edition) for material and testing standards
 NCAA Rules for Football
 NCAA Rules for Soccer
 NCAA Rules for Softball

1.08 POST AWARD SUBMITTALS

- A. Shop Drawings: submit to the Engineer complete and detailed drawings showing all component parts of the synthetic turf system. The shop drawings shall be drawing to scale (1"=20') and shall include:
 - 1. total depth of infill
 - 2. edge details
 - 3. insert details including backing material
 - 4. seam details
 - 5. seam layout
 - 6. gluing patterns
 - 7. dimensional shop drawing for all field lines, markings and boundaries
- B. Synthetic Turf Samples: submit to the Owner:
 - 1. Two 12"x 12" samples each of each color turf showing backing with perforations.
 - 2. Two 12" x 12" samples each of turf showing method of seam makeup with perforations. One sample to have example of inlaid lines.
 - 3. Two 12" x 12" samples each of the other colors proposed for use on the field for lines and markings.
 - 4. Two 1-pound samples of the proposed In-fill material(s).
- C. Manufacturer's Specifications and Warranty:
 - 1. Submit to the Engineer selected manufacturer's material specifications and installation instructions. Include detailed specifications of manufacturer's provisions for achieving permeability, stating rate in infiltration and permeability in inches per hour of system materials for the vertical draining system.
 - 2. Submit to the Engineer warranty package herein specified for review.
- D. Testing and Quality Control: Submit to the Engineer the following test results for the system specified. An independent testing laboratory experience with testing of synthetic turf or

carpeting materials shall certify these tests. The qualifications of the testing laboratory to be utilized for the submittal and the pre-shipment testing shall be submitted to the Engineer for approval. Applicable minimum material ASTM tests:

1. Dynamic Cushion Test - ASTM F355, Procedure A, (system); ASTM F355 procedure A at the 24" drop.
2. Yarn and fabric characteristics.
3. Pill Burn Test – ASTM D2859

E. Maintenance and Operating Data:

1. Prior to acceptance and/or occupancy by the Owner, furnish to the Owner two (2) copies in hard cover form of maintenance and operating data with imprinted Project, Owner, Engineer, Contractor and Turf Subcontractor names, and date of turf system installation.
2. In addition, provide descriptions of any equipment recommended for maintenance and repair, citing specific vendors for each unit.
3. Use and Limitations - Provide a separate page stating approved activity usage for the turf and activities not recommended relative to warranty.
4. Index - Index with tab dividers for data as follows: Materials installed with their characteristics:
 - a. General maintenance
 - b. Small repair procedures
 - c. Minor seam repair
 - d. Discussion of precautions to be practiced, general maintenance, and uses to avoid to protect turf surface and to maintain installation's warranty
 - e. Recommendations for paint application and removal of lines and markings.

1.09 PRE-SHIPMENT SUBMITTALS

- A. Prior to shipment of the synthetic turf materials to the job site, synthetic turf material from every sixth roll shall be randomly sampled and the tested by an independent testing laboratory experience with testing synthetic turf materials. The testing laboratory shall be completely independent with no ties to the turf manufacturer. The testing shall include the following:

<u>Item</u>	<u>ASTM</u>	<u>Property</u>
1.	FTIR Spectrograph	Pile Composition
2.	D418	Pile Weight
3.	D418	Total Weight
4.	D418	Pile Height
5.	D418	Backing Perforation Diameter and Spacing
6.	D1335	Tuft Bind (without infill)
7.	D1682	Grab/Tear Strength.

- B. Copies of the test results shall be transmitted to the Owner and Engineer directly from the testing laboratory. The synthetic turf materials shall not be shipped to the site without written authorization from the Engineer after the Owner and Engineer have approved the test results.
- C. Samples of the synthetic turf material tested from every sixth (6th) roll shall also be transmitted to the Engineer for approval by the independent testing laboratory prior to shipment of the synthetic turf materials to the job site. Sample size shall be minimum 12" x 12".
- D. All fees and costs associated with the pre-shipment sampling and testing shall be paid by the Contractor.

1.10 CERTIFICATION OF THE BASE

- A. The Synthetic Turf Surfacing Contractor shall furnish to the Owner, prior to the synthetic turf system installation as applicable, a written certification of the acceptability by the turf vendor of the permeable aggregate for installation and warranty validation.

1.11 TURF SYSTEM HOLD HARMLESS

- A. The synthetic turf manufacturer and installer shall not infringe upon any current or pending patents held by other synthetic turf manufacturers or installers.
- B. The Contractor, their synthetic turf subcontractor, and the synthetic turf manufacturer shall hold the Owner, Owner's Representative, and the Engineer harmless from infringement of any current or future patent issued for the synthetic turf surfacing system, installation methods and vertical draining characteristics. A notarized statement shall be provided as part of the submittal package.

1.12 WARRANTY OF SYNTHETIC TURF

- A. Warranty shall cover, in general, the usability of the turf surface, accessories, use characteristics, and suitability of the installation. All items covered by warranty are to be replaced or repaired with new materials, including installation at the sole expense of the warranting contractor for the period of eight (8) years to the Owner, for the designated uses enumerated as follows:
 - Football
 - Soccer
 - Lacrosse
 - Softball
 - Ultimate
 - Physical exercises
 - Snow removal
 - Pneumatic rubber-tired maintenance and service vehicles
 - Pedestrian traffic and other similar uses
 - Ceremonial and Entertainment Events
- B. A principal of the applicable firm, duly-authorized to make contracts, shall sign the turf vendor warranty. If the turf vendor is not the manufacturer, the manufacturing firm shall also sign the warranty. The term "Contractor" contained herein means the firm furnishing warranty. "Owner" is the Carroll College. Warranty period shall be a minimum of eight years from date of acceptance of the installed system by the Owner.
- C. Furnish a pre-paid insurance policy in support of the warranty required for the field, for the entire warranty period from an A-rated domestic insurance carrier. The warranty shall be secured to the Owner with an insurance policy of not less than \$300,000 per claim and an aggregate of \$5,000,000.

1.13 FORM OF WARRANTY OF SYNTHETIC TURF SYSTEM

- A. Contractor hereby warrants to Owner, subject to the limitations and conditions set forth below, that its synthetic turf system consisting of synthetic turf described as _____, and the adhesives used in the installation, is free from defects in material and workmanship and shall, for a period of eight years as applicable from the date of acceptance by the Owner, remain serviceable for multiple sports activities.

- B. Contractor warrants to the Owner that its synthetic turf materials shall not fade, fail, shrink, wrinkle, or reflect excessive wear. Contractor shall, at their sole expense and cost, replace such areas of the synthetic turf system not performing to these standards for the life of the warranty.
- C. Definitions
1. The term "not fade" in the context of this warranty shall mean that the synthetic turf material shall remain a uniform shade of green, or other colors installed, with no significant loss of color.
 2. The term "not fail" or "excessive wear" as used in the context of this warranty shall mean that the length and weight of the face yarn or pile material in the synthetic turf surface above the infill materials shall not have been decreased by more than 10% per year according to ASTM D418, nor exceed 50% during the warranty period. In the event that the synthetic turf system does not retain its fiber height or shock absorbency and is consequently no longer serviceable during the warranty period, the Contractor shall, at their sole expense, replace such portion of the system that is no longer serviceable.
 3. The term "serviceable" in the context of this warranty shall mean that the synthetic turf system for the soccer field shall have a maximum "G" value according to ASTM F1936-10 and Procedure A, ASTM F355, not to exceed 120G's at any location upon installation and shall not exceed 160G's throughout life of the warranty period. This shall be determined by conducting dynamic cushioning tests at the locations designated in ASTM F1936-10 and at corners of the soccer penalty boxes at opposite sides of the field. Any increase from 120G's to allowable 160-G's maximum shall be at a relative uniform rate not to exceed 15 G's in any single yearly period.
- D. Where applicable, the fabric seams shall remain attached to the underlying surface over the warranty period and shall not separate or become unglued or unattached, as applicable.
- E. Contractor warrants to the Owner that the permeable synthetic system shall drain vertically a minimum of 20 inches precipitation per hour without visible surface ponding.
- F. Contractor shall replace with new materials, at their sole expense, any damage to the synthetic turf system that extends more than 3 feet beyond the location of foreign combustibles, which may ignite and fire-damage the synthetic turf system. The Contractor shall not be held liable for any incidental or consequential damages. These warranties and the Contractor's obligations here-under are expressly conditioned upon;
1. The Owner making all minor repairs to the synthetic turf system upon the discovery of the need for such repairs;
 2. The Owner maintaining and properly caring for the synthetic turf system in accordance with the Contractor's maintenance manual and instructions;
 3. The Owner complying with the dynamic and static load specifications established by the Contractor.
- G. The warranty is not to cover any defect, failure, damage or undue wear in or to the synthetic turf system caused by or connected with abuse, neglect, deliberate acts, act of God, casualty, static or dynamic loads exceeding Contractor's recommendations, footwear having cleats, spikes, or similar projections other than conventional baseball, football, soccer, or rugby shoes having cleats of not more than 1/2" in length, and other conventional running track shoes having spikes of not more than 1/4" in length, or use of improper cleaning methods.
- H. Contractor shall be allowed to examine the synthetic turf system regarding any claim that the Owner makes to be present at any time, to analyze the results of all tests conducted by the

Owner or others, and to conduct such tests of their own. Contractor shall not be responsible for any costs or expenses incurred by the Owner or others with respect to such tests, except the Contractor shall pay for costs of all tests and analysis conducted or directed by their representative.

- I. In the event the Contractor does not respond to the Owner's written notice within 10 days of receipt of notice or does not submit, schedule and execute corrective work within 30 days for any material replacement and within 5 days for work limited to repairs of existing materials or repair that can be made with attic stock materials, the Owner has the option of having the work performed at the expense of the Contractor.
- J. Sample form of warranty herein set forth is a suggested form for use for the work under this section. Manufacturer's standard form of warranty may be used provided all conditions specified are incorporated. All claims by the Owner under this warranty must be made in writing to Contractor's address at _____ within 30 days after the Owner learns of the defect giving rise to the claim. This warranty shall constitute a contract made in the State of Montana and shall be governed by the laws thereof.

1.14 FORM OF WARRANTY FOR SUPPLEMENTAL PAD SYSTEM (ADDITIVE ALTERNATE)

- A. Contractor hereby warrants to Owner, subject to the limitations and conditions set forth below, that field underlayment system consisting of _____, is free from defects in material and workmanship and shall, for a period of eight years from the date of acceptance by the Owner, remain serviceable for multiple sports and snow removal activities.
- B. Contractor warrants to the Owner that its field underlayment materials shall remain permeable and shall not fail, shrink or buckle. Contractor shall, at their sole expense and cost, replace such areas of the field underlayment system not performing to these standards for the life of the warranty.
- C. Definitions
 - 1. The term "permeable" in the context of this warranty shall mean that the field underlayment material shall provide a minimum vertical drainage rate of 20 inches per hour.
 - 2. The term "not shrink" in the context of this warranty shall mean that the field underlayment panels shall remain butted together without gaps exceeding ¼ inch in any location across the field.
 - 3. The term "buckle" in the context of this warranty shall mean that the field underlayment shall lay flat on the base without warping or creating surface irregularities in excess of ¼ inch.
- D. Contractor shall replace with new materials, at their sole expense, any field underlayment materials that do not comply with these warranty requirements.
- E. These warranties and the Contractor's obligations here-under are expressly conditioned upon;
 - 1. The Owner maintaining and properly caring for the synthetic turf and field underlayment system in accordance with the Contractor's maintenance manual and instructions;
 - 2. The Owner complying with the dynamic and static load specifications established by the Contractor.
- F. The warranty is not to cover any defect, failure, damage caused by or connected with abuse, neglect, deliberate acts, act of God, casualty, static or dynamic loads exceeding Contractor's

recommendations.

- G. Contractor shall be allowed to examine the field underlayment system regarding any claim that the Owner makes to be present at any time, to analyze the results of all tests conducted by the Owner or others, and to conduct such tests of their own. Contractor shall not be responsible for any costs or expenses incurred by the Owner or others with respect to such tests, except the Contractor shall pay for costs of all tests and analysis conducted or approved by the Owner's Representative.
- H. In the event the Contractor does not respond to the Owner's written notice within 10 days of receipt of notice or does not submit, schedule and execute corrective work within 30 days, the Owner has the option of having the work performed at the expense of the Contractor.
- I. Sample form of warranty herein set forth is a suggested form for use for the work under this section. Manufacturer's standard form of warranty may be used provided all conditions specified are incorporated. All claims by the Owner under this warranty must be made in writing to Contractor's address at _____ within 30 days after the Owner learns of the defect giving rise to the claim. This warranty shall constitute a contract made in the State of California and shall be governed by the laws thereof.

1.15 WARRANTY TESTING

- A. The turf for the football/soccer field is to be tested for dynamic cushioning ("G" Test) by an experienced independent testing laboratory acceptable to the Engineer or Owner at the completion of the installation shortly prior to acceptance inspection by the Owner/Engineer, at the anniversary date of the first year, second year, fourth year, sixth year, and 60 days prior to the anniversary date of the warranty expiration. If conditions of the Specifications and/or Warranty are not met, the Contractor has the option of corrective work or replacement. In the event corrective work does not meet the requirements of the Specifications after a second attempt to bring the system within these limits, then the Contractor is to replace non-conforming areas or sections solely at the Owner's discretion and direction.
- B. Tests shall be performed in accordance with ASTM F-1936-10 and F355.
- C. Test locations as designated in F-1936-10, Paragraph 8.1. Included in the report shall be the measured depth of the infill material at all test locations.
- D. All costs for the stated testing shall be paid by the Synthetic Turf Surfacing Contractor.
- E. If the Contractor does not have the tests performed within 10 days of specified times listed, the Owner has the option of ordering the testing work at the expense of the Synthetic Turf Surfacing Contractor.

PART 2 - MATERIALS

2.01 GENERAL

- A. Infilled Synthetic Turf: The turf system shall be a vertical-draining permeable synthetic turf system. The turf system shall consist of a synthetic grass-like surface pile, which shall be tufted into a synthetic backing.
- B. All backing layers and coatings shall be firmly bonded together. Coating materials must be completely cured and bonded to the other backing layers. Synthetic turf panels or rolls that do not meet this requirement will be rejected.

- C. The entire system shall be resistant to weather, insects, rot, mildew, and fungus growth, and be non-allergenic and non-toxic. The entire system shall be constructed to maximize dimensional stability, to resist damage and normal wear and tear from its designated use, and to minimize ultraviolet degradation.
- D. All adhesives used in bonding the system together shall be resistant to moisture, bacterial and fungus attacks, and resistant to ultraviolet rays at any location upon installation.

2.02 DYNAMIC CUSHIONING REQUIREMENTS

- A. The dynamic cushioning of the system shall not exceed a maximum value of 130 G's per ASTM, F1936-10 and ASTM, F355, procedure A at any location upon installation.

2.03 SUPPLEMENTAL PAD COMPOSITION (ADDITIVE ALTERANTE)

- A. The supplemental pad system shall be either an interlocking polypropylene panels or a paved in place elastic layer pad. The shock-absorbing pad shall become part of the base for the synthetic turf surfacing system where noted.

B. Polypropylene Panels:

1. The panels shall be interlocking with gaps that allow for thermal expansion and contraction but do not exceed 0.25 inches. The panels shall be designed and manufactured specifically for in-filled synthetic turf underlayment applications. The panels shall meet the following minimum requirements:

Size: 61 x 42 inches interlocking panels
 Area: Net coverage per panel 16.90+/- ft²
 Thickness: 0.90" (23mm) +/- .18"
 Panel Weight: approximately 4.1 lbs / panel

2. Company must demonstrate successful installations totaling a minimum of 5 million square feet of manufacturer's material.

3. The panels shall provide the following minimum performance requirements:

Surface contact: 50% minimum with synthetic turf backing,
 Friction coefficient: movement of artificial turf over 50mm distance 8.92N maximum force ISO 8295
 Shock Absorption: 60-70% per EN 14808
 Vertical Deformation: less than 4 mm per EN14809
 Repeated impact compression resistance: 106psi, repeated load, 20,000 cycle's system test with infilled turf; not to exceed 3%
 Bacteria and Fungi resistance: Pass per ASTM G22-76/G21-96
 Water Quality: ESSM 105-d/1997 Pass

Material must be 100% recyclable, recycling for energy through combustion is not acceptable. Manufacturer must demonstrate recycling process as part of the pre-approval process.

4. Manufacturer Reference: Brock International Power Base or pre-approved equal
 Brock International
 2840 Wilderness Place
 Boulder, CO 80301
 Telephone: (303) 544-5800

5. Manufacturer Warranty: The interlocking polypropylene panels shall include a 20 year manufacturer's warranty.

C. Polyurethane Elastic Layer Pad

1. The shock-absorbing pad shall be a paved-in-place (in-situ) porous elastic layer and shall become part of the base for the system.
2. The elastic layer shall be porous and shall resist the effects of adhesives, water, freeze-thaw, heavy loads associated with athletic fields, compression/deflection, rot, mold, mildew, bacteria, and air-borne pollution.
3. Single Layer Installation: The paved-in-place (in-situ) elastic layer shall be installed in one lift to a minimum thickness of 25mm. The elastic layer shall contain only the following:

<u>Components</u>	<u>% by Weight</u>
Granulated SBR rubber (1-5mm)	43-47%
Clean-washed "bird's-eye" aggregate (3-6mm)	44-48%
Single component high quality polyurethane binder	6-8%

4. The exact material mix ratio may be altered to provide strength, shock attenuation (in conformance with the 120G limit specified herein) and to provide permeability as approved by the Engineer. Installer may submit an elastic layer formulation with minor modification for Engineer's consideration and approval.

2.04 PERMEABILITY REQUIREMENTS OF THE SYNTHETIC TURF SYSTEM

- A. The system including the synthetic turf, infill materials and the supplemental pad shall drain vertically a minimum of 20 inches precipitation per hour without visible surface ponding.

2.05 SYNTHETIC TURF PILE SURFACE

- A. The pile surface shall provide good traction in all types of weather with the use of conventional "sneaker-type shoes" and composition, molded-sole athletic shoes.
- B. The pile surface shall be suitable for both temporary and permanent line markings using rubber-base paint where applicable.
- C. Pile surface shall be nominally uniform in length for all portions of the field. Synthetic turf panels or rolls with irregular pile heights or with "J hooked" fibers that extend more than 1/4 inch above the surrounding fibers will be rejected.

2.06 SYNTHETIC TURF FABRIC SURFACE

- A. The fabric surface shall be constructed and installed in minimum 15-foot widths with no longitudinal or transverse seams, except for head or tee seams at field boundaries and inlaid lines within a finished roll assembly. The seams shall be 15'-0" spacing.
- B. Rolls that do not lay evenly and with full dimension width will be rejected. No fitted pieces or relief cuts will be allowed to true alignment.
- C. The color shall be uniform with no visible deviations in shade permitted. Rolls that do not meet this requirement will be rejected.

2.07 SYNTHETIC TURF SYSTEM MATERIAL COMPONENTS

- A. Pile fibers shall resemble freshly-grown natural grass in appearance, texture and colors.

- B. Fabric backing for the in-filled synthetic turf systems can be loose laid and anchored at the perimeter of the fields as shown in the details or adhered to the base.
- C. No transverse or "head" seams will be permitted within the football field grid (160' width x 360' length)
- D. All panel seams shall be secured with either sewing or adhesive with a supplemental fabric. Sewn turf seams shall utilized a high strength polyester fiber cord or nylon. Adhered seams shall include a minimum 12" width seam backing shall be utilized with adhesive to extend the width and length of the seam.

2.08 SYNTHETIC TURF PERFORATIONS

- A. Synthetic turf with tufted fibers and a coated backing must include either perforations in the backing for vertical drainage, or the turf shall include a partially coated backing providing permeability without the use of perforations. Certified independent test results indicating a minimum drainage rate of 40 inches per hour for the permeable backing must be provided.
- B. Perforations in turf backing to be a minimum of 3/16" diameter clear opening and shall be spaced a maximum of 4" uniformly on-center. The turf shall be perforated with a minimum of 95% integrity over entire surface. Holes must be full diameter, completely through the underside of the turf backing with no material residue or fragmented fibers remaining.
- C. Engineer shall approve the turf perforations prior to shipment, upon shipment onsite, or during on-site perforating operations as applicable.
- D. If the non-permeable backing material exceeds 12 inches in width it shall be perforated in accordance with paragraph 2.7 of this section. Perforations shall be drilled from the surface after the adhesive has set.

2.09 LINES AND MARKINGS

- A. A complete field lining, marking and field boundary system with team area limits, etc., shall be provided with the initial installation of the surfacing system. Layouts shall be accurately surveyed and marked prior to installation.
- B. All lines and field markings shall be tufted in or installed as synthetic turf inlays. Wherever possible, lines shall be tufted into the turf panels in lieu of inlays. All markings shall be uniform in color, providing a sharp contrast with the turf color, and shall have sharp and distinct edges. Markings shall be true and shall not vary more than 7/32" from specified width and location.
- C. Manufacturer shall guarantee the synthetic turf is adaptable to painted lines in the event painting is utilized in the future.
- D. For cemented seams, use supplemental backing material. The supplemental backing material shall bridge all inlaid lines and markings a minimum of 4 inches on each side of the seam. Supplemental backing material that is greater than 12 inches in width shall be perforated in accordance with paragraph 2.7 of this section. Perforations shall be drilled from the surface after the adhesive has set.

2.10 MINIMUM SPECIFICATIONS FOR SYNTHETIC TURF SYSTEM MATERIALS

- A. The minimum material specification requirements will be verified and enforced and will be the basis for Owner's testing. Material that fails to meet these minimum specifications will be

rejected. The material specifications in this section are minimums. The manufacturer of the synthetic turf fiber and fabric may elect to exceed these specifications to ensure compliance with all requirements and the warranty as specified in this section.

- B. Color of synthetic turf field shall be green with brown panels for the baseball and softball infield areas. The fiber used for the lines and markings shall be of the same composition in all respects except for color as that used for the green field areas.
- C. Pile fiber shall be a combination of monofilament, long parallel slit film, and nylon or polyethylene root zone/thatch fibers as follows:

ASTM	Property	Minimum Specifications
D418	Pile Weight (PE)	46 oz/sq yard
D418	Primary Backing	6 oz/sq yard total
D418	Back Coating	14oz/sq yard
D418	Total Weight	66 oz/sq yard
D418	Pile Height	2.00"-2.25"
D1335	Tuft Bind (without infill)	8 lbs.
D1682	Grab/Tear Strength	200 lbs.
D2859	Pill Burn Test	Pass

- D. The primary pile fiber shall be 100% polyethylene athletic quality yarn designed specifically for outdoor use and stabilized to resist the effects of ultra-violet degradation, heat, wear, water and airborne pollution. They shall include a uniform blend of both long parallel slit-film and monofilament fibers. The coating and backing materials shall assure suitable tuft bind strength, dimensional stability, and long-term wearing properties.
- E. Fiber shall be certified to have less than 50 ppm or less of lead from both the fiber supplier and the turf vendor.
- F. The primary monofilament fiber shall meet the following requirements:

ASTM	Property	Minimum Specifications
D1577	Yarn Denier / Ply	7,200 / 6
D1577	Base Filament Thickness	300 U Micron
D2256	Yarn Breaking Strength	20 lbs
D2256	Yarn Elongation to Break	50%
D789	Yarn Melting Point	240 Degrees F.

- G. The primary long parallel slit film fiber shall meet the following requirements:

ASTM	Property	Minimum Specifications
D1577	Yarn Denier / Ply	5,000 / 1
D1577	Base Filament Thickness	100 U Micron
D2256	Yarn Breaking Strength	12 lbs
D2256	Yarn Elongation to Break	30%
D789	Yarn Melting Point	240 Degrees F.

- H. Fiber Wear Simulation: Fiber shall exhibit no splitting or appreciable degradation after a minimum of 12,000 cycles of simulated Lisport wear testing and shall remain serviceable without appreciable face weight loss after a minimum of 40,000 cycles of simulated Lisport

wear testing.

- I. The fiber, 100% polyethylene athletic quality yarn designed specifically for outdoor use and stabilized to resist the effects of ultra-violet degradation, heat, wear, water and airborne pollution.
- J. Fiber shall be certified to have less than 50 ppm or less of lead from both the fiber supplier and the turf vendor.
- K. Fabric Composition: Shall consist of 100% polyethylene yarn tufted into polypropylene backings coated with high-grade polyurethane. Coating and backing materials shall assure suitable tuft bind strength, dimensional stability, and long-term wearing properties.

2.11 INFILL MATERIALS

- A. The synthetic turf shall utilize a combination of sand and rubber infill materials. The maximum sand content shall not exceed 30% by volume and shall not be less than 20% by volume. Proprietary infill volumes with greater than 30% sand will be considered on a product by product basis. The exact in-fill material ratio may be altered to provide strength, shock attenuation, and to provide permeability by the vendor/installer as approved by the Engineer, however the minimum sand by volume shall not be less than 20%.
- B. Infill material shall be applied in a dried condition when the turf is dry. It shall be applied in uniform layers effectively dragged and/or brushed to distribute the material uniformly onto the backing of the turf.
- C. The sand infill material shall be graded silica sand, sub-round to round, compaction resistant, washed and dried. The sand shall meet the following criteria:

Percent Silica	80-95%
Shape	Round to Sub-round
Sphericity	0.65 – 0.85
Roundness	0.60 – 0.70
Hardness (Moh)	7

The sand gradation shall meet the following wet sieve analysis:

<u>Sieve Size</u>	<u>Percent Retained</u>
#16	0% – 5%
#20	10% – 20%
#30	50% – 70%
#40	15% – 25%
#50	0% – 10%
#100	0% – 5%
Pan	0% – 2%

- D. Rubber Infill:
 - 1. The rubber shall be 100% SBR ambient or cryogenically processed free of any tire cord and steel materials or kevlar. SBR rubber shall be manufactured from North American automotive or truck tires and shall be generated from California based tires. Tires more than 10 years old from date of production are not allowed. The rubber infill material gradation shall meet the following size requirements:

2.0 – 1.5 mm	0% - 10%
1.5 – 1.0 mm	10% - 30%
1.0 – 0.5 mm	40% - 80%
0.5 – 0.0 mm	0% - 10%

- F. SBR rubber shall be certified in writing to have less than 50 ppm or less of lead from both the rubber supplier and the turf vendor.
- G. Infill material shall be applied in a dried condition when the turf is dry. It shall be applied in uniform layers effectively dragged to distribute the material uniformly to the backing of the turf.
- H. The application rate shall provide a total minimum weight of 3.0 lbs of rubber infill material per square foot of the turf area.
- I. Maximum exposed fiber height shall range from ¾” to ½” after infill placement, settling, and compaction, however in no instance shall exposed pile height conflict with any known patents.

2.12 SURFACE PERFORMANCE REQUIREMENTS FOR SOCCER

- A. Performance of field surface shall conform to FIFA Performance Guidelines as follows:

Standard	Description	Field Requirement
FIFA 04 and FIFA 09	Shock Absorption	55% to 70%
FIFA 05 and FIFA 09	Vertical Deformation (foot stability)	4mm to 8mm
FIFA 06 and FIFA 09	Rotational Resistance (traction)	30n to 45n
FIFA 07	Linear Friction – Deceleration	3.0g to 5.5g
FIFA 07	Linear Friction – Slide	130 to 210
FIFA 08	Skin Abrasion (dry)	<30%
FIFA 08	Skin / Surface Friction (dry)	0.25 to 0.75
FIFA 01 and FIFA 09	Vertical Ball Rebound (Soccer)	60 cm to 85 cm
FIFA 02	Angled Ball Behavior (Soccer)	45% to 60%
FIFA 03	Ball Roll (Soccer Specific)	4 to 8 meters

2.13 MAINTENANCE EQUIPMENT – SWEEPER UNIT

- A. The Contractor shall provide one tow behind sweeper/ provide ground driven rotary brush for the cleaning and maintenance of the infilled synthetic turf. Unit shall:
 1. Provide for metered re-application of infill material with simultaneous dirt removal through 2 sieve trays
 2. Provide sieve trays with variable settings from 4-10MM;
 3. Adjustable depth row of tines for decompact infill material
 4. Working width to be nominally 6 ft.
 5. Rear mounted drag brush.
 6. Provide connections for tow behind standard tractor or utility vehicle.
- B. Manufacturer’s Reference: The sweeper unit shall be SMG TurfCare TCA 2000 or approved equal. Contact SMG Equipment LLC, (253) 350-8803 / www.smgequipment.com.

2.14 MAINTENANCE EQUIPMENT – DRAG BRUSH UNIT

- A. One tow-behind drag unit shall be furnished to the Owner with the surfacing system.

- B. The drag brush unit shall include 3-point hitch, rear-mount with tow coupling.
- C. Include four specially-arranged brush rows to level surface of turf with infilling granulate
- D. Working width to be nominally 5 ft.
- E. Manufacturer's Reference: The unit shall be SMG Turftuner TT1600 or approved equal. Contact SMG Equipment LLC, (253) 350-8803 / www.smgequipment.com.

2.15 ALTERNATE FIELD EQUIPMENT

- A. The synthetic turf vendor may request to substitute equipment for those specific units specified, provided an equivalent function is provided to the specified equipment.

PART 3 - INSTALLATION

3.01 CERTIFICATION OF FIELD BASE INSTALLATION

- A. The Contractor or the Contractor's subcontractor shall perform an inspection of the permeable aggregate and submit written certification of acceptance of the base for the installation of the synthetic turf system.
- B. Summary of certification shall include, but not be limited to:
 1. Acceptance of the base construction "finish surfaces" as totally suitable for the application of work specified under this section.
 2. Verification and certification of the infiltration and permeability rates of the permeable aggregate as applying to the warranty.
- C. All discrepancies between the required materials, application and tolerance requirements noted by the turf installer shall be brought immediately to the attention of the Contractor and the Engineer. Failure of the turf installer to immediately inform the Contractor and Engineer of any prior work that does not meet the required specifications will result in the turf installer being required to perform any work needed to bring the base to acceptable condition.

3.02 SUPPLEMENTAL PAD INSTALLATION (ADDITIVE ALTERNATE)

- A. Polypropylene Panel Installation:
 1. Acceptance of the base construction "finish surfaces" as totally suitable for the application of work specified under this section.
 2. Use only new materials manufactured and shipped for the specific installation. No used, recycled or refurbished materials are to be installed. Manufacturer must provide documentation of material content and MSDS sheet for submittal package.
 3. Product to be shipped as flat panels on prepackaged pallets. Pallets to be wrapped with heavy-duty barrier for protection from moisture and UV exposure.
 4. Seams should be mechanically locked into place by hand without use of additional materials, glue, fasteners or secondary processes or equipment.
 5. Material must be installed using manufacturers guidelines.
 6. Manufacturer must provide written procedures to selected turf supplier for the installation of turf on top of underlayment.

7. Surplus materials to be determined by the Owner prior to order and delivery of product to the installation site. Surplus quantities to be identified in writing by the General Contractor at the time of order placement.
8. Upon completion of installation, a walk-through will be conducted to inspect the quality of work and ensure all details meet specifications.
9. Perform all work in strict accordance to the drawings, shop drawings and manufacturer's installations and instructions.

B. Elastic Layer Pad Installation

1. The Superintendent shall thoroughly inspect all materials delivered to site both for quality and quantity to assure that the entire installation shall have sufficient material to maintain proper mixing ratios.
2. Installation of the elastic layer shall not take place if the ambient temperature is below 50 degrees F, if the material is wet, or if rain is falling or pending.
3. The material to be placed shall be mechanically mixed to obtain a homogeneous mixture. Extreme care shall be taken under the immediate supervision of the Superintendent in the weighing and mixing of the components to maintain a uniform mixture with predicable and consistent performance characteristics across the entire field area. The polyurethane shall be of sufficient volume to obtain satisfactory long-term bonding of the components but shall not be of such volume as to render the elastic layer hard and uncomfortable for athletic use.
4. The elastic layer shall be installed with a paving machine that utilizes an electrically heated finish surface screed bar. The paving machine must be operated by a minimum of two skilled technicians at all times.
5. All seams shall be hand rolled and cold pad joints shall be primed with a polyurethane primer supplied by the binder manufacturer.
6. The Superintendent must consistently monitor thickness of the elastic layer and supervise all mixing ratios by means of component weight checks.
7. The elastic layer pad must cure free of foot and equipment traffic for 48 hours after placement.
8. The finished elastic layer must be properly compacted, uniform in texture, density, thickness, and tolerance to grade and suitable as a shock attenuation pad providing dynamic cushioning for the turf system.
9. The elastic layer shall have minimum thickness of 25 mm. The finished surface shall not vary more than 1/4" in 10' (6.25mm in 3.0 meters) measured in any direction as gauged from a string line or straight edge.
10. The Contractor shall test the permeability of the in-situ pad prior to synthetic turf installation. The pad shall be tested in a minimum of six (6) representative locations. The test results shall be submitted to the Engineer prior to synthetic turf installation.

3.03 SYNTHETIC TURF INSTALLATION

- A. Perform all work in strict accordance to the drawings, specifications, shop drawings and manufacturer's specifications and instructions.
- B. Verification: The Contractor is responsible for inspecting, verifying, and accepting all installed work of this section.
- C. Environmental Conditions: Do not apply adhesive materials or infill material when:
 1. Ambient air temperature is below 50 degrees F.
 2. Material temperatures are below 50 degrees F.
 3. Rain is falling or pending

4. Conditions exist, or are pending, that will be unsuitable to the installation of the system.

D. Preparation:

1. Accept base onto which the synthetic turf surfacing system and the anchoring system are to be applied, as specified above.
2. Immediately prior to application of the synthetic turf, the base shall be thoroughly cleaned of all foreign material, soil, or any other substances that may be detrimental to permeability and the installation of the turf system.

3.04 INSPECTION OF MATERIALS

A. Prior to installation, and immediately upon delivery of synthetic turf system materials to the project site, the Synthetic Turf Surfacing Contractor shall inspect material as follows:

1. For damaged or defective items;
2. Measure turf pile height and thickness of each roll;
3. Measure backing perforation diameter and spacing;
4. Reject damaged materials and all materials out of tolerance with this specification.

B. After installation, inspect project area for acceptable seaming, adhesive bonding, uniformity of color of turf, bubble- and wrinkle-free surface smoothness as laid, field lines and markings, insert installations, edge details. Remove and/or repair deficient workmanship in a manner consistent with these specifications prior to requesting the Engineer's inspection pursuant to completion and acceptance of the work.

3.05 OWNER'S TEST

A. Owner may have samples of the turf submitted and tested for verification of conformance to specifications. Turf system acceptance is subject to the results of these tests.

B. Any material so tested and found not conforming to specification will be rejected and replaced with material conforming to the specification at Synthetic Turf Surfacing Contractor's expense. Re-submittal shall be required.

3.06 SYNTHETIC TURF INSTALLATION

A. Perform all work in strict accordance to the drawings, shop drawings and manufacturer's specifications and instructions.

B. Verification: The Contractor is responsible for inspecting, verifying, and accepting all installed work of this section.

C. Environmental Conditions: Do not apply adhesive materials or infill material when:

1. Ambient air temperature is below 40 degrees F.
2. Material temperatures are below 40 degrees F.
3. Rain is falling or pending
4. Conditions exist, or are pending, that will be unsuitable to the installation of the system.

D. Preparation:

1. Accept base onto which the synthetic turf surfacing system and the anchoring system are to be applied, as specified above.

2. Immediately prior to application of the synthetic turf, the base shall be thoroughly cleaned of all foreign material, soil, or any other substances that may be detrimental to permeability and the installation of the turf system.
- E. Equipment and Access:
1. Passenger vehicles shall not be allowed to park or staged upon the completed aggregate surface either prior to or during installation of the synthetic turf.
 2. Equipment utilized during construction including compressors, generators, etc. shall be in complete working order, with exhaust systems oriented vertically and away from the synthetic turf surface. At any location where equipment is parked and/or staged on the turf surface during installation, adequate protection of the finish turf surface will be required including, but not limited to heat resistant panels to ensure 100% viability of the finish turf surface and fibers. Should a portion of the turf be damaged as a result of installation techniques, the entire turf panel may be subject to rejection and replacement at the direction of the Owner's Representative.
- F. The fabric surface shall be constructed and installed in 15 -foot minimum widths with no longitudinal or transverse seams, except for head or tee seams at field boundaries and inlaid lines within a finished roll assembly.
- G. Rolls that do not lay evenly and with full dimension width will be rejected. No fitted pieces will be allowed to true alignment.
- H. Bonding of Material Surfaces: The bonding or fastening of all system material components shall provide a permanent, tight, secure and hazard-free, athletic playing surface. System material components include:
1. Bonding all seams and inlaid line and markings
 2. Bonding and seaming must maintain their integrity for total length of warranty period.
- I. Seams:
1. All turf seams shall be either sewn with high strength polyester fiber cord or nylon or adhered to a supplemental backing material.
 2. Backing layers must lie flat on the field base to provide a uniform pile surface.
 3. The width between fiber rows at the seam locations shall not exceed that of the tufting gauge of the turf materials.
 4. All sewn seams shall be brushed to provide full coverage of fiber over the thread.
- J. Turf Edges: Turf edges to be as shown on the edge fastening detail and nailed at the perimeter.

3.07 LINING / MARKING INSTALLATION

- A. Complete field markings shall be provided with the initial installation of the surfacing system. Provide lines and markings in conformance with these specifications. Layouts shall be accurately surveyed and marked prior to installation.
- B. If overlapping backing materials are utilized for the inlaid lines and markings resulting in a non-permeable surface in excess of 12 inches wide, the backing materials shall be perforated in conformance with section 2.08 after gluing and prior to installation of the infill material.

- C. Painted lines and markings shall be crisp and distinct, with no weeping or overspray. Application of paint shall be exactly aligned with required dimensions and a guide wire/string line shall be used to produce straight lines.
- D. Contractor shall reapply paint if markings exhibit any appreciable fading or degradation within three months of initial application.

3.08 SYNTHETIC TURF EDGE ANCHOR INSTALLATION

- A. Anchor synthetic turf along the sides and ends with the existing edge nailer board as shown in the details. Complete any adjustments/additions to the turf nailer board to ensure the top of the infill meets and matches the top of the concrete or rubberized surface edge directly adjacent to the synthetic turf.

3.09 IN-FILL INSTALLATION

- A. The in-fill material shall be applied in a dry condition and when the synthetic turf is dry.
- B. The synthetic turf installer shall not infringe upon any current or pending patents held by other synthetic turf manufacturers or installers with the installation of the in-fill materials.
- C. The infill materials will be installed with a minimum of 12 applications. The infill installation shall not result in fiber material trapped below the surface of the infill material. If fiber is trapped below the surface, a portion or all of the infill material must be removed and reinstalled.
- D. The infill material shall be installed at a uniform depth across the entire field area. Infill depths shall not vary by more than +/- 5 mm from the design infill level indicated in the approved submittals across the entire synthetic turf surfacing area.
- E. The in-fill materials shall be water settled to provide accelerated consolidation of the in-fill material prior to use by the Owner. Water is available from quick coupling valves located around the field, as well as the washwater/spray system. The Synthetic Turf Contractor shall utilize existing equipment to evenly apply a minimum of 1 inch of water over the entire field area for water settlement. Upon completion of the initial water settlement, the surface will be inspected the Owner and Engineer for footing stability and in-fill consolidation. The Synthetic Turf Contractor shall provide any additional water settling as required by the Owner and Engineer to achieve the desired level of in-fill stability and consolidation.

3.10 CLEANING

- A. Remove all excess materials of all types, equipment, debris, etc., from the site immediately after completion of the work. Remove all stains and other blemishes from all finished surfaces. Leave work in clean, new appearing condition, ready for use by Owner.
- B. The Contractor shall inspect the entire field area with a hand held metal detector to identify any construction materials or tools left on the field. All such materials shall be removed prior to Owner occupancy of the field.

3.11 PROTECTION

- A. Adequate protection of materials and work from damage will be the responsibility of the installer during installation and until acceptance of their work. Synthetic Turf Surfacing Contractor will be responsible for protection after the acceptance of the work until final acceptance of all contract work by the Owner. All material damaged prior to acceptance by the Owner shall be

replaced at no cost to the Owner.

3.12 EXTRA MATERIALS

- A. Deliver to Owner all extra materials herein specified. Receive Owner's written receipt for all materials. Deliver receipt to Engineer.
- B. Infill Materials: Provide four (4) 33-gallon rubber trash containers with lids of each infill material used.
- C. Turf for Future Repairs: Material may be roll ends or cutoffs; however, each piece of fabric shall be at least 5' x 10'. At least one green piece shall be at least 10' x 15'. The following are minimum areas for the extra synthetic turf materials to be provided by the Synthetic Turf Surfacing Contractor to the Owner:

1. Green Turf:	1000 sf
2. White Turf:	100 LF 4" lines
3. Yellow Turf:	100 LF 4" lines
4. White Turf	500 SF
5. Purple Turf	500 SF

3.13 MAINTENANCE EQUIPMENT

- A. Contractor shall uncrate, assemble and demonstrate operation of equipment to Owner and Owner's Representatives.
- B. Following assembly of equipment, Contractor shall complete a minimum four (4) hour training session utilizing the equipment with a variety of maintenance personnel from the Sweetwater Union High School District and Olympian High School staff.

3.14 MAINTENANCE

- A. Vendor shall complete maintenance of the synthetic turf field at both 6 months and 1 year after the date of Substantial Completion. Minimum maintenance activities shall include:
 - 1. Inspect and repair as required each inlay and seam.
 - 2. Brush and remove surface debris, loose fibers and any other deleterious material. Use of a rotating, mechanical brush is recommended.
 - 3. Decompact and re-level infill materials. Import and place /top dress new infill material matching original infill materials as needed to establish original infill depth, with original installation height of exposed fiber.
- B. All maintenance activities shall be as approved and directed by the original manufacturer. All maintenance activities shall be coordinated with scheduled use of the facility and completed at the convenience of the owner and applicable user groups.

END OF SECTION

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SECTION 32 84 23
FIELD IRRIGATION SYSTEMS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Connect to existing point of connection for site irrigation systems. Protect and modify existing irrigation systems to remain, so that existing systems remain operational at all times during the construction period. One (1) 24 hour shut down period will be allowed at three (3) time intervals to effectively isolate, and reconnect new irrigation systems to existing irrigation systems. Work shall be as shown on the plans including service line extension; isolation gate / ball valves; quick coupler valves; automatic control valves and rotor/spray head assemblies.
- B. Isolate and abandon water supply and irrigation control systems within work area. Piping and appurtenances within work area to be removed.
- C. Coordinate all work with existing site landscape irrigation systems and potable water services.

1.02 STANDARD SPECIFICATIONS

- A. All sections of the standard specifications applicable to any and all parts of this project shall govern, except as specifically modified in these contract documents.
 - 1. The Standard Specifications for Municipal Public Works Construction, Washington State Chapter (latest edition).
 - 2. American Water Works Association
 - 3. American Society for Testing and Materials
 - 4. State of Washington and Standards

1.03 FIELD DIMENSION AND LAYOUT

- A. The Contractor will be responsible for furnishing, setting, and marking of all line, grade, and location stakes, including offsets and general construction staking. The Engineer will provide reference points.
- B. There shall be onsite at all times when work-requiring control is being performed, all necessary equipment, supplies and instruments related thereto. A qualified layout specialist must be assigned to the Contractor's crew for this work. This equipment and specialist must be available at no additional cost to the Engineer for the purpose of approving layout and certifying work progress onsite.
- C. The Engineer prior to commencing construction and on a continuing basis must approve all layout work, materials and methods for each phase requiring accuracy control.

1.04 SUBMITTALS

- A. Product Information: The Contractor shall submit copies of catalog information of all equipment for approval.
- B. As-Built Drawings: Contractor shall furnish accurate as-built drawings of the complete irrigation and washwater systems. The drawing shall be a blueprint to scale. Drawings shall

show installed manufacturer's name and catalog number. The as-built drawing shall be turned over to the Engineer for review at or before the professional review (punch list) of the project.

PART 2 – PRODUCTS

2.01 PVC WASHWATER & IRRIGATION PIPING

- A. Main line and lateral pipe shall be Schedule 40 PVC. Plastic pipe shall be extruded from 100% virgin Polyvinyl chloride (PVC) Pipe to conform to ASTM D2241, F477, D1784 Cell Class 124-54-A, B.
- B. Sleeving pipe shall be Schedule 40 PVC.
- C. Pipe shall be guaranteed to be free from manufacturing defects in material and workmanship in accordance with the section of specifications covering warranties. The pipe is to be guaranteed to operate within the limits of pressure and temperatures recommended by the manufacturer and as required in these specifications.
- D. Pipe Sizing: Schedule 40 PVC

Size	O.D.(In)	Min. Wall (In)
3"	3.500	0.216
2 ½"	2.875	0.203
2"	2.375	0.154
1 ½"	1.900	0.145
1 ¼"	1.660	0.140

2.02 PLASTIC PIPE FITTINGS AND CONNECTIONS

- A. Fittings to be PVC except as noted on riser, valve assemblies, details, etc.
- B. Connections shall be solvent weld, except at valves, risers, etc. that require threaded connections.
- C. Threaded connections shall be of male adapter type.
- D. Couplings and fittings to be taper-molded, Schedule 40, except where indicated in details to be Schedule 80.
- E. Threaded nipples must be Schedule 80.
- F. Fittings shall conform to ASTM D2466-76a and D1484-75.

2.03 JOINING MATERIALS

- A. All joining materials used will be manufactured by I.P.S. or equal, and will be used in accordance to the manufacturer's written specifications and safety recommendations.
- B. All threaded connections (PVC) shall be sealed by using Teflon tape or Teflon paste.
- C. All galvanized threads shall be sealed with an approved Teflon base pipe compound.
- D. PVC solvent compounds shall be IPS "Weld-On" P-70 purple primer and "Weld-On" P-705, P-711 heavy-bodied gray cement, IPS "Weld-On" 721 or approved equal.

2.04 BACKFLOW PREVENTION DEVICES

- A. Irrigation Backflow Prevention Device for washwater irrigation system shall be a Febco No. LF 850 Reduced Pressure Assembly, 2" with test cock plugs or approved equal.
- B. Backflow prevention device shall be installed in Utility Vault Model No. 38-TA (2") or 25 TA (1").
- C. Backflow prevention devices shall be as approved by the City of Helena Water and Sewer Department.

2.05 MANUAL ISOLATION GATE VALVES

- A. All Valves to conform to the latest revision of AWWA Standard C-509.
- B. Gate Valves
 - 1. Valves to conform to the latest revision of AWWA Standard C-509.
 - 2. All parts shall be accessible for repair or maintenance without removing the body from the line.
 - 3. The body, bonnet, and seal plate shall have a factory applied thermoplastic epoxy coating on all interior and exterior surfaces. The wedge shall be cast iron completely encapsulated with a resilient elastomer material permanently bonded to the wedge and shall have a rubber tearing bond that meets ASTM D429.
 - 4. The gate valve shall be rated for 200 psi WWP.
 - 5. Gate valves shall be M+H 4067-07 with hand operated wheel handle or approved equal.
 - 6. Two valve operating keys are to be furnished.

2.06 MANUAL ISOLATION BALL VALVES

- A. Valves to conform to the latest revision of AWWA Standard C-509.
- B. All parts shall be accessible for repair or maintenance without removing the body from the line.
- C. The body shall be brass, 400# WOG, thread ended ball valve with PVC coated round handle. Locking handle is not acceptable.
- D. 1"- 3", Matco-Norca, 758 full port, FIPT x FIPT, forged brass, Chromed Plated Ball, Teflon Seat, Two Piece Body, Ball Valve, 600 PSI non-shock WOG, 150 PSI SWP. Threaded Ends Comply with ANSI B2.1. Valves shall be installed with the handle on the side, parallel with the ground when in the open position. The handle shall be perpendicular to the ground, pointing upward when in the closed position.

2.07 QUICK COUPLING VALVES

- A. Quick-coupling valves shall be bronze two-piece construction or iron body, bronze mounted, globe pattern. Pressure rating to be 150 psi. Connections shall be iron pipe, threaded. The cover shall designate non-potable water. Valves to be Rainbird 44-LRC, 1", two-piece.
- B. Contractor is to furnish to the Owner two couplers with either 1 " x 1" or 1" x 3/4" (per Owner's option). Hose swivels shall be attached with two coupler keys.
- C. Valves to be housed as shown in the details, for installation in or adjacent to the concrete turf anchor.

- D. Work to include layout, trenching, pipe installations, backfill, quick coupling valves, valve boxes, riser assemblies, and related items.

2.08 QUICK COUPLER VALVE BOX – SYNTHETIC TURF

- A. Quick Coupler Valves at synthetic turf field to be housed in TurfCool Quick Connect Valve Box, TC-3700-QCV as manufactured by Sportsfield Specialties Inc. (1-888-975-3343), or approved equal. Box shall be equipped and/or modified to have synthetic turf or rubberized surfacing cover as detailed.
- B. All caps shall be Purple (NP).
- C. Quick Coupler Valves shall be installed with as Lasco Swing Joint #G332-212.

2.09 DETECTABLE MARKING TAPE

- A. Detectable marking tape: Christy's 3" detectable marking tape consists of a minimum 5 mil overall thickness; five ply composition; ultra-high molecular weight; 100% virgin polyethylene; acid, alkaline and corrosion resistant. The tape shall have a 20 gauge solid aluminum foil core, encapsulated within 2.55 mil polyethylene backing. Tape tensile strength shall be in accordance with ASTM D882-80A and be not less than 7,800 psi. Tape legend—Caution Irrigation Line Below. TA-DT-3-GI.

2.10 VALVE BOXES

- A. All ball valves, gate valves, quick coupling valves or remote control valves outside of synthetic turf field limits shall be installed in an Oldcastle/Carson #1419-12 valve box with a 1419 plastic lid. The cover shall be secured with stainless steel bolts

2.11 UNDERGROUND ELECTRICAL WIRE

- A. All wiring is to be UL labeled type "UF" for direct bury.
- B. All wire shall be No. 14 AWG, single strand copper. Red or Black jackets for hot wires. White jacket for common wire.
- C. Wiring is to be supplied in minimum 1,000' continuous lengths.
- D. Underground splices shall be made in a new splice box with vinyl insulated connectors and sealed in Epoxy Resin (3M DBY/DBR or approved equal).
- E. Separate spare wires shall be installed to the splice box as designated in the plans. Spare wires shall be marked "spare" and be of a different color, not black or white.

2.12 TRACE WIRE

- A. Trace wire shall be 12 GA. solid bare copper wire. Wire to be UF rated and UL listed.

2.13 ELECTRICAL EQUIPMENT

- A. All components of control equipment, solenoid valves, etc., shall be UL labeled, certified and conform to current National Electrical Code, and be acceptable to local governing codes.

2.14 AUTOMATIC (REMOTE CONTROL) VALVES

- A. Valves shall include heavy-duty plastic construction. Pressure rating to be 200 PSI. Connections shall be threaded per detail.
- B. Valves to be electrically generated, actuated by a solenoid utilizing AC current, 24 volts, and rated at not more than 9.9 VA. The solenoid is to be sealed so it is completely waterproof.
- C. Operation to be normally closed.
- D. The valves shall include a 10 year warranty.
- E. Solenoid to mounted directly on the valve body or bonnet. All parts and tubing downstream of the entrance opening must be of larger size to permit passage of foreign particles.
- F. Construction is to be so that all operating parts are accessible and removable from the top by removing the bonnet without having to disconnect the valve body from the pipeline.
- G. Valves to be Weathermatic 8200 series or approved equal.

2.15 VALVE BOXES

- A. Valve boxes for individual auto-control valves shall be CARSON-BROOKS No. 1730-18 (jumbo box) or approved equal, green with 1730-4B bolt down green cover. Use CARSON-BROOKS 1730-18 or approved equal, turned upside down at each ACV per detail. Valve boxes shall be installed with retaining clip and furnished with stainless steel bolts.

2.16 SPRINKLERS

- A. Sprinkler performance must meet or exceed the listed criteria in the legend of the drawing, except gallons per minute flow may not be exceeded by more than 5%. Nozzles shall have matching precipitation rates.
- B. Rotary pop-up sprinklers shall be furnished with gear drive mechanism.
- C. Sprinklers shall have a minimum extension in the operating position of 2 1/4" for lawn areas and 12" for shrub and planting bed areas. The sprinklers shall be spring-loaded for return to the recessed position.
- D. Rotating unit shall be stainless steel nozzle turret with a rubber cover.
- E. Adjustable heads are not acceptable for use as full-circle (360 degree) heads.
- F. Rotors: Hunter I-20, I-25, and I-40 series 4" Pop-Up Rotors with stainless steel riser assembly, nozzles as necessary to accommodate the head spacing and layout as shown. Rotating unit shall be stainless steel nozzle turret with a rubber cover.
- G. The Contractor shall furnish to the Owner two spare full circle and two spare part circle sprinkler heads.
- H. Swing joint assemblies: Pre-fabricated Schedule 40 PVC swing joint - Approved manufacturer's Lasco, Rainbird, Spears. Size swing joint assembly as indicated on detail sheet.

2.17 JOINING MATERIALS

- A. All joining materials used for solvent welded joints shall be manufactured by I.P.S. or equal, and will be used in accordance to the manufacturer's written specifications and safety recommendations.
- B. All threaded connections (PVC) shall be sealed by using Teflon tape or Teflon paste.
- C. PVC solvent compounds shall be IPS "Weld-On" P-70 purple primer and "Weld-On" P-711 heavy-bodied gray cement or approved equal.

2.18 MARKING TAGS

- A. All appurtenances shall be installed with polyurethane identification tags manufactured by T. Christy Enterprises or approved equal. Tags shall read "CAUTION: NON-POTABLE WATER – DO NOT DRINK" in English on one side, and valve number designation on the opposing side. Tags shall be white, with black ink.

PART 3 – EXECUTION

3.01 TRENCH EXCAVATION

- A. Trenches shall be excavated to the line and grade indicated in the plans and specifications. Except for unusual circumstances where approved by the Engineer, the trench site shall be excavated to only such width as is necessary for adequate working space. The top width of the trench will generally not exceed 18" for sizes 2-1/2" and smaller. The trench shall be kept free from water until all connections are completed. No water is to be permitted in the trenches until jointing material has set in the case of solvent and weld joints. Surface water shall be diverted so as not to enter the trench. Boulders, rocks, roots and other obstructions shall be entirely removed or cut out to the width of the trench and to a depth 6" below the bottom of the pipe.
- B. Trenches, where applicable, shall be excavated to a depth to provide 24" cover minimum below finish grade over piping in synthetic turf field areas.

3.02 INSTALLATION OF PLASTIC PIPING

- A. Pipe couplings and fittings shall be handled and installed in accordance with the recommendations of the pipe manufacturer. The chemical used in solvent welding are intended to penetrate the surface of both pipe and fitting, which after curing, result in a complete fusion at the joint. Use solvent and cement only as recommended by the pipe manufacturer.
- B. Solvent welds:
 - 1. Follow all recommendations of the approved cement manufacturer.
 - 2. Remove all dust, dirt and moisture from the surfaces to be welded.
 - 3. Make up solvent welds only when environmental conditions are appropriate.
 - 4. Check all fittings for correct position before solvent weld sets.
 - 5. Allow at least 15 minutes set up (curing) time for each welded joint before moving or handling.
 - 6. Do not introduce flow or pressure until the manufacturers recommended set-up and cure time has elapsed.

- C. Plastic to Metal Connections: On plastic to metal connections, work the metal connection first. Use Perma-Tex No. 2, Teflon tape, or similar non-hardening material on 3-threaded connections. Liquid Teflon is not acceptable. Light wrench pressure is all that should be used. Connections between metal and plastic are to be threaded adapters, except where indicated in the details.
- D. Curing: Prior to introducing water into the piping, a minimum of two hours curing time for the plastic joint connections shall transpire.

3.03 QUICK COUPLING VALVE (QCV) INSTALLATION

- A. All piping shall be thoroughly flushed through extended risers before quick coupling valves (QCV) are attached.
- B. Quick coupling valves shall be installed as indicated in the details, perpendicular to the surface. Valve top to be 1" to 1-1/2" below inside surface of box lid.
- C. When installing QCV the top nipple of the riser assembly is to be threaded to QCV above ground, carefully checking so as not to cross-thread. Then thread nipple with QCV to intermediate coupling.

3.04 QUICK COUPLING VALVE BOX INSTALLATION

- A. Valves to be housed in a plastic or aluminum valve box as shown in the details.

3.05 SPRINKLER INSTALLATION

- A. All piping shall be thoroughly flushed through extended risers before sprinklers are attached. Liquid Teflon may be used on sprinkler threads.
- B. Sprinklers shall be installed as indicated in the details, perpendicular to the surface.
- C. When installing sprinklers, the top nipple of the riser assembly is to be threaded to sprinkler above ground, carefully checking so as not to cross-thread. Then thread nipple with sprinkler to intermediate coupling.
- D. Sprinkler heads located in the natural turf areas shall be installed flush with finish grade.

3.06 AUTOMATIC (REMOTE CONTROL) VALVE INSTALLATION

- A. Install valves in valve manifold vaults or plastic valve boxes as designated on the plans.
- B. Refer to the details for specific installation requirements associated with zone conditions.

3.07 BACKFILLING

- A. Sand backfill material shall be placed and compacted around and under the piping and risers by hand tools to a depth of 6" above and 6" below the top of all piping, including lateral and main line piping. Backfill is to be compacted to 95% minimum density by mechanical tamping. Trench must be free of water during backfilling operation.
- B. All backfill around quick coupling valves and sprinkler risers shall be mechanically compacted to 95% minimum density with moisture added.
- C. Detectable marking tape: 6" cover over mainline and lateral lines.

3.08 TESTING

- A. Before testing, all piping is to be thoroughly flushed.
- B. Request Architect and Owner attendance at each test. Provide a minimum of 24 hour prior notice.
- C. Prior to acceptance of work, all pressure piping and fittings shall be subjected to a hydrostatic pressure test of 150 psi. This test shall include all mainline and lateral piping for a minimum of one hour. Leaks and/or imperfections developing under said pressure shall be remedied by the Contractor before final acceptance of the work. Pressure shall be maintained while the entire installation is inspected. The Contractor shall provide all work connected with the tests. Include temporary above ground piping to connect a riser from each lateral so that the entire system can be tested simultaneously.
- D. Blocking shall be in place at the time of testing. Insofar as practical, tests shall be made with valves and risers exposed for inspection.
- E. Allowable leakage in gallons per 1,000 lineal feet of pipe is as follows:

3"	3.0 gallons per hour
2"	2.0 gallons per hour
1-1/2" and 1"	1.5 gallons per hour
- F. Performance Testing: After system is 100% installed, perform a coverage test to determine whether water coverage and operation of the system is adequate for planting, without areas of excessive flooding, dry spots, areas of insufficient overlap, or excessive overspray. Test to be performed under automatic operation of the controller via the remote radio system. If the irrigation system is determined by Owner to be inadequate due to Contractor's poor workmanship or materials, it shall be replaced or repaired at Contractor's expense and both pressure and coverage tests repeated until accepted.
- G. Adjusting: Contractor shall substitute or modify up to 10% of the total nozzles as directed by the Owner. Adjustments to the system will be made without additional cost to the Owner.

3.09 INSTRUCTIONS AND LITERATURE

- A. Contractor is to conduct training sessions to demonstrate and instruct school personnel on operation and maintenance of all equipment installed.
- B. Where applicable, Contractor shall have equipment manufacturers' representatives participate in this session.
- C. Contractor is to supply four (4) sets of descriptive literature and parts lists for all equipment furnished.

END OF SECTION

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SECTION 33 46 16
FIELD SUBSURFACE DRAINAGE

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Furnish and install field drainage system for the synthetic turf field area as shown on the plans including perimeter infiltration trench with pea gravel bedding and backfill and perforated piping. Provide overflow connection to the existing onsite storm drainage system as shown on the plans.
- B. Furnish and install infiltration trench and subsurface drainage collector around the perimeter of the field area and connect to site storm drainage system as shown on the civil plans. Infiltration trench and subsurface drainage collector shall include perforated CPEP piping installed in a pea gravel trench as shown in the plans.
- C. Furnish and install subsurface drainage laterals across the field area on 15' centers with 12" x 1" flat drains as shown on the plans.
- D. Upon completion of this work, restore subgrade to specified condition and tolerances, compacted to 95% density with no loose material on surface.

1.02 STANDARD SPECIFICATIONS

- A. American Public Works Association, Washington State Chapter, Standard Specifications for Municipal Public Works Construction (APWA) (latest edition).
- B. Standard Specifications for Road, Bridge, and Municipal Construction, Washington State Department of Transportation (WSDOT), American Public Works Association (APWA)
- C. United States Department of Agriculture, Soil Conservation Service, Engineering Standard 606.

1.03 SUBMITTALS

- A. Submit to the Engineer for approval:
 - 1. Pea gravel sieve analysis
 - 2. Product data for perforated and non-perforated tubing
 - 3. Product data for all fittings and connections

1.04 RELATED WORK IN OTHER SECTIONS

Section 31 00 00 Earthwork
Section 31 22 16 Field Subgrade Establishment
Section 33 46 23 Field Permeable Aggregate

PART 2 – PRODUCTS

2.01 PERFORATED PIPING

- A. The piping shall be dual wall corrugated polyethylene with smooth interior wall.
- B. Material shall conform to requirements of Type III, Grade 4, Class "C" polyethylene as specified in ASTM D1248.

C. Dimensions:

1. Inside diameter variance shall not exceed -0.0% or +5%.
2. Lengths shall be in coiled configuration with a -0.0% tolerance.

D. Water inlet areas shall be slotted with a width of 1/16" " 0.020" to a maximum of 3/32" "0.030" uniformly spaced circumferential slots located on the inner depression of the corrugation, totaling a minimum of 1.25 square inches per lineal foot. The perforations shall provide a clear opening. Tubing with perforations that are punched with a flap type opening or that are not uniform will be rejected.

E. Fittings and Connections:

1. Fittings shall be as furnished by the manufacturer of the pipe.
2. Connections of tubing lengths shall be with split coupling or snap-in-type couplings utilizing polyethylene or construction tape.
3. Tubing is to be inserted into sockets for the full socket length. "Slip-fit" connections will not be permitted.
4. All split coupling connections are to be fully taped. All connections at fittings and connections are to be taped at interface of exposed joint.

2.02 PERFORATED FLAT DRAINS

A. Flat Drains: For perforated laterals, use "AdvanEdge" flat pipe, 1" x 12" without geotextile fabric wrapping. Water inlet areas shall be slotted with a width of 1/16" (0.020) to a maximum of 3/32" (0.030) uniformly spaced circumferential slots located on the inner depression of the corrugation, totaling a minimum of 1.25 square inches per lineal foot.

B. The perforations shall provide a clear opening. Tubing with perforations that are punched with a flap type opening or that are not uniform will be rejected. Use manufacturers end caps, couplers, and fittings to connect to the collector pipe where indicated.

2.03 PEA GRAVEL

A. Pea-gravel bedding for perforated pipe shall be clean, washed, uniformly graded 3/8" to 1/8". The pea gravel material graduation must meet the following sieve analysis:

<u>Sieve Size</u>	<u>Percent Passing</u>
1/ 2"	100
3/ 8"	90 - 100
# 4	5 - 15
# 8	0 - 10
# 100	0 - 0.6
# 200 (wet sieve)	0 - 0.4
# 270 (wet sieve)	0 - 0.2

2.04 TESTING

A. The Owner will be performing testing of materials delivered to the job site for the purpose of verifying compliance with the contract documents. The Owner's testing is for this purpose only and not for construction quality control by the Contractor.

B. The Contractor shall coordinate directly with the Owner's testing firm relative to the delivery schedules of the imported materials. Sampling will be scheduled each day deliveries occur.

C. The Contractor shall provide testing and surveillance as required to assure materials and work fully comply with contract requirements.

PART 3 – EXECUTION

3.01 TRENCHING

- A. Excavation shall be made to the alignment, elevation, grade and slope as indicated on the drawings.
- B. Trenching shall be accomplished utilizing equipment with slope and depth control, such as "Laser Plane Control System", so as to ensure accuracy in the bottom of the trench.
- C. No high points above designated invert or calculated trench bottom elevation will be permitted. No sloughing of site material or loose excavated soil will be permitted to remain in the trenches.
- D. Surplus excavated soil shall be removed from the field area. Excavated material may not remain on subgrade. Excess soil material shall be disposed of off of the playfield area.
- E. Provide a smooth, even subgrade after removal of the trench material. Subgrade to be compacted to 95% density. Leave no loose material on the subgrade. Remove all loose material from lateral trench bottom.
- F. Trench to line and grade as shown on the drawings utilizing laser-controlled equipment. Dispose of excavated trench material.
- G. Install corrugated polyethylene (CPEP) perforated piping with pea gravel bedding and backfill as shown on the plans.
- H. For flat drainage piping, install perforated lateral piping directly on structural fabric.

3.02 PLACEMENT

- A. Excavation below invert grade must be established to a depth so as to provide for specified placement of pea gravel bedding at bottom of pipe elevation prior to laying the tubing.
- B. Pea-gravel bedding for perforated pipe shall be clean, washed, and uniformly graded 3/8" to 1/8".
- C. No foreign material will be permitted inside, alongside, under, or on top of, installed perforated piping.

3.03 BACKFILL

- A. The backfill for all perforated pipe shall be clean washed pea gravel, uniformly graded 3/8" to 1/8".
- B. All trenches to have backfill material "crowned" a minimum of 2" above subgrade to protect from foreign material and provide for ease of location identification. Crowns with foreign material contamination shall be removed prior to placement of base aggregate.
- C. Specified bedding shall not be placed until Engineer approves the trench.
- D. Trench backfill shall not be placed before Engineer approves perforated pipe placement.
- E. During placement of specified trench backfill, pipe must be held in place with a hand device to prevent displacement and provide for achieving specified invert elevation. Do not damage

pipe or allow pipe to be displaced by placement of backfill material.

3.04 CONNECTIONS

- A. All connections are to be made with approved fittings as recommended by the tubing manufacturer and approved by the Engineer.
- B. Tubing is to be inserted into sockets for the entire length. Tape all connections utilizing polyethylene or construction tape.
- C. No foreign material will be permitted inside the installed tubing.
- D. Cap the ends of all lateral runs as shown on the drainage plan. All open ends during construction are to be temporarily capped or plugged.
- E. Connection of laterals to collector drains shall be made with a combination reducing tee and reducing saddle tee or end tee utilizing snap connections.

3.05 EQUIPMENT MOVEMENT

- A. No trucks or equipment will be allowed to drive over the top of the trenches or flat pipe except track-equipped machinery utilized in spreading imported granular materials.

END OF SECTION

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SECTION 33 46 23
FIELD PERMEABLE AGGREGATE

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Include all labor, material, transportation and services to complete installation of the permeable aggregate base and the permeable aggregate top course as shown on the drawings for the synthetic turf field surfacing areas including:
 - 1. Confirmation of Final subgrade establishment
 - 2. Structural soil-bearing fabric
 - 3. Base course permeable aggregate
 - 4. Top course permeable aggregate
 - 5. Recycled Plastic Edge Anchor

1.02 STANDARD SPECIFICATIONS

- A. Design Procedure and General Specifications, Asphalt Paving, Asphalt Association of Washington, Inc., (APAAW);
- B. American Public Works Associations, Washington State Chapter, Standard Specifications for Municipal Public Works Construction, (APWA), latest edition.
- C. American Standard Testing Materials, (ASTM);
- D. American Association of State Highway and Transportation Officials, (AASHTO).

1.03 RELATED WORK IN OTHER SECTIONS

Section	11 68 24	Outdoor Athletic Equipment and Furnishings
Section	31 22 16	Field Establishment
Section	32 18 23	Synthetic Turf Surfacing
Section	33 46 16	Field Subsurface Drainage

1.04 SUBMITTALS

- A. Submit to the Engineer for approval:
 - 1. Qualifications of contractor installing and fine grading the permeable aggregate.
 - 2. Permeable structural fabric product data.
 - 3. Concrete Anchors.
 - 4. Base Course Permeable Aggregate sieve analysis.
 - 5. Base Course Permeable Aggregate infiltration rate (for material compacted to a minimum density of not less than 98% of maximum dry density as determined by ASTM D698).
 - 6. Top Course Permeable Aggregate sieve analysis.
 - 7. Top Course Permeable Aggregate infiltration rate (for material compacted to a minimum density of not less than 98% of maximum dry density as determined by ASTM D698).
 - 8. Equipment and procedures to be utilized for the permeable aggregate installation.
 - 9. Recycled Plastic; Manufacturers Published Product Data.

1.05 QUALIFICATIONS

- A. The subcontractor responsible for field permeable aggregate placement and compaction shall

be submitted to the Engineer for approval. Specific qualification requirements are included as follows:

1. The subcontractor shall be and has been actively and directly engaged in constructing synthetic field projects and shall provide proof of five (5) or more full size (75,000SF) sports field base installations completed in the past three (3) years. The Contractor's experience shall include completion of high school, collegiate, or professional level competition fields. Upon request, provide a listing of all construction contracts (whether completed or in progress) entered into or performed by the subcontractor and completed with the subcontractor's staff within the past three years for projects similar in scope, time and complexity of the work called for under this Contract; include the names of the contracts, and the names and contact information of the owners, and the subcontractors staff who have completed the work. Qualification experience requirement cannot be satisfied with personnel who will not be actively involved with this project.

PART 2 - MATERIALS

2.01 STRUCTURAL SOIL-BEARING FABRIC

A. Fabric

1. Material: Fabric to be 100% Polypropylene, non-woven, needle-punched engineering fabric with a minimum weight of 4.0 oz/sy.
2. Physical Properties:

Tensile Strength, lbs., (ASTM D-4632):	100	
Elongation (%), (ASTM D4632):	50	
Puncture Strength, (lbs), (ASTM D4833):		65
Mullen Burst Strength (PSI), (ASTM D3786):	225	
Trapezoidal Tear, (lbs), (ASTM D4533):	45	
Abrasion Res. % Str. Ret., (ASTM D4886):	80	
Coefficient. of Perm., cm/sec., (ASTM D4491):	0.22	
Flow Rate Gal./Min./Sq.Ft.) (ASTM D4491):	140	
3. Material to be Northwest Linings (253) 872 0244, or approved equal.

2.02 BASE COURSE PERMEABLE AGGREGATE

- A. The base course permeable aggregate shall be installed below the top course permeable aggregate in areas to receive synthetic turf.
- B. Aggregate to be open-graded, fractured, durable, friction course.
 1. To ensure free drainage, material to be clean with minimal fines.
 2. The compacted base course permeable aggregate shall have a minimum infiltration rate of 40 inches per hour when the material is compacted to a density of not less than 98% of the maximum dry density as determined by ASTM D698 (98% Proctor).
 3. Material Strength and Durability
 - a. The material shall demonstrate a compressive strength sufficient to support the anticipated construction loading, including the necessary traffic and compactive effort, without significant breakage of individual particles, or significant alteration of the particle gradation as approved.
 - b. Where the compressive strength is suspect, the Engineer will remove a sample of the material that has been placed by the Contractor at the specified density and perform a particle gradation, the results of which will be compared to previous production test results (approved baseline values). If the results of this test indicate higher passing values for any given screen exceeding 10% of the baseline, the material may be considered noncompliant.

- B. Base course material to be a minimum of 75% fractured with at least one fractured face by mechanical means on each individual particle larger than 1/4". A sand and gravel source is acceptable for this material.
- C. Gradation:

The following values are provided as guidance in generating the performance criteria established above. Minor variations in locally or regionally available aggregate products may require deviation from the table below. Upon proof of compliance with fracture, durability, and infiltration at density, a production particle gradation may be approved as the baseline for future testing.

Typical Base Course Permeable Aggregate particle size range:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
1-1/4"	100
1"	90 - 100
3/4"	80 - 100
1/2"	50 - 80
3/8"	40 - 60
No. 4	15 - 40
No. 8	10 - 20
No. 30	5 - 15
No. 100	0 - 3.0
No. 200 (wet sieve)	0 - 2.0

2.03 TOP COURSE PERMEABLE AGGREGATE

- A. The top course permeable aggregate shall be installed over the base course permeable aggregate in the synthetic turf areas.
- B. Aggregate to be open-graded, 100% fractured, durable, friction course. To ensure free drainage, material to be clean with minimal fines. The compacted top course permeable aggregate shall have a minimum infiltration rate of 20 inches per hour when the material is compacted to a minimum density of not less than 98% of maximum dry density as determined by ASTM D698.
- C. Material Strength and Durability
 - 1. The material shall demonstrate a compressive strength sufficient to support the anticipated construction loading without significant breakage of individual particles, resulting in a significant alteration of the particle gradation as approved.
 - 2. Where the compressive strength is suspect, the Engineer will remove a sample of the material that has been placed by the Contractor at the specified density and perform a particle gradation, the results of which will be compared to previous production test results (approved baseline values). If the results of this test indicate higher passing values for any given screen exceeding 10% of the baseline, the material may be considered noncompliant.

D. Gradation

The following values are provided as guidance in generating the performance criteria established above. Minor variations in locally or regionally available aggregate products may require deviation from the table below. Upon proof of compliance with fracture, durability, and infiltration at density, a production particle gradation may be approved as the baseline for future testing.

Typical Base Course Permeable Aggregate particle size range:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
3/4"	100
1/2"	90 - 100
3/8"	70 - 90
No. 4	30 - 60
No. 8	20 - 40
No. 30	5 - 15
No. 100	2 - 5
No. 200 (Wet Sieve)	0 - 3.0
No. 270 (Wet Sieve)	0 - 1.5

2.04 TESTING

- A. The Owner will be performing testing of materials delivered to the job site for the purpose of verifying compliance with the contract documents. The Owner's testing is for this purpose only and not for construction quality control by the Contractor.
- B. The Contractor shall coordinate directly with the Owner's testing firm relative to the delivery schedules of the imported materials. Sampling will be scheduled each day deliveries occur.
- C. The Contractor shall provide testing and surveillance as required to assure materials and work fully comply with contract requirements.
- D. The Contractor at a price equal to the Owner's contract testing agreement shall pay for owner's tests that do not meet specifications. The Contractor shall pay directly to the testing organization upon invoice to the owner, which has been approved by the Engineer.

2.05 RECYCLED PLASTIC EDGE ANCHOR

- A. Includes all materials required to provide a secure recycled plastic edge for establishment of Permeable Aggregate grade and anchoring of synthetic turf.
- B. A recycled plastic lumber nailer board shall be installed per the details to secure the turf. Product shall be manufactured from 100% recycled materials, consisting of HDPE Plastic Lumber. Material should be dimensional lumber in lengths no shorter than 6'.
 - 1. Where attachment is scheduled to concrete curbing, provide minimum 2"x4" nominal dimensional lumber.
- C. Manufacturer's reference: Product is available from RESCO Plastics, Inc., Coos Bay, Oregon. (800) 266-5097.
- D. Concrete Anchoring: Concrete wedge anchor, zinc plated, 3/8" x5" length, partially threaded, with zinc plated washer and nut.
- E. Steel power-load driven or ram-set Concrete Anchor Nail, minimum shank diameter 5/32", minimum head/washer diameter 3/8", sufficient length to insure a minimum 2" embedment. Individual anchors shall develop a minimum 450 lb shear, 350 lb tension in 4,000 psi concrete at 2" embedment.

PART 3 – EXECUTION

3.01 SUBGRADE ESTABLISHMENT

- A. No work shall be performed in this section until subgrade is 100% completed and accepted by the Engineer.
- B. Finish subgrade shall be compacted to a minimum 95% maximum dry density.
- C. Subgrade shall be established to within the tolerance of +0.00' or -0.10' of the design subgrade elevation.

3.02 STRUCTURAL SOIL-BEARING FABRIC INSTALLATION

- A. No loose material is allowed on subgrade prior to placement of structural fabric. Loose material is to be removed prior to placement.
- B. Fabric to be laid on smooth, compacted, subgrade surface between drainage trenches.
- C. Subgrade shall be approved by the Engineer prior to placement of structural-bearing fabric.
- D. Structural fabric must be flat on stabilized subgrade for full width.
- E. Dimensions to be a minimum width of 12.5' and minimum continuous length of 150 lf.
- F. When the length of the fabric is not continuous, the lateral seam shall have a minimum overlap of 24".
- G. Fabric shall not be folded or turned up along the edges.
- H. The fabric shall be field cut as necessary to meet specified tolerances of distance from drainage trenches.
- I. Fabric shall be placed between trenches. In no instance shall fabric cover trench, lie against aggregate or pea gravel backfill, or extend vertically above subgrade.
- J. Stabilization: Immediately upon laying, the fabric is to be covered with base aggregate. No loaded trucks are to be permitted to move over fabric-covered surfaces until a minimum of 8" of aggregate has been placed, except if specifically approved by the Engineer, who will require strict, direct - 100% - control of all vehicle movement on site.

3.03 EQUIPMENT MOVEMENT

- A. No trucks or equipment will be allowed to drive over the top of the field subsurface drainage piping, whether lateral piping or collector piping. Following placement of a minimum of 8" depth of reservoir aggregate.
- B. In the event non-track traffic is observed or evidenced to cross trenches, the Contractor shall, at their own expense, expose the drainpipe in the area directed for observation by the Engineer and repair any damage promptly.

3.04 AGGREGATE PLACEMENT

- A. Moisture Content: Aggregate to contain 3.5% to 4.0% moisture content to ensure that fines do not migrate and to facilitate proper compaction. Contractor must ensure that aggregate

leaving the source plant meets this requirement and is required to apply water to aggregate on site to attain and maintain this minimum moisture content in stockpile and during all placement operations.

- B. Prior to aggregate placement, remove any excess or contaminated backfill from the subsurface drainage trenches.
- C. Surface must be free of standing water and subgrade stabilized with structural fabric in place prior to placement.
- D. Materials to be placed in layers not exceeding 6" bulk and 4-1/2" compacted in depth. Each layer must be spread uniformly with equipment that will not cause perceptible separation in gradation (segregation), preferably a self-propelled paving machine.
- E. Should there occur during any stage of the spreading or stockpiling a separation of the material particles, the Contractor must immediately remove and dispose of segregated material and correct or change handling procedures to prevent any further separation.

3.05 AGGREGATE COMPACTION

- A. Each layer shall be compacted to a minimum density of not less than 95% of maximum dry density as determined by ASTM D698 and measured using a nuclear method.
- B. Use Static Tandem Drum-type roller of not less than five tons weight.

3.06 AGGREGATE TOLERANCES

- A. The Contractor shall utilize a laser plane system for grade control.
- B. The surface of the base course permeable aggregate in areas to be covered with top course aggregate as applicable shall not deviate from designated compacted grade within the range of -0.50" and +0.00".
- C. The surface of the top course permeable aggregate shall not deviate from designated compacted grade with the range of -0.00" and +0.25".
- D. Upon completion of the fine grading, compaction, and Contractor confirmation of conformance with the tolerances, the Contractor shall notify the Engineer and schedule an inspection for approval. The Contractor shall have a laser plane system available to the Engineer for the inspections. The Contractor shall not be authorized to place synthetic turf over the permeable aggregate until it has been inspected and approved by the Engineer.
- E. Upon completion of elevation verification, the entire permeable aggregate surface shall be inspected for planarity. Planarity inspection shall be completed in conjunction, coordination with the synthetic turf vendor. The installation foreman for the synthetic turf shall be present at the time of the inspection. Inspection shall consist of stretching a stringline taut over the finished permeable aggregate surface at such interval as may be required to confirm surface planarity and acceptance for installation of synthetic turf surface. Any deviation greater than 1/4" shall require remediation efforts as may be required to meet subgrade tolerance.

3.07 RECYCLED PLASTIC EDGE ANCHOR

- A. Prior to proceeding with Edge Anchor installation, confirm with the Engineer the final elevation for installation relative to adjacent surfaces.
- B. The Edge Anchor may be temporarily set with temporary hardware to establish the proper line and grade. This temporary hardware may remain after final installation.

1. Wedge Anchor
 - a. The Plastic Edge Anchor may be temporarily set with power-loads to establish the proper line and grade. This temporary hardware may remain after final installation.
 - b. Once the initial line and grade has been established, pre-drill the edge anchor and establish a void in the adjacent concrete surface that meets the approved anchor supplier's requirements for proper securing of the anchor.
 - c. Minimum requirements for anchor installation:
 - 1). Depth of Embedment: 3" or as recommended by the anchor supplier, whichever is greater.
 - 2). Horizontal Spacing: no greater than 36" on center and 12" from end of any length of lumber.
 - 3). Nut Torque: Per approved manufacturer's recommendation.
 - 4). Do not trim bolt ends. Bolts with trimmed or damaged ends will be rejected and must be removed.

2. Concrete Anchor Nail
 - a. The Plastic Edge Anchor may be temporarily set with power-loads placed at the Contractors option to assist in establishing the proper line and grade. This temporary hardware may remain after final installation.
 - b. Once the initial line and grade has been established, install the specified ram-set or power-load driven Concrete Anchoring Nails in manner consistent with the approved manufacturers printed instruction and the specified spacing.
 - c. Minimum requirements for Concrete Anchor Nail installation:
 - 1). Depth of Embedment: 2" or as recommended by the anchor supplier, whichever is greater.
 - 2). Horizontal Spacing: no greater than 21" on center and 6" from end of any length of lumber.
 - 3). Stagger the spacing of each Anchor up and down within the middle one-half the face of the Recycled Edge Anchor.

END OF SECTION

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CARROLL COLLEGE NELSON STADIUM - FIELD & LIGHTING BID SET

1857 N. Benton Ave. Helena, MT 59601

COORDINATION NOTE

IT IS ABSOLUTELY NECESSARY THAT ALL TRADES COORDINATE WITH EACH OTHER AND VERIFY THAT THERE ARE NO CONFLICTS IN LOCATION OF DUCTS, CONDUITS, SPRINKLER HEADS, DIFFUSERS, ELECTRICAL BOXES, EQUIPMENT, AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.



CWG Architecture + Interiors

P.O. Box 1198 59624
650 Power Street
Helena, Montana
Tel (406) 443-2340
Fax (406) 442-8565
cwg@cwg-architects.com

STRUCTURAL MORRISON MAIERLE
HELENA, MONTANA TEL 406-442-3050

MECHANICAL GPD ENGINEERING, INC.
GREAT FALLS, MONTANA TEL 406-452-9558

ELECTRICAL GPD ENGINEERING, INC.
GREAT FALLS, MONTANA TEL 406-452-9558

CIVIL ROBERT PECCIA & ASSOCIATES
HELENA, MONTANA TEL 406-447-5000

TURF CONSULTANT D.A. HOGAN & ASSOCIATES
SEATTLE, WASHINGTON TEL 206-285-0400

FIELD LIGHTING CONSULTANT STANTEC
SEATTLE, WASHINGTON TEL 206-667-0555



GENERAL NOTES

GENERAL NOTES

- THIS IS A TYPE V-B, NON-SPRINKLED STRUCTURE
- DO NOT SCALE DRAWINGS. CONTRACTOR SHALL VERIFY ALL DIMENSIONS SIZES, QUANTITIES, & LOCATION BEFORE BEGINNING WORK
- VERIFY LOCATION OF EXISTING UTILITIES PRIOR TO CONSTRUCTION. ANY UTILITIES LOCATED ARE SHOWN APPROXIMATE AND SHOULD NOT BE USED TO DETERMINE THEIR LOCATION ON THE GROUND, AND DOES NOT RELIEVE ANY PERSON OR COMPANY OF THEIR RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES PRIOR TO ANY EXCAVATION BY CALLING UTILITIES UNDERGROUND LOCATION CENTER AT 1-800-424-5555.
- THERE ARE NO KNOWN HAZARDOUS MATERIALS STORED ON THE PREMISES AS DEFINED BY 2021 IBC
- PROJECT SHALL COMPLY WITH THE 2021 IBC, 2021 IMC, 2021 IECC, 2021 NEC, 2021 IFC, 2021 UPC
- ELECTRONIC DRAWING FILES ARE AVAILABLE FROM THE ARCHITECT. STRUCTURAL, MECHANICAL AND ELECTRICAL ENGINEERS AT \$100.00 PER DRAWING & \$25.00 FOR PDF. DRAWINGS WILL BE STRIPPED OF ALL DATA EXCEPT FOR BASIC PLAN OR SECTION INFORMATION. A WAIVER WILL NEED TO BE SIGNED AND RECEIVED PRIOR TO RELEASE OF DRAWING FILES.

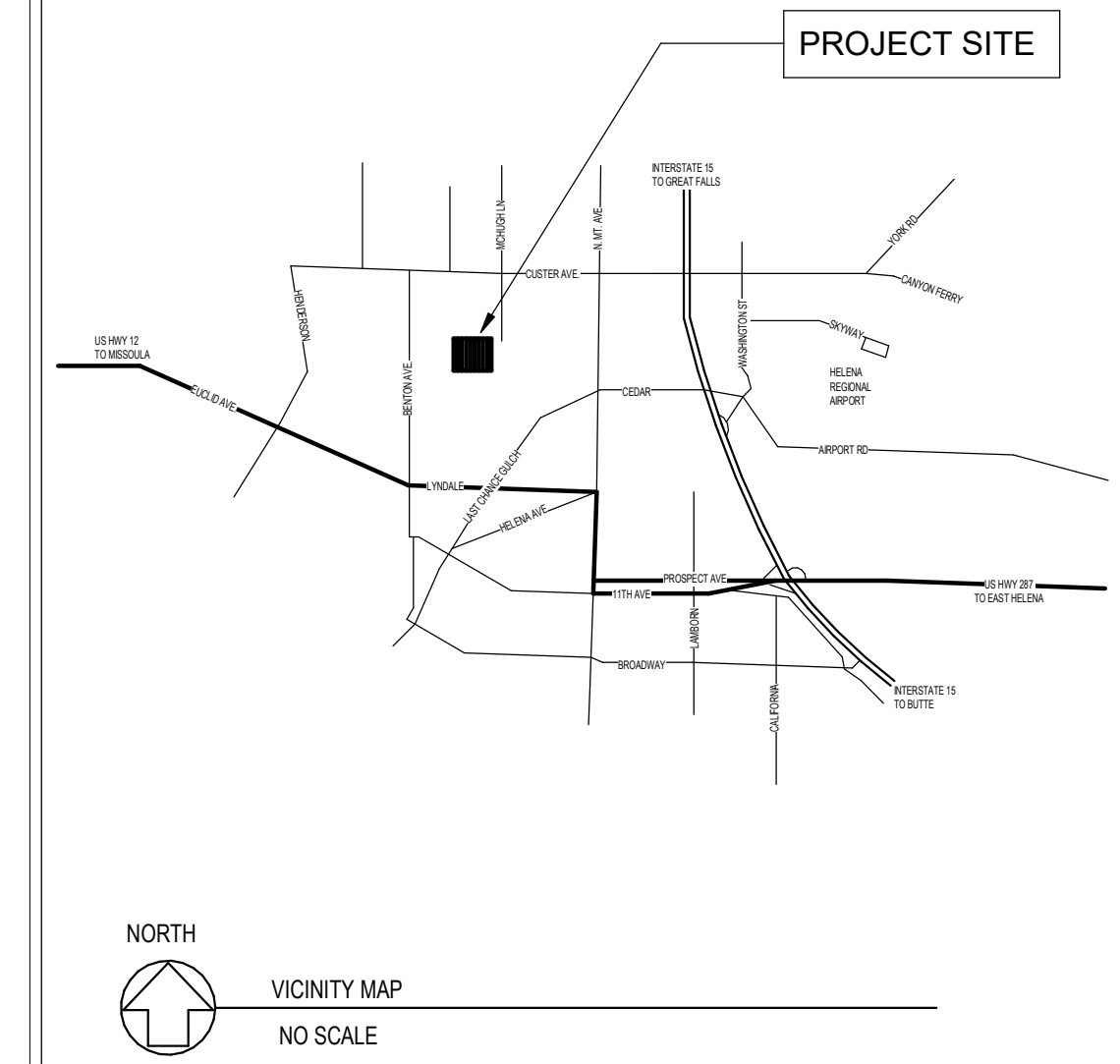
REQUIRED SPECIAL INSPECTIONS

IN ADDITION TO THE REGULAR INSPECTIONS, THE FOLLOWING NOTED ITEMS WILL ALSO REQUIRE SPECIAL INSPECTION IN ACCORDANCE WITH IBC SEC. 1705

ITEM	REQUIRED	NOT REQUIRED
SOILS COMPLIANCE PRIOR TO FOUNDATION INSPECTION	X	
STRUCTURAL CONCRETE OVER 2500 PSI	X	
FIELD WELDING	X	

SUBMITTAL DOCUMENTS FOR DEFERRED SUBMITTAL ITEMS SHALL BE SUBMITTED TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE, WHO SHALL REVIEW THEM AND FORWARD THEM TO THE BUILDING OFFICIAL WITH A NOTATION INDICATING THAT THE DEFERRED SUBMITTAL DOCUMENTS HAVE BEEN REVIEWED AND THAT THEY HAVE BEEN FOUND TO BE IN GENERAL CONFORMANCE WITH THE BUILDING DESIGN. THE DEFERRED SUBMITTAL ITEMS SHALL NOT BE INSTALLED UNTIL THEIR DESIGN AND SUBMITTAL DOCUMENTS HAVE BEEN APPROVED BY THE BUILDING OFFICIAL.

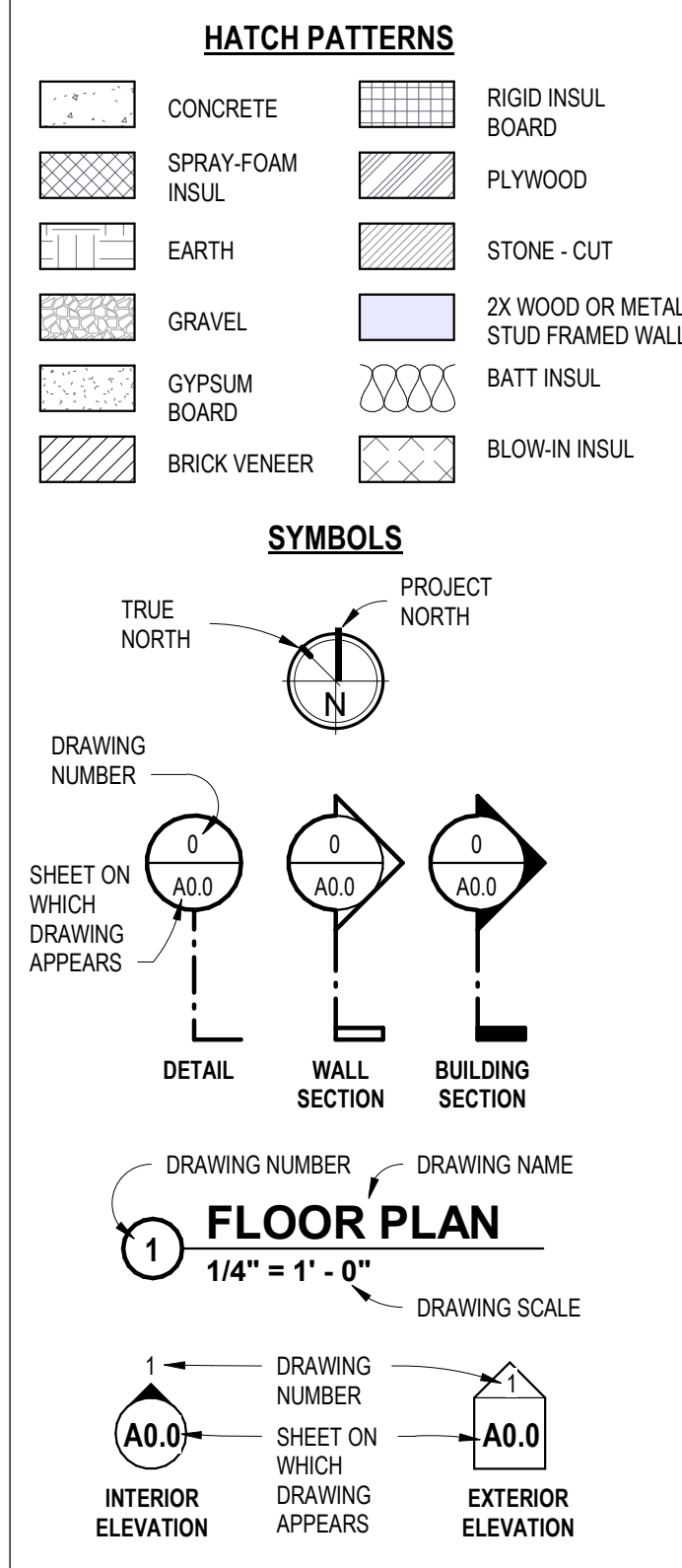
VICINITY MAP



ARCHITECTURAL ABBREVIATIONS

#	PLUS OR MINUS	GA	GAUGE
*	DEGREE	GALV.	GALVANIZED
Ø	DIAMETER	GL.	GLU-LAM
⊕	CENTER LINE	GYP. BD.	GYP. BOARD
ACT.	ACOUSTICAL TILE	H.M.	HOLLOW METAL
ADJ.	ADJUSTABLE	HORIZ.	HORIZONTAL
A.F.F.	ABOVE FINISH FLOOR	INSUL.	INSULATION
ALT.	ALTERNATE	I & W.	ICE AND WATER SHIELD
ALUM.	ALUMINUM	MAX.	MAXIMUM
BD.	BOARD	MDF.	MEDIUM DENSITY FIBER BD.
B.O.	BOTTOM OF	MECH.	MECHANICAL
BOTT.	BOTTOM	MFR.	MANUFACTURER
BRG.	BEARING	MIN.	MINIMUM
BS.	BACKSPLASH	MISC.	MISCELLANEOUS
C.J.	CONTROL JOINT	M.O.	MASONRY OPENING
CLG.	CEILING	MTL.	METAL
CLR.	CLEAR	N.I.C.	NOT IN CONTRACT
CMU	CONCRETE MASONRY UNIT	N.T.S.	NOT TO SCALE
C.O.	CLEAN OUT	O.C.	ON CENTER
COL.	COLUMN	O.C.E.W.	ON CENTER EACH WAY
CONC.	CONCRETE	O.S.B.	ORIENTED STRAND BOARD
CONT.	CONTINUOUS	PLWD.	PLYWOOD
CPT.	CARPET	PREFIN.	PREFINISHED
C.T.	CERAMIC TILE	P.T.	PRESSURE TREATED
DBL.	DOUBLE	R.D.	ROOF DRAIN
D.F.	DRINKING FOUNTAIN	REINF.	REINFORCE (ED) (ING)
DIA.	DIAMETER	REQD.	REQUIRED
DIM.	DIMENSION	R.O.	ROUGH OPENING
D.S.	DOWNSPOUT	SCHD.	SCHEDULE
(E)	EXISTING	SIM.	SIMILAR
ELEC.	ELECTRICAL	SPEC.	SPECIFICATION
EQ.	EQUAL	STL.	STEEL
EQUIP.	EQUIPMENT	STRUCT.	STRUCTURAL
EXP.	EXPANSION	SUSP.	SUSPENDED
EXT.	EXTERIOR	S.V.	SHEET VINYL
EW.	EACH WAY	T.O.	TOP OF
FACT.	FACTORY	T.S.	TUBE STEEL
FD.	FLOOR DRAIN	TYP.	TYPICAL
FDC.	FIRE DEPARTMENT CONNECTION	V.C.T.	VINYL COMPOSITION TILE
FE.	FIRE EXTINGUISHER	VERT.	VERTICAL
FEC.	FIRE EXTINGUISHER CAB	W.	WITH
FN.	FINISH	WD.	WOOD
FLR.	FLOOR	WDW.	WINDOW
FNDTN.	FOUNDATION		
FRP.	FIBER REINFORCED PLASTIC		
F.S.	FLOOR SINK		
FTG.	FOOTING		

PATTERNS & SYMBOLS



SHEET LIST

C0.1 COVER
C1.1 SITE GRADING PLAN
C1.2 SITE GRADING SECTIONS
ADA GENERAL DETAILS
ARCHITECTURAL
A1.0 AS-BUILT SITE PLAN & CODE REVIEW
A1.1 OVERALL PLAN
A1.2 OVERALL PLAN - SPOT ELEVATION
A1.3 RAMP ELEVATIONS
A2.1 SECTIONS & DETAILS
STRUCTURAL
S0.1 STRUCTURAL NOTES
S0.2 STRUCTURAL DETAILS
TURF
F1.1 FIELD LAYOUT
F1.2 FIELD GRADING
F1.3 FIELD DRAINAGE
F1.4 FIELD IRRIGATION
F2.1 FIELD SECTION & DRAINAGE DETAILS
F2.2 FIELD IRRIGATION DETAILS
F2.3 FIELD DETAILS
F3.1 SYNTHETIC TURF COMPOSITE PLAN
F3.2 SYNTHETIC TURF FOOTBALL MARKINGS
F3.3 SYNTHETIC TURF SOCCER MARKINGS
F3.4 SYNTHETIC TURF LOGO & END ZONE DETAILS
ELECTRICAL FIELD LIGHTING
E0.1 ELECTRICAL SERVICE & GENERATOR PLANS & DETAILS
E0.2 ELECTRICAL SERVICE & GENERATOR DIAGRAMS & DETAILS
E1.1 ELECTRICAL SITE PLAN
E2.0 ELECTRICAL DETAILS
E2.1 ELECTRICAL DETAILS
E2.2 ELECTRICAL DETAILS

CITY PERMIT STAMP

Blank area for City Permit Stamp.

CARROLL COLLEGE
1857 N. Benton Ave. Helena, MT 59601
NELSON STADIUM - FIELD & LIGHTING BID SET

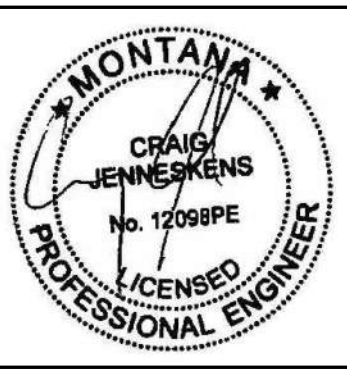
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COVER SHEET
DATE 10-13-23
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COORDINATION NOTE

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CWO Architects
 Architects
 P.O. Box 1198
 Helena, MT 59624
 cwo@cwo-architects.com
 (406)443-2340

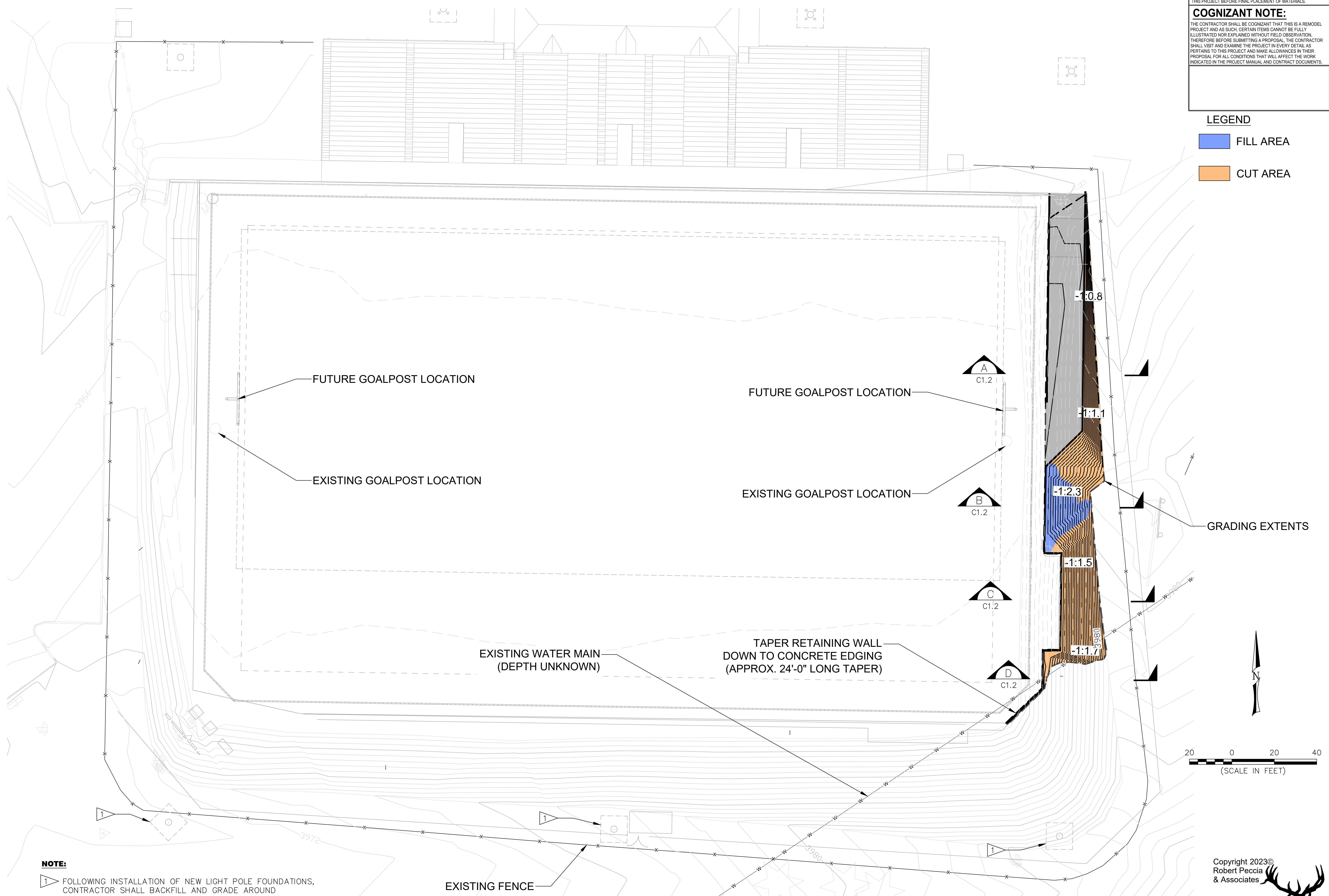


REVISIONS

#	DATE

LEGEND

- FILL AREA
- CUT AREA



NOTE:
 1 FOLLOWING INSTALLATION OF NEW LIGHT POLE FOUNDATIONS, CONTRACTOR SHALL BACKFILL AND GRADE AROUND FOUNDATIONS TO BLEND INTO SURROUNDING EXISTING GRADE.

SITE GRADING PLAN 1

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**CARROLL COLLEGE
 NELSON STADIUM - FIELD & LIGHTING BID SET**
 1857 N. Benton Ave. Helena, MT 59601
SITE GRADING PLAN

70.41.03

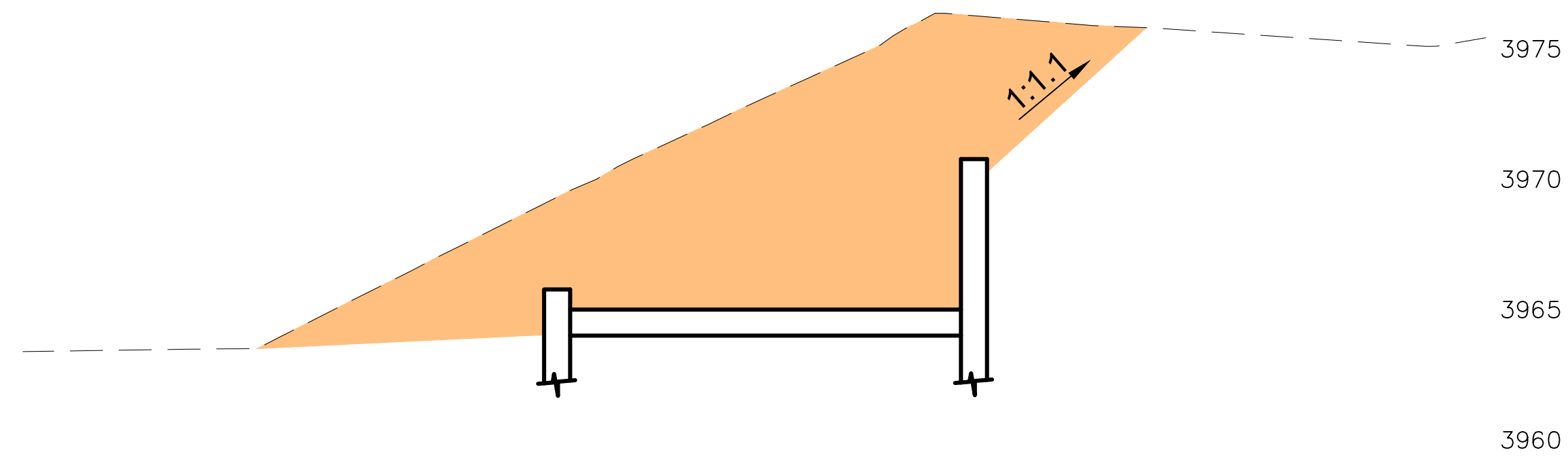
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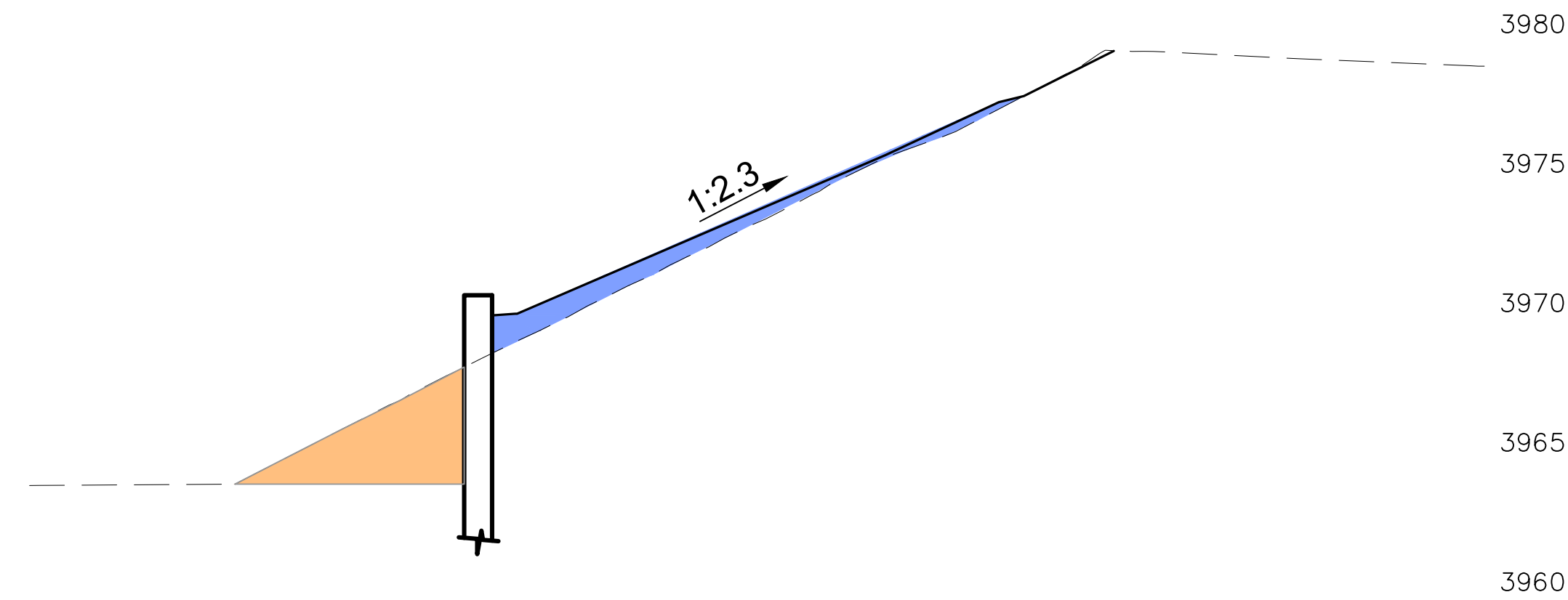
DATE 10-13-23

C1.1

NOTE:
 CONCRETE RETAINING WALLS AND RAMP SURFACES SHOWN IN THESE SECTIONS ARE FOR ILLUSTRATIVE PURPOSES ONLY. SEE ARCHITECTURAL AND STRUCTURAL SHEETS FOR DETAILED DIMENSIONAL INFORMATION FOR ALL NEW CONCRETE STRUCTURES AND SURFACING.



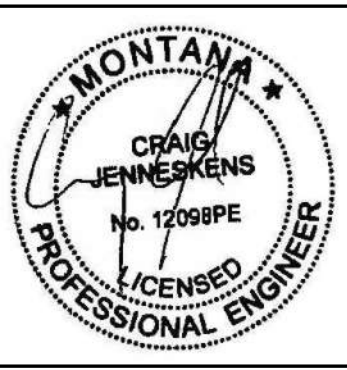
SECTION A
 SCALE: 1"=5'-0" C1.1



SECTION B
 SCALE: 1"=5'-0" C1.1

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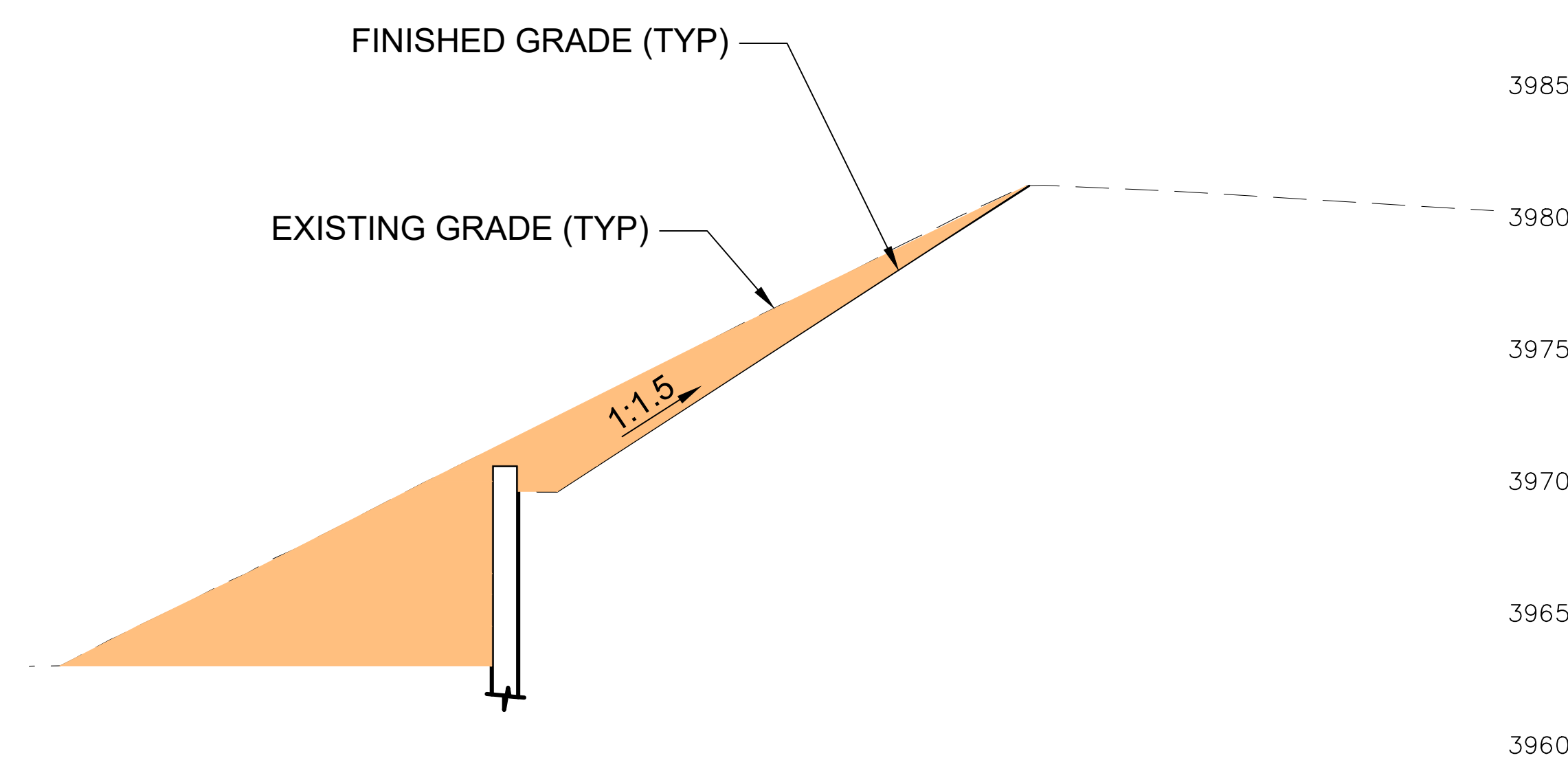
CWG Architecture
 1857 N. Benton Ave.
 P.O. Box 1139
 Helena, MT 59624
 cwg@cwg-architects.com
 (406)443-2340
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#	DATE

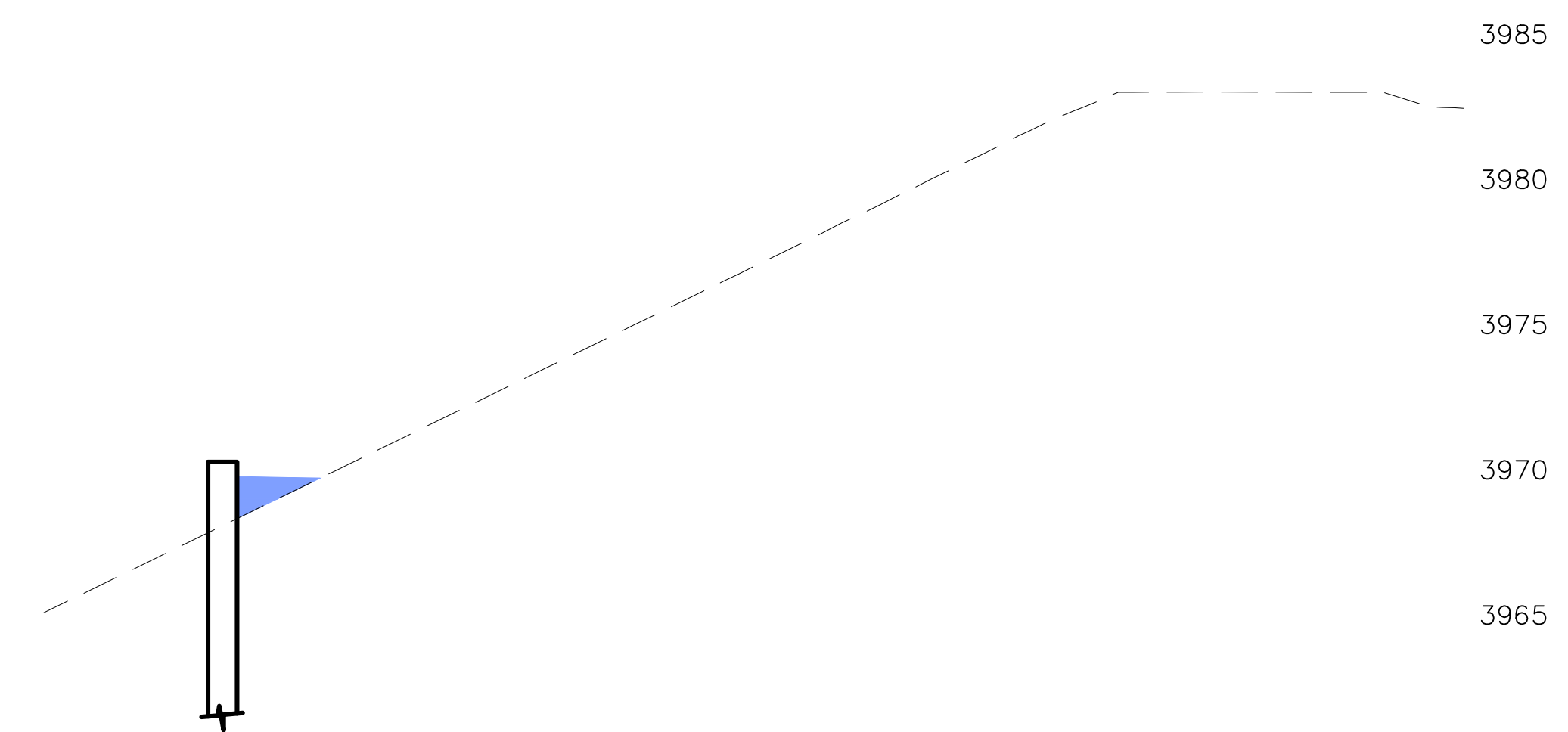
LEGEND

FILL AREA

CUT AREA



SECTION C
 SCALE: 1"=5'-0" C1.1



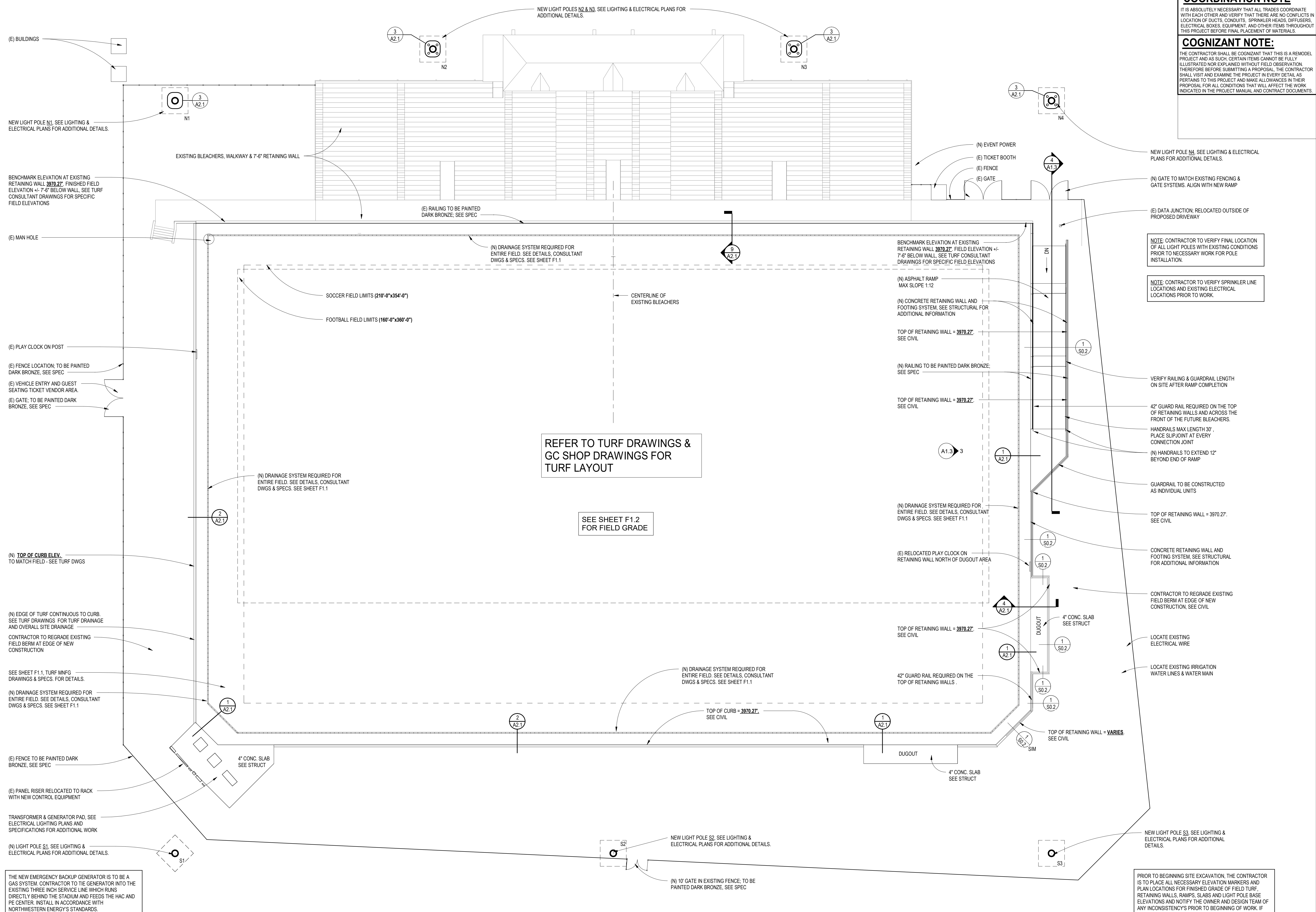
SECTION D
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**CARROLL COLLEGE
 NELSON STADIUM - FIELD & LIGHTING BID SET**
 1857 N. Benton Ave. Helena, MT 59601
SITE GRADING SECTIONS

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DATE 10-13-23
C1.2

© Project: Carroll College Nelson Stadium (2023) 03 Design - Drawings - Specs 3 - Revise 2023/03/08 10:02:29 AM
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COORDINATION NOTE
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CWG Architecture + Interior
 650 Power St.
 P.O. Box 1198
 Helena, MT 59624
 cwg@cwg-architects.com
 (406)443-2340
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#	DATE

REFER TO TURF DRAWINGS & GC SHOP DRAWINGS FOR TURF LAYOUT

SEE SHEET F1.2 FOR FIELD GRADE

**CARROLL COLLEGE
 NELSON STADIUM - FIELD & LIGHTING BID SET**
 1857 N. Benton Ave. Helena, MT 59601
OVERALL PLAN

70.41.03
 DRAWN BY: JE
 APPROVED BY: RJ
 DATE: 10-13-23

A1.1

1 UPPER BLEACHERS
 1" = 20'-0"

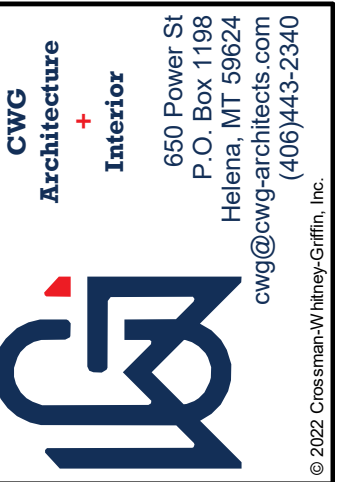
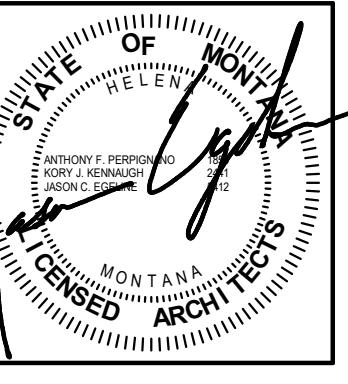
PRIOR TO BEGINNING SITE EXCAVATION, THE CONTRACTOR IS TO PLACE ALL NECESSARY ELEVATION MARKERS AND PLAN LOCATIONS FOR FINISHED GRADE OF FIELD TURF, RETAINING WALLS, RAMPS, SLABS AND LIGHT POLE BASE ELEVATIONS AND NOTIFY THE OWNER AND DESIGN TEAM OF ANY INCONSISTENCY'S PRIOR TO BEGINNING OF WORK. IF NOT COMPLETED IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO REPAIR, MOVE OR REPLACE ANY INCONSISTENCIES IN THE LAYOUT.

COORDINATION NOTE

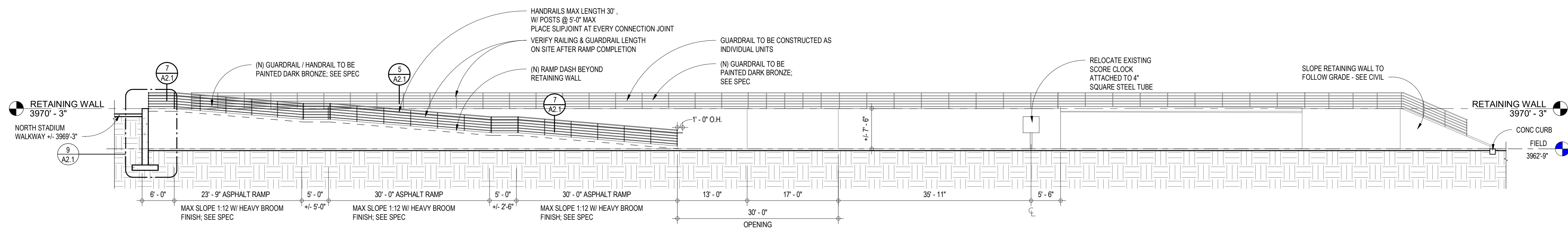
IT IS ABSOLUTELY NECESSARY THAT ALL TRADES COORDINATE WITH EACH OTHER AND VERIFY THAT THERE ARE NO CONFLICTS IN LOCATION OF DUCTS, CONDUITS, SPRINKLER HEADS, DIFFUSERS, ELECTRICAL BOXES, EQUIPMENT, AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.

COGNIZANT NOTE:

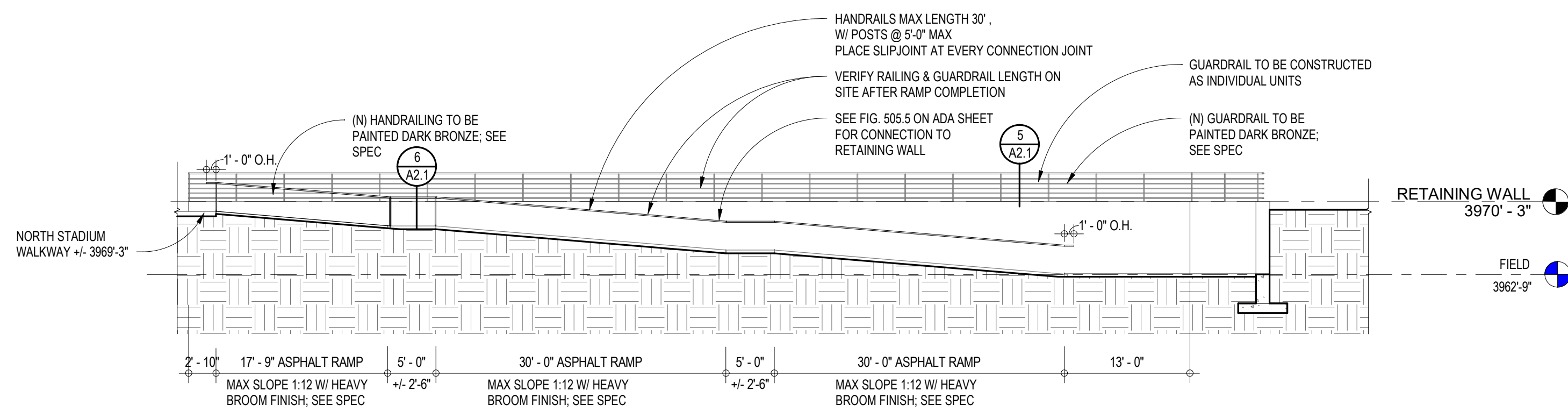
THE CONTRACTOR SHALL BE COGNIZANT THAT THIS IS A REMODEL PROJECT AND AS SUCH, CERTAIN ITEMS CANNOT BE FULLY ILLUSTRATED NOR EXPLAINED WITHOUT FIELD OBSERVATION. THEREFORE BEFORE SUBMITTING A PROPOSAL, THE CONTRACTOR SHALL VISIT AND EXAMINE THE PROJECT IN EVERY DETAIL AS PERTAINS TO THIS PROJECT AND MAKE ALLOWANCES IN THEIR PROPOSAL FOR ALL CONDITIONS THAT WILL AFFECT THE WORK INDICATED IN THE PROJECT MANUAL AND CONTRACT DOCUMENTS.



REVISIONS	
#	DATE



3 EAST RAMP - ELEVATION
3/32" = 1'-0"

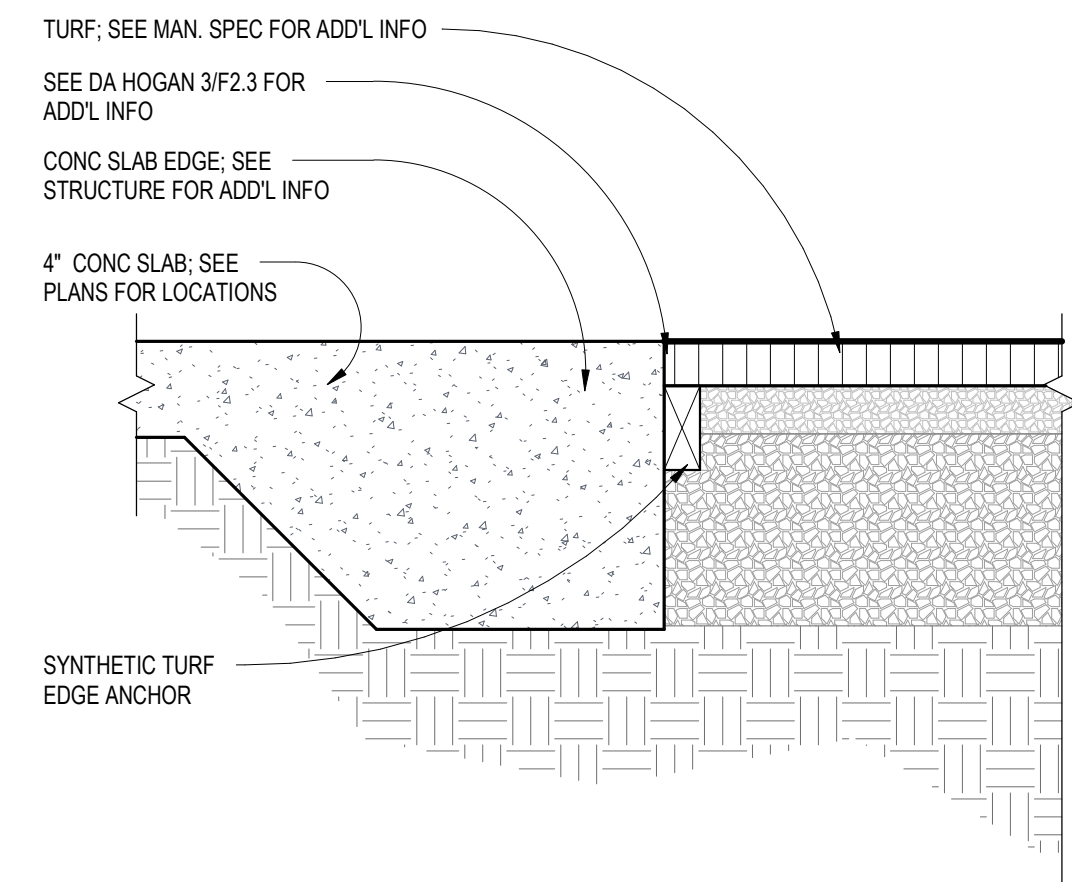


4 EAST RAMP HANDRAIL - SECTION
3/32" = 1'-0"

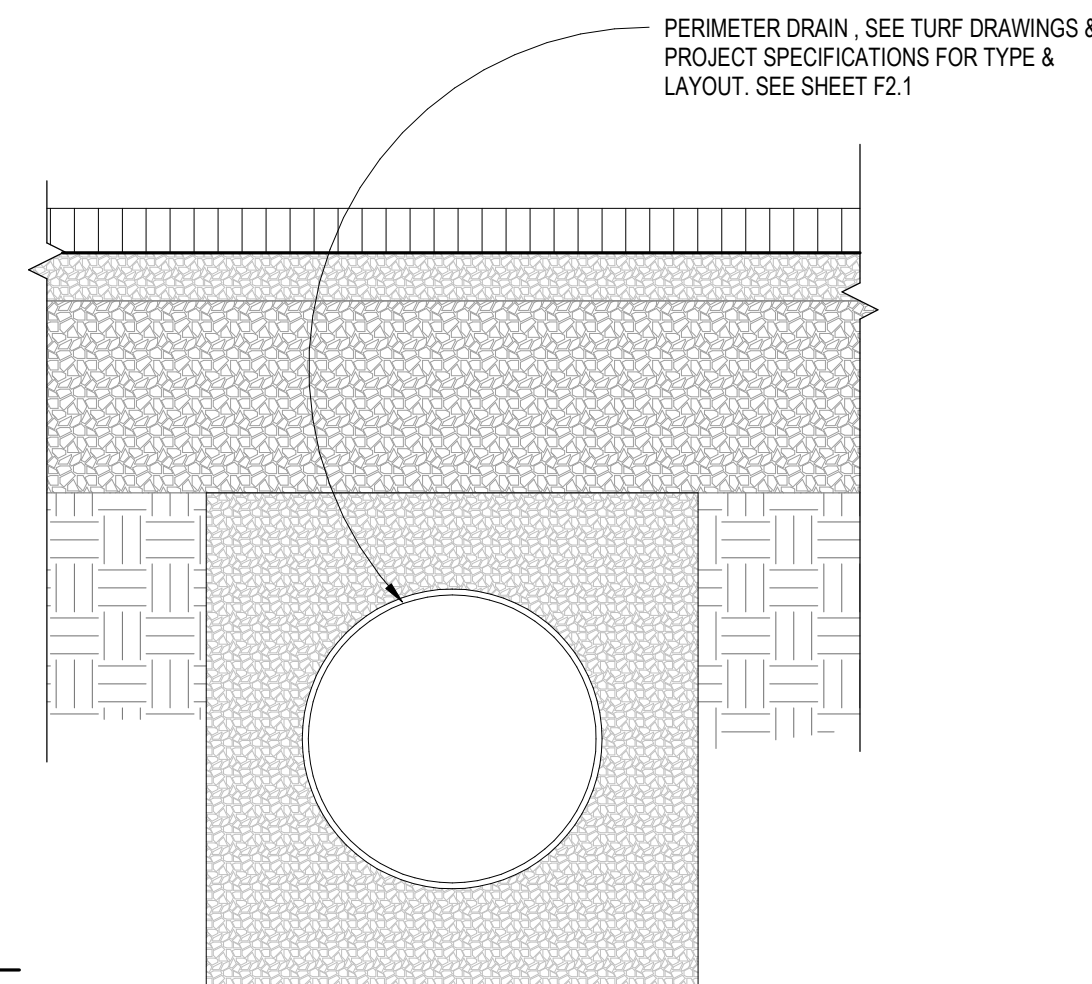
**CARROLL COLLEGE
 NELSON STADIUM - FIELD & LIGHTING BID SET**
 1857 N. Benton Ave. Helena, MT 59601
RAMP ELEVATIONS

70.41.03
 DRAWN BY CWG
 APPROVED CWG
 DATE 10-13-23

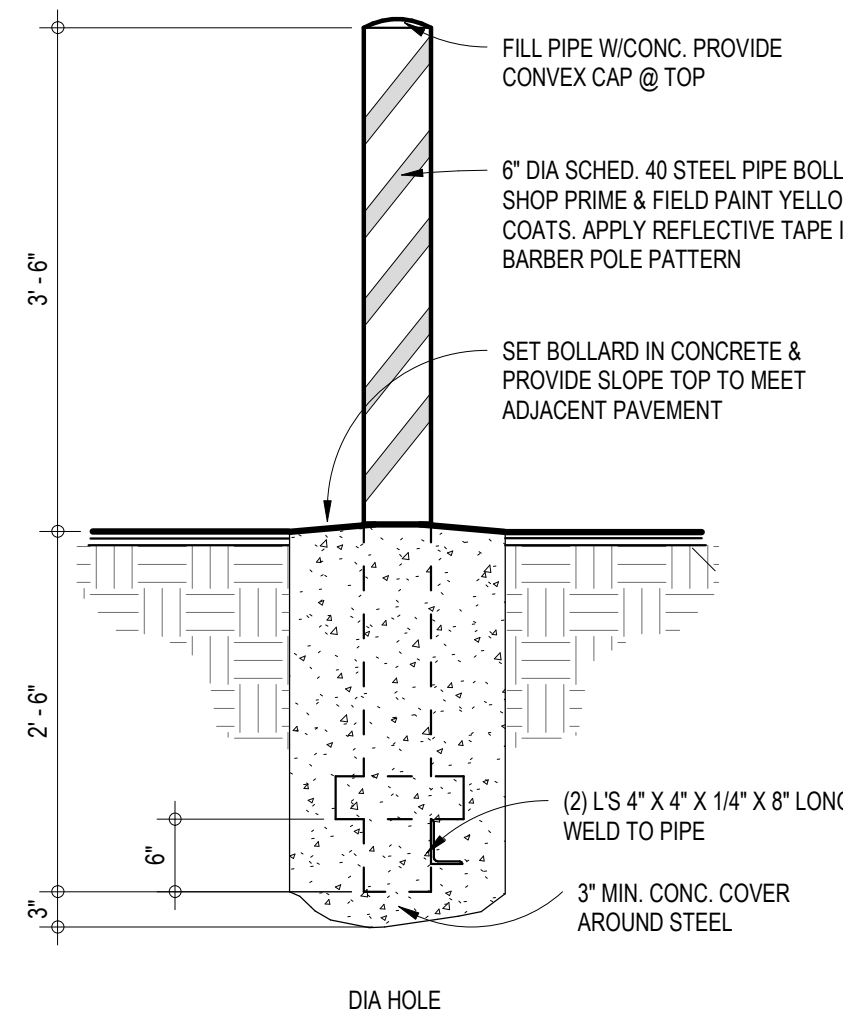
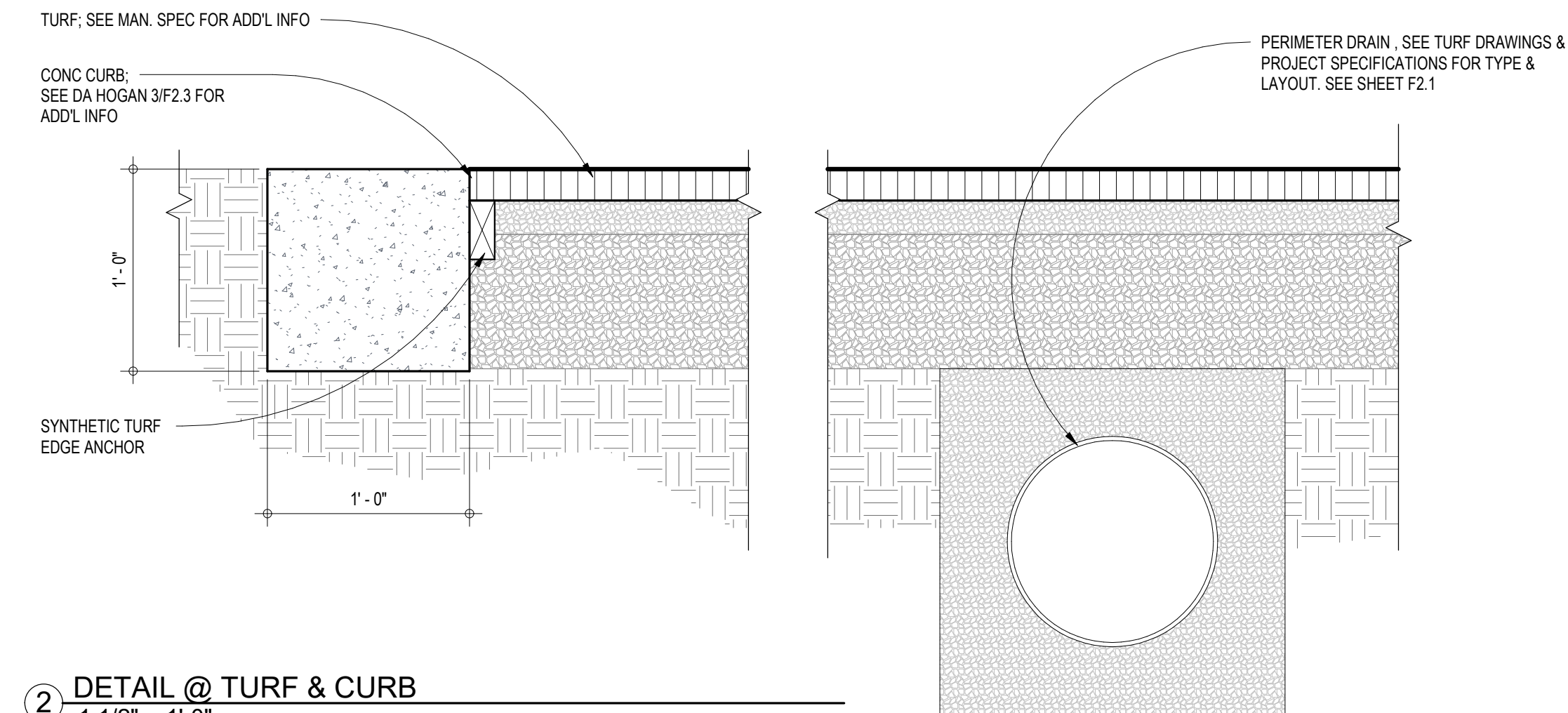
A1.3



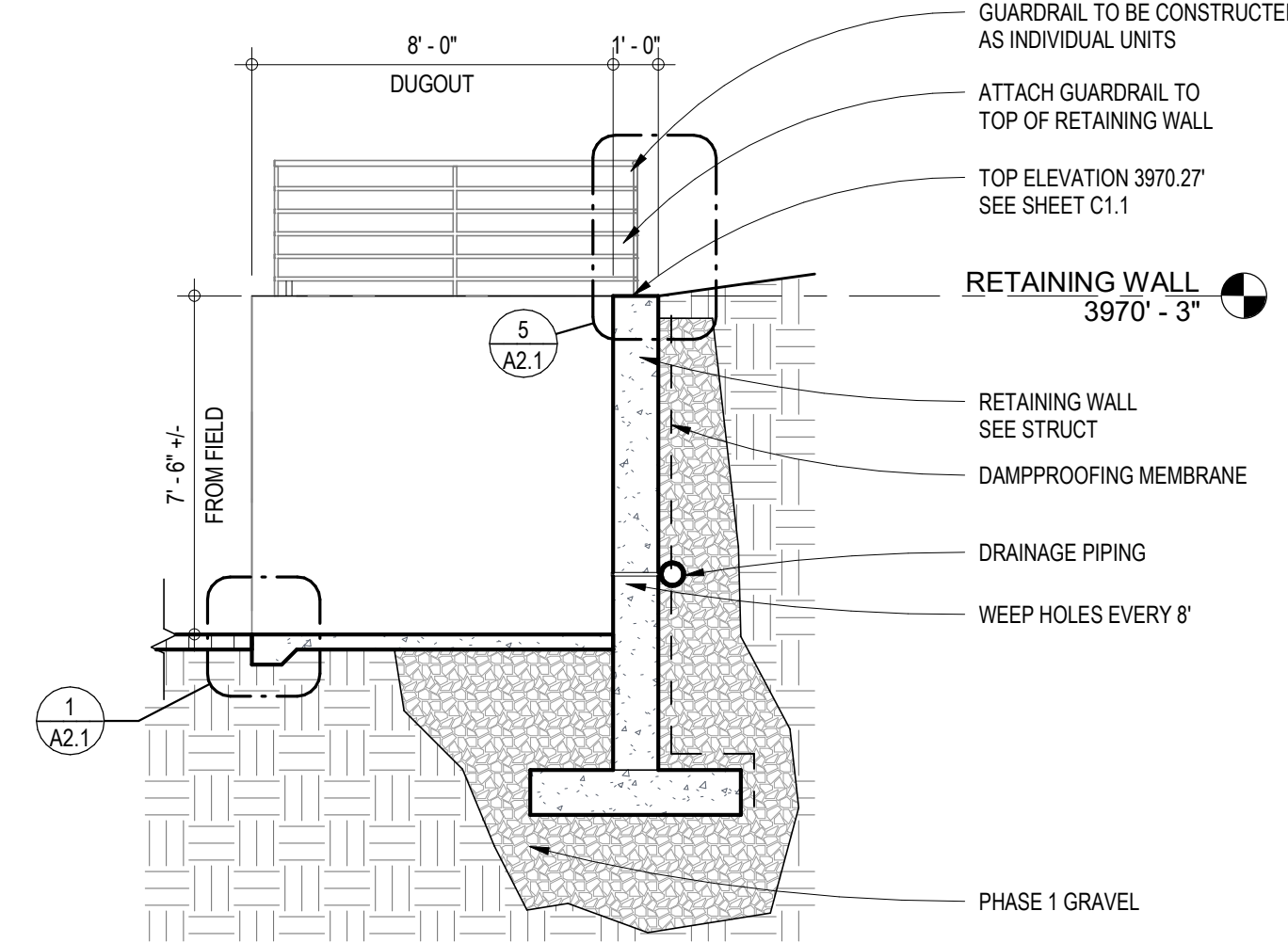
1 **DETAIL @ TURF & CONCRETE**
1 1/2" = 1'-0"



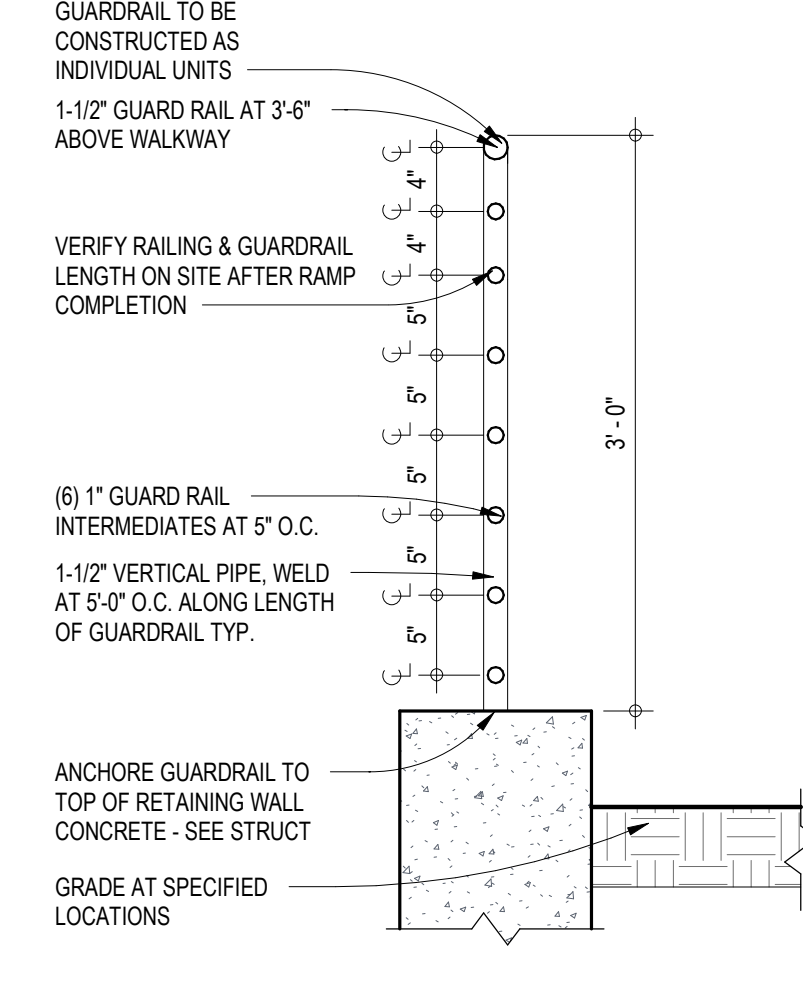
2 **DETAIL @ TURF & CURB**
1 1/2" = 1'-0"



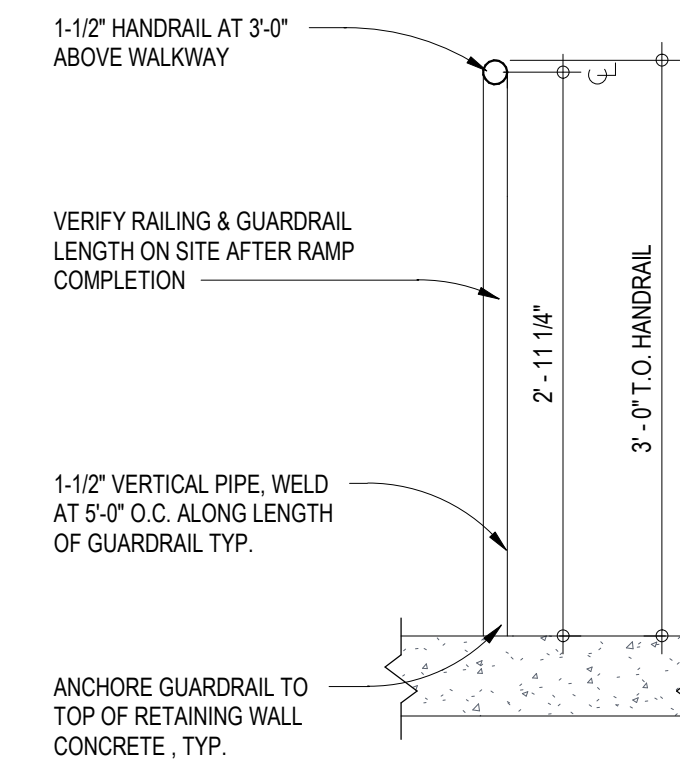
3 **PIPE BOLLARD AT LIGHT POLES**
3/4" = 1'-0"



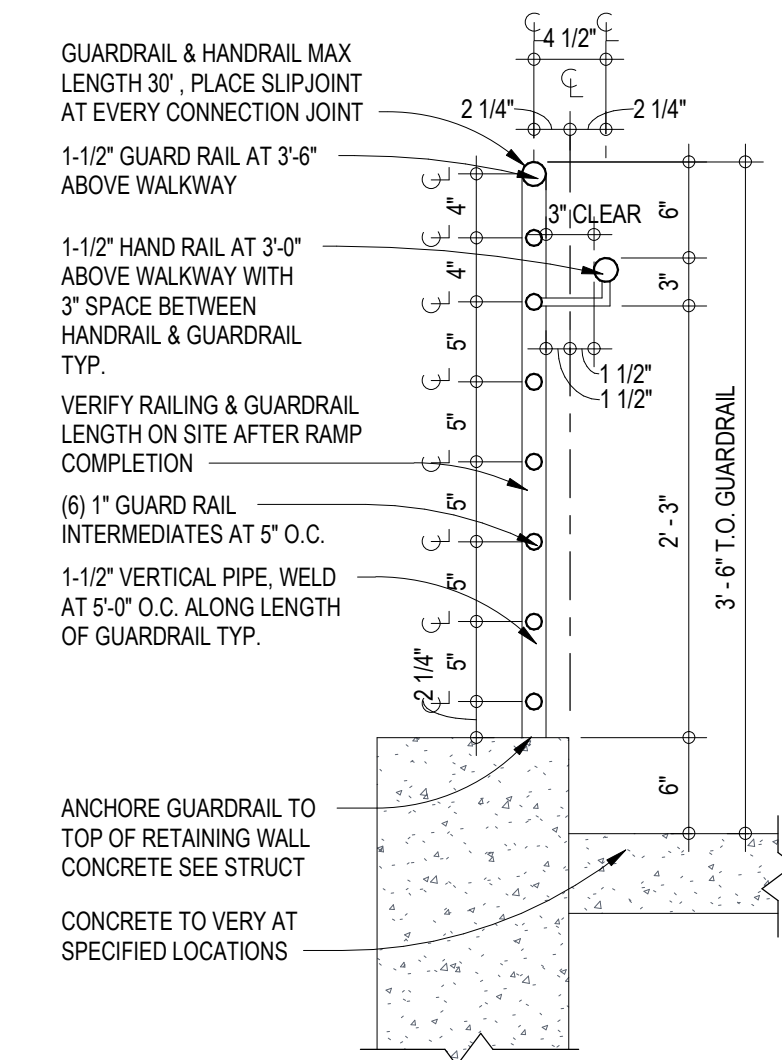
4 **DUGOUT**
1/4" = 1'-0"



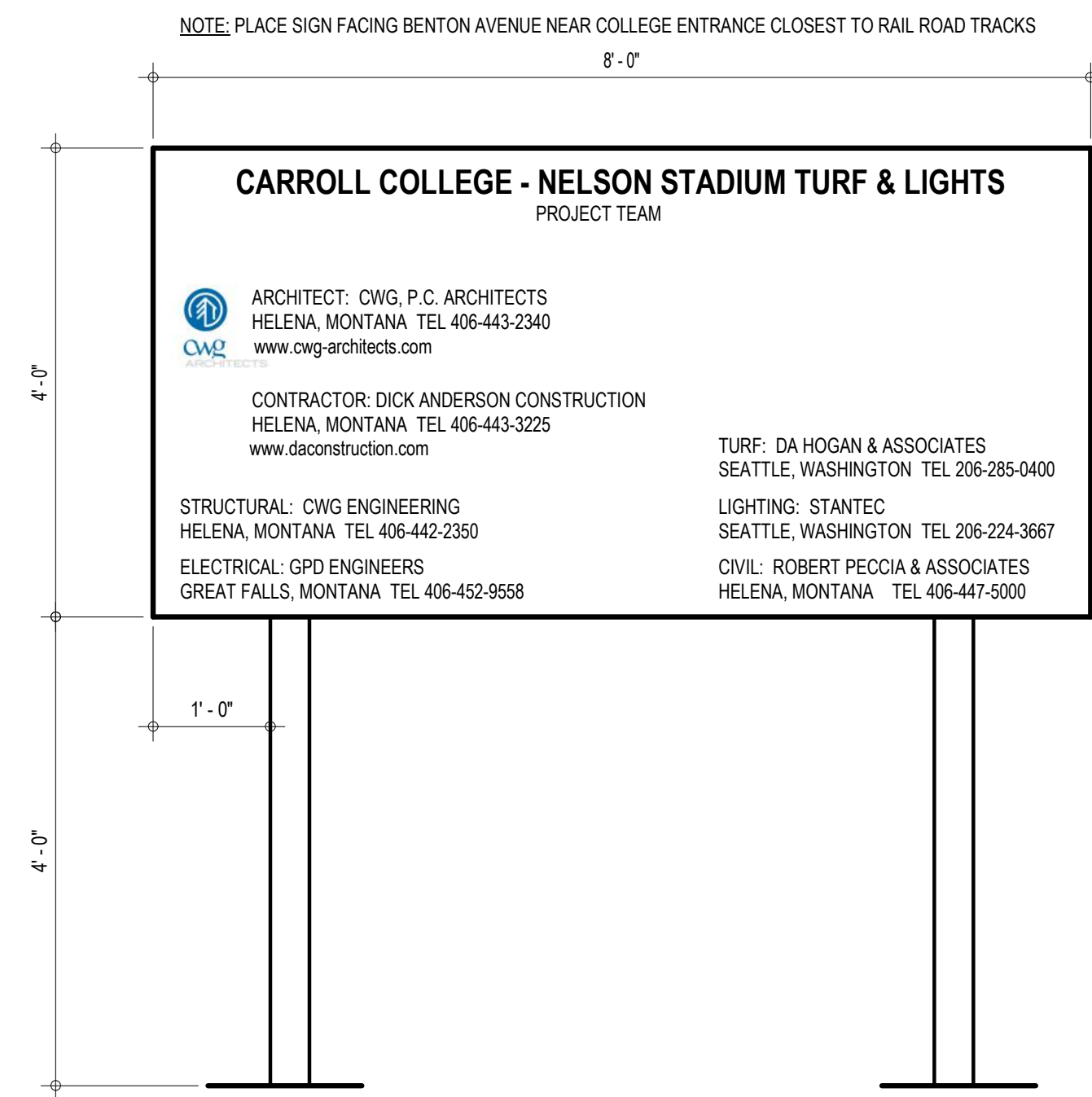
5 **GUARDRAIL @ RETAINING WALLS**
1" = 1'-0"



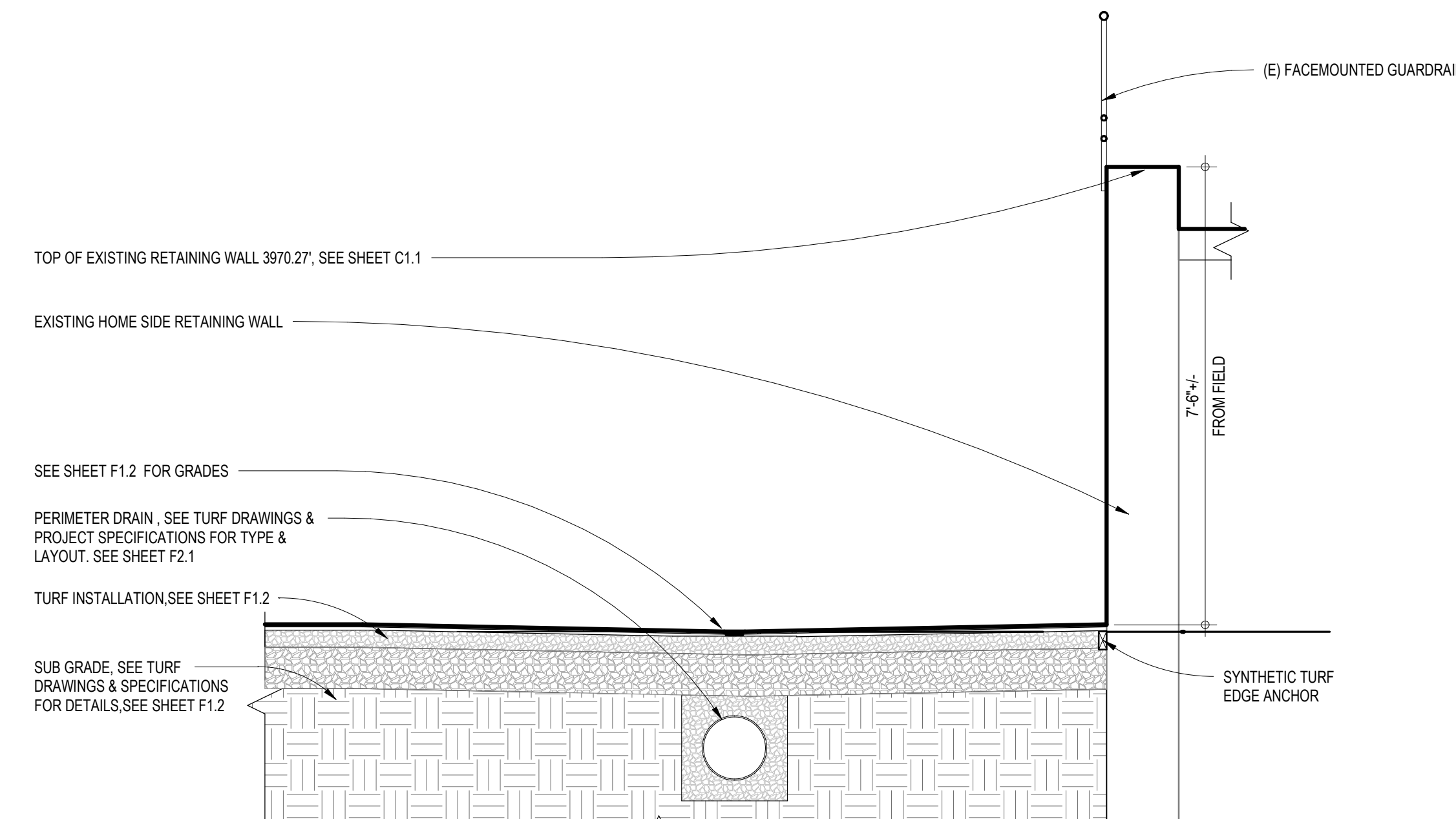
6 **HANDRAIL MOUNTED @ RAMP**
1" = 1'-0"



7 **GUARDRAIL & HANDRAIL**
1" = 1'-0"



8 **CONSTRUCTION SIGN**
3/4" = 1'-0"



9 **SECTION @ NEW TURF & EXISTING BLEACHER RETAINING WALL**
1/2" = 1'-0"

COORDINATION NOTE
IT IS ABSOLUTELY NECESSARY THAT ALL TRADES COORDINATE WITH EACH OTHER AND VERIFY THAT THERE ARE NO CONFLICTS IN LOCATION OF DUCTS, CONDUITS, SPRINKLER HEADS, DIFFUSERS, ELECTRICAL BOXES, EQUIPMENT, AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.

COGNIZANT NOTE:
THE CONTRACTOR SHALL BE COGNIZANT THAT THIS IS A REMODEL PROJECT AND AS SUCH, CERTAIN ITEMS CANNOT BE FULLY ILLUSTRATED NOR EXPLAINED WITHOUT FIELD OBSERVATION. THEREFORE BEFORE SUBMITTING A PROPOSAL, THE CONTRACTOR SHALL VISIT AND EXAMINE THE PROJECT IN EVERY DETAIL AS PERTAINS TO THIS PROJECT AND MAKE ALLOWANCES IN THEIR PROPOSAL FOR ALL CONDITIONS THAT WILL AFFECT THE WORK INDICATED IN THE PROJECT MANUAL AND CONTRACT DOCUMENTS.



CWG Architects + Interiors
650 Power St.
P.O. Box 1198
Helena, MT 59624
cwg@cwg-architects.com
(406)443-2340

REVISIONS	
#	DATE

**CARROLL COLLEGE
NELSON STADIUM - FIELD & LIGHTING BID SET**
1857 N. Benton Ave. Helena, MT 59601
SECTIONS & DETAILS

70.41.03
DRAWN BY: CWG
APPROVED BY: CWG
DATE: 10-13-23
A2.1

GENERAL STRUCTURAL NOTES:

THESE DRAWINGS HAVE BEEN PREPARED SOLELY FOR USE IN THE CONSTRUCTION OF PHASE 1 NELSON STADIUM - FIELD & LIGHTING PROJECT AT THE LOCATION OF CARROLL COLLEGE CAMPUS, 1857 N BENTON AVENUE, HELENA, MT. POSSESSION OF THESE DRAWINGS DOES NOT GRANT A LICENSE TO CONSTRUCT OR FABRICATE THE WHOLE, OR PARTS OF THIS PROJECT IN OTHER LOCATIONS.

STRUCTURAL DRAWINGS ARE A PORTION OF THE CONTRACT DOCUMENTS AND ARE INTENDED TO BE USED WITH ARCHITECTURAL, MECHANICAL, ELECTRICAL, AND SITE CIVIL DRAWINGS. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING THE REQUIREMENTS FROM THESE DRAWINGS INCLUDING BUT NOT LIMITED TO DIMENSIONS, BLOCKOUTS, OPENINGS, SLEEVES, EMBEDDED ITEMS, ETC. INTO THEIR SHOP DRAWINGS AND WORK. NOTIFY THE ARCHITECT/STRUCTURAL ENGINEER OF RECORD OF ANY DISCREPANCIES OR IF ACTUAL CONDITIONS DIFFER FROM THOSE SHOWN OR NOTED.

THE CONTRACTOR SHALL FURNISH THE PRODUCTS SPECIFIED ON THE DRAWINGS. SUBSTITUTIONS WILL BE CONSIDERED ONLY IF THE CONTRACTOR PROVIDES DOCUMENTATION TO PROVE THE ALTERNATIVE EQUALS OR EXCEEDS THE STRUCTURAL PERFORMANCE CHARACTERISTICS OF THE SPECIFIED PRODUCT.

CODE REQUIREMENTS:
ALL WORK SHALL BE IN STRICT COMPLIANCE WITH:
A. 2021 INTERNATIONAL BUILDING CODE (IBC) AS AMENDED BY THE STATE OF MONTANA (INTERNATIONAL BUILDING CODE, 2021 EDITION, EFFECTIVE JUNE 9, 2022)
B. ALL OTHER STATE AND LOCAL BUILDING REQUIREMENTS THAT APPLY.

TEMPORARY CONDITIONS:
CONTRACTOR SHALL PROVIDE ALL NECESSARY TEMPORARY SUPPORT PRIOR TO COMPLETION OF VERTICAL AND LATERAL LOAD SYSTEMS. MORRISON-MAIERLE HAS NOT BEEN RETAINED TO PROVIDE ANY SERVICES RELATED TO JOB SITE SAFETY PRECAUTIONS, OR TO REVIEW THE MEANS, METHODS, TECHNIQUES, SEQUENCES, OR PROCEDURES FOR THE CONTRACTOR TO PERFORM WORK, UNLESS WE ARE SPECIFICALLY RETAINED AND COMPENSATED TO DO OTHERWISE. OUR WORK IS LIMITED TO THE FINAL DESIGN OF THE WORK DESCRIBED ON OUR DRAWINGS FOR THIS PROJECT.

CONTRACTOR'S CONSTRUCTION AND/OR ERECTION SEQUENCES SHALL RECOGNIZE AND CONSIDER THE EFFECTS OF THERMAL MOVEMENTS OF STRUCTURAL ELEMENTS DURING THE CONSTRUCTION PERIOD.

EXISTING CONDITIONS:
EXISTING BUILDING/SITE DIMENSIONS AND ASSUMED CONDITIONS ARE TO BE VERIFIED IN THE FIELD AND ARE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR SHALL NOTIFY THE ARCHITECT/STRUCTURAL ENGINEER OF RECORD OF ALL DISCREPANCIES WHICH REQUIRE A SIGNIFICANT CHANGE IN THE DESIGN AND/OR CONSTRUCTION FROM THAT SHOWN ON THE DRAWINGS.

ASSUMED FUTURE CONSTRUCTION:

VERTICAL: NONE
HORIZONTAL: NONE

DESIGN CRITERIA:
DESIGN IS BASED ON THE FOLLOWING LOADING FOR THE BASIS OF STRENGTH, PERFORMANCE, AND SERVICEABILITY OF THE STRUCTURE:

DESIGN CRITERIA

Table with 3 columns: FLOOR LIVE LOADS, UNIFORM LOAD, CONCENTRATED LOAD. Includes seismic load criteria and risk category information.

EARTHWORK:

GENERAL:
A GEOTECHNICAL INVESTIGATION AND REPORT HAS BEEN COMPLETED AS NOTED IN THE 'DESIGN CRITERIA'. REFER TO GEOTECHNICAL REPORT FOR RECOMMENDATIONS ON SITE PREPARATIONS, FILL SPECIFICATIONS AND SITE SPECIFIC CONSTRUCTION CONSIDERATIONS.

STABILITY OF CONSTRUCTION EXCAVATION AND WORKER SAFETY ARE THE RESPONSIBILITY OF THE CONTRACTOR. BASED UPON THE GEOTECHNICAL REPORT, TEMPORARY CONSTRUCTION EXCAVATIONS, ABOVE GROUNDWATER, TO BE PLANNED IN ACCORDANCE WITH OSHA PROVISIONS SHOULD ASSUME TYPE B MATERIAL FOR STIFF CLAY, AND TYPE C MATERIAL FOR SAND.

DO NOT EXCAVATE CLOSER THAN 2:1 SLOPE BELOW FOOTING EXCAVATIONS.

CONCRETE:

CAST-IN-PLACE CONCRETE:
CONCRETE SHALL BE IN ACCORDANCE WITH ACI 301, SPECIFICATION FOR STRUCTURAL CONCRETE, AND ACI 117, SPECIFICATION FOR TOLERANCES FOR CONCRETE CONSTRUCTION AND MATERIALS, UNLESS NOTED OTHERWISE.

AVERAGE CONCRETE STRENGTH DETERMINED BY JOB CAST LAB CURED CYLINDER TO BE AS INDICATED BELOW PLUS INCREASE DEPENDING ON THE PLANT'S STANDARD DEVIATION AS SPECIFIED IN ACI 318. MINIMUM CONCRETE PROPERTIES SHALL BE AS FOLLOWS:

Table with 7 columns: USE, EXPOSURE, MIN COMPRESSIVE STRENGTH, TEST AGE DAYS, AIR CONTENT, MAX WATER TO CEMENT RATIO, MAX AGGREGATE SIZE.

THE CONTRACTOR SHALL SUBMIT CONCRETE MIX DESIGNS ALONG WITH TEST DATA A MINIMUM OF TWO WEEKS PRIOR TO PLACING CONCRETE.

CONDUITS EMBEDDED IN SLABS SHALL NOT BE LARGER IN OUTSIDE DIMENSION THAN ONE THIRD OF THE THICKNESS OF THE SLAB AND SHALL NOT BE SPACED CLOSER THAN THREE DIAMETERS ON CENTER.

CURING OF CONCRETE SHALL COMPLY WITH ACI 308, UNLESS NOTED OTHERWISE.

WHERE CONCRETE IS PLACED AGAINST EXISTING CONCRETE, THE EXISTING CONCRETE SURFACE SHALL BE CLEANED AND ROUGHENED TO A MINIMUM 1/4" AMPLITUDE.

PROVIDE 3/4" CHAMFERS ON ALL EXPOSED CONCRETE CORNERS UNLESS NOTED OTHERWISE.

SHORING DESIGN IS THE CONTRACTOR'S RESPONSIBILITY. SHORING FORMWORK SHALL NOT BE REMOVED FROM HORIZONTAL MEMBERS BEFORE CONCRETE STRENGTH IS AT LEAST 70 PERCENT OF DESIGN STRENGTH AS DETERMINED BY FIELD CURED CYLINDERS.

REINFORCING STEEL:
REINFORCING STEEL SHALL CONFORM TO THE FOLLOWING PROPERTIES:

Table with 3 columns: USE, REINFORCEMENT SIZE, SPECIFICATION.

REINFORCING STEEL TO BE WELDED SHALL USE ONLY LOW HYDROGEN ELECTRODES. ALL WELDING TO BE IN COMPLIANCE WITH AWS D1.4. WELD REINFORCING STEEL ONLY WHERE INDICATED ON THE DRAWINGS. WELDING OR TACK WELDING OF REINFORCEMENT BARS TO OTHER BARS OR STEEL COMPONENTS IS PROHIBITED.

REINFORCING STEEL IN BEAMS AND SLABS SHALL BE SUPPORTED ON CONCRETE DOBBIES, OR APPROVED CHAIRS IN SUFFICIENT NUMBERS TO SUPPORT THE BARS WITHOUT SETTLEMENT. FABRICATE AND INSTALL REINFORCING STEEL ACCORDING TO THE MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES - ACI STANDARD 315.

CONTACT LAP ALL REINFORCING BARS PER THE TYPICAL LAP SPLICE LENGTH SCHEDULE, EXCEPT AS NOTED ON DRAWINGS. MISCELLANEOUS NOTES ON THE DRAWINGS SHALL BE DAYTON SUPERIOR BAR-LOCK OR APPROVED WITH A CURRENT ICC-ES OR IAPMO-ES EVALUATION REPORT.

GRADE 60 REINFORCING STEEL LAP SPLICE LENGTH AND DEVELOPMENT LENGTH

Table with 3 main sections for f'c = 3,000 PSI, 4,000 PSI, and 5,000 PSI. Columns include bar size, lap length, and hook length.

- 1. ALL TABULATED VALUES ARE IN INCHES. FOR GRADE 60, UNCOATED REINFORING, NORMAL WEIGHT CONCRETE WITH CLEAR SPACING AND CLEAR COVER GREATER THAN THE BAR DIAMETER.
- 2. IT SHALL BE PERMITTED TO INTERPOLATE BETWEEN CONCRETE STRENGTHS OR USE THE NEXT LOWER CONCRETE STRENGTH.
- 3. TOP BARS ARE ANY HORIZ BAR PLACED SUCH THAT MORE THAN 1/2" OF FRESH CONCRETE IS CAST IN THE MEMBER BELOW THE BAR IN ANY SINGLE POUR. HORIZ WALL BARS ARE CONSIDERED TOP BARS.
- 4. LAP SPLICES ARE FOR NON-LATERAL LOAD RESISTING ELEMENTS. FOR REBAR LAPS SPLICES AT LATERAL LOAD RESISTING ELEMENTS, REFERENCE PLANS AND ELEVATIONS.
- 5. Ld = DEVELOPMENT LENGTH IN TENSION OF DEFORMED BAR. Ldh = DEVELOPMENT LENGTH IN TENSION OF DEFORMED BAR OR DEFORMED WIRE WITH A STANDARD... LAP = LAP SPLICE LENGTH OF DEFORMED BAR OR DEFORMED WIRE

Table with 2 columns: USE, CLEAR COVER. Lists cover requirements for slabs, concrete cast against earth, and concrete exposed to weather.

PROVIDE DOWELS FROM FOOTINGS TO MATCH ALL VERTICAL WALL, PILASTER AND COLUMN REINFORCING. PROVIDE CORNER BARS TO MATCH HORIZONTAL REINFORCING IN WALLS AND FOOTINGS AT ALL CORNERS AND INTERSECTIONS. CONTINUE HORIZONTAL WALL BARS THROUGH PILASTERS COLUMNS AND INTERSECTING WALLS.

ALL ANCHOR BOLTS, HOLDDOWNS AND OTHER REQUIRED ACCESSORIES SHALL BE SECURED IN PLACE PRIOR TO INSPECTION AND CONCRETE PLACEMENT. DO NOT STAB THE ABOVE LISTED ITEMS INTO FRESH CONCRETE AFTER PLACEMENT. PROPERLY VIBRATE AROUND INSTALLED ITEMS TO ENSURE PROPER CONSOLIDATION OF CONCRETE.

CONCRETE CONNECTORS:

UNLESS A SPECIFIC ANCHOR PRODUCT IS NOTED IN THE DRAWINGS, POST-INSTALLED ANCHORS MAY USE ONE OF THE ANCHORS LISTED BELOW FOR THE REQUIRED TYPE.

Table with 3 columns: TYPE, PRODUCT, REPORT #. Lists various concrete anchors like Simpson Set-XP, Hilti Hit-HY 200, etc.

ALL ANCHORS SHALL BE INSTALLED IN STRICT CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND PRODUCT EVALUATION REPORTS.

EMBEDMENTS SPECIFIED ON DRAWINGS ARE "EFFECTIVE" EMBEDMENTS. REFERENCE MANUFACTURER LITERATURE FOR CORRESPONDING ACTUAL EMBEDMENT DEPTHS.

ANCHORS RODS EXPOSED TO EARTH OR WEATHER SHALL BE PROTECTED FROM CORROSION BY HOT-DIP GALVANIZING OR USE OF STAINLESS STEEL. POST INSTALLED EXPANSION AND SCREW ANCHORS EXPOSED TO EARTH OR WEATHER SHALL BE STAINLESS STEEL.

FOR POST-INSTALLED ANCHORS, LOCATE REINFORCEMENT AND CONFIRM FINAL ANCHOR LOCATIONS PRIOR TO FABRICATING PLATES, MEMBERS, OR OTHER STEEL ASSEMBLIES ATTACHED.

IF REINFORCEMENT IS ENCOUNTERED DURING DRILLING, ABANDON AND SHIFT THE HOLE LOCATION TO AVOID THE REINFORCEMENT. PROVIDE A MINIMUM OF (2) ANCHOR DIAMETERS OR 1 INCH, WHICHEVER IS LARGER, OF SOUND CONCRETE BETWEEN THE ANCHOR AND THE ABANDONED HOLE. FILL THE ABANDONED HOLE WITH NON-SHRINK GROUT. IF THE ANCHOR OR DOWEL MANY NOT BE SHIFTED AS NOTED ABOVE, SEEK GUIDANCE FROM THE STRUCTURAL ENGINEER OF RECORD.

SPECIAL INSPECTION OF ANCHOR INSTALLATION IS REQUIRED UNLESS SPECIFICALLY NOTED OTHERWISE IN DRAWINGS. SEE SPECIAL INSPECTION AND MATERIALS TESTING PROGRAM AND NOTES.

Large table of structural abbreviations with columns for symbol, description, and symbol.

STATEMENT OF SPECIAL INSPECTION AND TESTING NOTES:

- 1. SPECIAL INSPECTIONS SHALL CONFORM TO SECTION 1705 OF THE 2021 IBC, CONTRACT DOCUMENTS AND APPROVED SUBMITTALS. REFER TO SPECIAL INSPECTION AND TESTING TABLES FOR PROJECT REQUIREMENTS.
- 2. SPECIAL INSPECTIONS AND ASSOCIATED TESTING SHALL BE PERFORMED BY AN APPROVED ACCREDITED INDEPENDENT AGENCY MEETING THE REQUIREMENTS OF ASTM E329 (MATERIALS). THE INSPECTION AND TESTING AGENCY SHALL FURNISH TO THE STRUCTURAL ENGINEER/ARCHITECT A COPY OF THEIR SCOPE OF ACCREDITATION. SPECIAL INSPECTORS SHALL BE APPROVED BY THE BUILDING OFFICIAL. WELDING INSPECTORS SHALL BE QUALIFIED PER SECTION 6.1.4.1(1) OF AWS D1.1.
- 3. THE SPECIAL INSPECTOR SHALL OBSERVE THE INDICATED WORK FOR COMPLIANCE WITH THE APPROVED CONSTRUCTION DOCUMENTS. ALL DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE CONTRACTOR FOR CORRECTION AND NOTED IN THE INSPECTION REPORTS. ISSUES REQUIRING IMMEDIATE CORRECTIVE ACTIONS OR ENGINEERING INPUT ARE TO BE BROUGHT TO THE ENGINEER'S ATTENTION IMMEDIATELY UPON DISCOVERY.
- 4. THE CONSTRUCTION OR WORK FOR WHICH SPECIAL INSPECTION IS REQUIRED SHALL REMAIN ACCESSIBLE AND EXPOSED FOR SPECIAL INSPECTION PURPOSES UNTIL COMPLETION OF THE REQUIRED SPECIAL INSPECTIONS.
- 5. THE SPECIAL INSPECTOR AND GEOTECHNICAL ENGINEER SHALL FURNISH INSPECTION REPORTS FOR EACH INSPECTION TO THE BUILDING OFFICIAL, STRUCTURAL ENGINEER, ARCHITECT, CONTRACTOR, AND OWNER. THE SPECIAL INSPECTION AGENCY SHALL SUBMIT A FINAL REPORT STATING THAT THE WORK REQUIRING SPECIAL INSPECTION WAS INSPECTED AND IS IN CONFORMANCE WITH THE APPROVED CONSTRUCTION DOCUMENTS AND THAT ALL DISCREPANCIES NOTED IN THE INSPECTION REPORTS HAVE BEEN CORRECTED.
- 6. QUALITY ASSURANCE (QA) IS REQUIRED FOR STRUCTURAL STEEL ITEMS PER AISC 360 AND 341 UNLESS SPECIFICALLY NOTED OTHERWISE. QUALITY CONTROL (QC) TO BE PROVIDED BY THE FABRICATOR, ERECTOR OR OTHER RESPONSIBLE CONTRACTOR AS APPLICABLE. CONTRACTOR AND SPECIAL INSPECTOR TO DOCUMENT QUALITY CONTROL AS REQUIRED IN AISC 360 SECTION N3 AND AISC 341 SECTION J2.
- 7. INSPECTION TYPES:
 - CONTINUOUS: THE FULL-TIME OBSERVATION OF WORK REQUIRING SPECIAL INSPECTION BY AN APPROVED SPECIAL INSPECTOR WHO IS PRESENT IN THE AREA WHERE THE WORK IS BEING PERFORMED.
 - PERIODIC: THE PART-TIME OR INTERMITTENT OBSERVATION OF WORK REQUIRING SPECIAL INSPECTION BY AN APPROVED SPECIAL INSPECTOR WHO IS PRESENT IN THE AREA WHERE THE WORK HAS BEEN OR IS BEING PERFORMED AND AT THE COMPLETION OF THE WORK.
 - OBSERVE (O): OBSERVE THESE FUNCTIONS ON A RANDOM, DAILY BASIS. OPERATIONS NEED NOT BE DELAYED PENDING OBSERVATIONS.
 - PERFORM (P): INSPECTIONS SHALL BE PERFORMED PRIOR TO THE FINAL ACCEPTANCE OF THE ITEM.
 - DOCUMENT (D): INDICATES CONTRACTOR AND SPECIAL INSPECTOR TO PROVIDE DOCUMENTATION IN ACCORDANCE WITH AISC 341.
- 8. SPECIAL INSPECTION OF MECHANICAL POST INSTALLED ANCHORS SHALL BE IN STRICT CONFORMANCE WITH THE ICC REPORT AND MANUFACTURER'S INSTALLATION REQUIREMENTS. ANCHOR INSTALLERS SHALL BE QUALIFIED AS REQUIRED BY JURISDICTION REQUIREMENTS.
 - INSPECTION REPORTS SHALL IDENTIFY NAMES OF INSTALLERS.
 - SPECIAL INSPECTOR SHALL PROVIDE DOCUMENTATION AT THE END OF ANCHOR INSTALLATIONS STATING THAT THE ANCHORS WERE INSPECTED PER APPROVED ANCHOR EVALUATION REPORT.
- 9. EACH CONTRACTOR RESPONSIBLE FOR THE CONSTRUCTION OF THE MAIN WIND-OR SEISMIC-FORCE-RESISTING SYSTEM, DESIGNATED SEISMIC SYSTEM OR A WIND-OR SEISMIC- RESISTING COMPONENT LISTED IN THE TABLES SHALL SUBMIT A WRITTEN STATEMENT OF RESPONSIBILITY TO THE BUILDING OFFICIAL AND THE OWNER PRIOR TO THE COMMENCEMENT OF WORK ON THE SYSTEM OR COMPONENT. THE CONTRACTOR'S STATEMENT OF RESPONSIBILITY SHALL CONTAIN THE FOLLOWING:
 - ACKNOWLEDGEMENT OF AWARENESS OF THE SPECIAL REQUIREMENTS CONTAINED IN THE STATEMENT OF SPECIAL INSPECTIONS.
 - ACKNOWLEDGEMENT THAT CONTROL WILL BE EXERCISED TO OBTAIN CONFORMANCE WITH THE CONSTRUCTION DOCUMENTS APPROVED BY THE BUILDING OFFICIAL.
 - PROCEDURES FOR EXERCISING CONTROL WITHIN THE CONTRACTOR'S ORGANIZATION, THE METHOD AND FREQUENCY OF INSPECTIONS AND DISTRIBUTION OF THE REPORTS
 - IDENTIFICATION AND QUALIFICATIONS OF THE PERSON(S) EXERCISING SUCH CONTROL AND THEIR POSITION(S) IN THE ORGANIZATION.

REQUIRED SPECIAL INSPECTIONS AND TESTS OF SOILS

Table with 5 columns: TASK, IBC REFERENCE, REFERENCE STANDARD, FREQUENCY, REMARKS. Lists soil inspection tasks like foundation capacity and excavation depth.

REQUIRED SPECIAL INSPECTIONS OF CONCRETE CONSTRUCTION

Table with 5 columns: TASK, IBC REFERENCE, REFERENCE STANDARD, FREQUENCY, REMARKS. Lists concrete inspection tasks like reinforcing steel placement and anchor inspection.

TESTING OF SOILS AND FOUNDATIONS

Table with 4 columns: TASK, IBC REFERENCE, REFERENCE STANDARD, FREQUENCY. Lists soil testing tasks like classification and testing of compacted fill.

TESTING OF CONCRETE CONSTRUCTION

Table with 4 columns: TASK, IBC REFERENCE, REFERENCE STANDARD, FREQUENCY. Lists concrete testing tasks like strength test specimens and fresh concrete sampling.

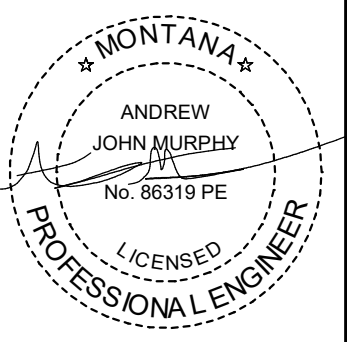


Table with 2 columns: #, DATE. Revisions section.

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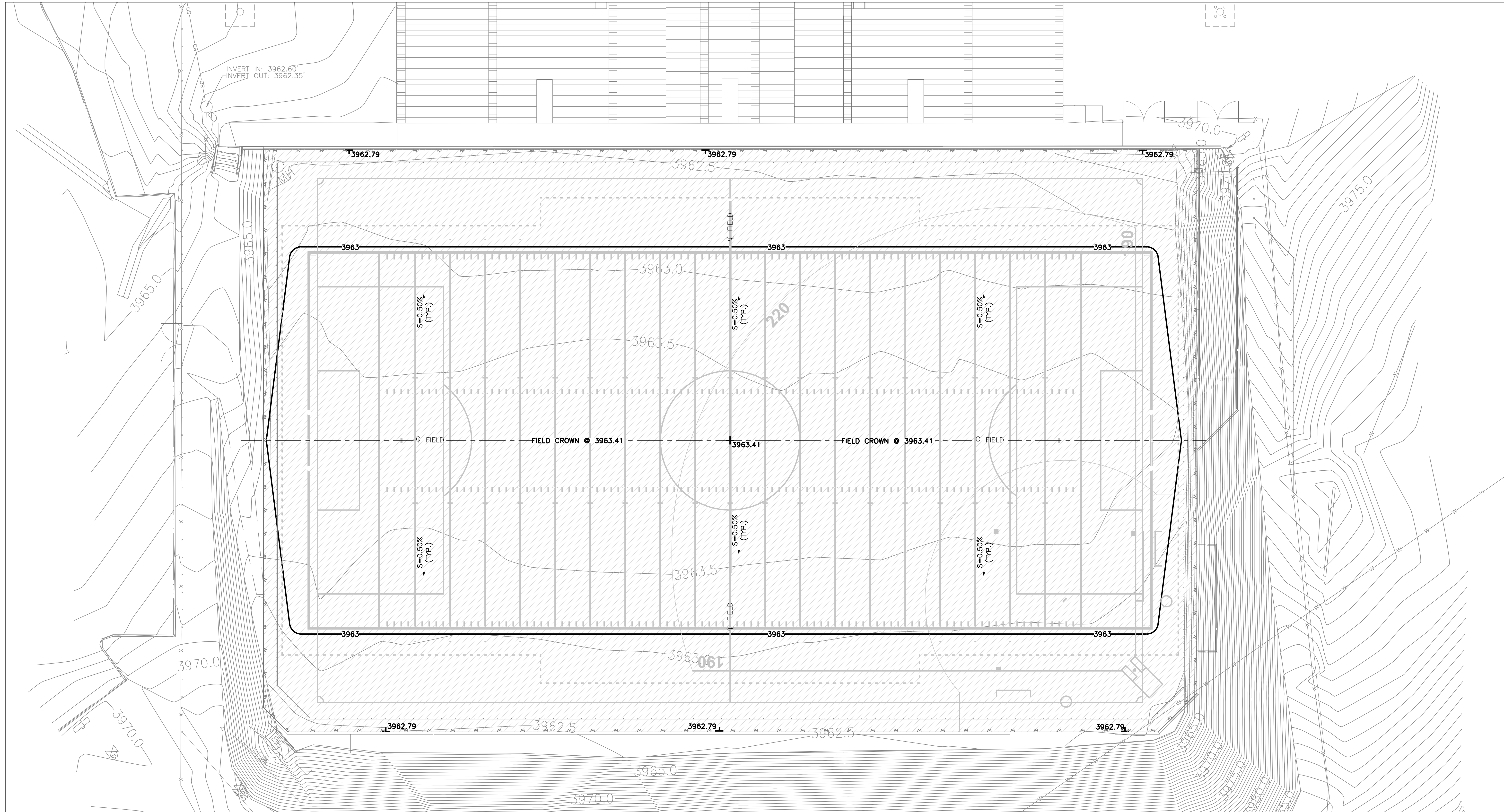
CARROLL COLLEGE
NELSON STADIUM - FIELD & LIGHTING BID SET
1857 N. Benton Ave. Helena, MT 59601
GENERAL STRUCTURAL NOTES, ABBREVIATIONS, AND SOSI

Table with 2 columns: DRAWN BY, APPROVED BY. Lists SGH and AVY.

DATE 10-13-23

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STRUCTURAL ABBREVIATIONS



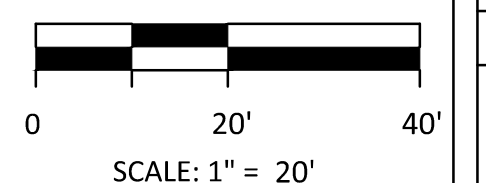
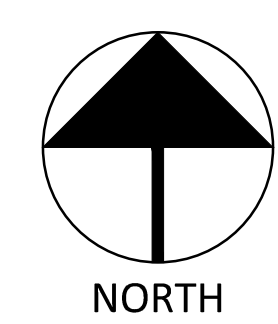
GRADING NOTES

1. THE CONTRACTOR SHALL CALL AND NOTIFY U-DIG AT 1-800-551-8344 A MINIMUM OF 2 WORKING DAYS BEFORE DEMOLITION, DIGGING, OR GRADING OPERATIONS OCCUR.
2. NEW CONTOURS SHOWN ARE FINISH GRADE ELEVATIONS.
3. BACKFILL AND COMPACT EXCAVATED AREAS RESULTING FROM DEMOLITION ACTIVITIES WITH SELECT FILL TO 95% WITH 12 INCH MAX LIFTS.
4. STRIP FIELD AREA OF EXISTING SOD AND ORGANIC MATERIALS AND DISPOSE OF OFF SITE. ALL UNSUITABLE SOIL MATERIALS SHALL BE REMOVED AND DISPOSED OF OFF SITE.
5. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN THE EVENT OR DISCOVERY OF POOR SOILS, GROUNDWATER OR DISCREPANCIES IN THE EXISTING CONDITIONS AS NOTED ON THE PLANS.
6. EXCAVATE ALL EXISTING LOAM AND TOP SOIL DOWN TO EXISTING PERMEABLE SUBGRADE SOILS AS DIRECTED BY THE OWNER'S GEOTECHNICAL ENGINEER (REFER TO GEOTECHNICAL REPORT FOR ANTICIPATED EXCAVATION DEPTH).
7. EXISTING LOAM AND TOP SOIL MATERIALS SHALL BE PLACED AND FINE GRADED ON THE EXISTING PRACTICE FIELD AREA AS DIRECTED BY OWNER.
8. THE OWNER'S GEOTECHNICAL ENGINEER SHALL APPROVE THE FIELD'S SUBGRADE INFILTRATION/ PERCOLATION RATE PRIOR TO PLACEMENT OF THE AGGREGATE SUBBASE.

9. THE FIELD SUBBASE SHALL BE SCARIFIED TO A DEPTH OF 6 INCH PRIOR TO PLACEMENT OF THE IMPORTED AGGREGATE SUBBASE.
10. THE FIRST LIFT OF AGGREGATE SUBBASE MATERIAL SHALL NOT EXCEED 6 INCHES IN COMPACTED DEPTH AND SHALL BE COMPACTED TO 92% MINIMUM AND 95% MAXIMUM.
11. SUBSEQUENT AGGREGATE SUBBASE LIFTS SHALL NOT EXCEED 12 INCH IN COMPACTED DEPTH AND SHALL BE COMPACTED TO 92% MINIMUM AND 95% MAXIMUM.
12. ALL PERIMETER PAVING SHALL MEET AND MATCH ADJACENT SURFACES.
13. SEE ARCHITECTURAL DRAWINGS FOR GRADING AT PERIMETER OF FIELD.
14. TWO OPTIONS ARE PROVIDED FOR THE CONTRACTOR'S SELECTION WITHIN THE PLANS FOR FIELD DRAINAGE AS FOLLOWS:
OPTION 1: FURNISH AND INSTALL 12-INCH DEPTH OF ADDITIONAL AGGREGATE BASE FOR WATER STORAGE AND INFILTRATION INTO THE SUBGRADE SOILS.
OPTION 2: FURNISH AND INSTALL SUBSURFACE DRAINAGE LATERALS ACROSS THE FIELD AREA ON 15' CENTERS WITH 1"x12" FLAT DRAINS AS SHOWN ON THE PLANS.

GRADING LEGEND

- 3985 EXISTING CONTOUR LINES
- 3963.75 SPOT ELEVATION
- 3962 NEW CONTOUR LINES
- S=1.56% SURFACE SLOPE
- MATCH TO EXISTING
- LIMIT OF IMPORTED AGGREGATE SUBBASE AND PERMEABLE AGGREGATE
- LIMIT OF SYNTHETIC TURF AND CONCRETE EDGE ANCHOR



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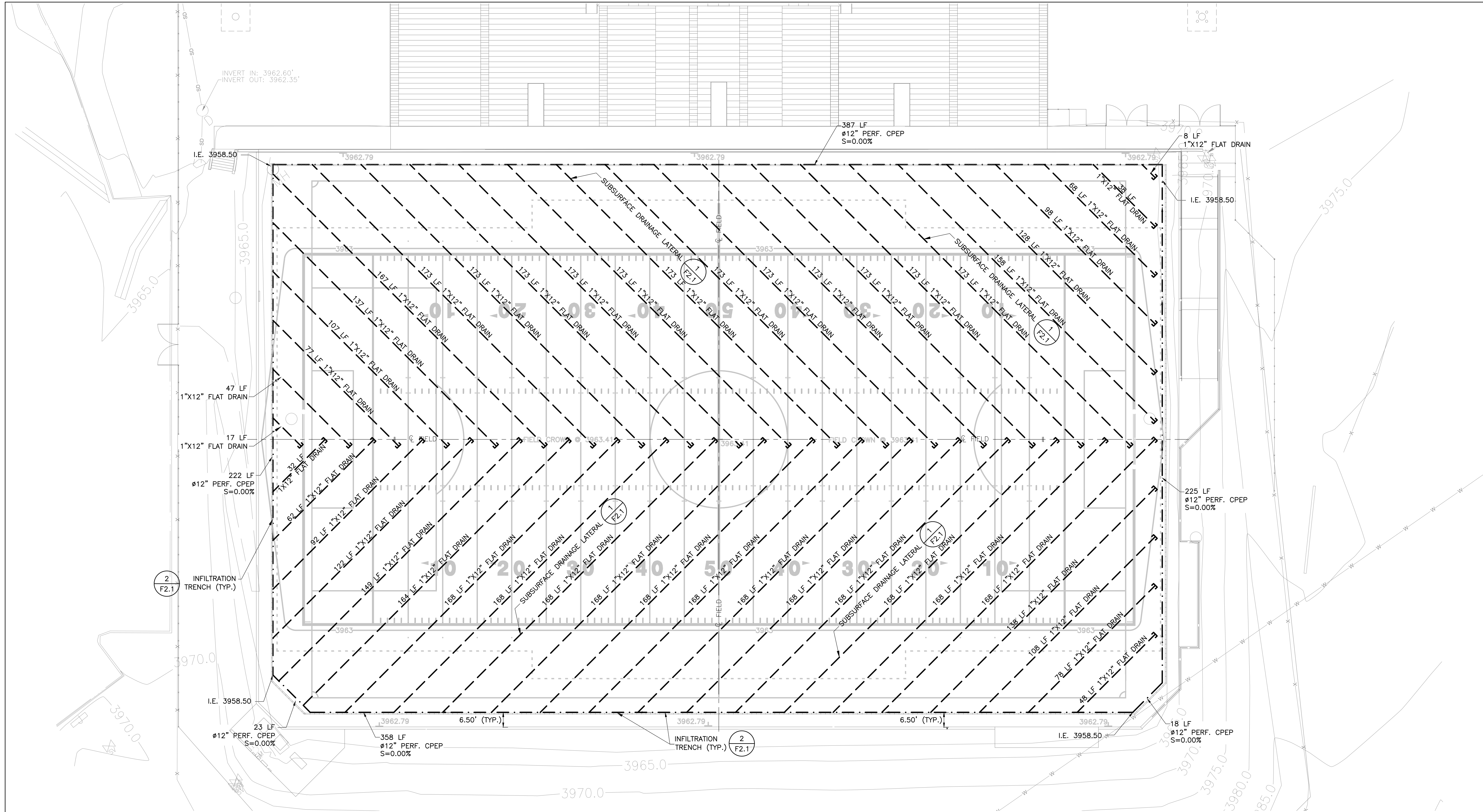
REVISIONS

NO.	DESCRIPTION

CARROLL COLLEGE
 PHASE 1 NELSON STADIUM - FIELD & LIGHTING
 1857 N. Benton Ave. Helena, MT 59601
 FIELD GRADING

704103
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 APPROVED: DLARSH
 DATE: 9-25-23

F1.2

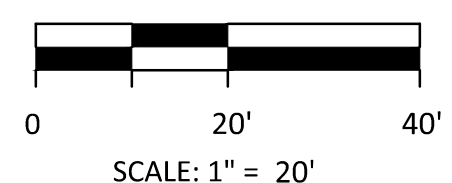


DRAINAGE NOTES

- COORDINATION: IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT THE IRRIGATION PIPING IS INSTALLED AT A SUFFICIENT DEPTH BELOW SUBGRADE BEFORE THE TRENCHING FOR THE SUBSURFACE DRAINAGE SYSTEMS TO AVOID CONFLICTS BETWEEN SYSTEMS.
- TRENCH EXCAVATION SHALL BE MADE TO THE ALIGNMENT, ELEVATION, GRADE AND SLOPE AS INDICATED ON THE DRAWINGS. TRENCHING SHALL BE ACCOMPLISHED UTILIZING EQUIPMENT WITH SLOPE AND DEPTH CONTROL, SUCH AS "LASER PLANE CONTROL SYSTEM", SO AS TO ENSURE ACCURACY IN THE BOTTOM OF THE TRENCH.
- NO HIGH POINTS ABOVE DESIGNATED INVERT OR CALCULATED TRENCH BOTTOM ELEVATION WILL BE PERMITTED. NO SLOUGHING OF SITE MATERIAL OR LOOSE EXCAVATED SOIL WILL BE PERMITTED TO REMAIN IN THE TRENCHES.
- SURPLUS EXCAVATED SOIL SHALL BE REMOVED FROM THE FIELD AREA. EXCAVATED MATERIAL MAY NOT REMAIN ON SUBGRADE.
- PROVIDE A SMOOTH, EVEN SUBGRADE AFTER REMOVAL OF THE TRENCH MATERIAL. SUBGRADE. LEAVE NO LOOSE MATERIAL ON THE SUBGRADE.
- EXCAVATION BELOW INVERT GRADE MUST BE ESTABLISHED TO A DEPTH SO AS TO PROVIDE FOR SPECIFIED PLACEMENT OF PEA GRAVEL BEDDING AT BOTTOM OF PIPE ELEVATION PRIOR TO LAYING THE PERFORATED PIPE.
- NO FOREIGN MATERIAL WILL BE PERMITTED INSIDE, ALONGSIDE, UNDER, OR ON TOP OF THE PERFORATED DRAIN PIPE.
- THE BACKFILL FOR ALL PERFORATED PIPE SHALL BE CLEAN WASHED PEA GRAVEL. REFER TO THE SPECIFICATIONS FOR THE GRADATION REQUIREMENTS.
- TOP OF CATCH BASIN COVERS MUST ACCOMMODATE SYNTHETIC TURF OR RUBBERIZED SURFACING PER DETAILS. GRADE SHOWN FOR COVER IS FINISH GRADE.
- TWO OPTIONS ARE PROVIDED FOR THE CONTRACTOR'S SELECTION WITHIN THE PLANS FOR FIELD DRAINAGE AS FOLLOWS:
 OPTION 1: FURNISH AND INSTALL 12-INCH DEPTH OF ADDITIONAL AGGREGATE BASE FOR WATER STORAGE AND INFILTRATION INTO THE SUBGRADE SOILS.
 OPTION 2: FURNISH AND INSTALL SUBSURFACE DRAINAGE LATERALS ACROSS THE FIELD AREA ON 15' CENTERS WITH 1"x12" FLAT DRAINS AS SHOWN ON THE PLANS.

DRAINAGE LEGEND

- 12" CORR. POLY DRAIN PIPE AND INFILTRATION TRENCH
- CPEP STORM DRAIN PIPE
- S=0.50% SLOPE
- I.E. 414.30 INVERT ELEVATION
- C.I.E. 413.00 COLLECTOR INVERT ELEVATION
- 1"x12" FLAT DRAIN TUBING, FOR OPTION #2 ONLY
- END CAP



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CARROLL COLLEGE
PHASE 1 NELSON STADIUM - FIELD & LIGHTING
1857 N. Benton Ave. Helena, MT 59601

FIELD DRAINAGE

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F1.3

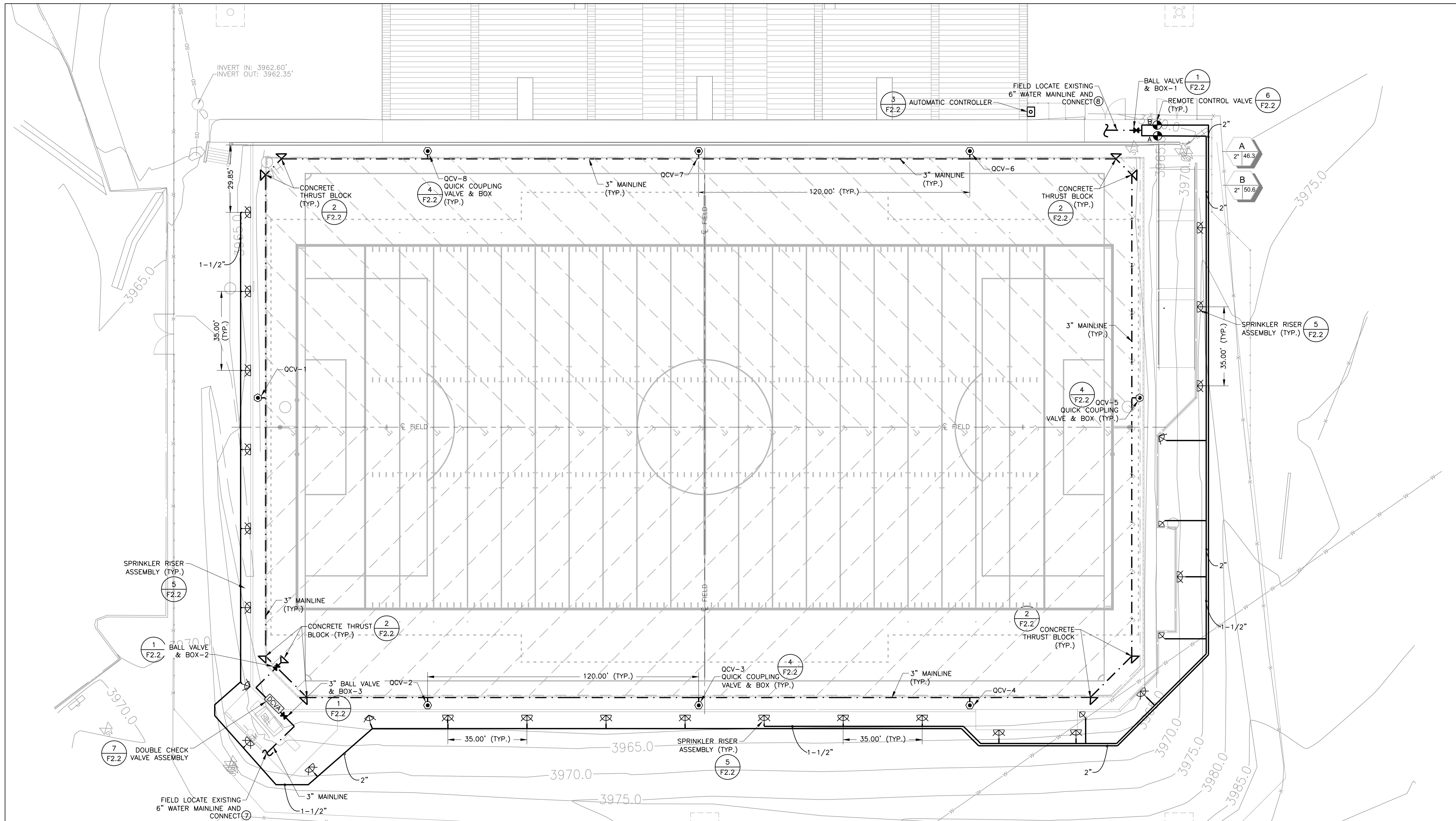
REVISIONS

NO.	DESCRIPTION

CARROLL COLLEGE
PHASE 1 NELSON STADIUM - FIELD & LIGHTING
 1857 N. Benton Ave. Helena, MT 59601
FIELD IRRIGATION

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 APPROVED DLARSH
 DATE 9-25-23

F1.4

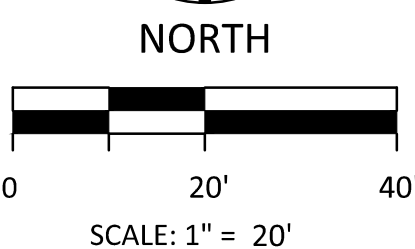
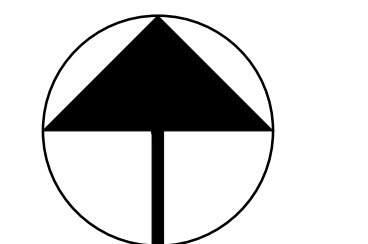


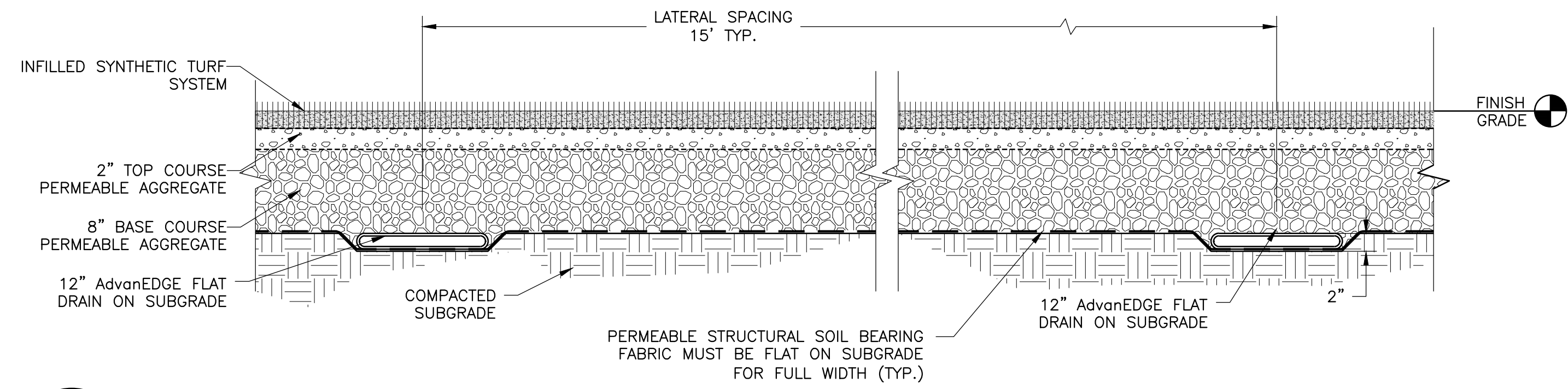
IRRIGATION NOTES

- COORDINATE QUICK COUPLING VALVE LOCATIONS TO CORRESPOND TO THE CONCRETE EDGE ANCHOR.
- MAIN LINES AND GATE VALVES ARE SHOWN IN SCHEMATIC LOCATIONS.
- ALL PIPE CROSSING UNDER PAVED SURFACES SHALL BE SLEEVED.
- MAINLINE ALIGNMENT FOR FIELD QUICK COUPLERS AND FIELD SPRAY HEADS SHALL BE LOCATED 24" INSIDE THICKENED CONCRETE EDGE. PIPING IS INDICATED SCHEMATICALLY FOR GRAPHIC CLARITY. COMBINE PIPING IN COMMON TRENCHES WHEREVER PRACTICAL.
- ELECTRICAL CONDUIT WITHIN FIELD LIMIT MAY UTILIZE COMMON TRENCH WITH IRRIGATION MAINLINE. SEE FIELD LIGHTING PLAN.
- ALL IRRIGATION MAIN LINE AND LATERALS SHALL HAVE TRACER WIRE TAPED TO TOP OF PIPE.
- FIELD LOCATE THE EXISTING 6 INCH DOMESTIC WATER LINE. CONNECT NEW 3 INCH WATER LINE FOR FIELD WASHWATER TO EXISTING WATER LINE. INSTALL 2-1/2 INCH ISOLATION VALVE AND 2 1/2 INCH DOUBLE CHECK VALVE ASSEMBLY ADJACENT TO THE POINT OF CONNECTION. COORDINATE ANY REQUIRED SERVICE INTERRUPTIONS WITH THE COLLEGE.
- FIELD LOCATE THE EXISTING IRRIGATION SUPPLY LINE. CONNECT NEW 2 INCH IRRIGATION LINE FOR THE PERIMETER LAWN AREA IRRIGATION SYSTEM. FURNISH AND INSTALL AN ISOLATION VALVE AT THE CONNECTION LOCATION. INTERCEPT THE EXISTING IRRIGATION SYSTEM CONTROL WIRES FOR THE EXISTING FIELD ZONES THAT ARE BEING REMOVED. CONNECT TWO OF THE CONTROL WIRES PLUS THE COMMON WIRE TO THE TWO NEW REMOTE CONTROL VALVES.

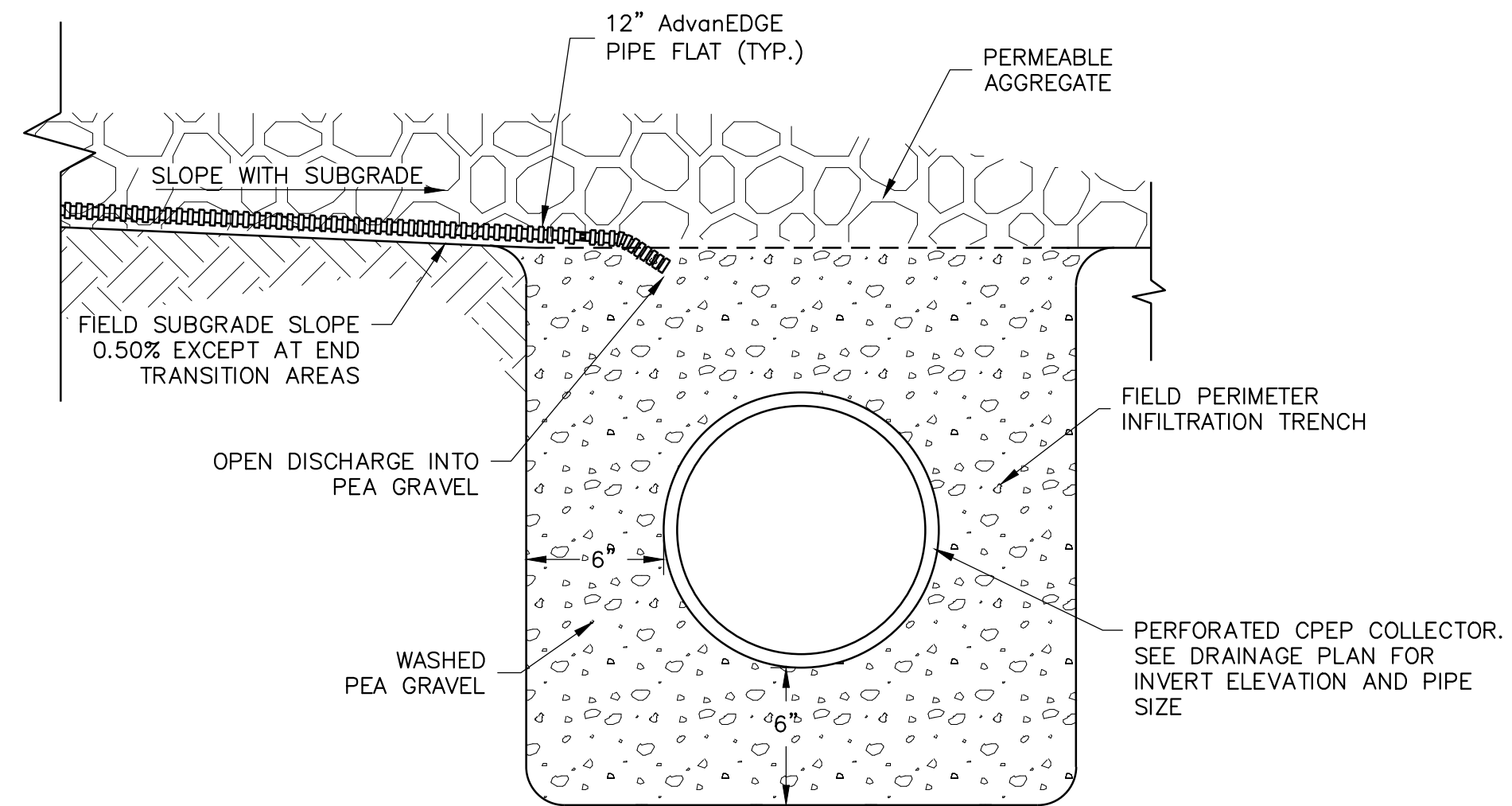
IRRIGATION LEGEND

	ADJUSTABLE ROTARY POP UP SPRINKLER, 45 PSI. 35' RADIUS, 3.81 GPM	HUNTER I-20-04-SS-MPR-35		DOUBLE CHECK VALVE ASSEMBLY	FEBCO 850 MASTER SERIES
	ADJUSTABLE ROTARY POP UP SPRINKLER, 45 PSI. 35' RADIUS, 2.46 GPM	HUNTER I-20-04-SS-MPR-35		SCH 40 PVC IRRIGATION MAIN LINE (3")	
	ADJUSTABLE ROTARY POP UP SPRINKLER, 45 PSI. 35' RADIUS, 1.92 GPM	HUNTER I-20-04-SS-MPR-35		SCH 40 PVC IRRIGATION LATERAL LINE-2" UNLESS OTHERWISE NOTED	
	ADJUSTABLE ROTARY POP UP SPRINKLER 55 PSI. 25' RADIUS, 2.21 GPM	HUNTER I-20-04-SS-MPR-25		24 VOLT ENERGIZER WIRE. #14 UF, SEPARATE WIRES PLUS COMMON TO CONNECT IRRIGATION REMOTE CONTROL VALVES TO CONTROLLER	
	ADJUSTABLE ROTARY POP UP SPRINKLER 55 PSI. 25' RADIUS, 1.11 GPM	HUNTER I-20-04-SS-MPR-25		SCH 40 SLEEVING PIPE 6"	
	3" BALL VALVE AND BOX			CONCRETE THRUST BLOCK	
	1" QUICK COUPLING VALVE AND BOX	MATCO-NORCO 75B OR APPROVED EQUAL RAINBIRD 44-LRC W/ LOCKING VINYL LID		VALVE STATION	VALVE GALLONS PER MINUTE (GPM)
	12 STATION AUTOMATIC CONTROLLER	HUNTER ICC-1200M		VALVE SIZE	
	REMOTE CONTROL VALVE IN INDIVIDUAL BOX	WEATHERMATIC 8200 SERIES OR APPROVED EQUAL			





1 FIELD & DRAINAGE SECTION
F2.1 NOT TO SCALE



2 SUBSURFACE DRAINAGE CONNECTION
F2.1 NOT TO SCALE

95% DESIGN
SUBMITTAL



REVISIONS

NO.	DESCRIPTION

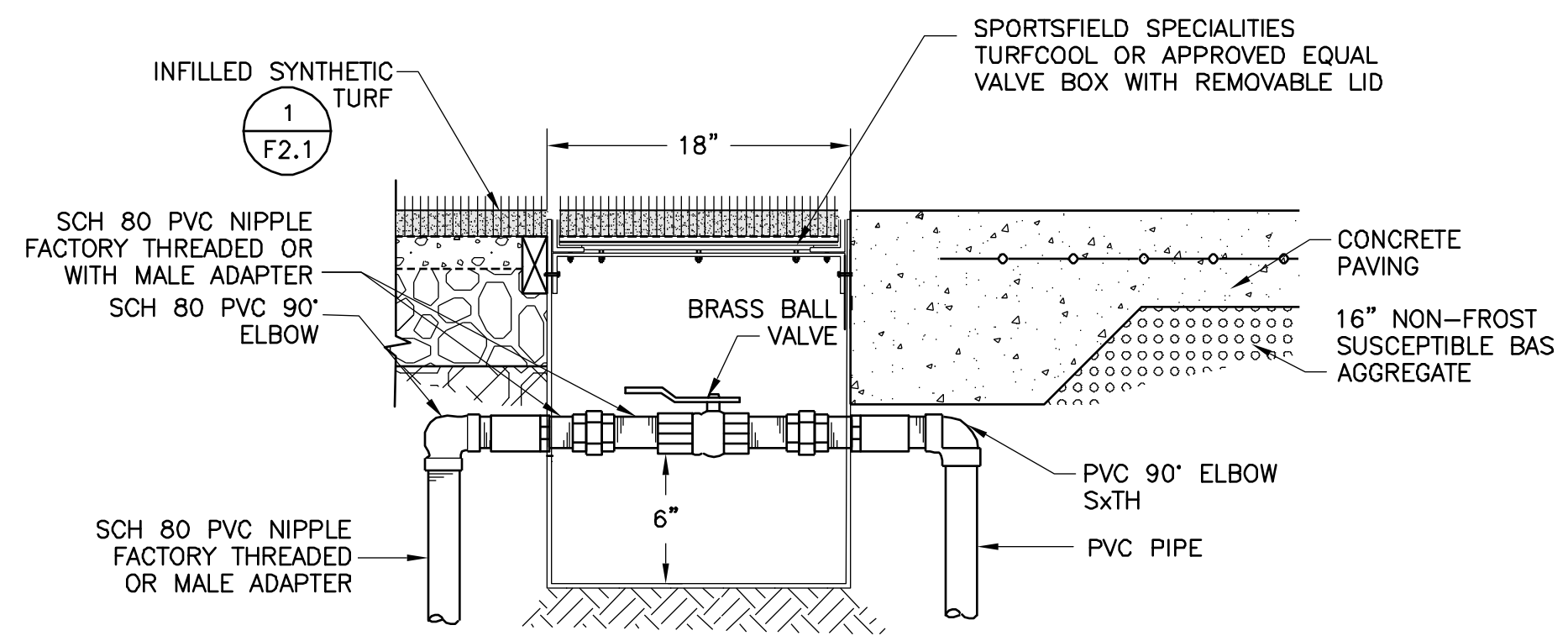
CARROLL COLLEGE
PHASE 1 NELSON STADIUM - FIELD & LIGHTING
1857 N. Benton Ave. Helena, MT 59601

FIELD SECTION &
DRAINAGE DETAILS

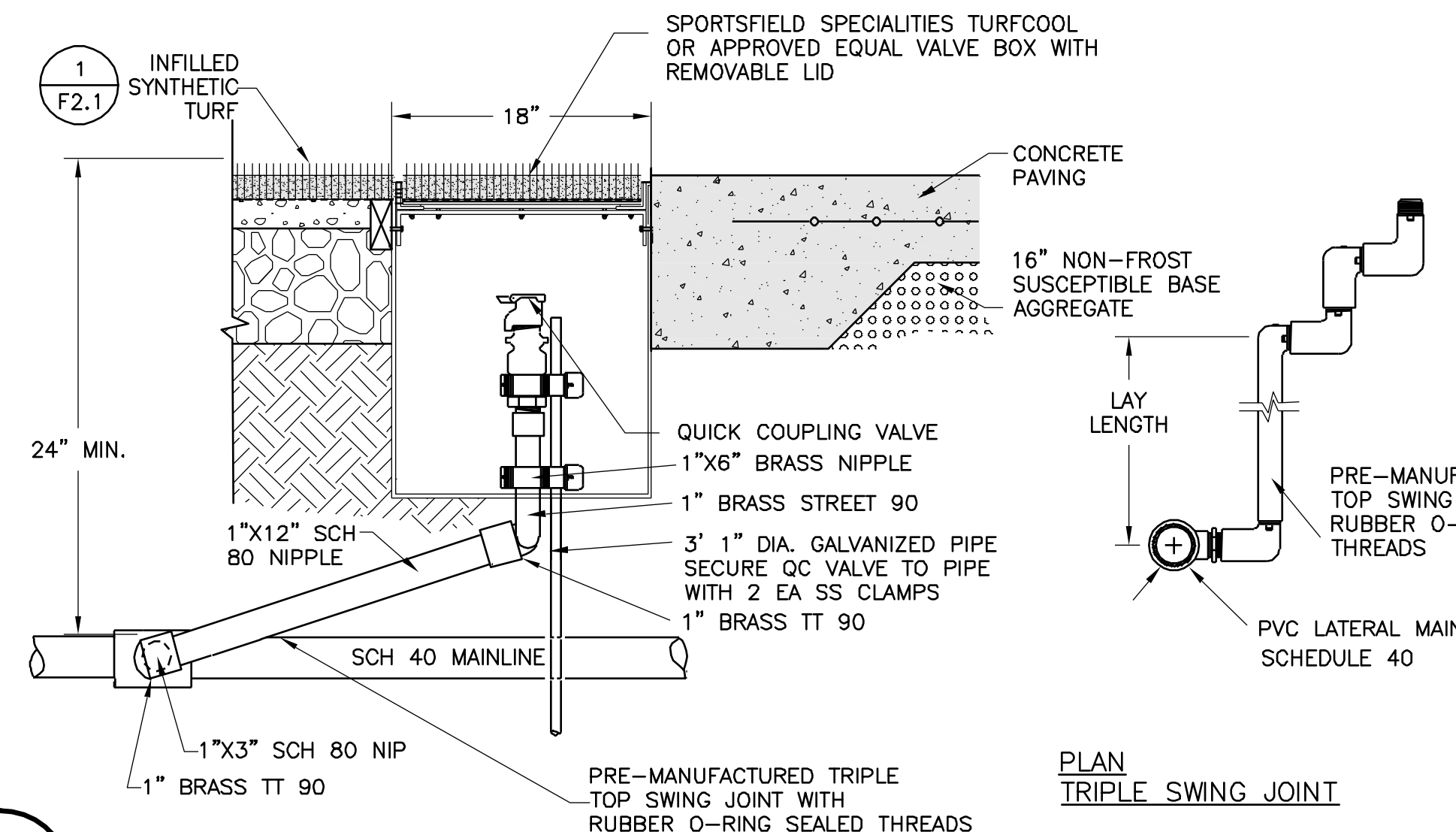


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F2.1



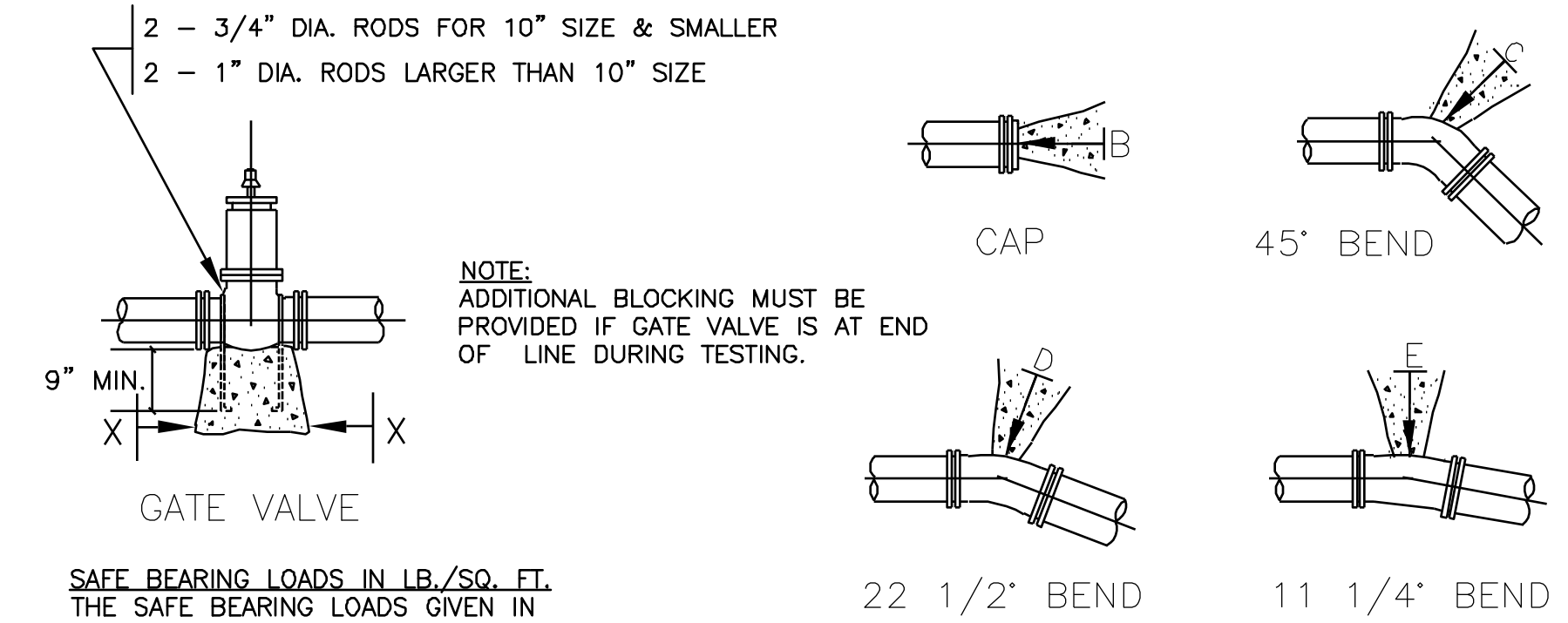
1 BALL VALVE & BOX
F2.2 NOT TO SCALE



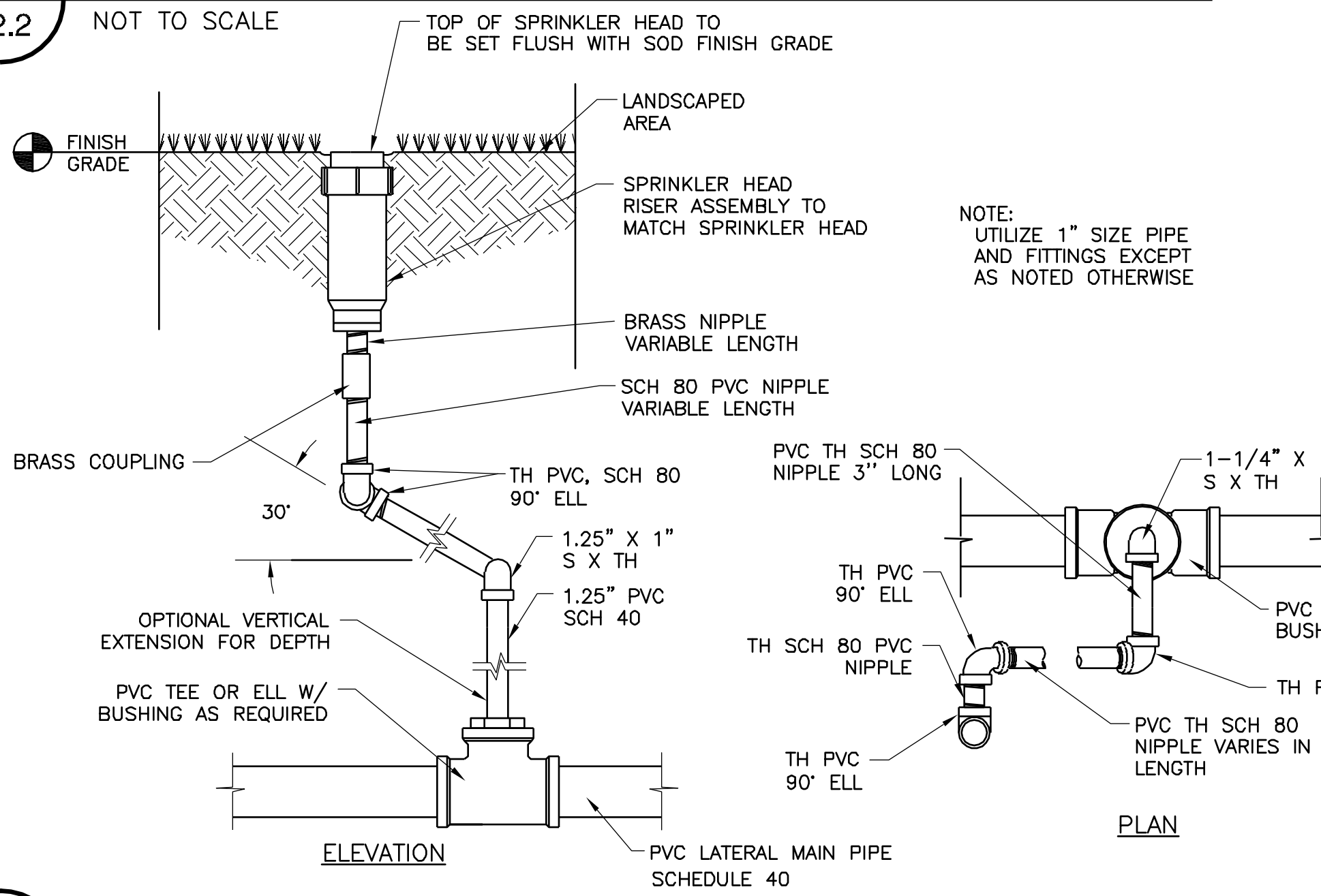
4 QUICK COUPLING VALVE AND BOX
F2.2 NOT TO SCALE

THRUST BLOCK - TABLE

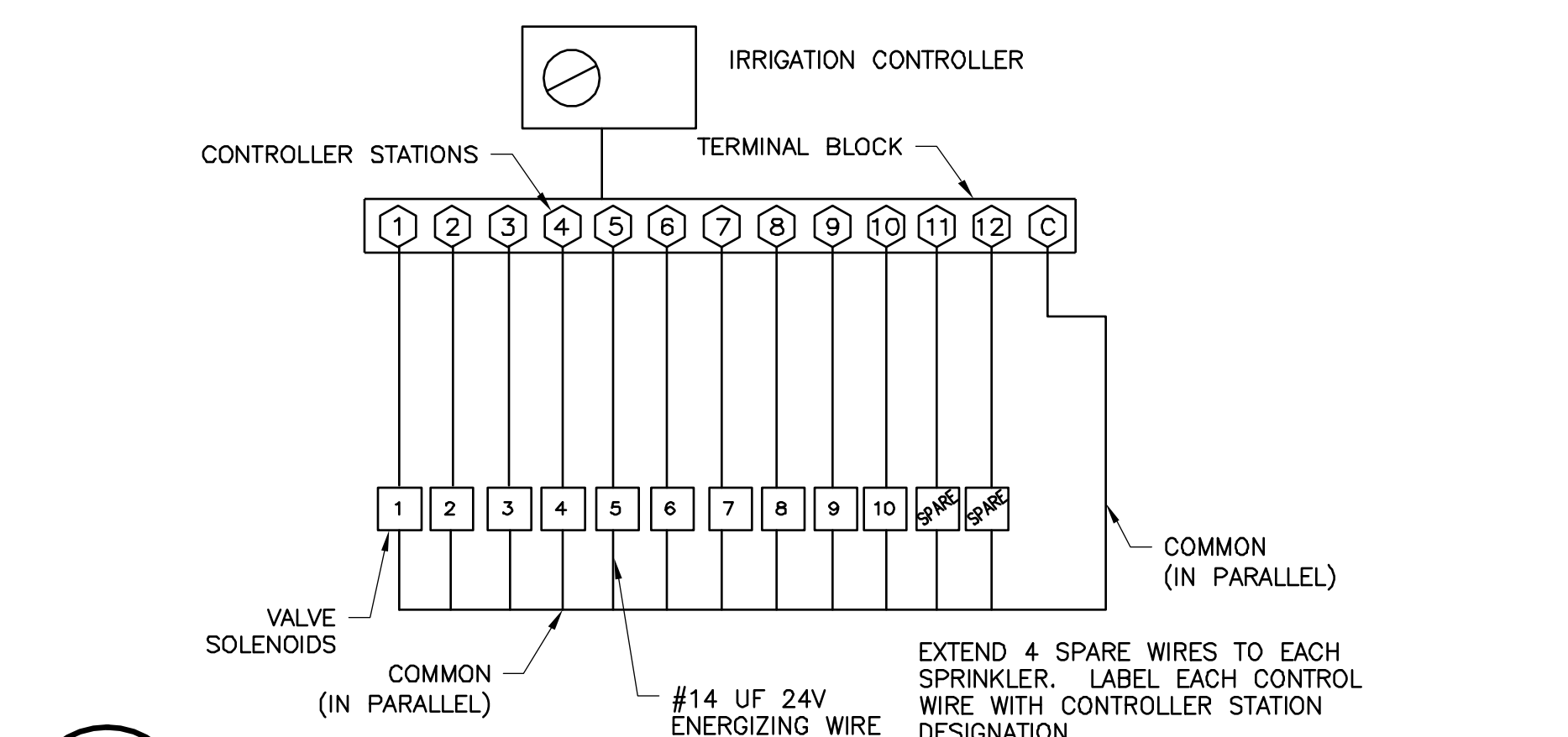
PIPE SIZE	PRESSURE PSI	MINIMUM BEARING AREA AGAINST UNDISTURBED SOIL SQUARE FEET					
		A	B	C	D	E	X (100 PSI)
3"	200	2/(1)	1/(NONE)	1/(NONE)	NONE	NONE	NONE
	300	3/(2)	2/(2)	2/(1)	1/(1)	NONE	NONE



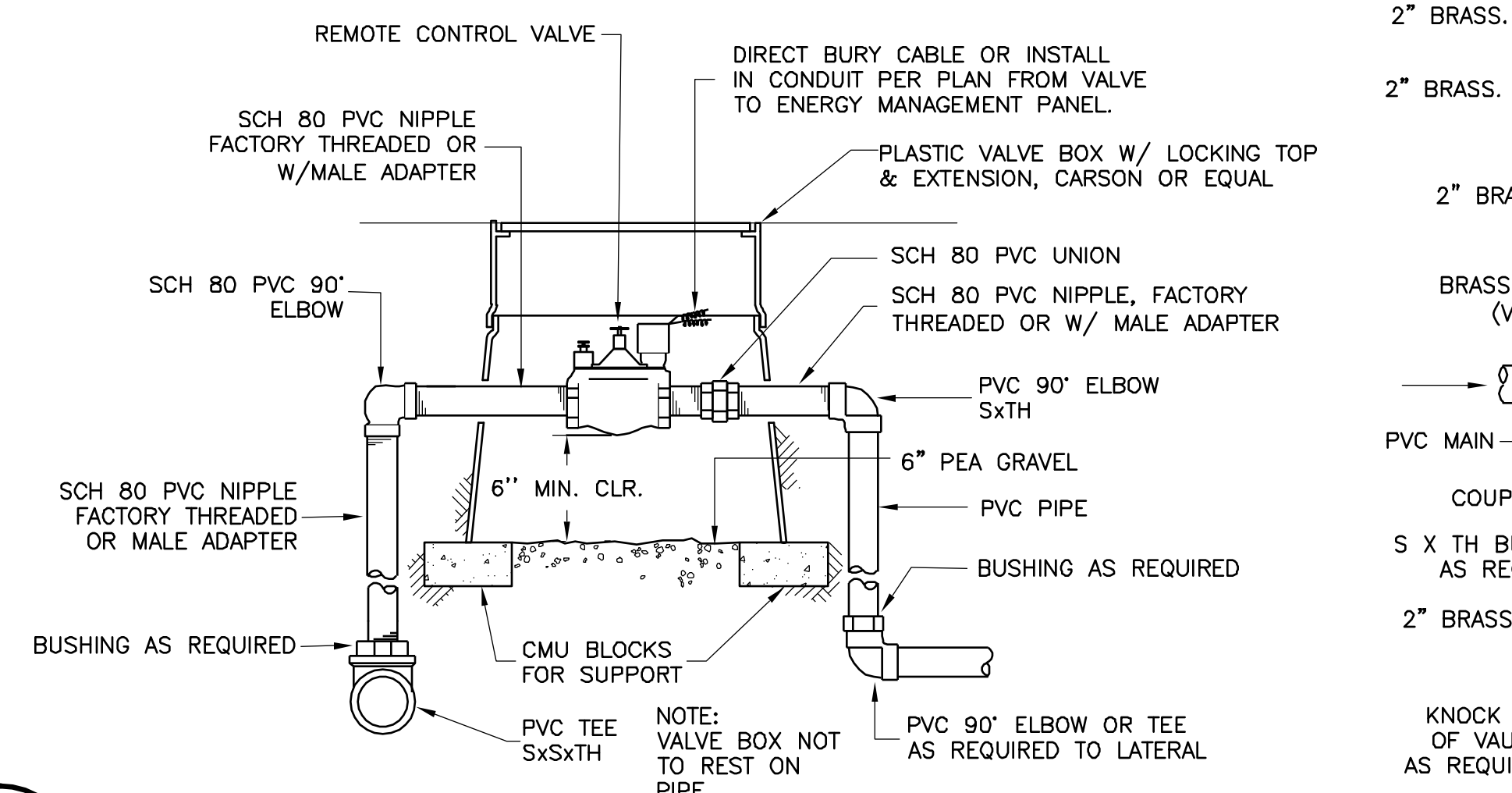
2 MAINLINE THRUST BLOCKS & NOTES
F2.2 NOT TO SCALE



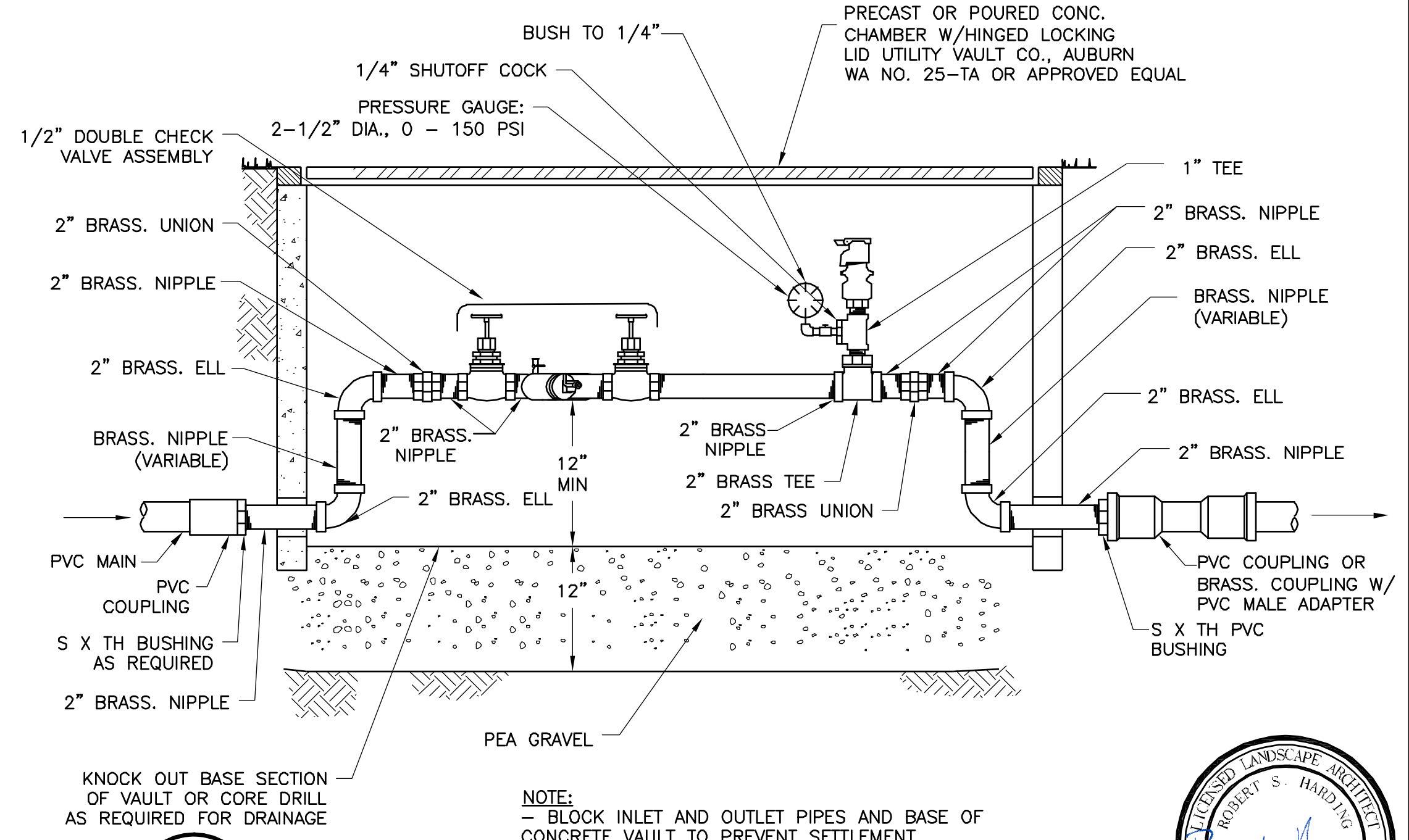
5 LANDSCAPE SPRINKLER RISER & ASSEMBLY
F2.2 NOT TO SCALE



3 IRRIGATION CONTROLLER SCHEMATIC
F2.2 NOT TO SCALE



6 LANDSCAPE REMOTE CONTROL VALVES & BOX
F2.2 NOT TO SCALE



7 DOUBLE CHECK VALVE ASSEMBLY
F2.2 NOT TO SCALE

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NO.	DESCRIPTION

**CARROLL COLLEGE
PHASE 1 NELSON STADIUM - FIELD & LIGHTING**
1857 N. Benton Ave. Helena, MT 59601
FIELD IRRIGATION DETAILS



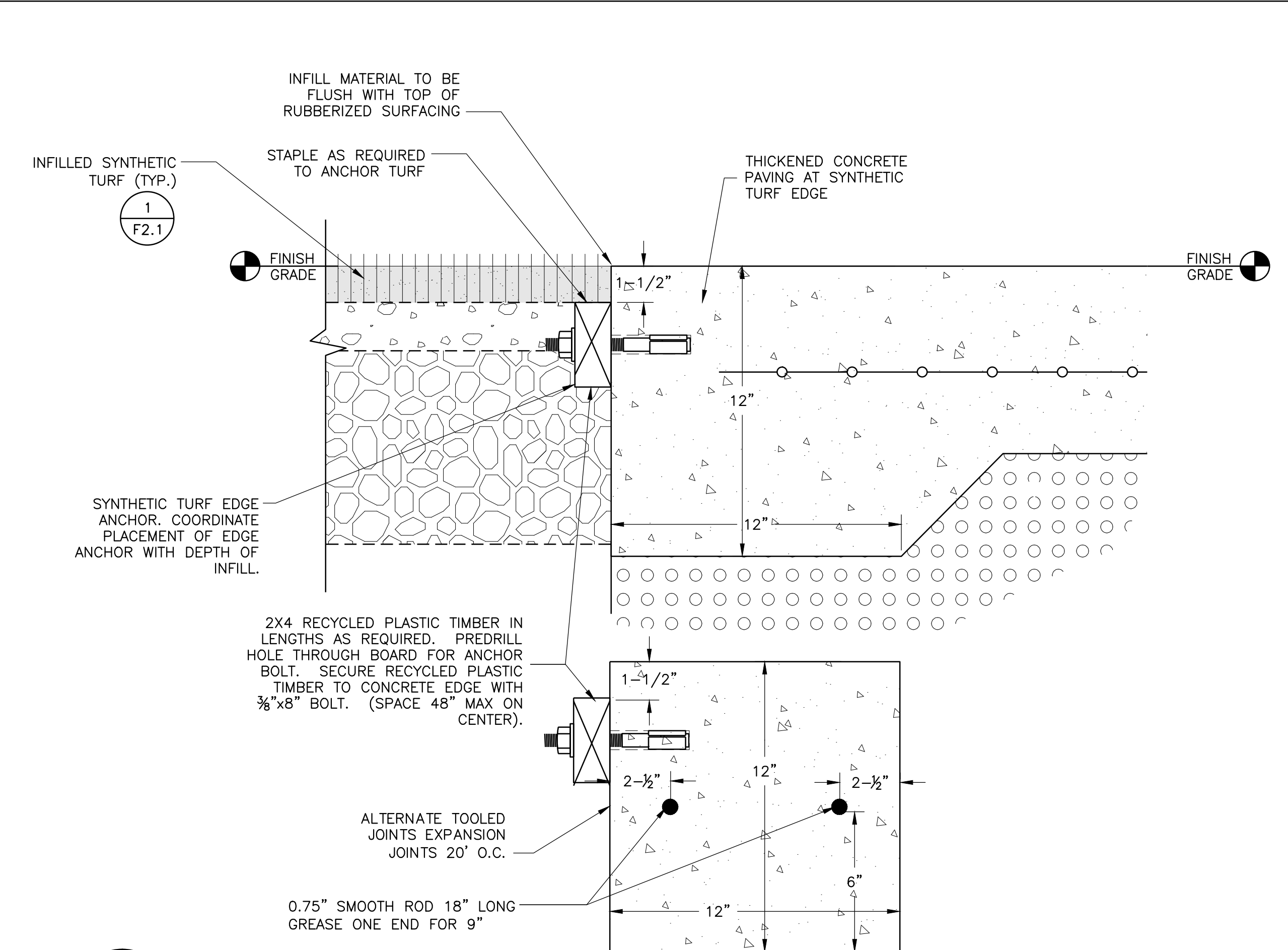
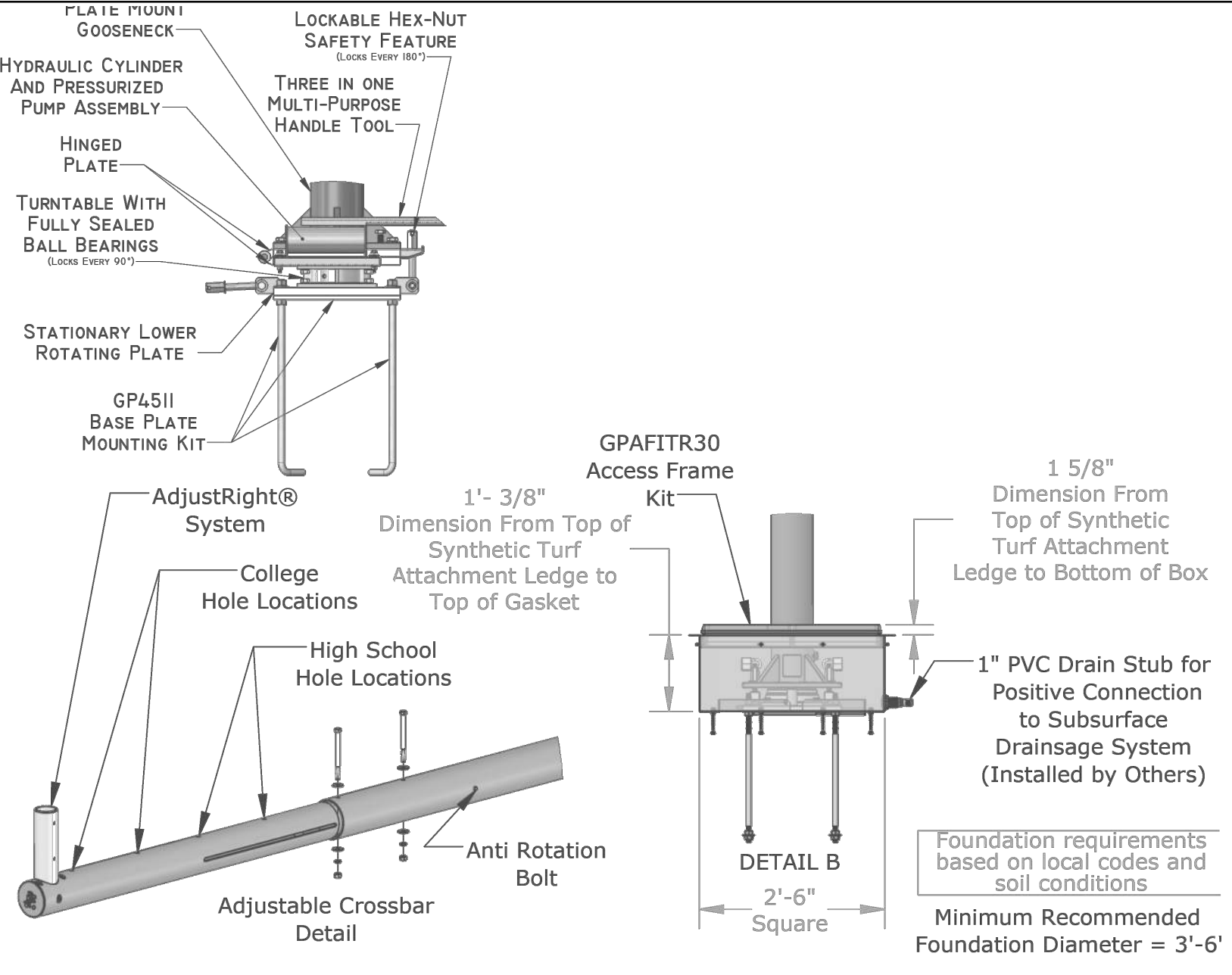
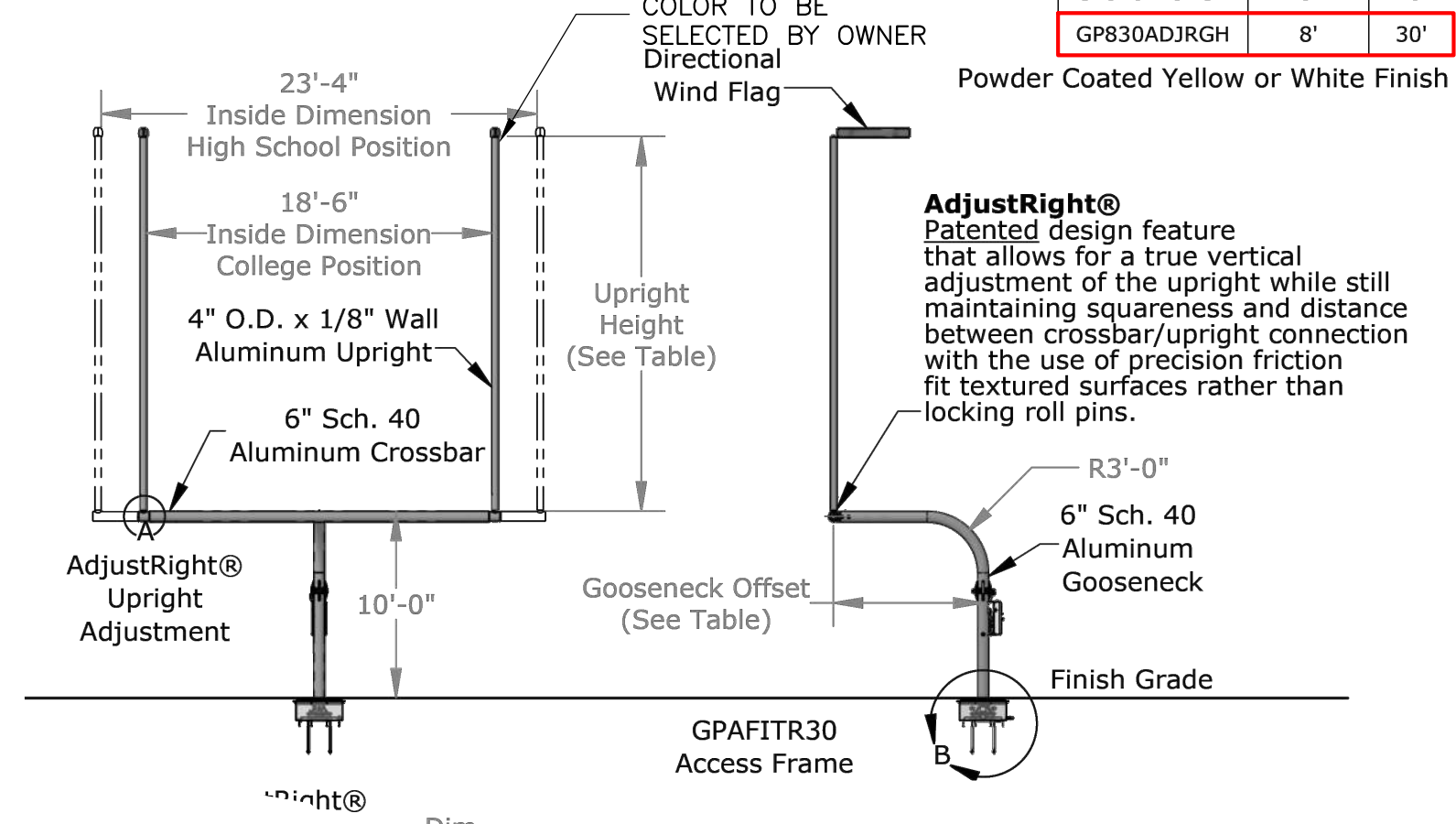
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F2.2

© Phyllis/7/11/14 Carroll College Nelson Stadium (2023)03 Design - Drawings - Specs3 - Revise/2023/03/01 4:47:00 PM

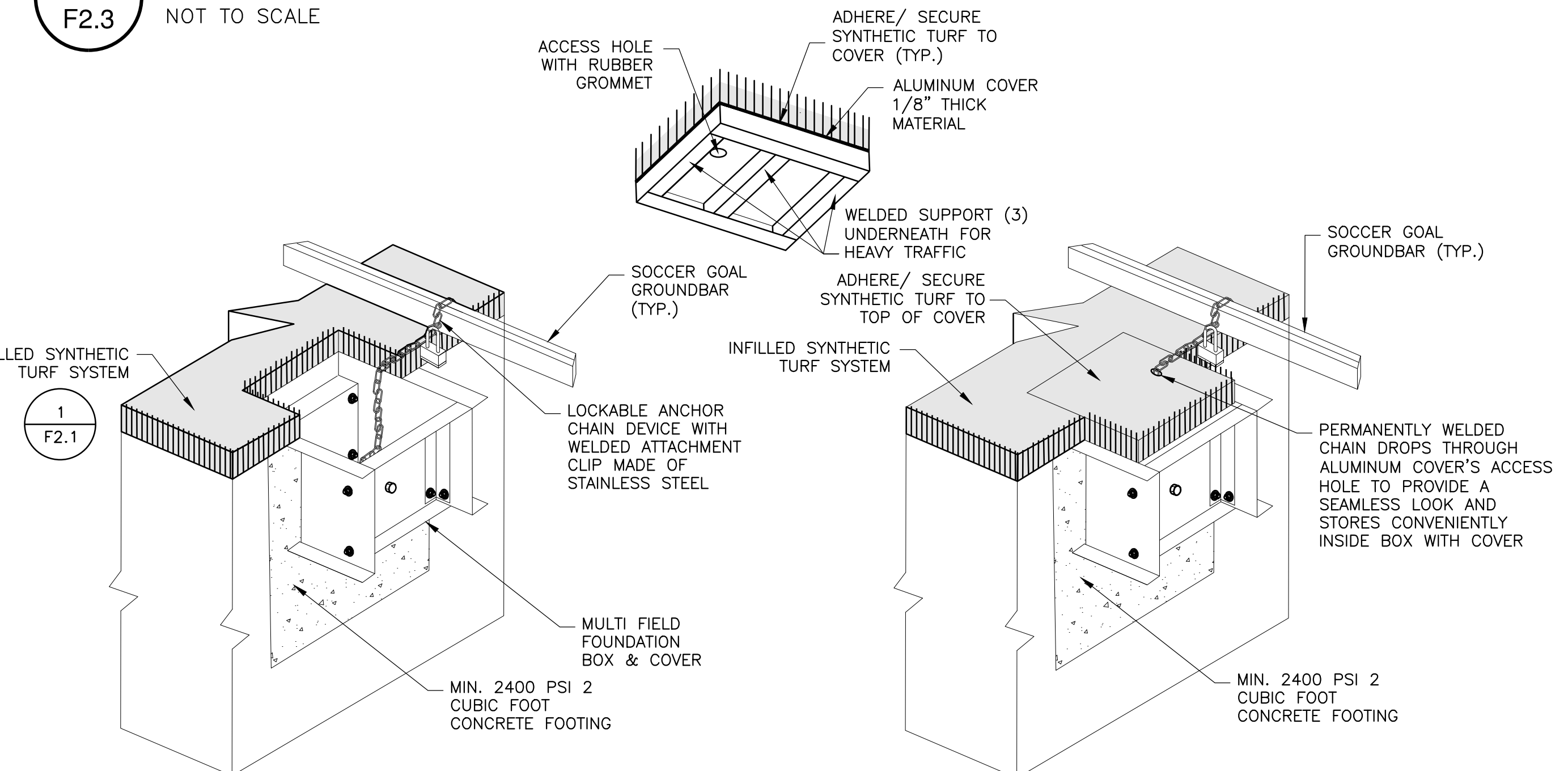
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 Not To Scale Sportsfield Specialties Inc 06102022

Part No.	Goosneck Offset	Upright Height
GP620ADJRGH	6'	20'
GP630ADJRGH	6'	30'
GP820ADJRGH	8'	20'
GP830ADJRGH	8'	30'

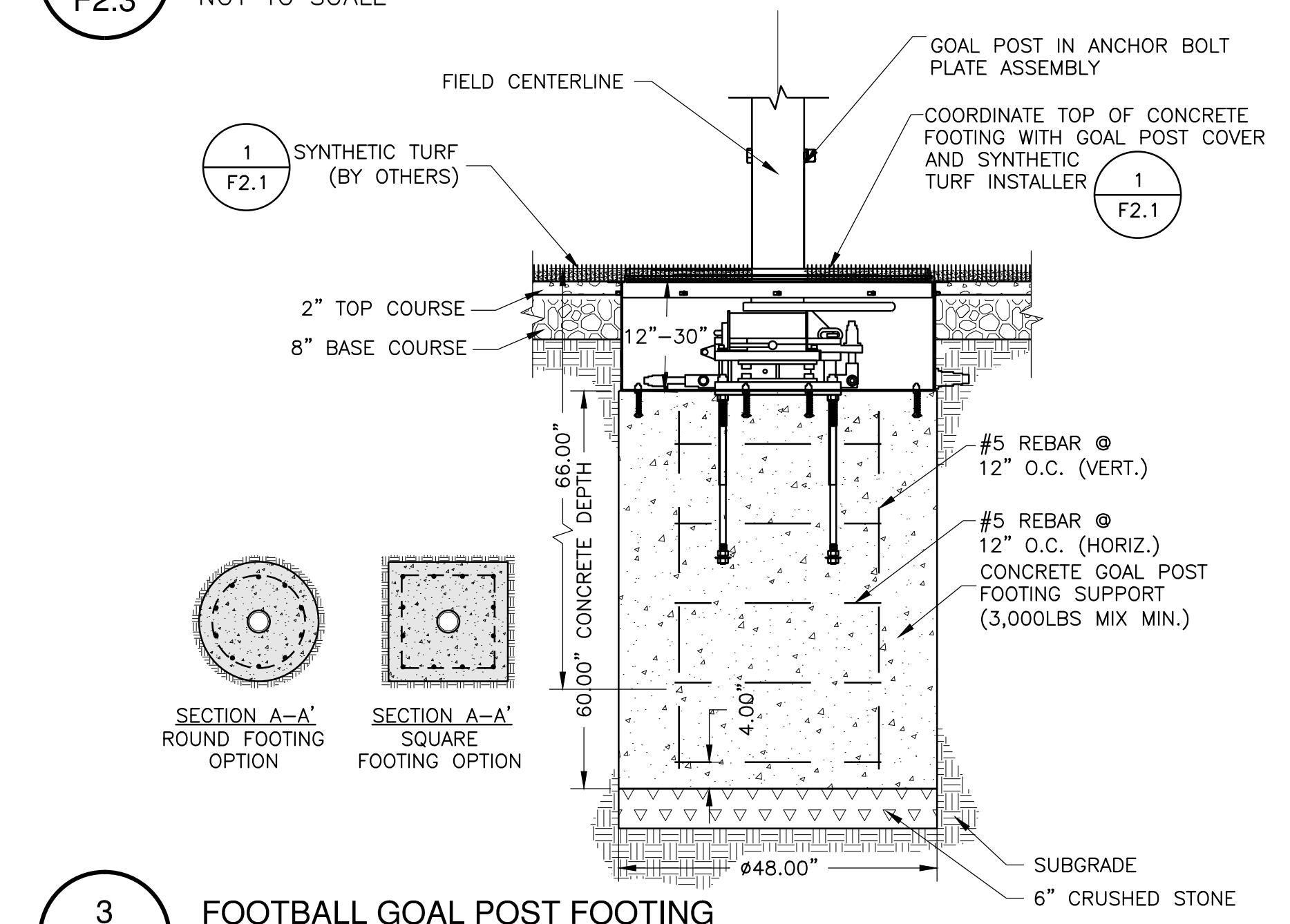


1 FOOTBALL GOAL POST
 F2.3 NOT TO SCALE

4 SYNTHETIC TURF EDGE ANCHOR
 F2.3 NOT TO SCALE



2 SOCCER GOAL ANCHOR
 F2.3 NOT TO SCALE



3 FOOTBALL GOAL POST FOOTING
 F2.3 NOT TO SCALE

95% DESIGN SUBMITTAL

DAVID HOGAN
 Landscape Architect

REVISIONS

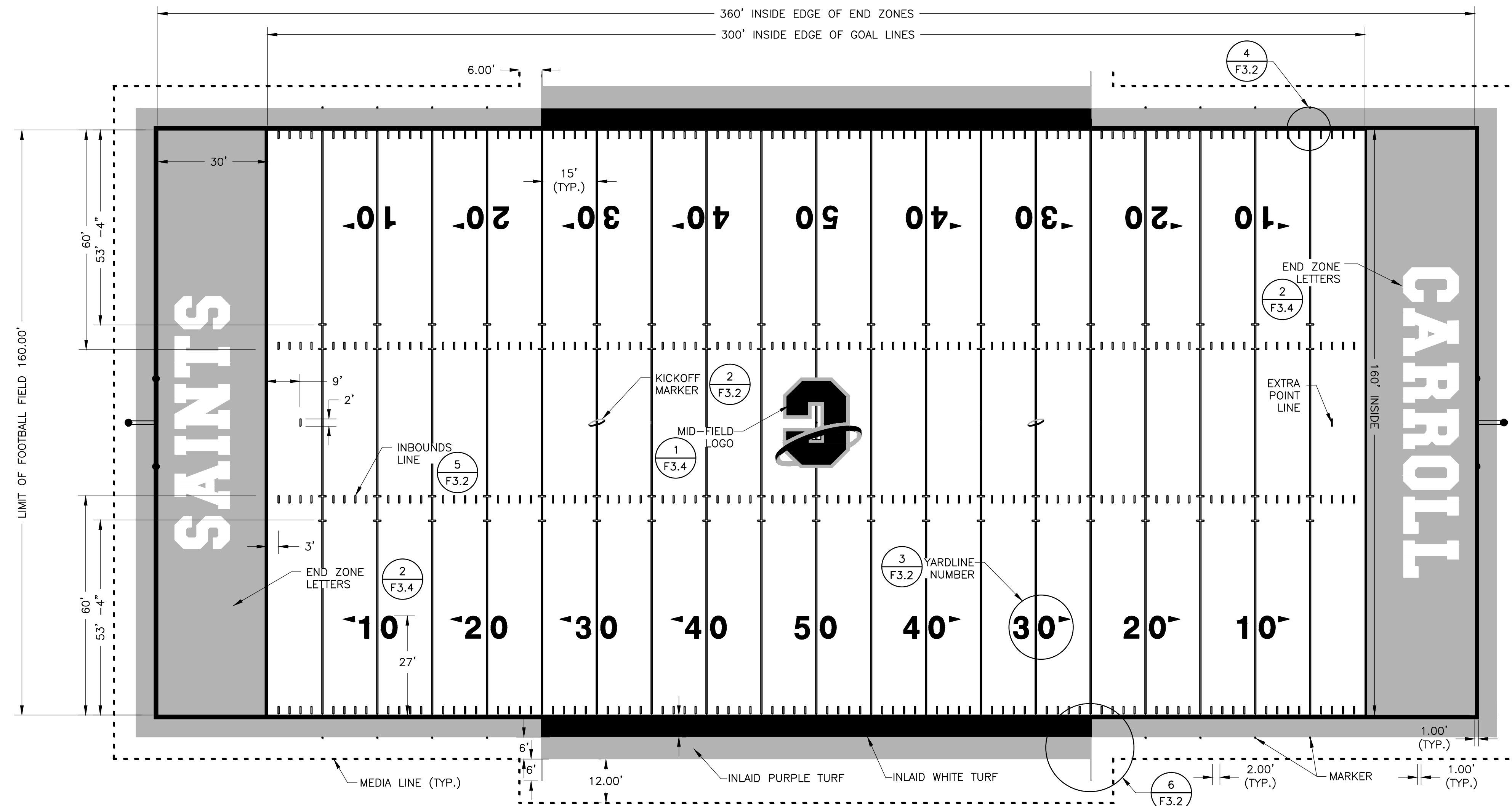
NO.	DESCRIPTION

CARROLL COLLEGE
PHASE 1 NELSON STADIUM - FIELD & LIGHTING
 1857 N. Benton Ave. Helena, MT 59601
FIELD DETAILS

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F2.3

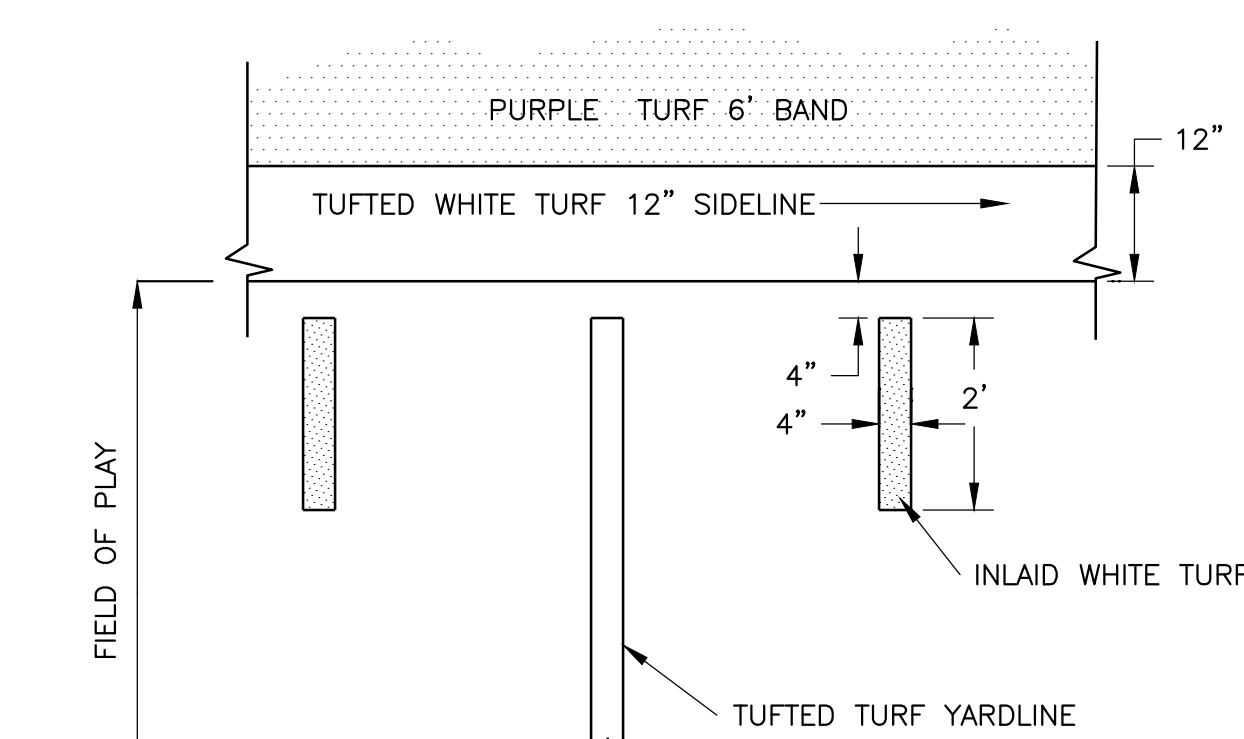




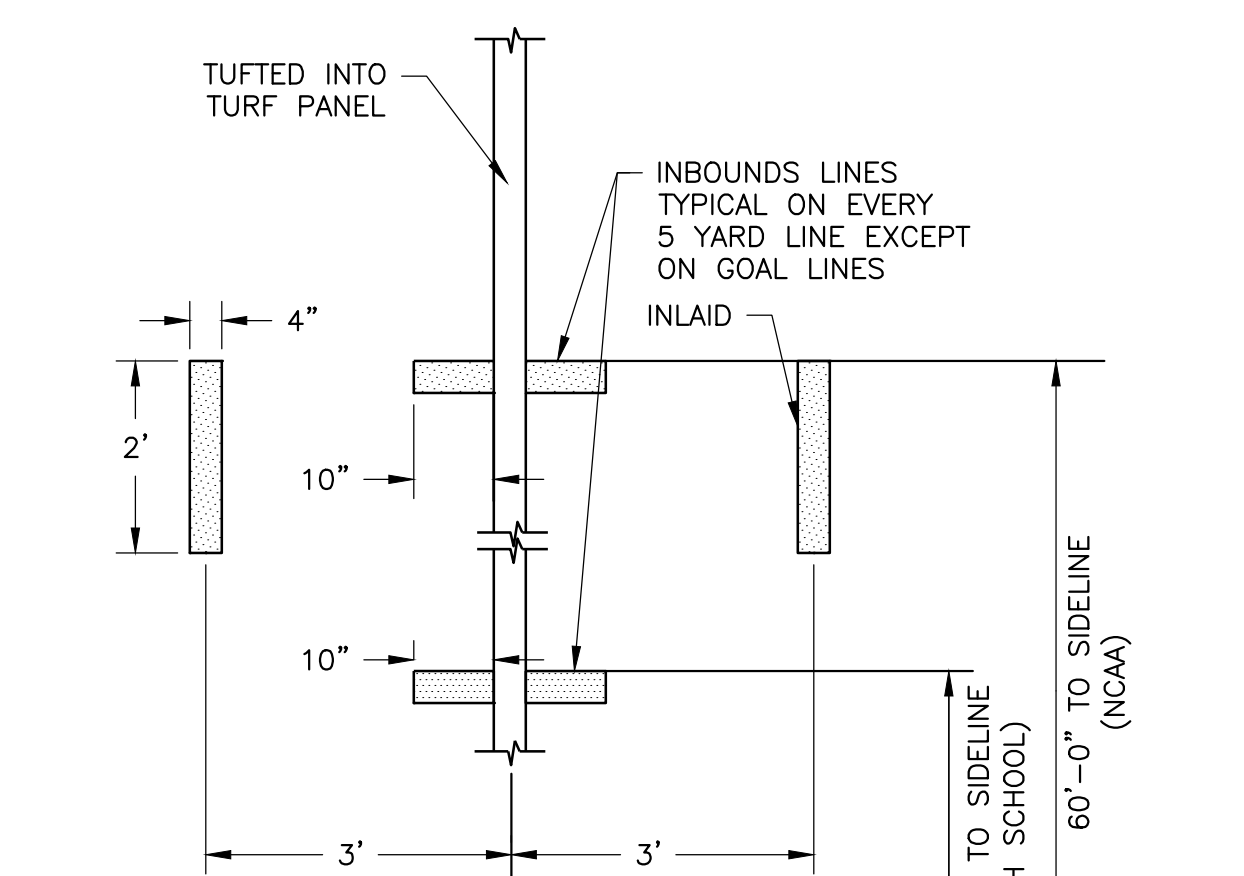
FOOTBALL LAYOUT NOTES

- CONTRACTOR SHALL VERIFY ALL DIMENSIONS.
- ALL LINE WORK IS TO BE LAID OUT WITH A TOLERANCE OF 1/4 INCH.
- ALL YARDLINES SHALL BE 4 INCH, WHITE, TUFTED INTO THE TURF PANELS, THE GOAL LINES WILL BE 8 INCH TUFTED INTO THE TURF PANELS.
- A 12 INCH WHITE LINE, TUFTED INTO THE TURF, WILL SURROUND THE ENTIRE PLAYING FIELD.
- 24 INCH SHORT YARDLINE EXTENSIONS, 4 INCHES FROM THE SIDELINES SHALL BE 4 INCHES WIDE, WHITE, INLAID LINES.
- THE COACHING BOX AND TEAM AREA SHALL BE PER NCAA RULES.
- THE TWO SETS OF INBOUNDS LINES ARE 60 FEET AND 53 FEET 4 INCHES FROM THE SIDELINES. INBOUNDS LINES AND SHORT YARDLINE EXTENSIONS SHALL BE 24 INCHES LONG AND 4 INCHES WIDE, INLAID, WHITE LINES. SHORT YARDLINE EXTENSIONS SHALL BE 60 FEET FROM THE SIDELINE.
- THE EXTRA POINT LINES ARE 2 FEET LONG, 4 INCHES WIDE, WHITE INLAID LINES AT THE CENTERLINE OF THE FIELD AND THE 3 YARDLINE ON EACH END OF THE FIELD. REFER TO PLAN FOR LOCATION.
- WHITE YARDLINE NUMBERS MEASURING 6 FEET IN HEIGHT AND 4 FEET IN WIDTH WITH THE TOP OF THE NUMBERS 27 FEET FROM THE INBOUND LINES ARE INLAID TURF.
- DIRECTIONAL ARROWS POINT TOWARD RESPECTIVE ENDZONES. ARROWS ARE WHITE, THERE ARE NO ARROWS ON THE 50 YARDLINE.
- AN X WILL MARK THE SPOT OF THE KICKOFF AT THE 40 YARDLINE ON EACH END OF THE FIELD. THE 40 YARDLINE SHALL BE WHITE TURF TUFTED INTO THE TURF PANELS AND THE EXTENSIONS FROM THE X SHALL BE INLAID WHITE TURF.
- THE MEDIA LINE SHALL BE A 4" WHITE LINE 12' OUTSIDE THE SIDELINES AND END LINES. 12" LONG DASHES WILL BE SPACED AT 24" INTERVALS.
- A 4"x4" MARKER IS MANDATORY AT EACH FIVE-YARD LINE EXTENDED BETWEEN THE GOAL LINE AS AN EXTENSION OF THE COACHING LINE.
- YARD LINE MARKERS WILL BE PLACED 12' FROM THE SIDELINE AT THE 20, 15, 10 AND 5 YARD LINES.

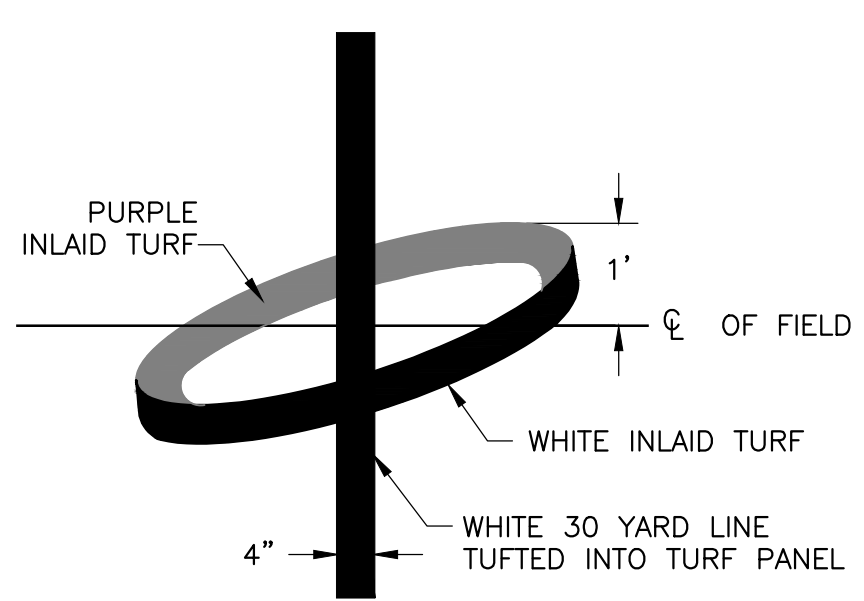
1 FOOTBALL FIELD LAYOUT MARKING PLAN
F3.2 SCALE 1"=20'



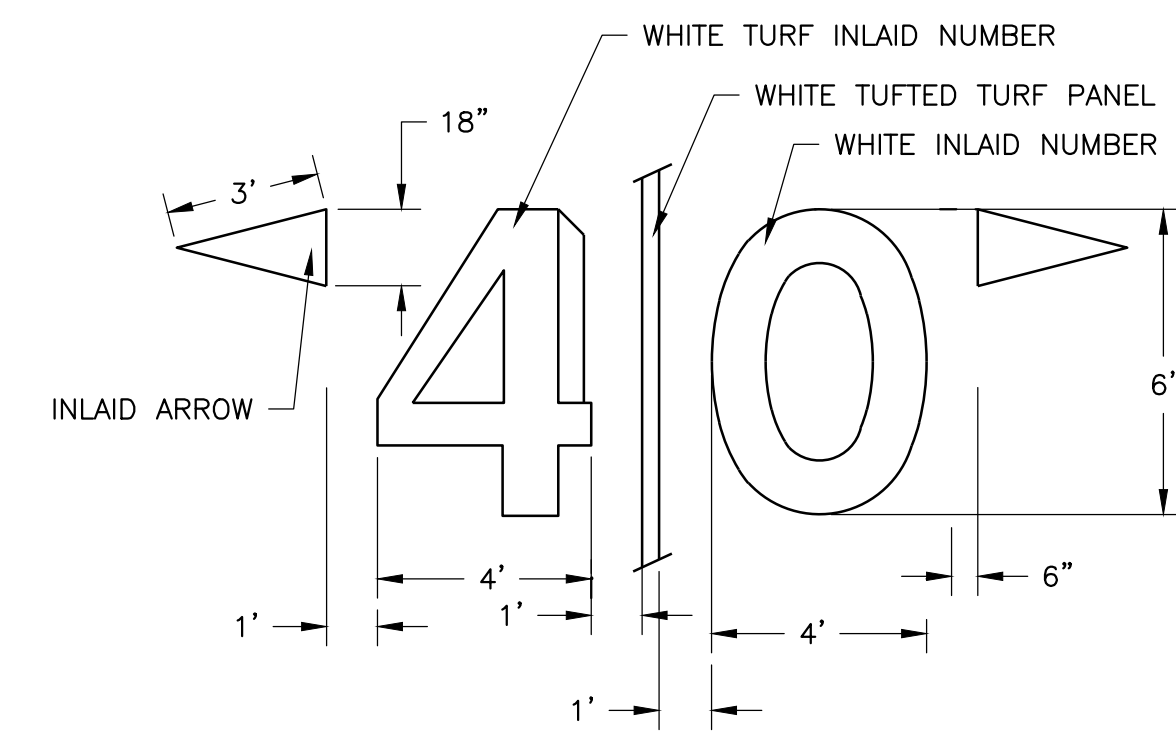
4 SIDE LINE DETAIL
F3.2 NOT TO SCALE



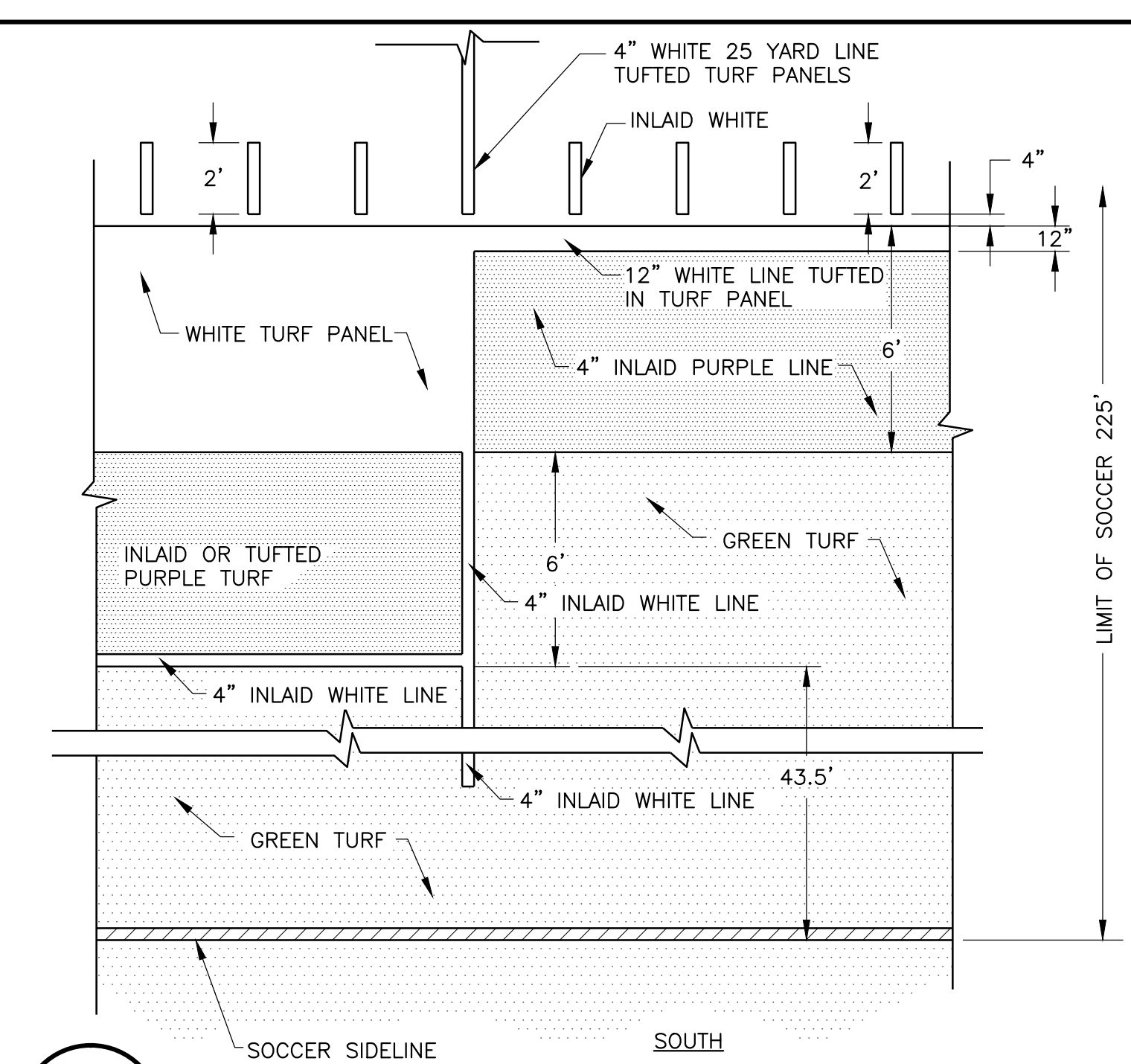
5 INBOUND LINE DETAIL
F3.2 NOT TO SCALE



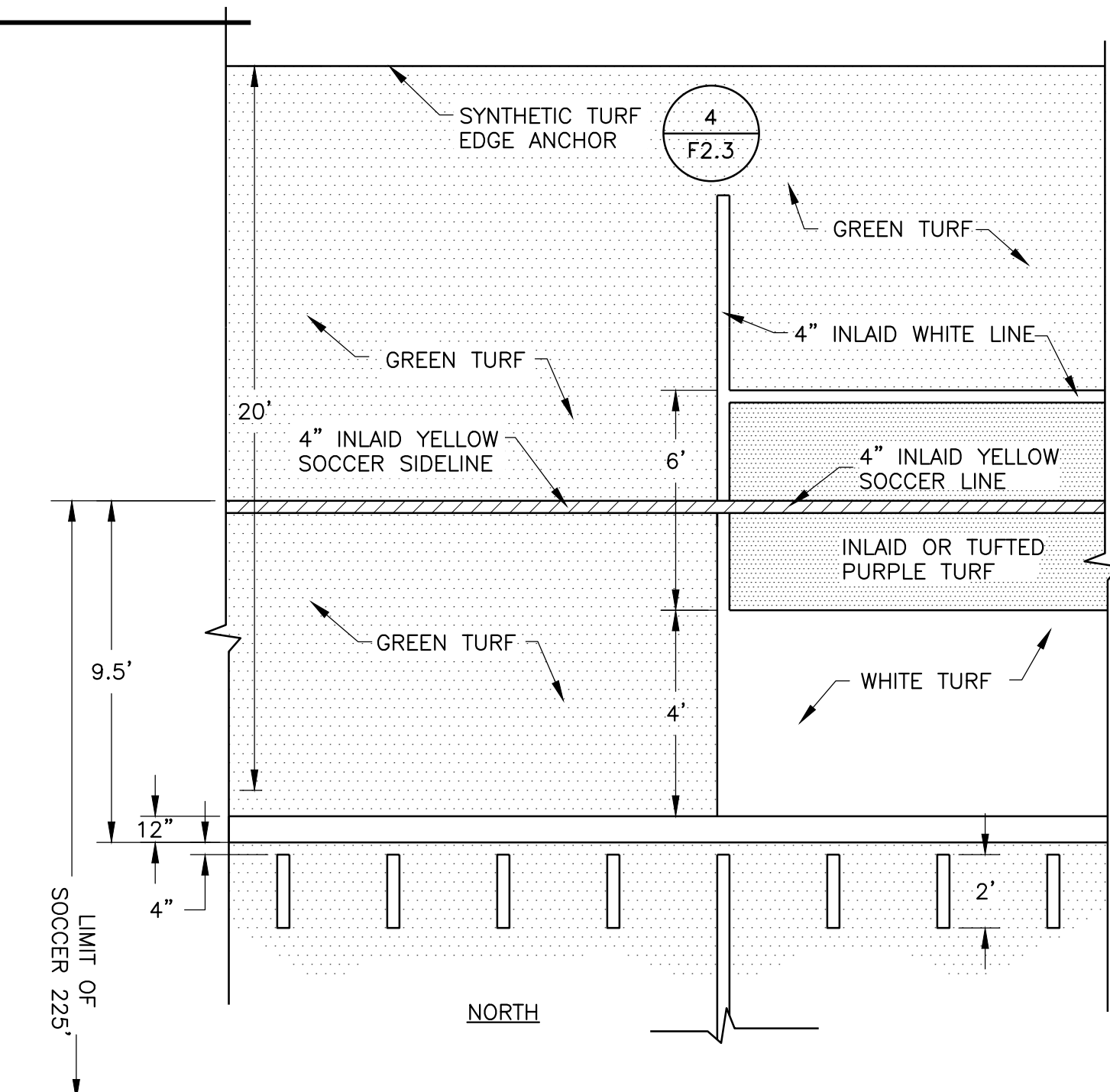
2 KICK-OFF MARKER
F3.2 NOT TO SCALE



3 YARDLINE NUMBER DETAIL
F3.2 NOT TO SCALE



6 COACHES BOX DETAIL
F3.2 NOT TO SCALE



95% DESIGN SUBMITTAL

DA HOGAN
Landscape Architecture

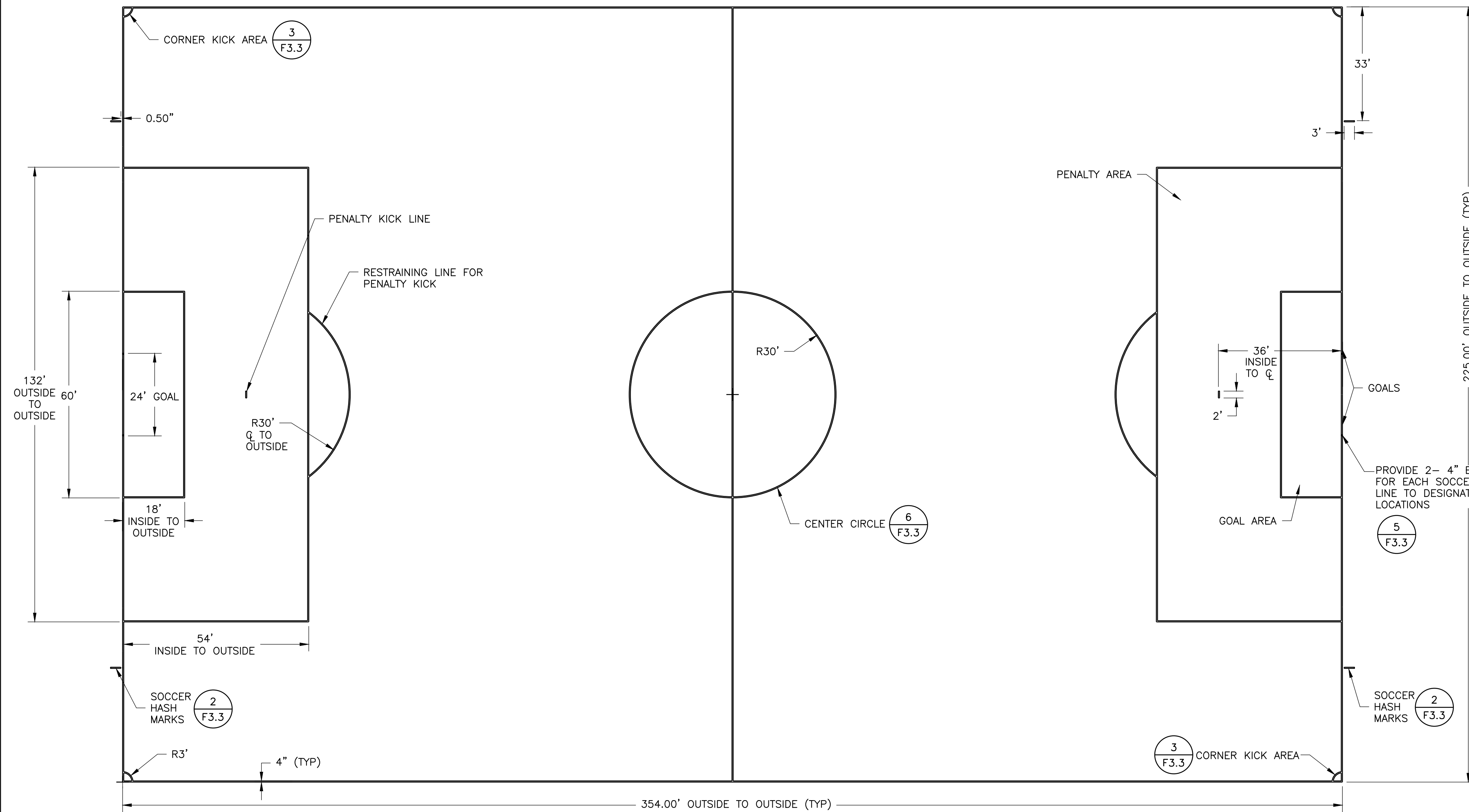
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**CARROLL COLLEGE
PHASE 1 NELSON STADIUM - FIELD & LIGHTING**
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SYNTHETIC TURF FOOTBALL MARKINGS

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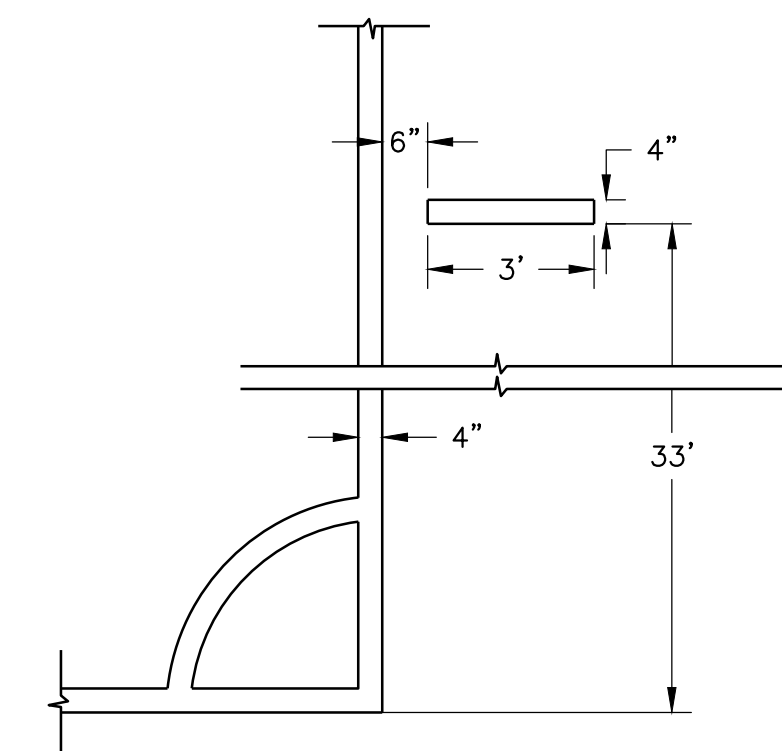
F3.2



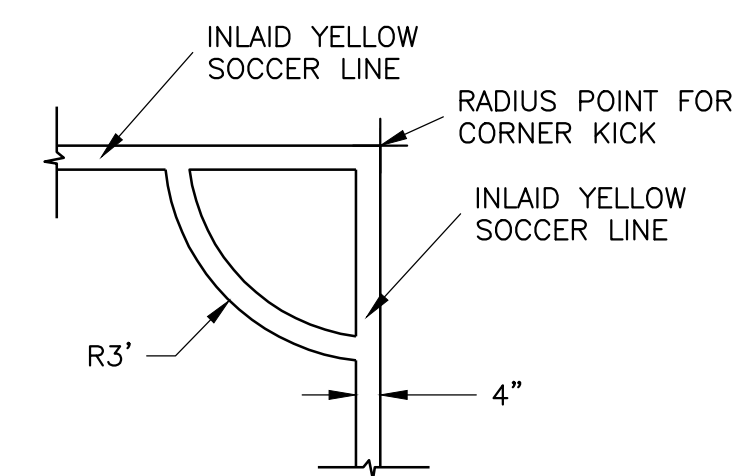
Soccer LAYOUT NOTES

- CONTRACTOR SHALL VERIFY ALL DIMENSIONS. ALL LINE WORK IS TO BE LAID OUT WITH A TOLERANCE OF 1/4 INCH.
- ALL SOCCER LINES ARE 4 INCH YELLOW INLAID OR TUFTED TURF AS DIMENSIONED ON SOCCER LAYOUT PLAN.
- THE SOCCER GOAL AREA IS 18 FEET BY 60 FEET.
- THE SOCCER PENALTY AREA IS 54 FEET BY 132 FEET.
- THE PENALTY MARK IS A 2 FOOT LINE, 4 INCHES WIDE, 36 FEET FROM THE END LINE AND CENTERED ON THE GOAL. THE RESTRAINING LINE FOR PENALTY KICK IS AN ARC 30 FEET FROM THIS MARK OUTSIDE OF THE PENALTY AREA.
- THE HALFWAY LINE FOR THE SOCCER FIELD IS A 4 INCH YELLOW INLAID LINE WITH A CIRCLE, 30 FEET IN RADIUS IN THE CENTER OF THE FIELD. THE RADIUS POINT OF THE MIDFIELD CIRCLE WILL BE INLAID YELLOW DOT WITH A 9 INCH DIAMETER. THE FOOTBALL LINES WILL PASS THROUGH THE SOCCER LINES. THE 50 YARD LINE OF THE FOOTBALL FIELD WILL BE WHITE WITH 4 INCHES OF YELLOW INLAID TURF ON EACH SIDE AND WILL EXTEND TO THE SIDELINE OF THE FOOTBALL FIELD.
- THE SOCCER LINE WILL EXTEND BEYOND THE FOOTBALL SIDELINE BEGINNING 4 INCHES OUTSIDE THE 12 INCH SIDELINE AND EXTENDING THROUGH THE OFFICIALS, COACHES AND TEAM BOX.
- THE CORNERS OF THE SOCCER FIELD SHALL HAVE A 3 FOOT RADIUS IN YELLOW TURF DESIGNATING THE CORNER KICK AREA. THE HASH MARK IS A 3 FOOT LINE, 4 INCHES WIDE, 33 FEET FROM THE SIDE LINE AND EXTENDS AWAY FROM THE FIELD OF PLAY.

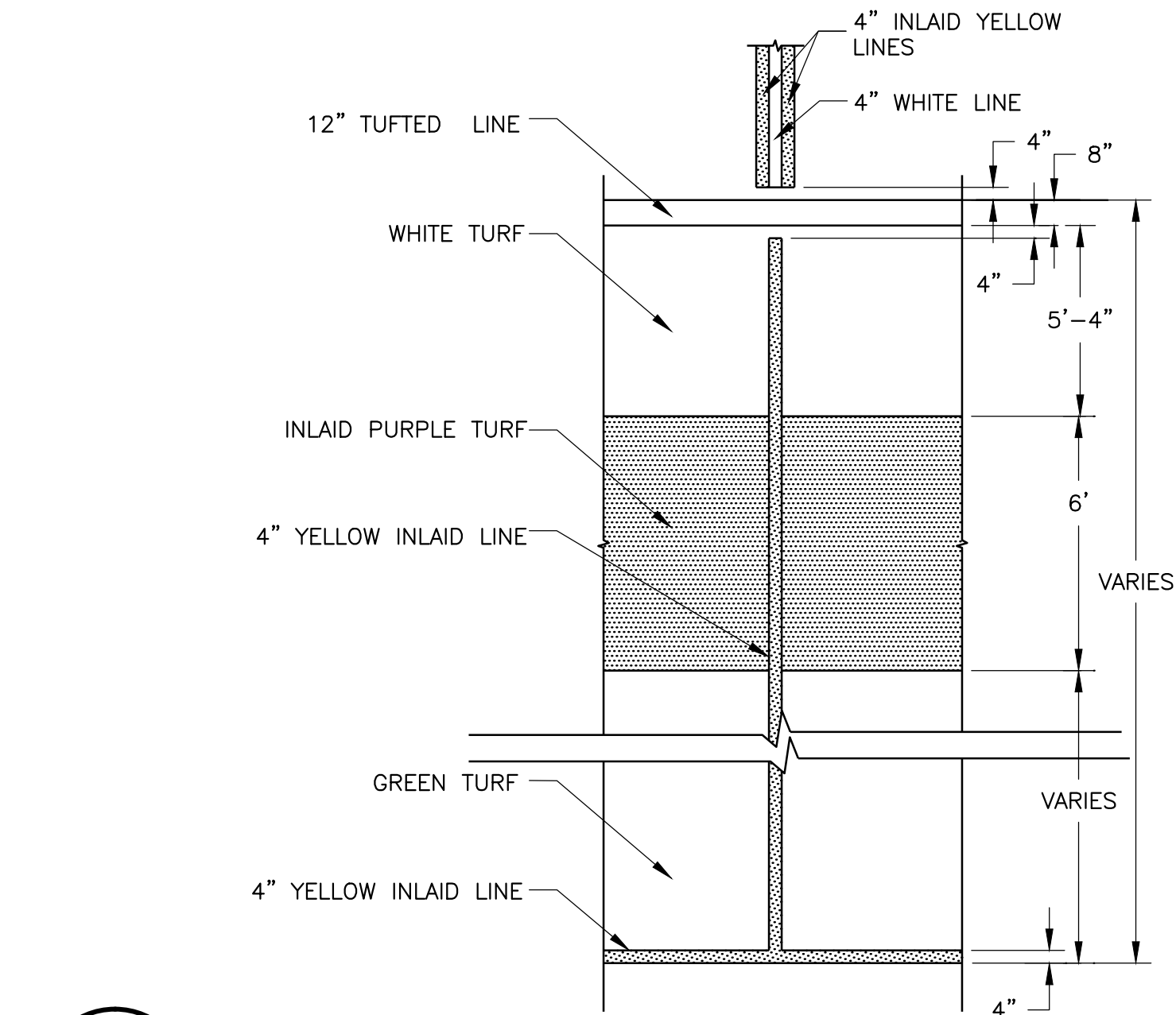
1 SOCCER FIELD LAYOUT MARKING PLAN
F3.3 SCALE 1"=20'



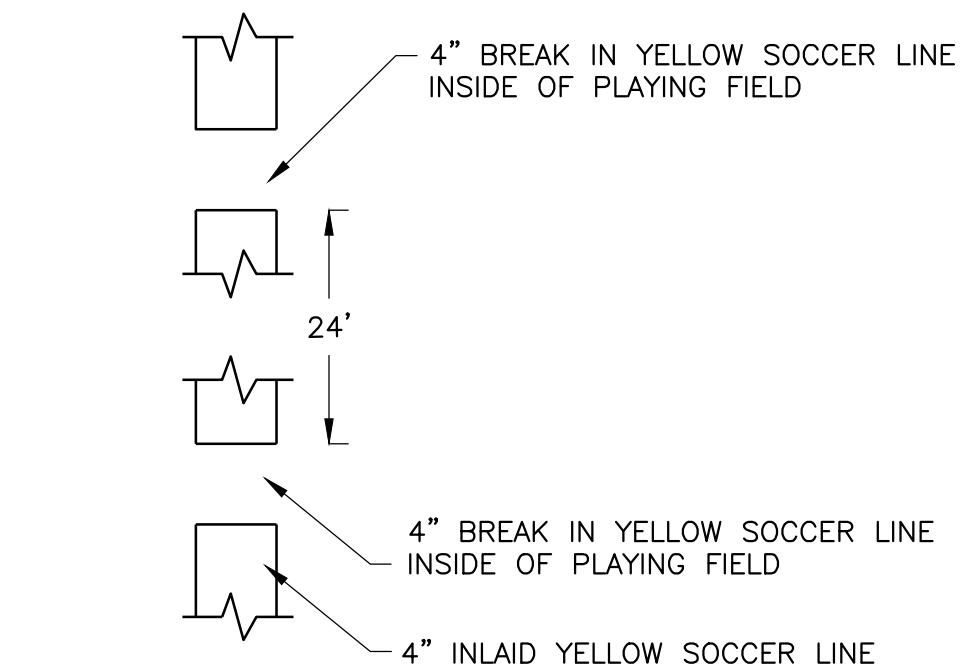
2 SOCCER HASH MARKS
F3.3 NOT TO SCALE



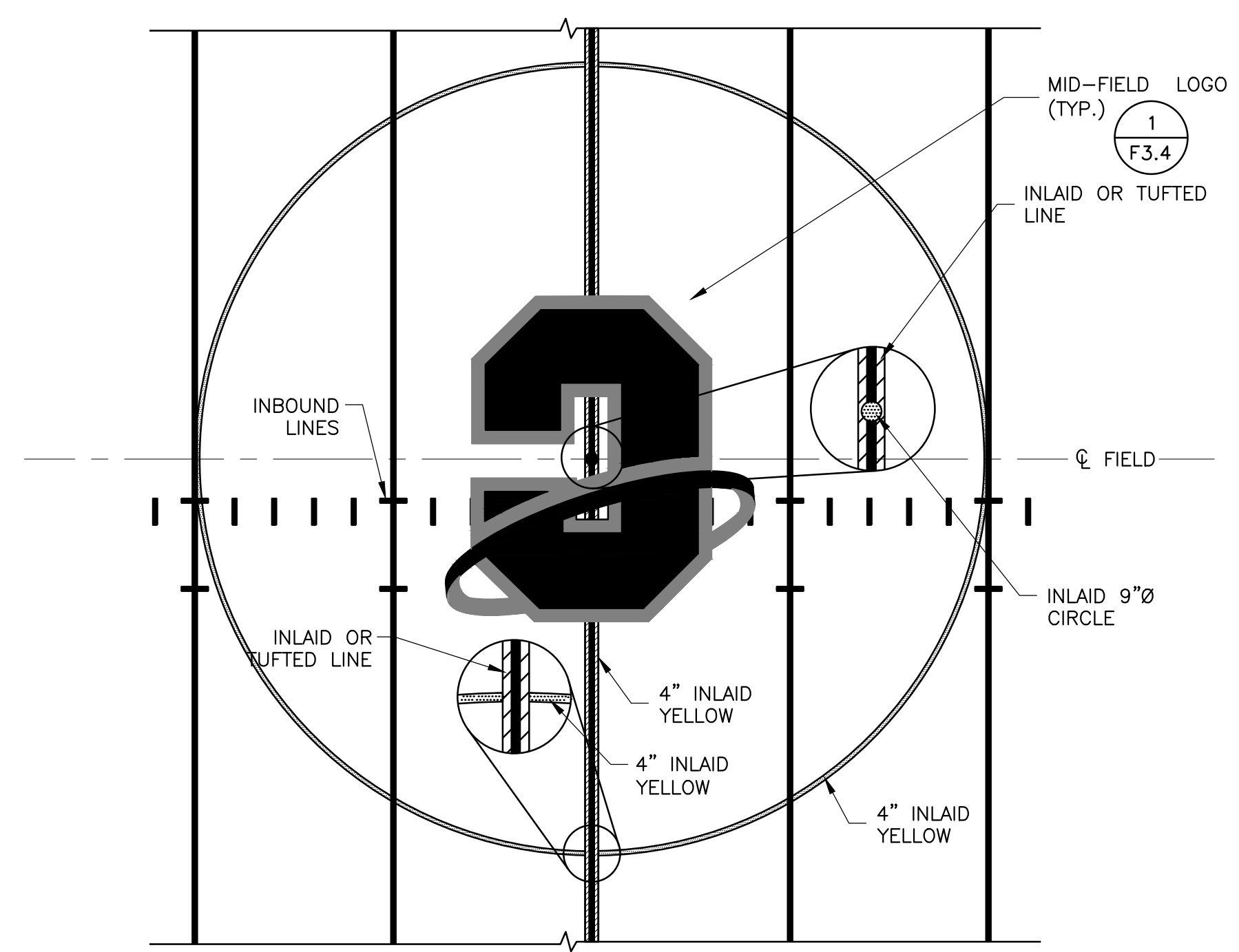
3 CORNER KICK DETAIL
F3.3 NOT TO SCALE



4 MID-FIELD LINE AT SIDELINE
F3.3 NOT TO SCALE



5 SOCCER GOAL ALIGNMENT SQUARES
F3.3 NOT TO SCALE



6 SOCCER CIRCLE AND MID-FIELD LINE
F3.3 NOT TO SCALE



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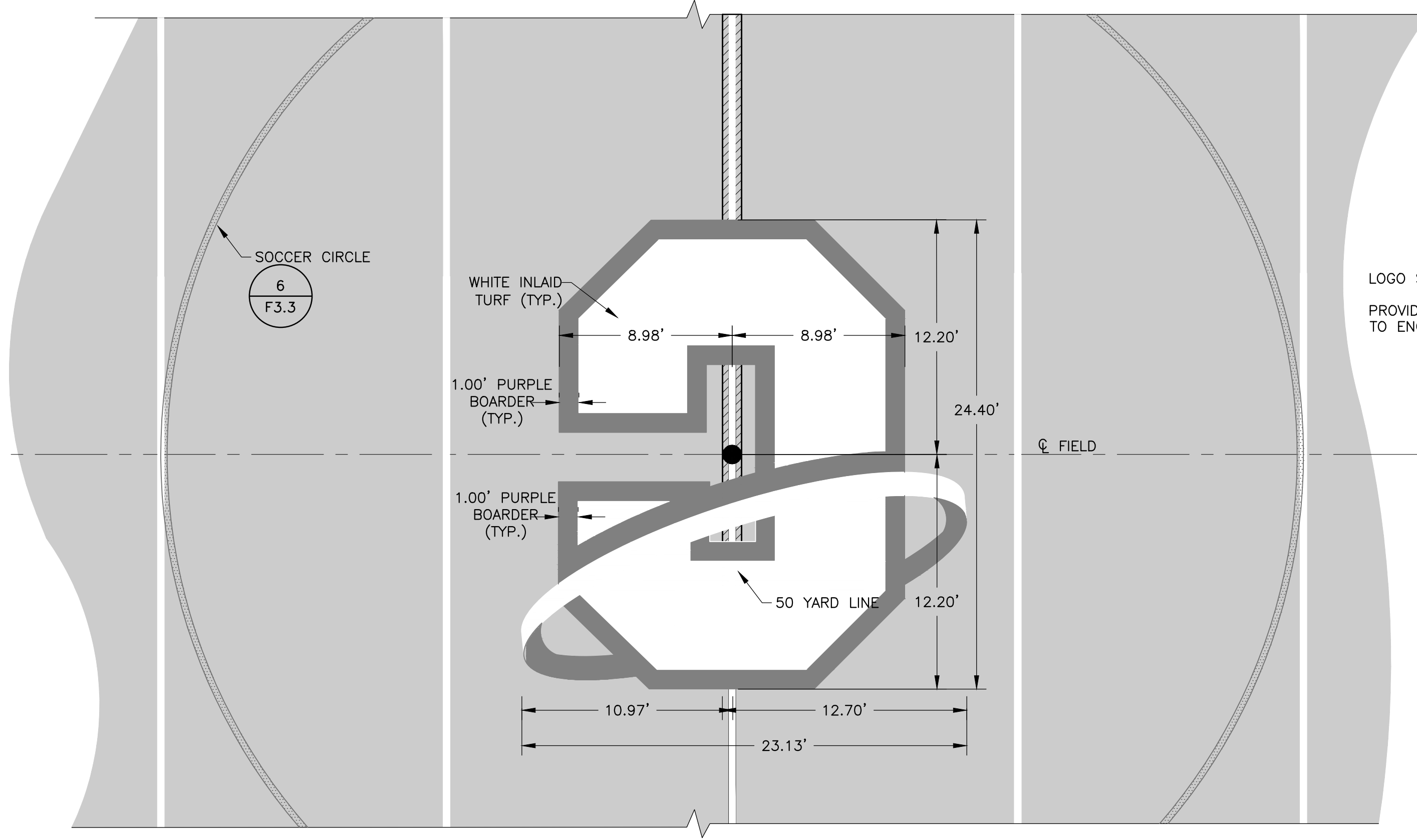


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PHASE 1 NELSON STADIUM - FIELD & LIGHTING
 1857 N. Benton Ave., Helena, MT 59601
SYNTHETIC TURF SOCCER MARKINGS

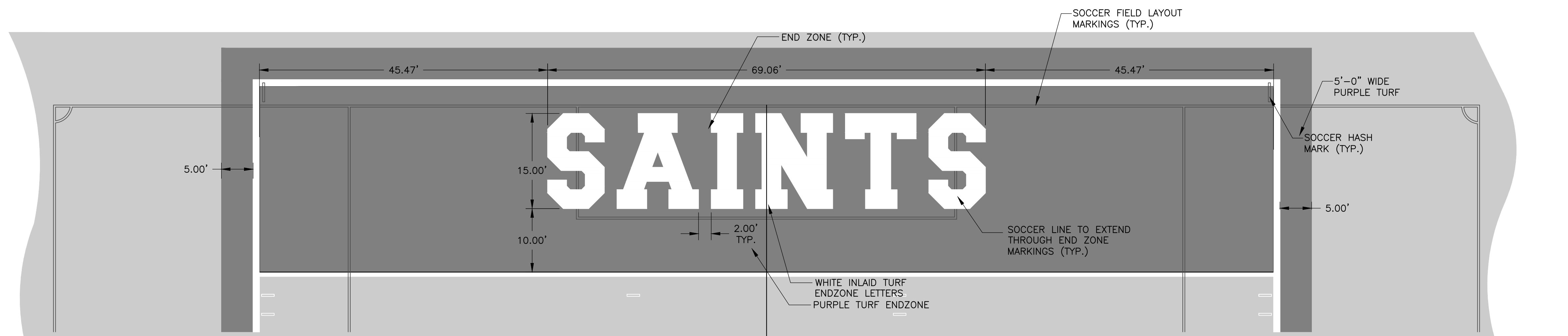
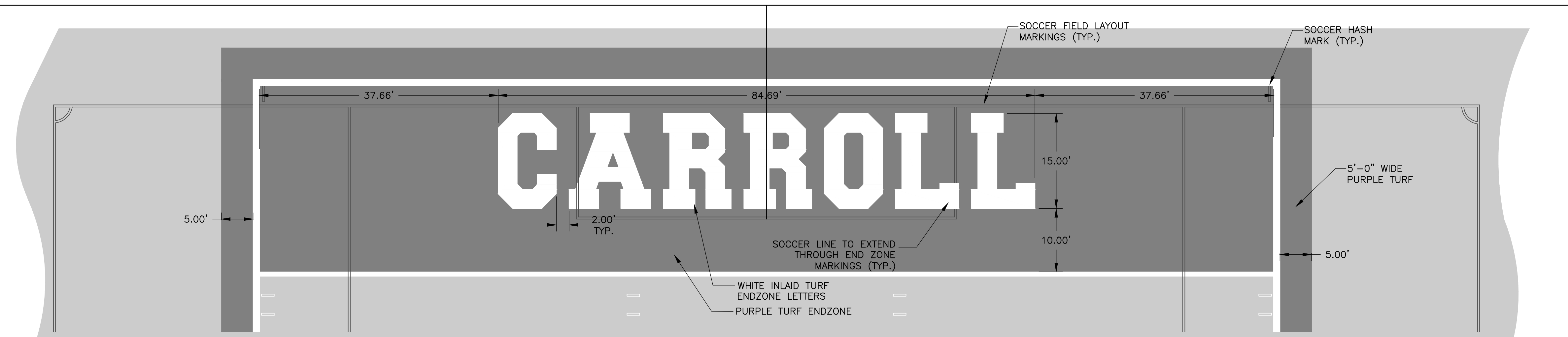
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F3.3



LOGO SHALL OVERLAY 50 YARD LINE.
PROVIDE SHOP DRAWINGS AND SUBMIT TO ENGINEER FOR APPROVAL.

1 MID-FIELD LOGO
F3.4 NOT TO SCALE



2 ENDZONE
F3.4 NOT TO SCALE

95% DESIGN SUBMITTAL



REVISIONS

NO.	DESCRIPTION

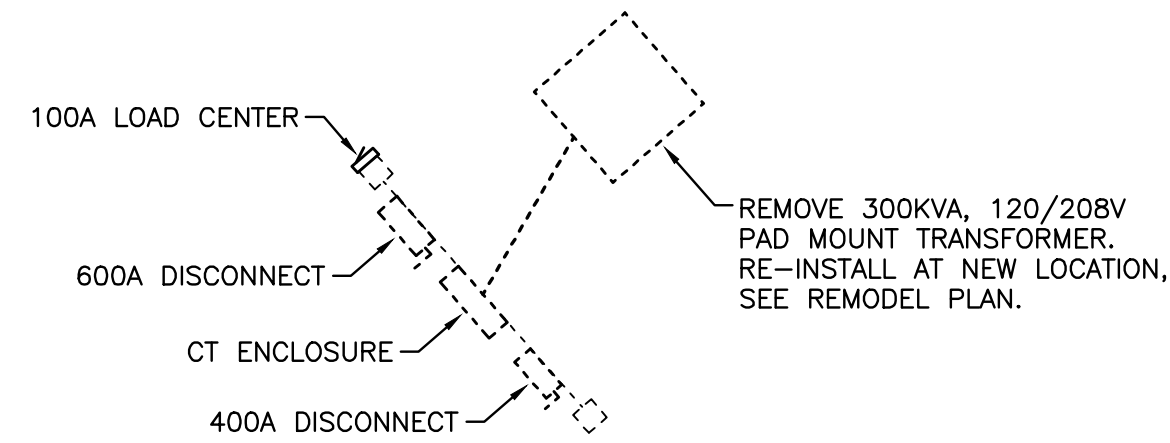
CARROLL COLLEGE
PHASE 1 NELSON STADIUM - FIELD & LIGHTING
1857 N. Benton Ave. Helena, MT 59601

SYNTHETIC TURF LOGO & END ZONE
DETAILS

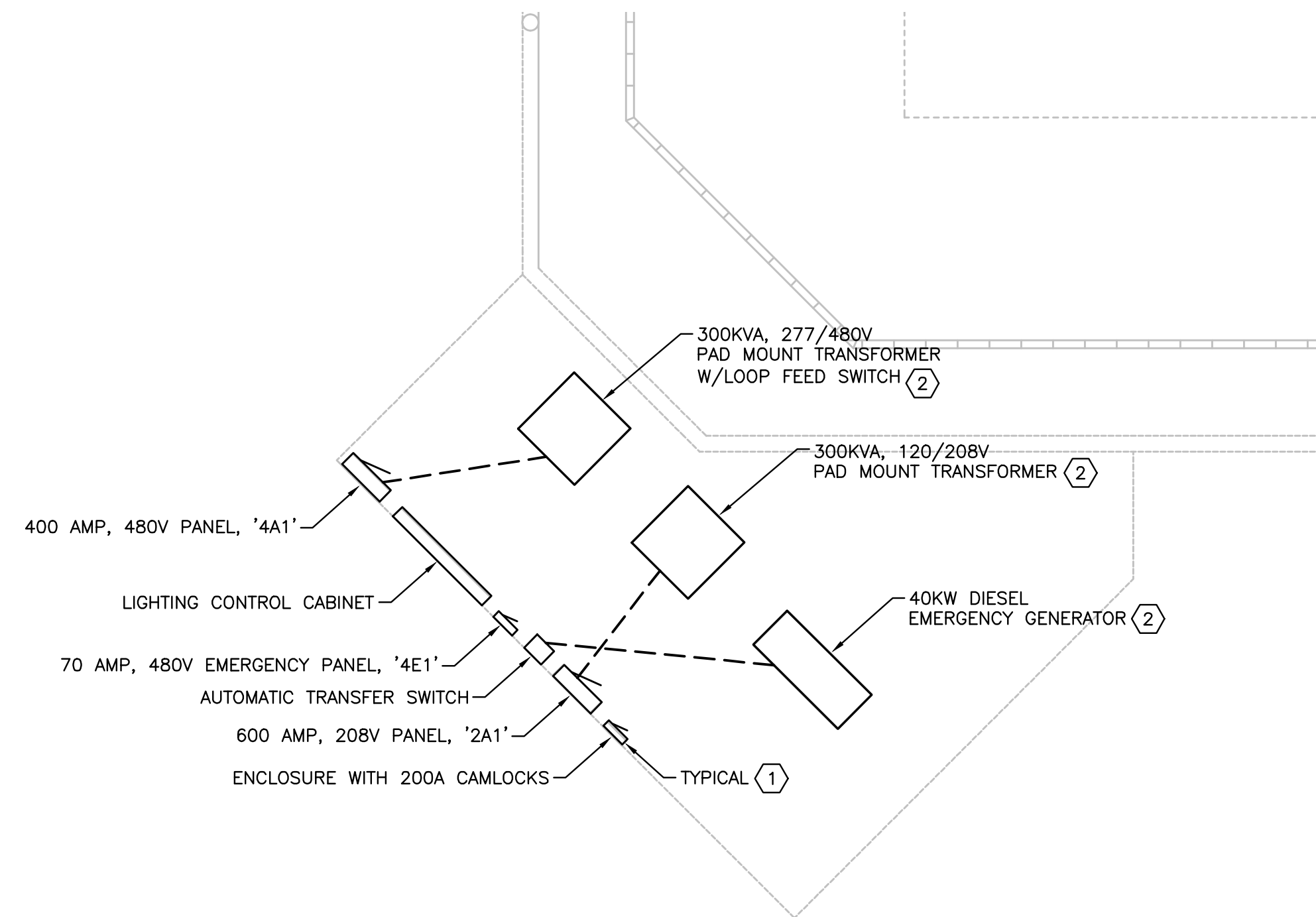
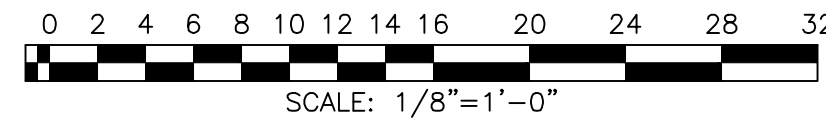


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DATE 9-25-23

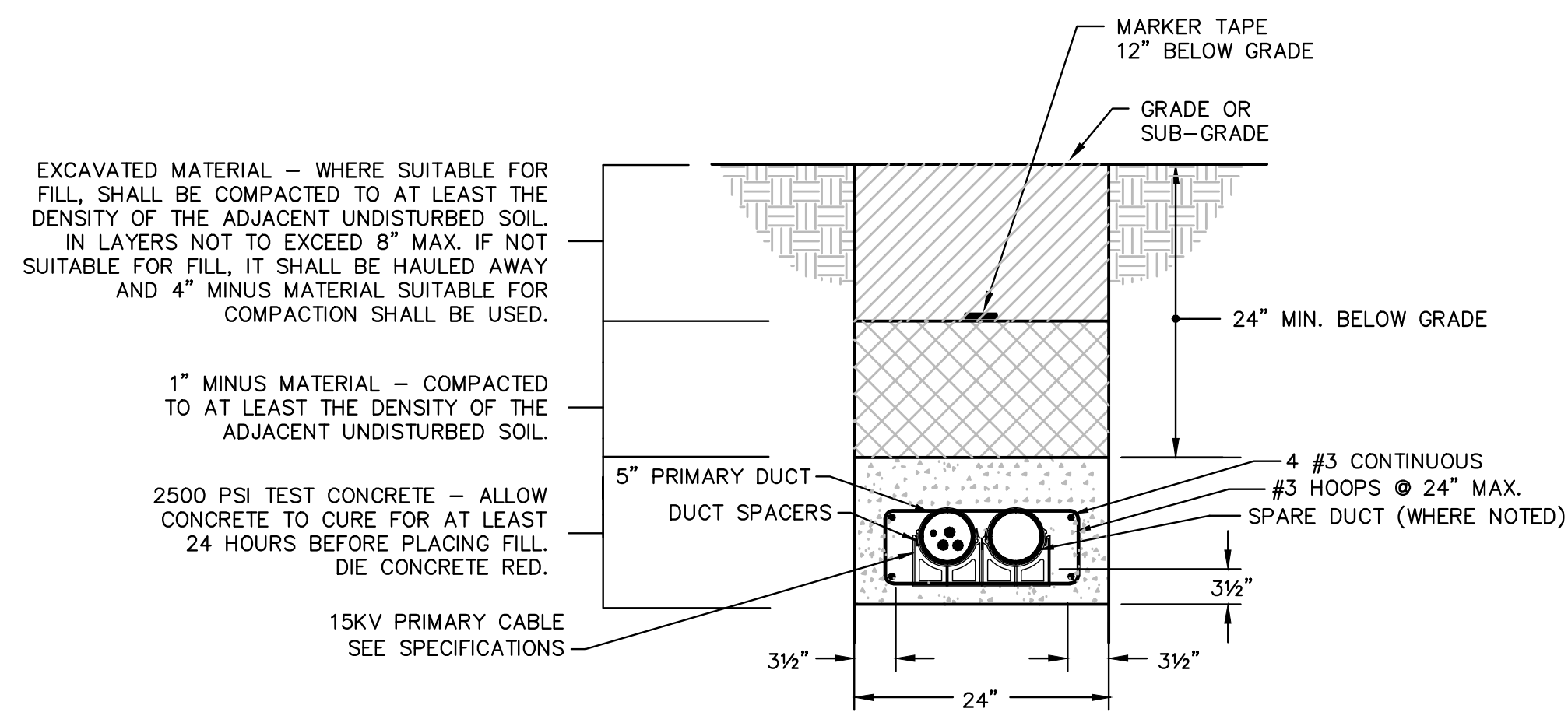
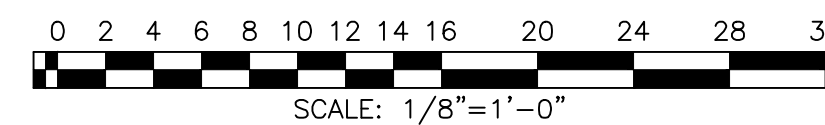
F3.4



1 ELECTRICAL DEMOLITION PLAN



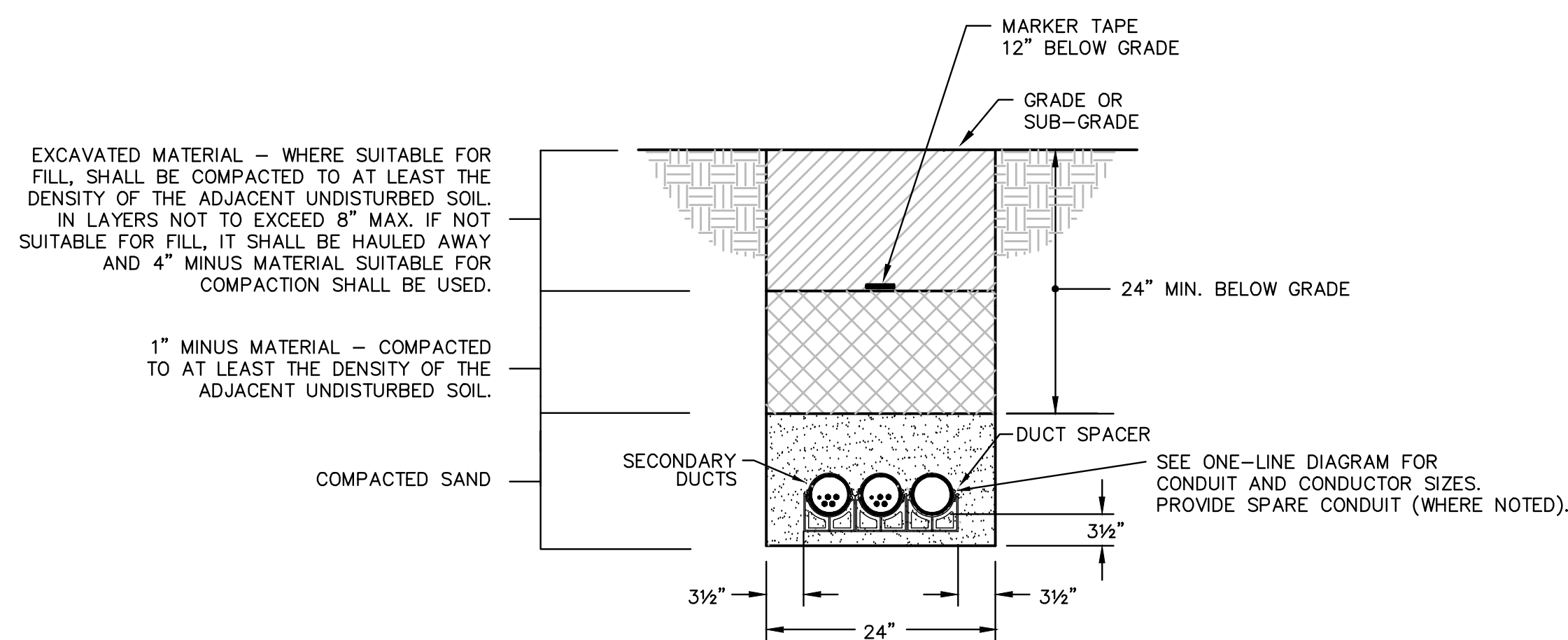
2 ELECTRICAL REMODEL PLAN



(THIS DETAIL APPLIES TO ALL UNDERGROUND PRIMARY FOR PROJECT)

3 PRIMARY TRENCH DUCT DETAIL

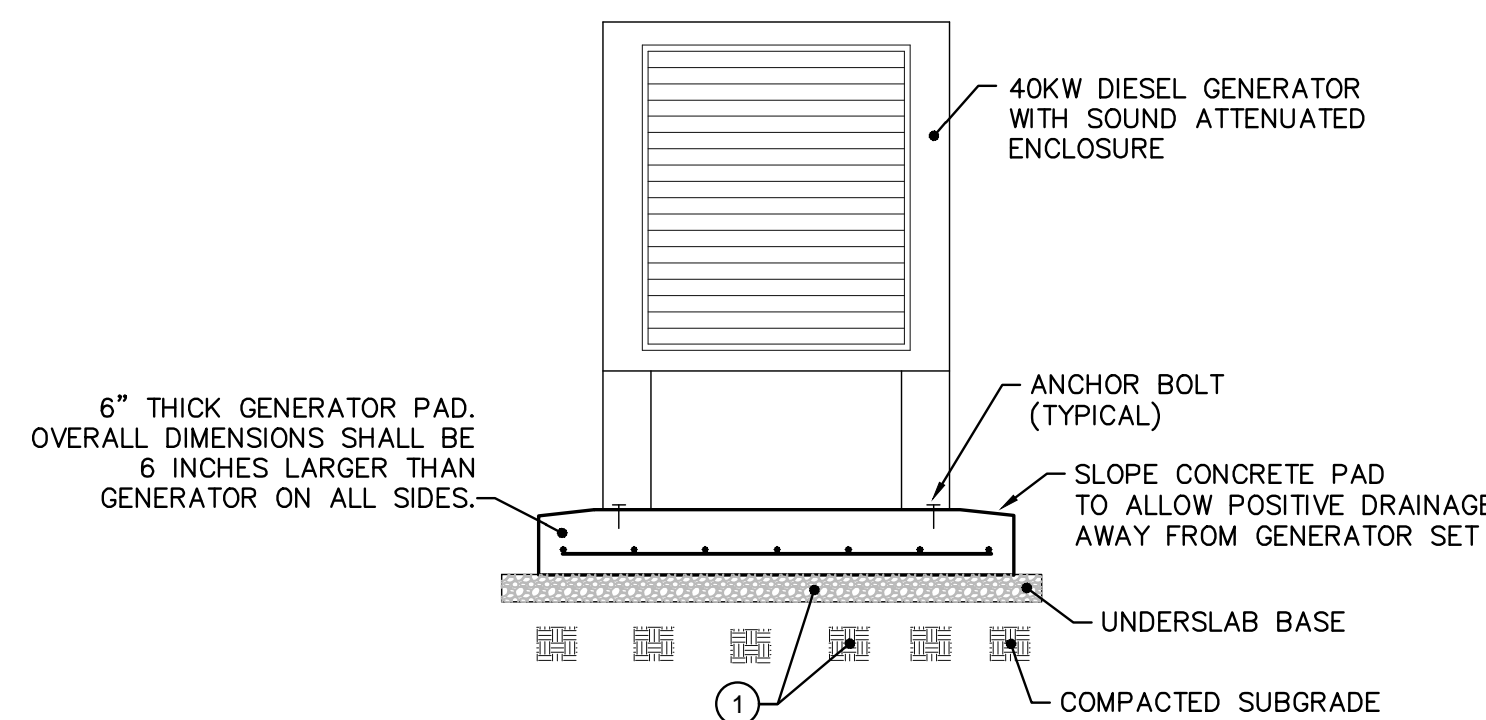
SCALE: NONE



(THIS DETAIL APPLIES TO ALL UNDERGROUND SECONDARY FOR PROJECT)

4 SECONDARY TRENCH DUCT DETAIL

SCALE: NONE



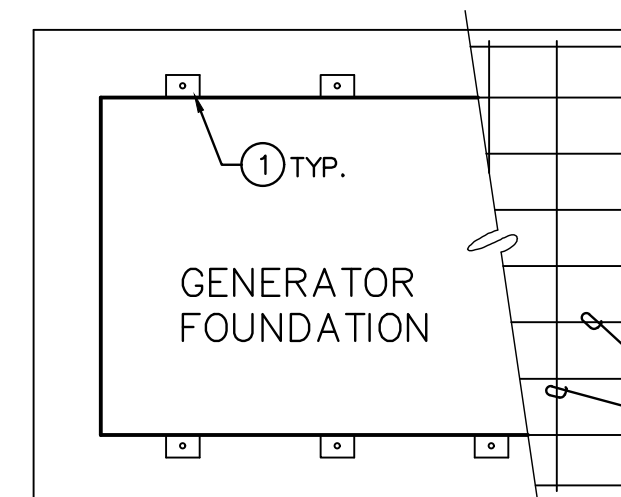
NOTES:

- THE CONTRACTOR SHALL COMPACT SUBGRADE TO A MINIMUM OF 95% PERCENT OF MAXIMUM DENSITY. UNDER SLAB BASE SHALL BE MINIMUM 4" THICK AND BE SELECT PIT RUN GRAVEL WITH MAXIMUM SIZE NOT TO EXCEED 1-1/2" IN SIZE. GRAVEL SHALL HAVE A NATURAL GRADATION FROM FINE TO COARSE AND SHALL CONTAIN SUFFICIENT FINES TO INSURE PROPER COMPACTION. REMOVE SURPLUS BACKFILL MATERIALS FROM SITE. LEAVE STOCKPILE AREAS CLEAN AND FREE OF EXCESS MATERIAL.

5 GENERATOR FOUNDATION SECTION DETAIL

NO SCALE

- ANCHOR EMERGENCY GENERATOR TO CONCRETE PAD WITH ANCHOR BOLTS (1/2" MINIMUM WITH 4" EMBED) CAST IN CONCRETE OR IN CURED CONCRETE USE HILTI CHEMICAL ANCHOR SYSTEM (HIT-RE 500 HIGH PERFORMANCE INJECTION SYSTEM). REFER TO GENERATOR DRAWINGS FOR ANCHOR HOLE LOCATIONS.



- NOTES:
- VERIFY SLAB SIZE WITH GENERATOR DRAWING PRIOR TO CONSTRUCTION.
 - CONCRETE SLAB SHALL BE SET TRUE AND LEVEL.
 - CONCRETE SHALL HAVE A MIN. COMPRESSIVE STRENGTH OF 3000 PSI. AT 28 DAYS.
 - #4 REBAR @ 12" EACH DIRECTION. 2 ROWS, 12" APART IN CONCRETE.

6 GENERATOR FOUNDATION PLAN

NO SCALE

COORDINATION NOTE

IT IS ABSOLUTELY NECESSARY THAT ALL TRADES COORDINATE WITH EACH OTHER AND VERIFY THAT THERE ARE NO CONFLICTS IN LOCATION OF DUCTS, CONDUITS, SPRINKLER HEADS, DIFFUSERS, ELECTRICAL BOXES, EQUIPMENT, AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.

COGNIZANT NOTE:

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GENERAL SHEET NOTES:

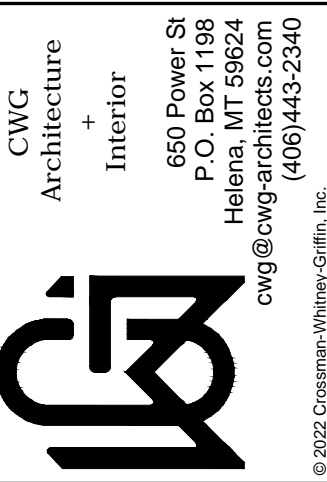
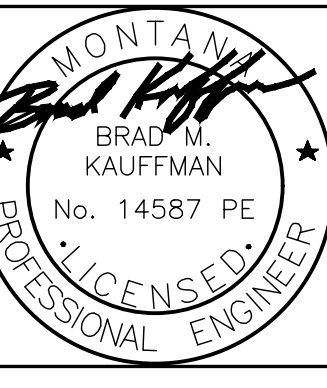
- COLLEGE OWNS CAMPUS ELECTRICAL PRIMARY DISTRIBUTION. ELECTRICAL CONTRACTOR RESPONSIBLE FOR ALL NEW ELECTRICAL PRIMARY CONDUCTORS, TRANSFORMERS, AND METERING. SEE SPECIFICATION SECTION 264020.
- THE ELECTRICAL CONTRACTOR SHALL BE COGNIZANT THAT THIS IS A REMODEL PROJECT AND AS SUCH, CERTAIN ITEMS CANNOT BE FULLY ILLUSTRATED NOR EXPLAINED WITHOUT FIELD OBSERVATION. THEREFORE BEFORE SUBMITTING A PROPOSAL, THE CONTRACTOR SHALL VISIT AND EXAMINE THE PROJECT IN EVERY DETAIL AS PERTAINS TO THIS PROJECT AND MAKE ALLOWANCES IN THEIR PROPOSAL FOR ALL CONDITIONS THAT WILL AFFECT THE WORK INDICATED IN THE PROJECT MANUAL AND CONTRACT DOCUMENTS.

SPECIFIC SHEET NOTES:

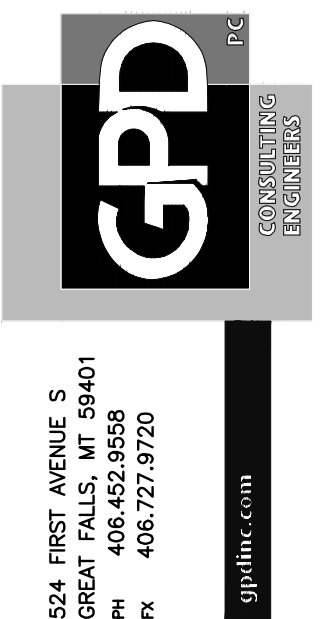
- SEE ELECTRICAL SHEET E2.0 FOR EQUIPMENT LAYOUT ALONG RETAINING WALL.
- PROVIDE CONCRETE PADS FOR EQUIPMENT. EQUIPMENT PADS SHALL RAISE AT LEAST 2" TO 4" ABOVE CONCRETE SLAB. GENERAL CONTRACTOR WILL BLOCK-OUT FOR TRANSFORMER AND GENERATOR PADS AS REQUIRED.

GENERAL PROJECT NOTES

- THE COMPLETE ELECTRICAL INSTALLATION SHALL BE DONE IN ACCORDANCE WITH THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE, THE LATEST RULES AND REGULATIONS OF THE SAFETY ORDERS ISSUED BY THE DIVISION OF INDUSTRIAL SAFETY, THE NATIONAL BOARD OF FIRE UNDERWRITERS AND ALL APPLICABLE STATE AND LOCAL CODES ISSUED BY THE AUTHORITIES HAVING JURISDICTION.
- ELECTRICAL CONTRACTOR SHALL DIRECT, PROVIDE, & SUPERVISE ALL ELECTRICAL WORK AND SHALL COORDINATE ALL WORK WITH OTHER TRADES. THE CONTRACTOR SHALL CONSULT THE ARCHITECTURAL, MECHANICAL, AND OTHER DRAWINGS RELATED TO THIS PROJECT FOR OTHER ELECTRICAL WORK TO BE DONE, WHICH MAY NOT BE SHOWN ON ELECTRICAL PLANS.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING ALL REQUIRED PERMITS AND INSPECTIONS.
- ELECTRICAL CONTRACTOR SHALL DETERMINE METHODS, PHASING, & SEQUENCE OF ELECTRICAL WORK TO SATISFY CONTRACT DOCUMENT REQUIREMENTS.
- GREEN INSULATED GROUND CONDUCTORS SHALL BE INSTALLED IN ALL FEEDER AND BRANCH CIRCUIT CONDUIT.
- ELECTRICAL EQUIPMENT AND FEEDERS SHALL BE SUPPORTED AND/OR ANCHORED IN ACCORDANCE WITH ALL LOCAL SEISMIC REQUIREMENTS.
- ELECTRICAL CONTRACTOR SHALL REVIEW & VERIFY ALL DIMENSIONS PRIOR TO WORK. REPORT ANY OBSERVED AMBIGUITY, OMISSION, OR ERROR, IN WRITING, AT ONCE, TO THE GENERAL CONTRACTOR.
- ELECTRICAL CONTRACTOR SHALL COORDINATE ALL BACKER, CONCRETE PADS, & STRUCTURAL RELATED FRAMING ISSUES, WITH THE GENERAL CONTRACTOR, PRIOR TO ROUGH-IN.



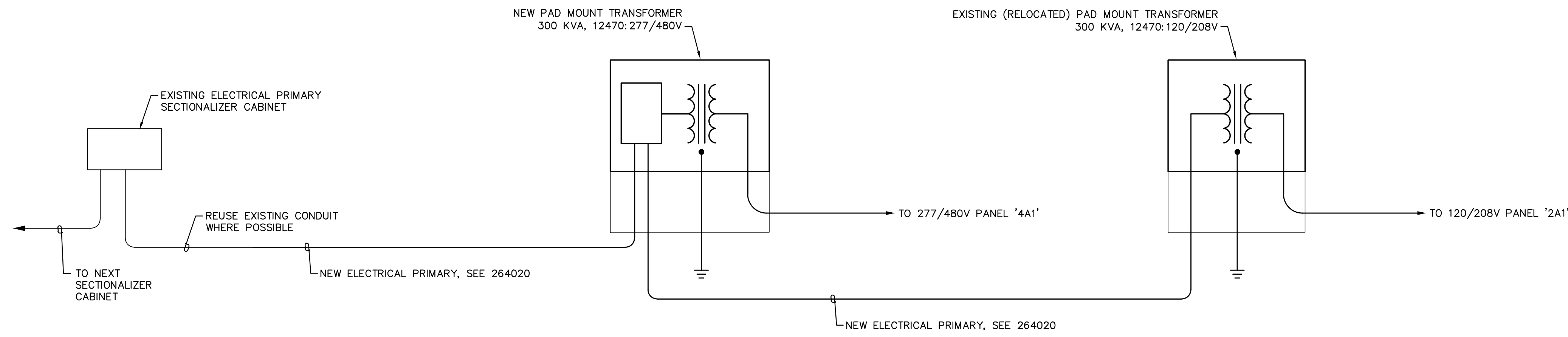
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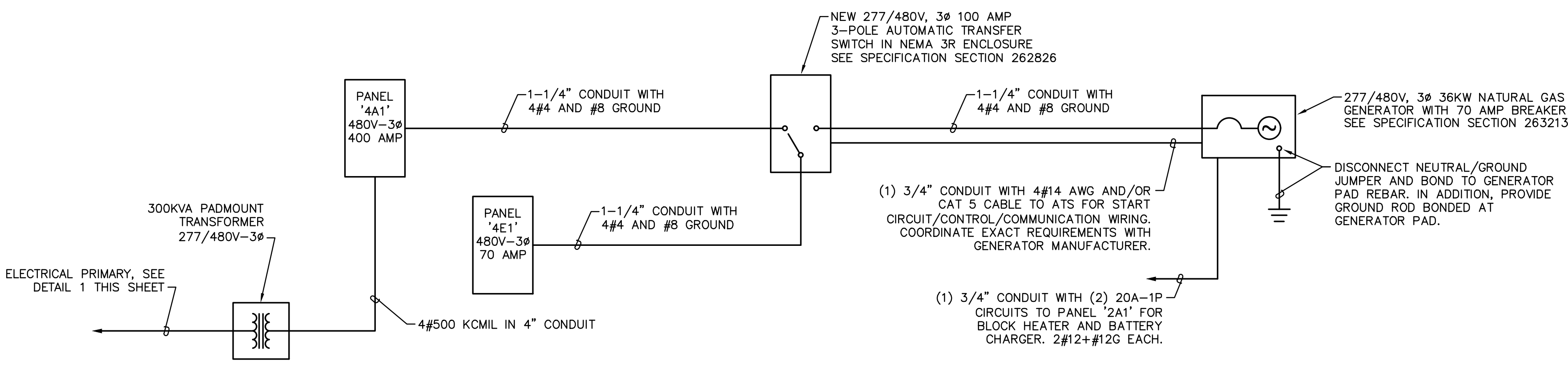
CARROLL COLLEGE
NELSON STADIUM - FIELD & LIGHTING BID SET
1857 N. Benton Ave. Helena, MT 59601
Electrical Service and Generator Plans and Details

70.41.03
DRAWN BY BMK
APPROVED BMK
DATE 10-13-23

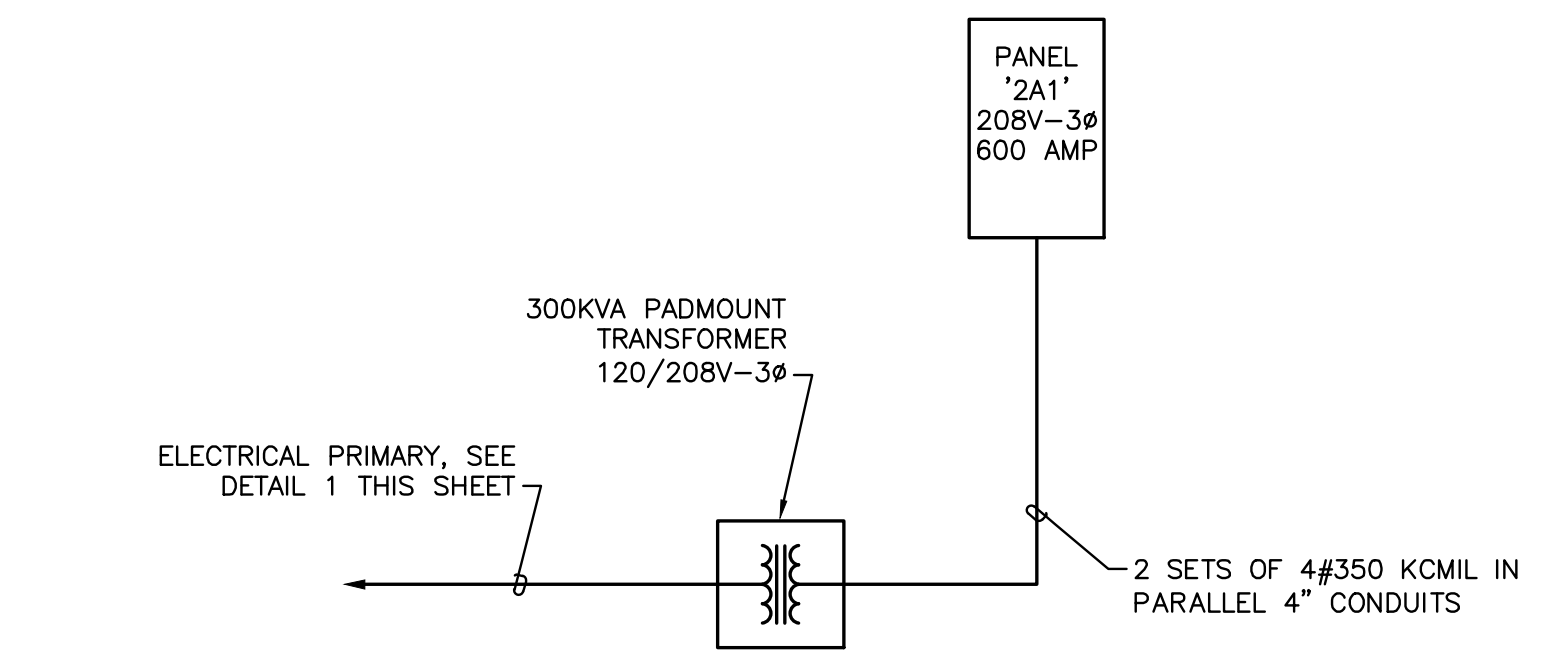
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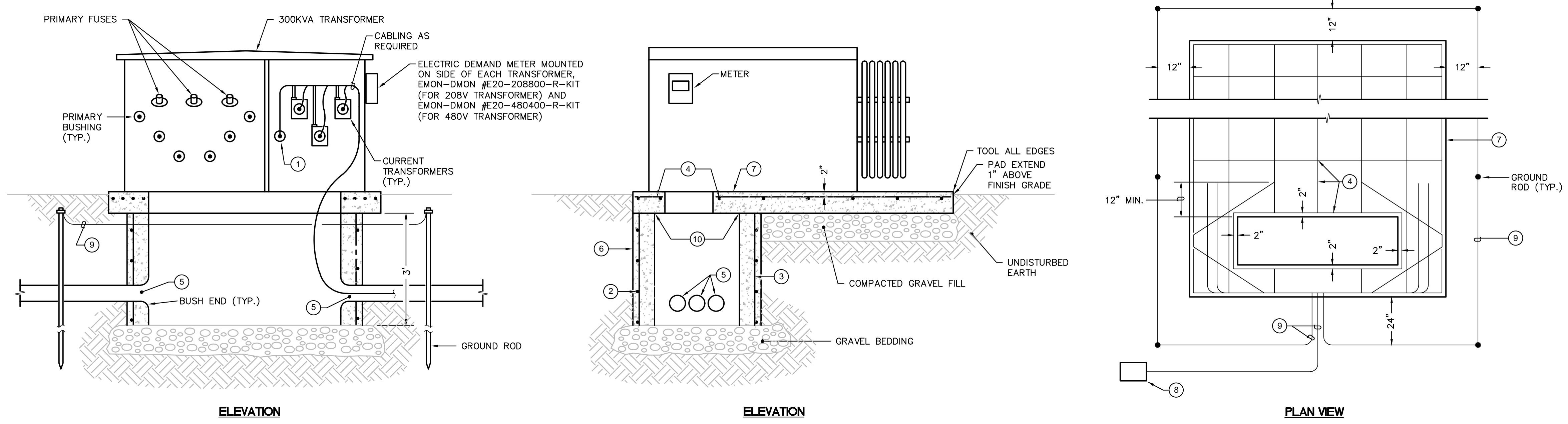
1 PARTIAL ELECTRICAL ONE-LINE DIAGRAM: CAMPUS PRIMARY AND SERVICE TRANSFORMERS
NO SCALE



2 ELECTRICAL ONE-LINE DIAGRAM: 277/480V SYSTEM
NO SCALE



3 ELECTRICAL ONE-LINE DIAGRAM: 120/208V SYSTEM
NO SCALE



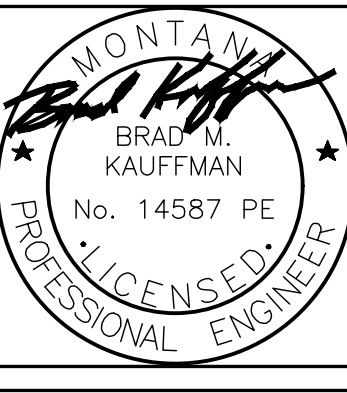
4 PAD MOUNTED TRANSFORMER DETAIL (TYPICAL OF 2 TRANSFORMERS)
SCALE: NONE

- NOTES: TRANSFORMER AND PAD INSTALLATION**
- 1 NEUTRAL GROUND STRAP.
 - 2 INSTALL 4 #4 REBAR HORIZONTALLY AROUND VAULT EVENLY SPACED.
 - 3 INSTALL #4 REBAR VERTICALLY 12" ON CENTER AROUND VAULT.
 - 4 INSTALL #4 REBAR IN PAD 12" ON CENTER BOTH WAYS. INSTALL ADDITIONAL #4 REBAR AROUND CABLE OPENING AS SHOWN.
 - 5 REFER TO DUCT BANK DETAILS FOR CONDUIT SIZE, QUANTITIES AND SPACING.
 - 6 6" THICK REINFORCED CONCRETE. TYPICAL FOR CABLE VAULT WALLS.
 - 7 8" THICK REINFORCED CONCRETE PAD. COORDINATE OVERALL PAD DIMENSIONS WITH TRANSFORMER MANUFACTURER.
 - 8 MAGNESIUM ANODE, 5lb LOCATE MINIMUM 5ft. FROM TRANSFORMER PAD.
 - 9 TYPICAL, #1/0 STRANDED COPPER GROUND WIRE.
 - 10 APPLY CONCRETE JOINT SEALANT BETWEEN VAULT AND PAD. CONCEAL BUTYL RESIN CS-202 OR EQUAL.

GENERAL SHEET NOTES:
A. ALL CONDUCTORS SHALL BE COPPER.

COORDINATION NOTE
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CWG
Architecture
+
Interior
650 Power St
P.O. Box 1198
Helena, MT 59624
cwg@cwg-architects.com
(406)443-2440

REVISIONS	
#	DATE

GPD
CONSULTING ENGINEERS

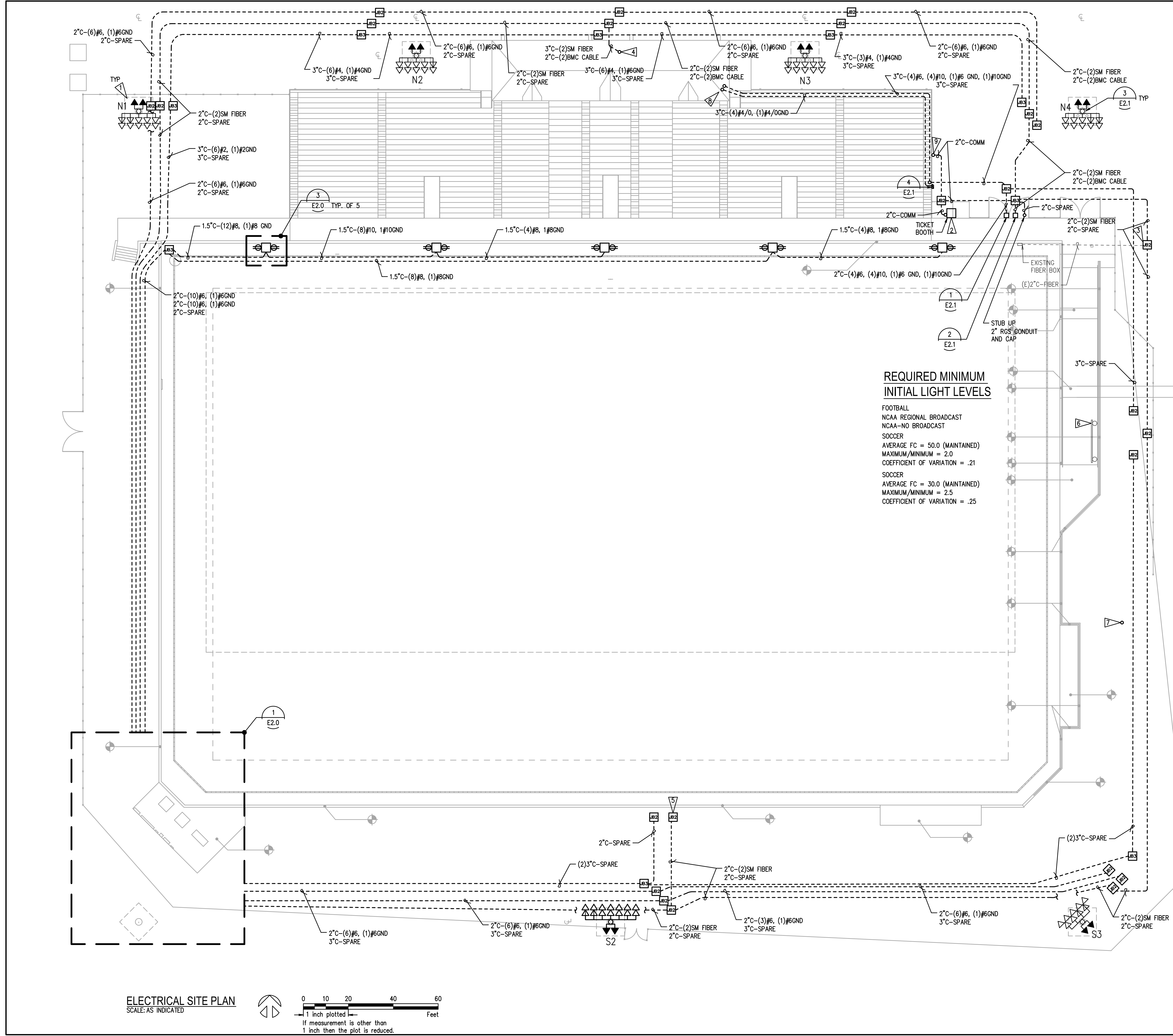
524 FIRST AVENUE S
GREAT FALLS, MT 59401
406.452.9558
FAX 406.727.9720
gpdinc.com

**CARROLL COLLEGE
NELSON STADIUM - FIELD & LIGHTING BID SET**
1857 N. Benton Ave. Helena, MT 59601
Electrical Service and Generator Diagrams and Details

70.41.03
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APPROVED BMK
DATE 10-13-23

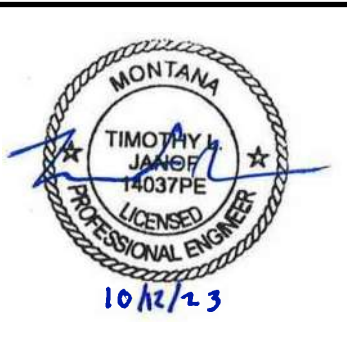
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Stantec
 3400 188th Street SW, Suite 285
 Lynnwood, Washington 98037-4772
 (206) 667-6555

REVISIONS

#	DATE

- GENERAL NOTES:**
- JUNCTION BOX LOCATIONS AND ROUTING ARE SCHEMATIC. ALIGN JUNCTION BOXES WITH SCORE LINES AND PAVEMENT EDGES. CONDUIT ROUTING SHALL BE COORDINATED WITH ARCHITECT TO AVOID FUTURE RETAINING WALLS AND BUILDING. SUBMIT CONDUIT AND JUNCTION BOX LAYOUT PLAN TO ENGINEER PRIOR TO INSTALLATION.
 - MAINTAIN AND PROTECT ALL EXISTING UNDERGROUND SYSTEMS AND UTILITIES. FIELD VERIFY LOCATIONS PRIOR TO ANY EXCAVATION. PRIOR TO STARTING CONSTRUCTION, CONTRACTOR SHALL CALL "ONE-CALL" FOR UTILITY LOCATIONS.
 - ALL SPARE/EMPTY CONDUIT TO BE PROVIDED WITH 200# NYLON PULL STRINGS.
 - ALL JUNCTION BOXES AND CONDUITS ARE SHOWN IN APPROXIMATE LOCATIONS. VERIFY LOCATION OF PROPERTY LINE, EASEMENTS AND UTILITIES PRIOR TO TRENCHING.
 - CAP ALL UNUSED CONDUITS. WHERE CONDUITS ARE CAPPED MARK LOCATION WITH AN ELECTRICAL MARKER.
 - FIELD BENDING OF STRAIGHT CONDUIT SECTIONS INTO LONG RADIUS SWEEPS IS PREFERRED.
 - GROUND CONDUCTIVE METAL IN BELOW GRADE JUNCTION BOXES, HAND HOLES, AND PULL BOXES PER MOST CURRENT VERSION OF THE NEC.

- FLAG NOTES:**
- PROVIDE SEPARATE FLOOD LIGHTS ON ALL SIX POLES FOR BLEACHER AND AREA LIGHTING. HOME AND VISITOR BLEACHERS SHALL BE LIGHTED TO 5.0 FC MINIMUM. TWO FLOODLIGHTS SHALL BE PROVIDED ON THE BACK SIDE OF EACH POLE AT 70' ABOVE GRADE FOR AREA LIGHTING.
 - EXTEND CONDUIT INTO TICKET BOOTH. INTERCEPT EXISTING FIBER/ETHERNET AND EXTEND TO BROADCAST COMMUNICATION DATA CABINET.
 - INTERCEPT EXISTING CONDUIT AND EXTEND INTO NEW JUNCTION BOX.
 - CORE DRILL AND PROVIDE RGS CONDULET. EXTEND CONDUIT INTO NETWORK CLOSET AND TIE INTO FIBER PATH CABINET. EXTEND CONDUIT, CABLE, AND FIBER TO PRESS BOX ABOVE. EXTEND FIBER AND CONNECT FIBER TOUCH PAD AT SCORER'S TABLE.
 - COIL 10' OF EACH FIBER AT JUNCTION BOX. PROVIDE CAMERA CONNECTOR AT EACH END. COORDINATE WITH LYON PRODUCTIONS.
 - MAINTAIN AND PROTECT EXISTING SCOREBOARD PANEL AND FEED.
 - MAINTAIN AND PROTECT EXISTING CLOCK TIMER CIRCUIT.
 - CORE DRILL WALL AND EXTEND CONDUIT(S) TO ELECTRICAL ROOM. PROVIDE NEW 3P200A FUSE IN EXISTING SPARE DISCONNECT AT MAIN SWITCHBOARD AND CONNECT CAMLOCK ENCLOSURE. PROVIDE (1) 3P30A AND (2) 1P20A CIRCUIT BREAKERS IN EXISTING 120/208 VOLT PANEL AND CONNECT BROADCAST TRUCK POWER CABINET.
 - INTERCEPT EXISTING CABLE. STUB UP CONDUIT AND PROVIDE CONDULET. REFEED CABLE FROM THIS LOCATION INTO TICKET BOOTH.

- LEGEND:**
- GALVANIZED STEEL POLE, POWDER COAT BLACK FINISH. SEE TABLE ON THIS SHEET FOR POLE HEIGHT
 - FLOODLIGHT WITH GLARE CONTROL SHIELDING, 1500 WATT LED, 5700K, 480V.
 - AREA FLOODLIGHT WITH GLARE CONTROL SHIELDING, 600 WATT LED, 5700K, 480V
 - EMERGENCY EGRESS FLOODLIGHT WITH GLARE CONTROL SHIELDING, 1500 WATT, LED, 5700K, 480V (REFER TO MANUFACTURER PRODUCTION DRAWINGS)
 - TYPE 2 JUNCTION BOX. REFER TO SPECIFICATIONS.
 - TYPE 3 JUNCTION BOX. REFER TO SPECIFICATIONS.
 - JUNCTION BOX, NEMA 4
 - DUPLEX RECEPTACLE, WP, GFCI, 120V
 - UNDERGROUND RACEWAY

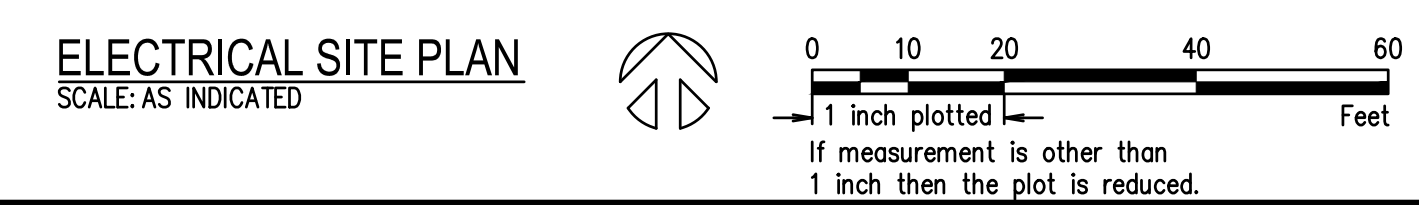
REQUIRED MINIMUM INITIAL LIGHT LEVELS

FOOTBALL
 NCAA REGIONAL BROADCAST
 NCAA-NO BROADCAST
 SOCCER
 AVERAGE FC = 50.0 (MAINTAINED)
 MAXIMUM/MINIMUM = 2.0
 COEFFICIENT OF VARIATION = .21

SOCCER
 AVERAGE FC = 30.0 (MAINTAINED)
 MAXIMUM/MINIMUM = 2.5
 COEFFICIENT OF VARIATION = .25

POLE AND FLOODLIGHT SCHEDULE

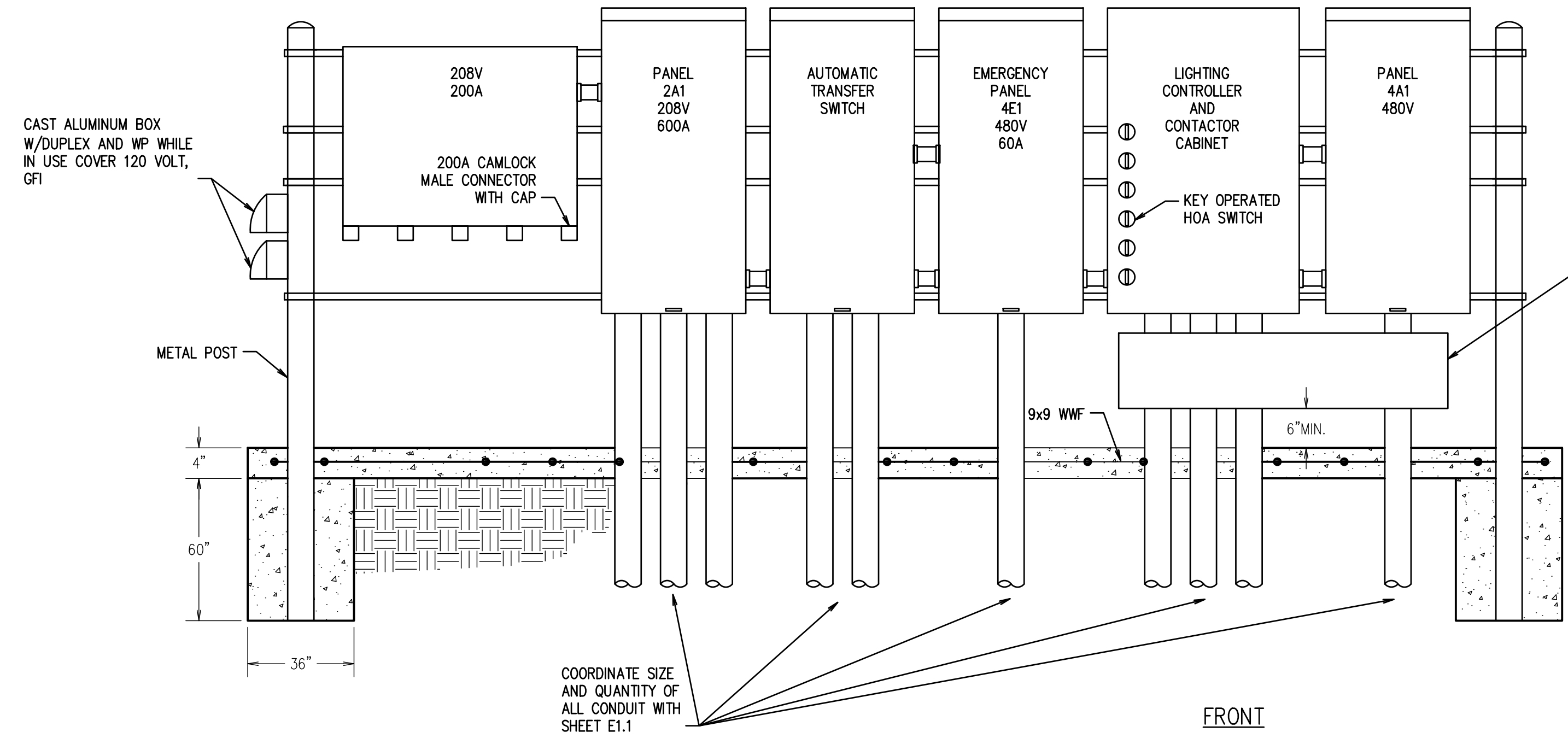
POLE	LENGTH	FLOODLIGHTS	AREA FLOODLIGHTS
N1	100'	9	2
N2	100'	10	1
N3	100'	10	1
N4	100'	9	2
S1	100'	9	2
S2	90'	14	2
S3	90'	9	2
TOTAL		70	12



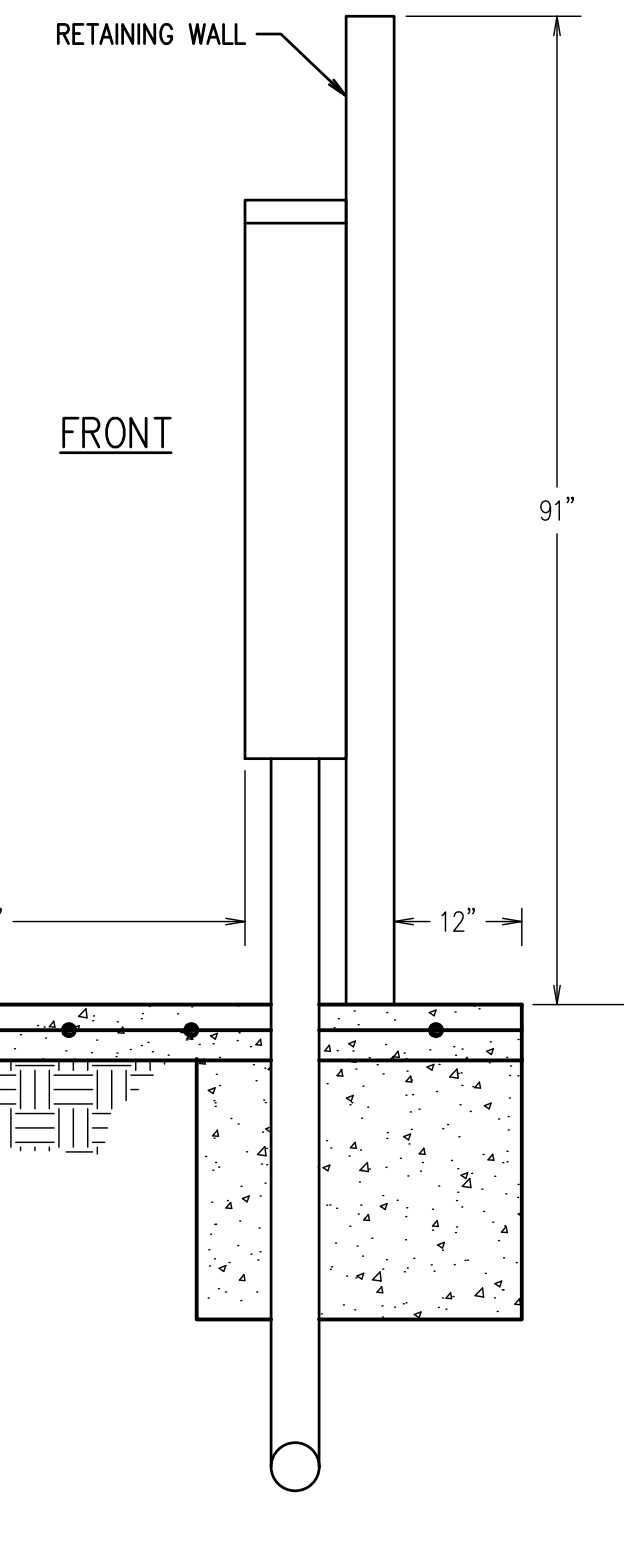
CARROLL COLLEGE
NELSON STADIUM - FIELD & LIGHTING BID SET
 1857 N. Benton Ave. Helena, MT 59601
ELECTRICAL SITE PLAN

70.41.03
 DRAWN BY: AAU
 APPROVED: CBF
 DATE: 10-13-23
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2 PANEL DETAIL
E2.0 SCALE: NONE



GENERAL NOTES:

- ALL STRUCTURAL CALCULATIONS PERFORMED BY MUSCO SPORTS LIGHTING. SEE STRUCTURAL DRAWINGS.
- JUNCTION BOX LOCATIONS AND ROUTING ARE SCHEMATIC. ALIGN JUNCTION BOXES WITH SCORE LINES AND PAVEMENT EDGES. CONDUIT ROUTING SHALL BE COORDINATED WITH ARCHITECT TO AVOID FUTURE RETAINING WALLS AND BUILDING. SUBMIT CONDUIT AND JUNCTION BOX LAYOUT PLAN TO ENGINEER PRIOR TO INSTALLATION.
- REFER TO DWG A1.1 FOR DIMENSIONED LOCATION FOR LIGHT POLE S1.

FLAG NOTES:

- 277/480 VOLT TRANSFORMER BY OTHERS.
- 120/208 VOLT TRANSFORMER BY OTHERS.
- EMERGENCY GENERATOR BY OTHERS.
- PROVIDE SINGLE FIBER DAISY CHAINED TO EACH FLOODLIGHT POLE. PROVIDE SINGLE FIBER TO PRESS BOX. COORDINATE TERMINATIONS OF CABLE ENDS WITH MUSCO.
- EXTEND ONE CONDUIT EACH AND STUB UP AT PANEL 4A1 AND PANEL 2A1.

LEGEND:

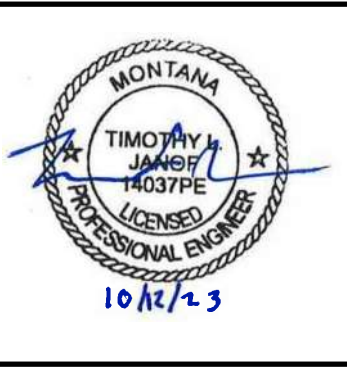
- GALVANIZED STEEL POLE, POWDER COAT BLACK FINISH
- △ FLOODLIGHT WITH GLARE CONTROL SHIELDING, 1500 WATT LED, 5700K, 480V
- ▲ EMERGENCY FLOODLIGHT WITH GLARE CONTROL SHIELDING, 1500 WATT LED, 5700K, 480V (REFER TO MANUFACTURER PRODUCTION DRAWINGS)
- JB2 TYPE 2 JUNCTION BOX
- JB3 TYPE 3 JUNCTION BOX
- UNDERGROUND RACEWAY

COORDINATION NOTE

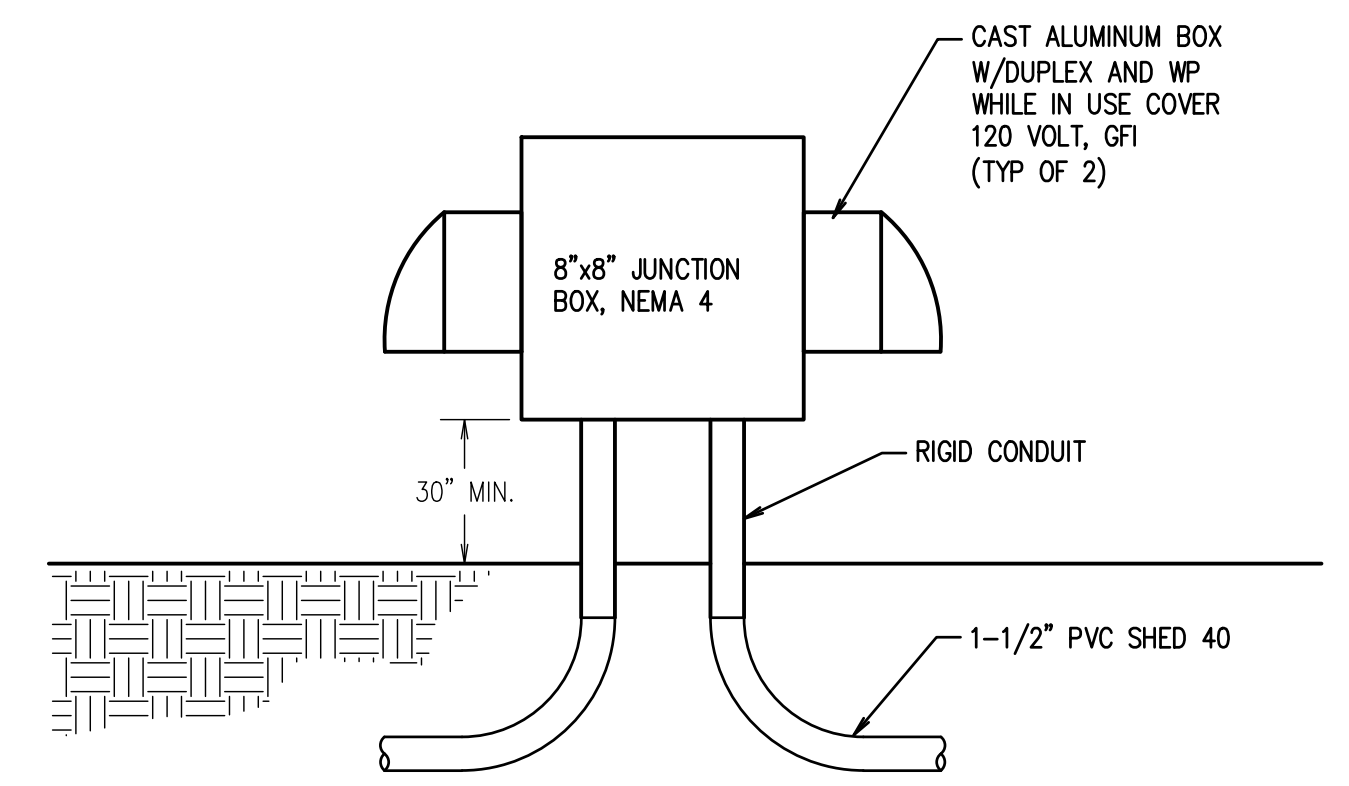
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COGNIZANT NOTE:

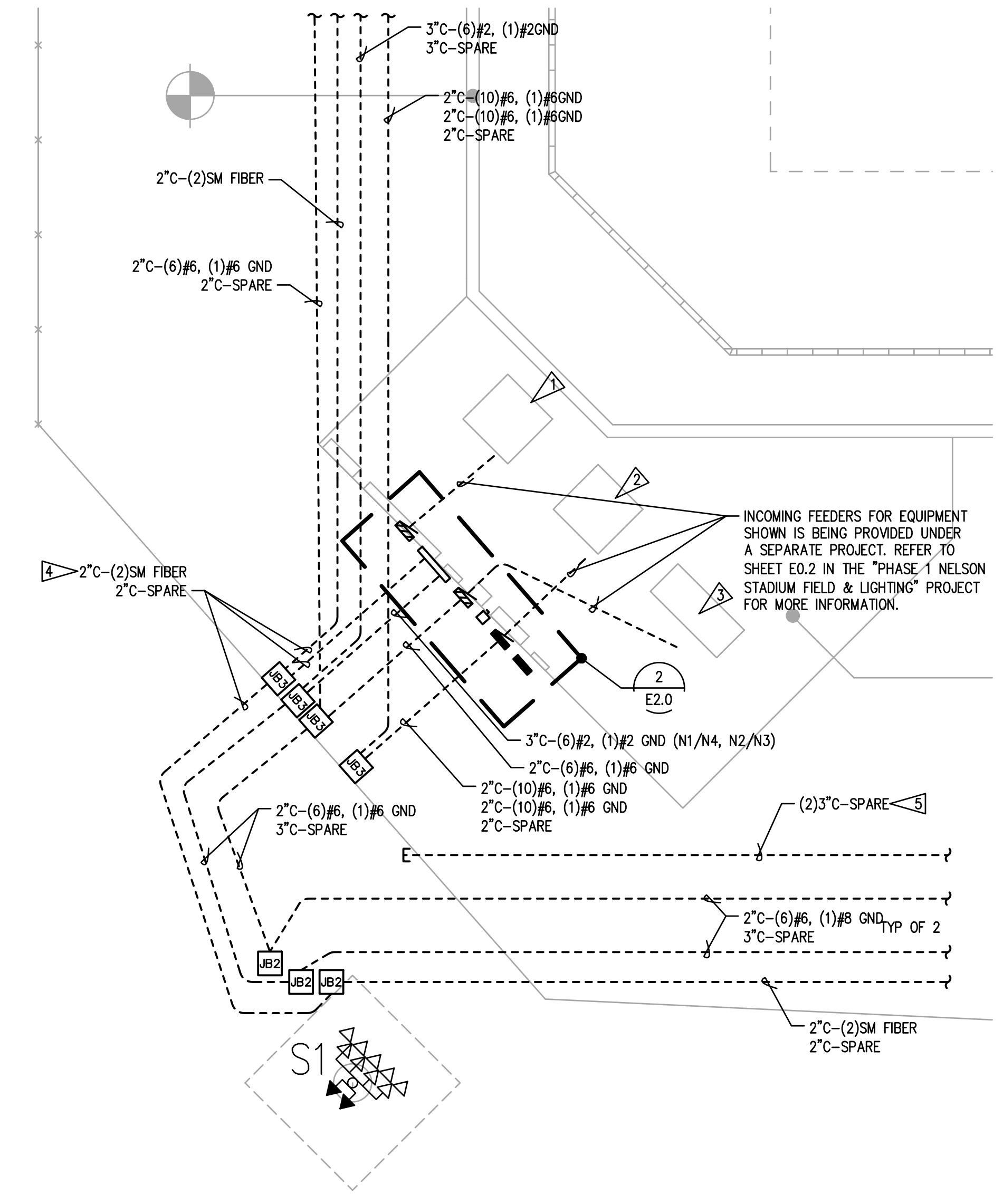
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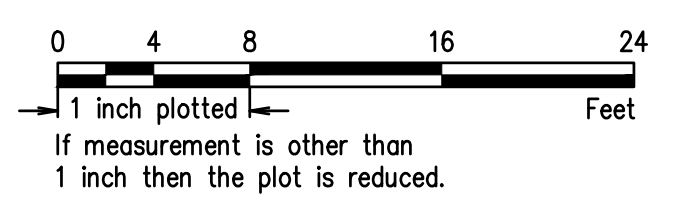
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3 RECEPTACLE DETAIL
E2.0 SCALE: NONE



1 PARTIAL SITE PLAN
E2.0 SCALE: AS INDICATED

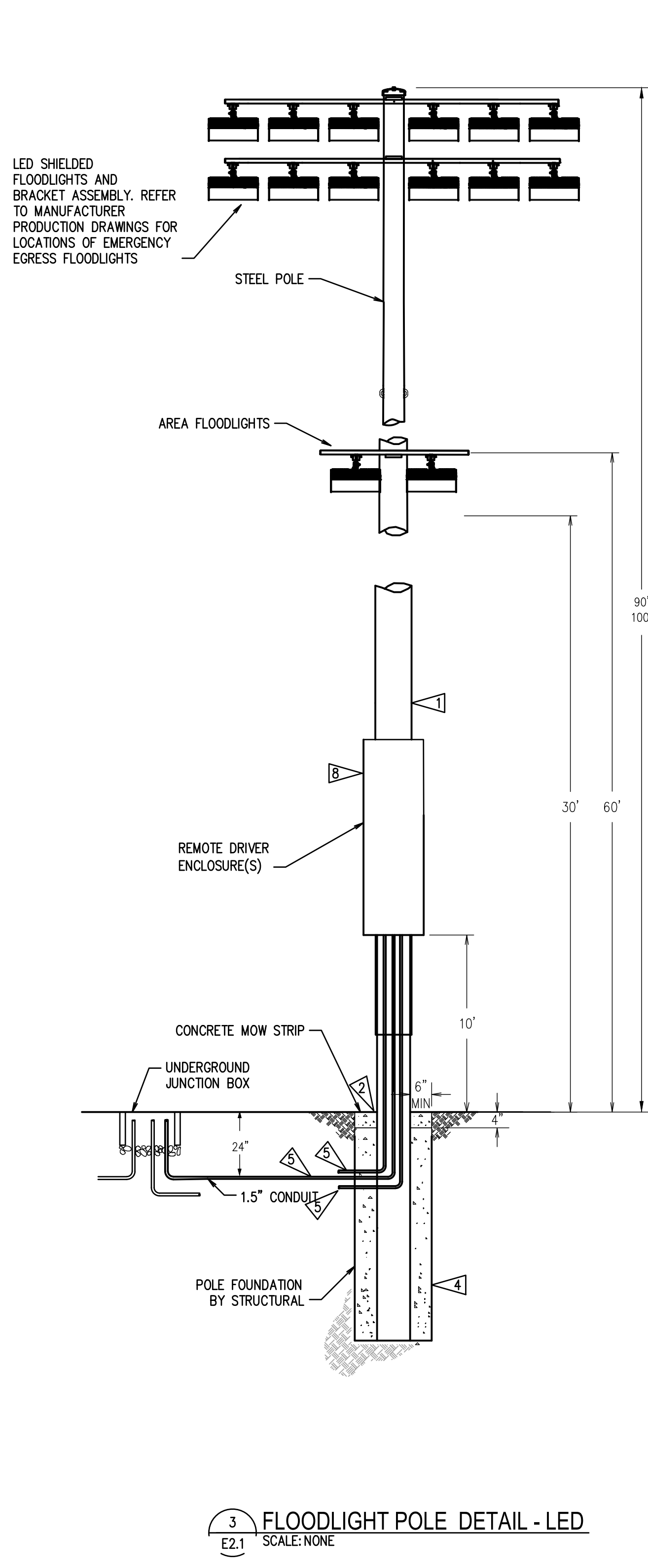


**CARROLL COLLEGE
 NELSON STADIUM - FIELD & LIGHTING BID SET**
 1857 N. Benton Ave. Helena, MT 59601
ELECTRICAL DETAILS

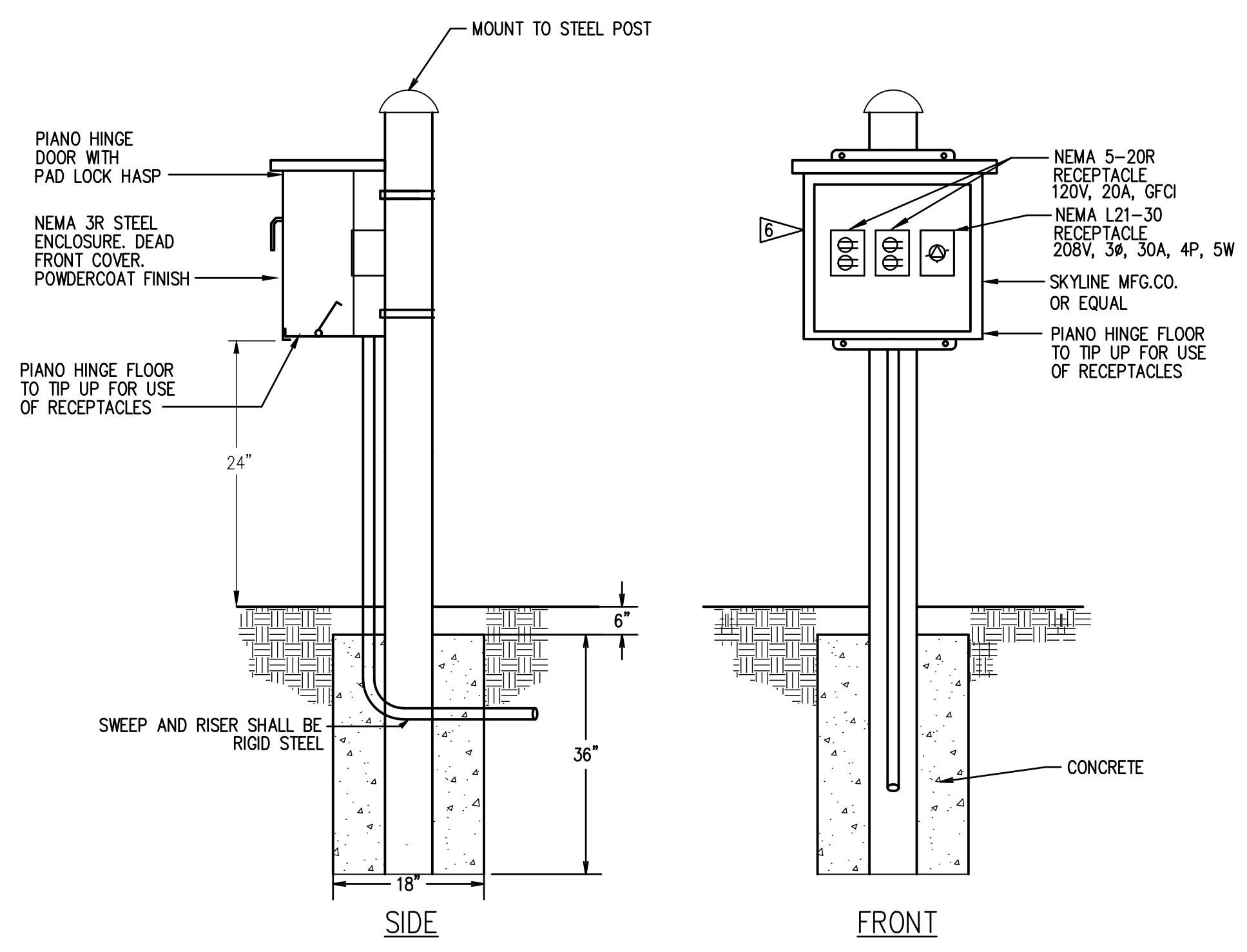
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 APPROVED:CBF
 DATE 10-13-23

E2.0

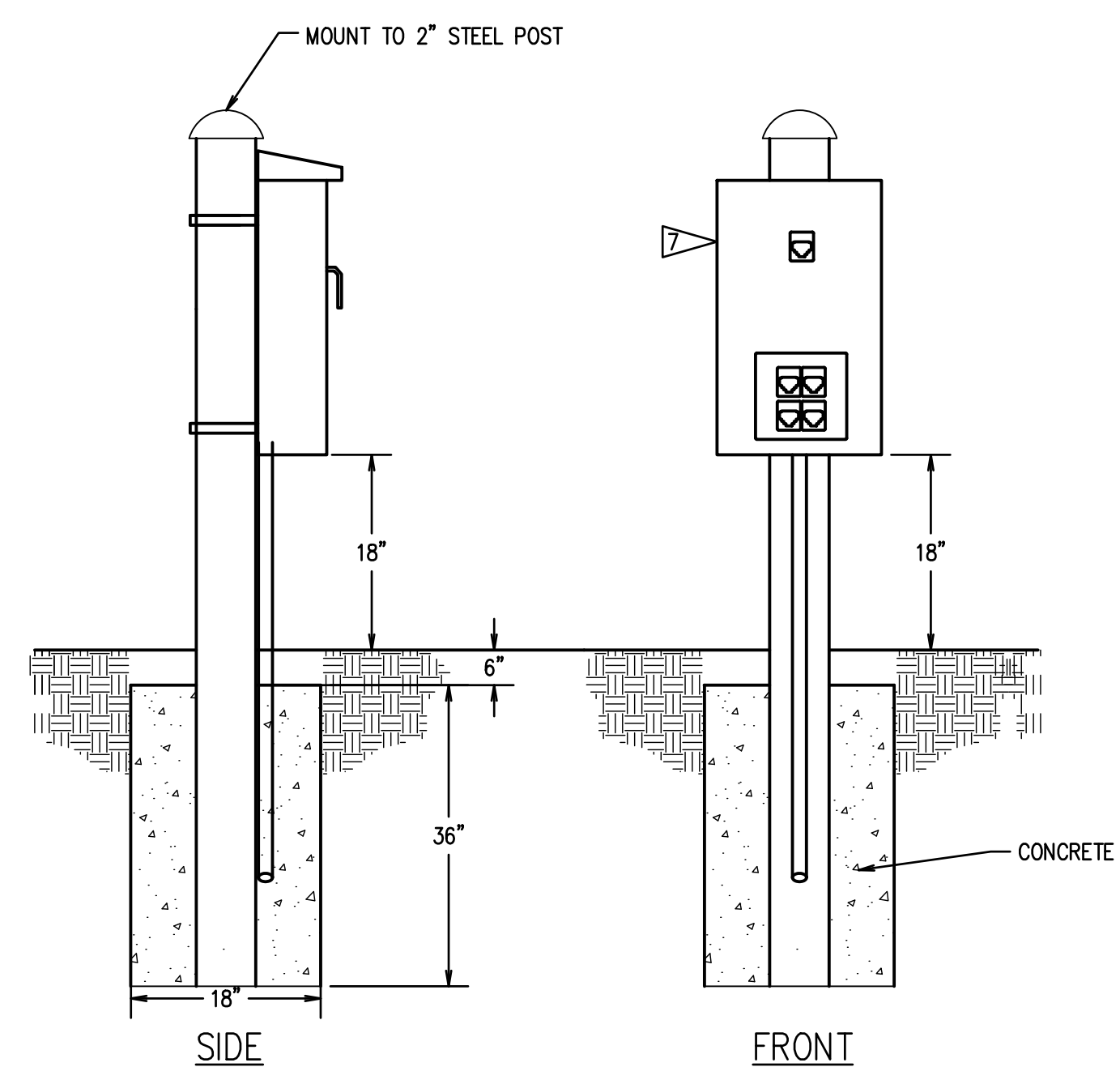
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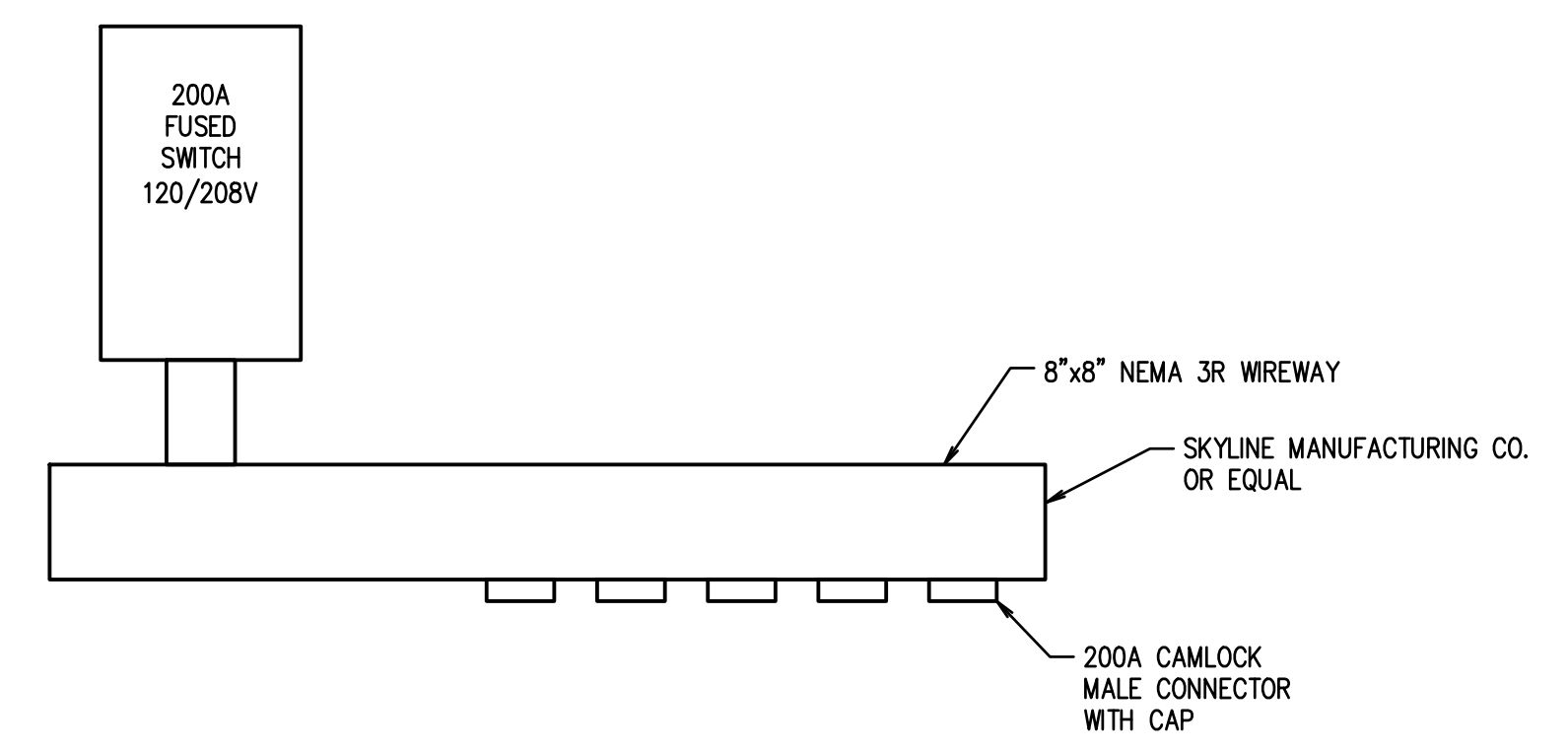
3 FLOODLIGHT POLE DETAIL - LED
 E2.1 SCALE: NONE



1 BROADCAST POWER CABINET ELEVATION DETAIL
 E2.1 SCALE: NONE



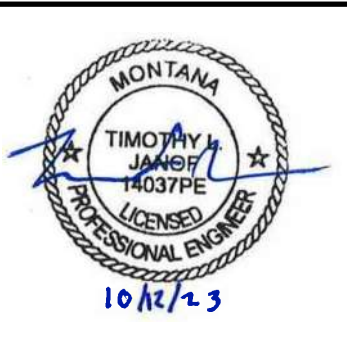
2 BROADCAST DATA CABINET ELEVATION DETAILS
 E2.1 SCALE: NONE



4 CAMLOCK CONNECTION DETAIL
 E2.1 SCALE: NONE

COORDINATION NOTE
 IT IS ABSOLUTELY NECESSARY THAT ALL TRADES COORDINATE WITH EACH OTHER AND VERIFY THAT THERE ARE NO CONFLICTS IN LOCATION OF DUCTS, CONDUITS, SPRINKLER HEADS, DIFFUSERS, ELECTRICAL BOXES, EQUIPMENT, AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.

COGNIZANT NOTE:
 THE CONTRACTOR SHALL BE COGNIZANT THAT THIS IS A REMODEL PROJECT AND AS SUCH, CERTAIN ITEMS CANNOT BE FULLY ILLUSTRATED NOR EXPLAINED WITHOUT FIELD OBSERVATION. THEREFORE BEFORE SUBMITTING A PROPOSAL, THE CONTRACTOR SHALL VISIT AND EXAMINE THE PROJECT IN EVERY DETAIL AS PERTAINS TO THIS PROJECT AND MAKE ALLOWANCES IN THEIR PROPOSAL FOR ALL CONDITIONS THAT WILL AFFECT THE WORK INDICATED IN THE PROJECT MANUAL AND CONTRACT DOCUMENTS.



Stantec
 3400 188th Street SW Suite 285
 Lynnwood, Washington 98037-4772
 (206) 667-6555

REVISIONS	
#	DATE

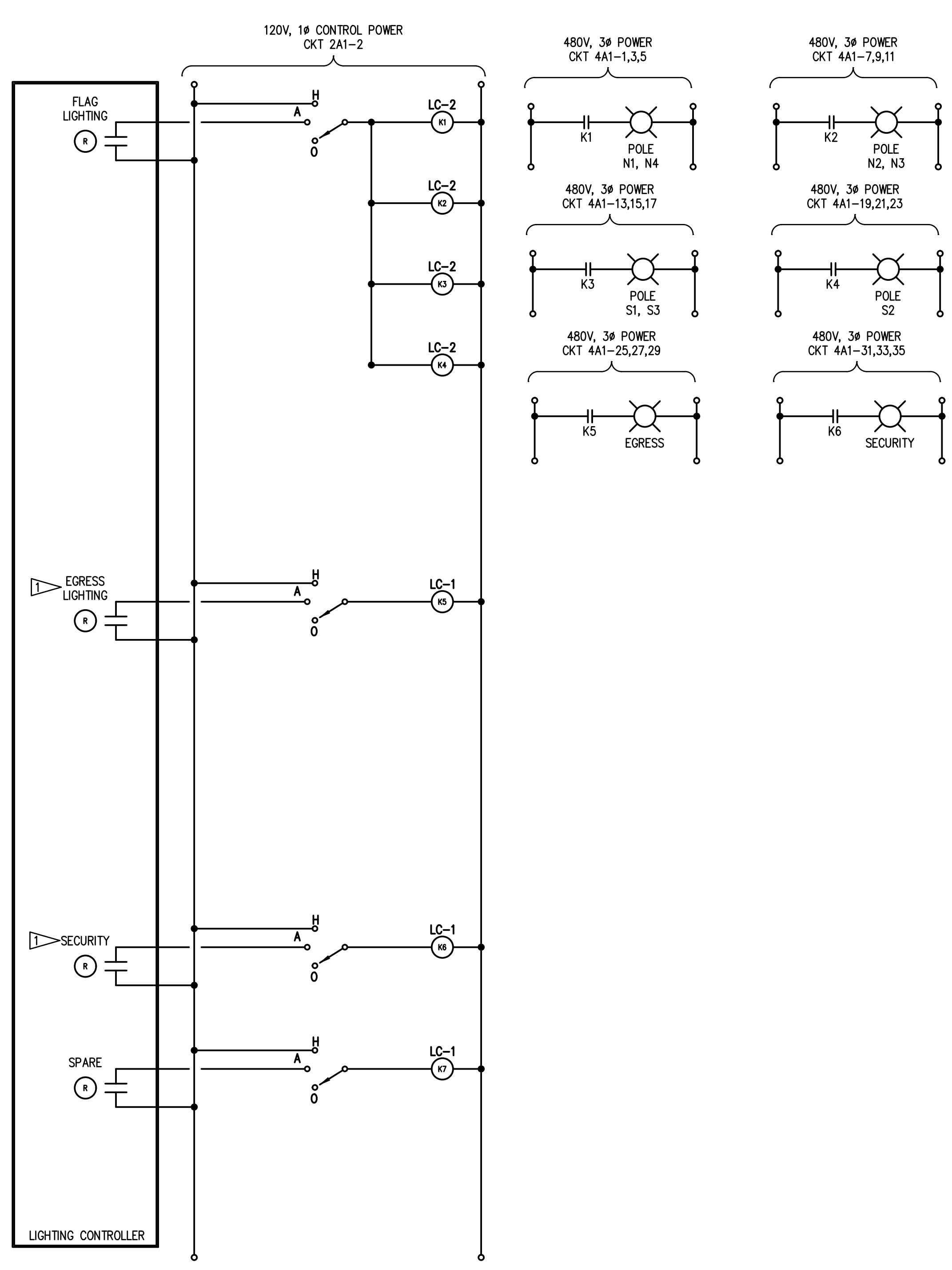
- FLAG NOTES:**
- SUPPLIER OF GALVANIZED STEEL POLE TO PROVIDE STRUCTURAL CALCULATIONS FROM A LICENSED STRUCTURAL ENGINEER REGISTERED IN THE STATE OF MONTANA. CALCULATION TO INCLUDE WIND AND SEISMIC LOADS PER IBC 2012. SUBMIT WITH MANUFACTURER SHOP DRAWINGS DURING SUBMITTAL PHASE OF PROJECT.
 - CONCRETE MOW STRIP.
 - NOT USED.
 - CONTRACTOR IS TO COORDINATE WITH THE LIGHTING SUPPLIER FOR THEIR STAMPED STRUCTURAL FOUNDATION DRAWINGS. STRUCTURAL DRAWINGS MUST BE COMPLETED BY STRUCTURAL ENGINEER LICENSED IN THE STATE OF MONTANA AND THE ENGINEER IS TO COORDINATE WITH THE CONTRACTOR AT TIME OF BUILDING PERMIT SUBMITTAL.
 - PROVIDE THREE CONDUITS INTO FLOODLIGHT POLE. ONE 1.5" (POWER), ONE 1.0" (COMM), AND ONE 0.75" (EMERGENCY). EXTEND TO ADJACENT JUNCTION BOX PER PLANS.
 - NEMA 3R STEEL ENCLOSURE, DEAD FRONT COVER, POWDERCOAT FINISH WITH PIANO HINGE FLOOR TO TIP UP FOR USE OF RECEPTACLES SKYLINE MFG.CO. OR EQUAL.
 - STAINLESS STEEL NEMA 12"x18"x12" TYPE 4X SLANT TOP ENCLOSURE WITH (1) 6-STRAND MULTI-MODE CABLES WITH ST CONNECTORS, PROVIDE (4) RJ45 CAT-5e CONNECTORS AND (1) ETHERNET PORT CONNECTION. PROVIDE ENCLOSURE WITH PAD LOCK HASP. HOFFMAN WATERSHED SERIES. COORDINATE WITH LANTEC AND LYON PRODUCTIONS.
 - PROVIDE ADDITIONAL ENCLOSURE CABINET TO CONNECT SECURITY FLOODLIGHTS AND EMERGENCY EGRESS FLOODLIGHTS TO SEPARATE EMERGENCY POWER CIRCUIT.

**CARROLL COLLEGE
 NELSON STADIUM - FIELD & LIGHTING BID SET**
 1857 N. Benton Ave. Helena, MT 59601
ELECTRICAL DETAILS

70.41.03
 DRAWN BY:AAU
 APPROVED:CBF
 DATE 10-13-23

E2.1

U:\204822548\01_ELECTRICAL\01_CAD\03_SHEETS\E22 Oct 12, 2023 11:02 AM By: JMT/MER



1 LIGHTING CONTROL LOGIC
E2.2 SCALE: NONE

FLAG NOTES:

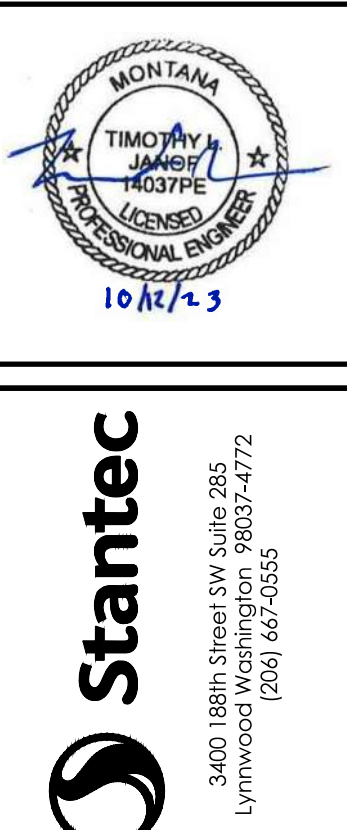
- 1 PROVIDE CONNECTION TO SEPARATE EMERGENCY CIRCUIT AND CONTROL. COORDINATE WITH MUSCO.
- 2 PROVIDE LUGS TO MATCH WIRE SIZES INDICATED ON POWER CIRCUITING PLANS.

LEGEND

- LC-1 LIGHTING CONTACTOR 3P30A
- LC-2 LIGHTING CONTACTOR 3P60A
- HOA SWITCH, SQUARE D 9001 SERIES
- PHOTOCELL 105-285 V. 1800 VA.
- SPST 120 V, OVERRIDE SWITCH
- POLE LIGHTS
- RELAY
- NORMALLY OPEN CONTACTOR, 3-POLE

COORDINATION NOTE
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COGNIZANT NOTE:
THE CONTRACTOR SHALL BE COGNIZANT THAT THIS IS A REMODEL PROJECT AND AS SUCH, CERTAIN ITEMS CANNOT BE FULLY ILLUSTRATED NOR EXPLAINED WITHOUT FIELD OBSERVATION. THEREFORE BEFORE SUBMITTING A PROPOSAL, THE CONTRACTOR SHALL VISIT AND EXAMINE THE PROJECT IN EVERY DETAIL AS PERTAINS TO THIS PROJECT AND MAKE ALLOWANCES IN THEIR PROPOSAL FOR ALL CONDITIONS THAT WILL AFFECT THE WORK INDICATED IN THE PROJECT MANUAL AND CONTRACT DOCUMENTS.



REVISIONS

#	DATE

CARROLL COLLEGE NELSON STADIUM - FIELD & LIGHTING BID SET
1857 N. Benton Ave. Helena, MT 59601
ELECTRICAL DETAILS

27

Stantec		277/480V		3 PH 4W		400A		Main CB		Type: Panelboard		Panel	
Name 4A1		277/480V		3 PH 4W		400A		Main CB		Type: Panelboard		Panel	
Location 4A1		277/480V		3 PH 4W		400A		Main CB		Type: Panelboard		Panel	
Serves:		277/480V		3 PH 4W		400A		Main CB		Type: Panelboard		Panel	
#	Description	Load	CB	*	A	B	C	CB	*	Load	Description	#	
1	Lighting Poles N1, N4 - Field Lighting	10.50	50/3	CB	X			20/3	CB	0.00	Equip MUSCO POWERLINE CONTROL	2	
3	-----Poles N1, N4 - Field Lighting	10.50	-----	---	X	-----	---	-----	---	0.00	-----MUSCO POWERLINE CONTROL	4	
5	-----Poles N1, N4 - Field Lighting	10.50	-----	---	X	-----	---	-----	---	0.00	-----MUSCO POWERLINE CONTROL	6	
7	Lighting Poles N2, N3 - Field Lighting	9.00	50/3	CB	X			0/1	0.00	Space		8	
9	-----Poles N2, N3 - Field Lighting	9.00	-----	---	X	0/1	---	0/1	0.00	Space		10	
11	-----Poles N2, N3 - Field Lighting	9.00	-----	---	X	0/1	---	0/1	0.00	Space		12	
13	Lighting Pole S1, S3 - Field Lighting	6.00	50/3	CB	X			0/1	0.00	Space		14	
15	-----Pole S1, S3 - Field Lighting	6.00	-----	---	X	0/1	---	0/1	0.00	Space		16	
17	-----Pole S1, S3 - Field Lighting	6.00	-----	---	X	0/1	---	0/1	0.00	Space		18	
19	Lighting Pole S2 - Field Lighting	7.50	50/3	CB	X			0/1	0.00	Space		20	
21	-----Pole S2 - Field Lighting	7.50	-----	---	X	0/1	---	0/1	0.00	Space		22	
23	-----Pole S2 - Field Lighting	7.50	-----	---	X	0/1	---	0/1	0.00	Space		24	
25	Space	0.00	0/1	X				0/1	0.00	Space		26	
27	Space	0.00	0/1	X				0/1	0.00	Space		28	
29	Space	0.00	0/1	X				0/1	0.00	Space		30	
31	Space	0.00	0/1	X				0/1	0.00	Space		32	
33	Space	0.00	0/1	X				0/1	0.00	Space		34	
35	Space	0.00	0/1	X				0/1	0.00	Space		36	
37	Space	0.00	0/1	X				70/3	CB	9.80	Panel 4E1	38	
39	Space	0.00	0/1	X				-----	---	9.80	-----4E1	40	
41	Space	0.00	0/1	X				-----	---	9.80	-----4E1	42	
Rev: PH A PH B PH C * Circuit Breaker Code													
Revised Ckts Marked * Existing Ckts Marked # Connected KVA 42.80 42.80 42.80 G = GFCI H = HID Rated													
B16693 S = Shunt Trip C = HACR Rated													
File: U:\204822548\d_working_files\10_electrical\03_analysis\4A1.PNL D = Switching Duty # = See Note													
A = AFCI													
Notes:													
Dem.													
Load Type	Conn KVA	NEC Demand Factor	KVA Dem. Amp		NEC Feed %	NEC Feed Amps							
Lighting	128.40	x 100%	128.40		154 x 125%	193							
			128.40		154	193							

27

Stantec		120/208V		3 PH 4W		600A		Main CB		Type: Panelboard		Panel	
Name 2A1		120/208V		3 PH 4W		600A		Main CB		Type: Panelboard		Panel	
Location 2A1		120/208V		3 PH 4W		600A		Main CB		Type: Panelboard		Panel	
Serves:		120/208V		3 PH 4W		600A		Main CB		Type: Panelboard		Panel	
#	Description	Load	CB	*	A	B	C	CB	*	Load	Description	#	
1	Recept HOME GRANDSTAND	0.50	20/1	CB	X			20/1	CB	0.20	Recept EQUIPMENT PAD	2	
3	Recept HOME GRANDSTAND	0.50	20/1	CB	X			20/1	CB	0.20	Recept EQUIPMENT PAD	4	
5	Recept HOME GRANDSTAND	0.50	20/1	CB	X			20/1	CB	0.50	Equip IRRIGATION CONTROLLER	6	
7	Recept HOME GRANDSTAND	0.50	20/1	CB	X			20/1	CB	0.50	Equip LTG CONTROLLER	8	
9	Recept HOME GRANDSTAND	0.50	20/1	CB	X			20/1	CB	0.00	Spare	10	
11	Recept HOME GRANDSTAND	0.50	20/1	CB	X			20/1	CB	0.00	Spare	12	
13	Recept HOME GRANDSTAND	0.50	20/1	CB	X			20/1	CB	0.00	Spare	14	
15	Recept HOME GRANDSTAND	0.50	20/1	CB	X			20/1	CB	0.00	Spare	16	
17	Recept HOME GRANDSTAND	0.50	20/1	CB	X			20/1	CB	0.00	Spare	18	
19	Recept HOME GRANDSTAND	0.50	20/1	CB	X			20/1	CB	0.00	Spare	20	
21	Space	0.00	0/1	X				0/1	0.00	Space		22	
23	Space	0.00	0/1	X				0/1	0.00	Space		24	
25	Space	0.00	0/1	X				0/1	0.00	Space		26	
27	Space	0.00	0/1	X				0/1	0.00	Space		28	
29	Space	0.00	0/1	X				0/1	0.00	Space		30	
31	Space	0.00	0/1	X				0/1	0.00	Space		32	
33	Space	0.00	0/1	X				0/1	0.00	Space		34	
35	Space	0.00	0/1	X				0/1	0.00	Space		36	
37	Space	0.00	0/1	X				0/1	0.00	Space		38	
39	Space	0.00	0/1	X				0/1	0.00	Space		40	
41	Space	0.00	0/1	X				0/1	0.00	Space		42	
43	Space	0.00	0/1	X				0/1	0.00	Space		44	
45	Space	0.00	0/1	X				0/1	0.00	Space		46	
47	Spare FUTURE FEED	0.00	200/3	CB	X			200/3	CB	10.00	Equip CAMLOK CABINET	48	
49	-----FUTURE FEED	0.00	-----	---	X	-----	---	-----	---	10.00	-----CAMLOK CABINET	50	
51	-----FUTURE FEED	0.00	-----	---	X	-----	---	-----	---	10.00	-----CAMLOK CABINET	52	
Rev: PH A PH B PH C * Circuit Breaker Code													
Revised Ckts Marked * Existing Ckts Marked # Connected KVA 12.70 11.70 12.00 G = GFCI H = HID Rated													
B16693 S = Shunt Trip C = HACR Rated													
File: \\lus1305-f01\workgroup\2048\active\204821463\d_working_files\10_electrical\03_analysis\2A1.PNL D = Switching Duty # = See Note													
A = AFCI													
Notes:													
Dem.													
Load Type	Conn KVA	NEC Demand Factor	KVA Dem. Amp		NEC Feed %	NEC Feed Amps							
Equip	31.00	x 100%	31.00		86 x 100%	86							
Recept	5.40	10 KVA @ 100%, rest @ 50%	5.40		15 x 100%	15							
			36.40		101	101							

2 PANEL SCHEDULES
E2.2 SCALE: NONE

70.41.03
DRAWN BY AAU
APPROVED CBF
DATE 10-13-23
E2.2



Addendum

Addendum No. 1

Date 4/22/2020

Project Number: 70-41-03

Project: Carroll College
Phase 1 Nelson Stadium – Field and Lighting
185 N. Benton Ave. Helena, MT 59625

Bidders for the above-captioned project are hereby informed that the drawings and/or specifications are modified, corrected or supplemented as follows. Acknowledge receipt of Addenda on Bid Form. **Contractor to take special care in reading attached notes and to coordinate with all trades.**

General Notes:

ITEM G-1 Note the pre-bid walkthrough has been moved to **this Friday April 24th at 9:00 onsite.** Due to continued Covid-19 concerns please limit a single attendee from each interested party. Otherwise this will be held outside to provide proper distancing.

ITEM G-2 Please note the existing fencing is to remain in place. Note sections will need to be removed/reinstalled in place as necessary for new construction. Two new gates are to be installed matching existing.

ITEM G-3 Please note bidders can reach out to Musco for additional light pole information, including foundation work. Initial drawings from Musco are attached and contact is listed below:

Dan Allman, Key Accounts, Musco Lighting

Ph# 1.800.825.6020 x2872

Cell# 641.660.3009

e-mail: dan.allman@musco.com

ITEM G-4 The contractor is required to protect existing landscaping that is to remain and repair any damaged sod or trees as part of this project.

ITEM G-5 What we know of underground utilities is shown on sheet A1.0, however this is a rough idea as no accurate as-built information exists. Contractor to coordinate with the College and perform a full utility locate to verify locations of underground utilities and sprinkler lines. The General Contractor and the sub-contractors will be responsible for repairing any damaged utilities and sprinkler system piping. Sheet A1.0 and associated details are not part of the new work.

ITEM G-6 The contractor will be responsible to for removal of all unused sod and soil. Backfill includes necessary sod/topsoil patch/repair at perimeter with rock installation on south side where future bleachers are to be installed

ITEM G-7 The Pine trees on the south side of the site are anticipated to remain. Contractor to trench in new lines outside the drip line of the trees to the greatest extent possible.

**CWG
Architecture**

Architecture
Engineering
Design

(406) 443-2340

650 Power St
P.O. Box 1198
Helena, MT 59624

cwg-architects.com

- ITEM G-8** Project is anticipated to start in Spring 2021 per instructions to bidders and is to be substantially complete on or before August 27th, 2021 per summary of work in specs.
- ITEM G-9** The 2011 Geotech report is the current report for this job and is available through Dick Anderson Construction or CWG Architects. Please note soils inspection at excavation will be required for light pole installation.
- ITEM G-10** The primary power that is existing comes from outside the fenced area near the tail gate area on the west side. Per the drawings the conductors must be new, but the contractor can reuse the conduit where possible. Those bidding this work will need to visit the site to verify final lengths.
- ITEM G-11** Please note the medium voltage transformer is basically staying in the same location with additional new work located in the same general area. The removal/relocation work is necessary for the installation of a new conc pad for the electrical service work noted at this location. It is expected that some conduit extension work will be required.
- ITEM G-12** Damproofing is specified in section 071113 of the specs (typical asphaltic type)
- ITEM G-13** Please note **the May 1st bid opening has been postponed.** The revised date will be published in a future addendum as soon as a new date is determined.

Amendments to the Project Manual:

- ITEM M-1** **SECTION 260573 – OCERCURRENT PROTECTIVE DEVICE COORDINATION:** An arch fault study is to be included as part of this work. Please see attached specifications for additional information.

Amendments to the Drawings:

- ITEM D-1** **SHEET F2.1: FIELD SECTION & DRAINAGE DETAILS:** Please note the perimeter pipe and infiltration trench are required with either option. The lateral flat drain piping is for option 2 only as noted. In coordination with the Geotech the subgrade elevation for option 2 will be about 12 inches to 15 inches below the existing surface which should be below most of the root and organic material from the existing field. The area in front of the home grandstand will be less deep (8 inches or so).
- ITEM D-2** **SHEET A1.2R: OVERALL PLAN – SPOT ELEVATION:** A 20'0" wide x 5'-0" deep notch in the south retaining wall has been added. This is to allow for dedicated soccer bench and is to have a concrete slab like the softball dugouts. A taller back to the retaining wall is to be constructed per attached

END OF ADDENDUM



Jason Egeline, AIA, NCARB, LEED GA

Attachments:

- Spec section 260573 – Overcurrent Protective Device and System Analysis
- Architectural Sheet A 1.2 Spot Elevations (for soccer bench notch in retaining wall)
- Sheet C1-SF and Sheet C1-DP Musco Light pole foundation options

SECTION 260573 - OVERCURRENT PROTECTIVE DEVICE AND SYSTEM ANALYSIS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes computer-based, fault-current and overcurrent protective device coordination studies and arc flash analysis. Protective devices shall be set based on results of the protective device coordination study.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Computer software program to be used for studies.
 - 2. Manufacturer's data certifying selectively coordinated devices
 - 3. Time current curves demonstrating selective coordination
 - 4. Time current curves with associated short circuit current, for worst case strings of feeders and branch circuits
 - 5. Recommended settings for all adjustable overcurrent protective devices, optimizing tripping of overcurrent protective devices.
 - 6. Equipment short circuit rating verification.
 - 7. Transformer Inrush determination
- B. Submittals **may** be in digital (.pdf) form.
 - 1. The following submittals shall be made concurrent with the approval process for system protective devices:
 - a. Fault current
 - b. Device trip setting report
 - c. Coordination-study input data, including completed computer program input data sheets.
 - d. Output data, trip curves
 - 2. Arc flash report
 - 3. Submittals on equipment with overcurrent protective device specifications in other sections of Division 26 will not be approved until the coordination study is completed and the submittals indicate the study recommendations.

1.4 QUALITY ASSURANCE

- A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are not acceptable.

- B. Coordination-Study Specialist Qualifications: An entity experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
 - 1. Professional engineer, licensed in the state where Project is located, shall be responsible for the study. All elements of the study shall be performed under the direct supervision and control of engineer.
- C. Comply with IEEE 242 for short-circuit currents and coordination time intervals.
- D. Comply with IEEE 1584-2018 for arc flash calculations, modified per the most recent edition of NFPA 70E.
- E. Comply with IEEE 399 for general study procedures.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Determine overcurrent protective device settings and operation for all adjustable overcurrent protective devices.
 - 1. Selective Coordination:
 - a. The following systems shall selectively coordinate in accordance with NFPA 70:
 - 1) Emergency Systems
 - 2) Life Safety Systems
 - 3) Legally Required Standby Systems
 - b. If the “system” or branch cannot be determined, the components shall be selectively coordinated.
 - c. Requirements for selective coordination take priority over other aspects of the drawings and specifications. Adjust equipment sizes, methods of construction, frame sizes, current sensing, and device trip characteristics to achieve overcurrent device coordination
 - 2. Selective coordination for faults extending beyond 0.1 seconds:
 - a. Requirements for coordination take priority over other aspects of the drawings and specifications. Adjust equipment sizes, methods of construction, frame sizes, current sensing, and device trip characteristics to achieve overcurrent device coordination.
 - 3. Optimize settings of overcurrent devices to achieve time current coordination to the extent possible:
 - 1) Where new selectively coordinated systems tie to an existing device,
 - 2) “Normal” power.
 - 3) Other electrical systems
- B. Equipment ratings: Verify indicated equipment ratings are congruent with the results of the study:
 - 1. Short circuit current withstand ratings for the number of cycles determined by overcurrent protective device settings.
 - 2. Ampere interrupting capacity of overcurrent protective devices.
 - 3. X/R ratios in compliance with NEMA standards for the ampacity of the device.
 - 4. Transformer inrush currents.

5. Where the study reveals the need for changing equipment ratings revise the equipment to comply with the rating determined by the study.

2.2 COMPUTER SOFTWARE DEVELOPERS

- A. Available Computer Software Developers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton (CYME)
 2. EnergoBit Group (EDSA)
 3. Operation Technology Inc. (etap)
 4. SKM Systems Analysis, Inc.
 5. EasyPower, LLC

2.3 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

- A. Comply with IEEE 399 and IEEE 1584-2002.
- B. Analytical features of fault-current-study computer software program shall include "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- C. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots. Computer software program shall plot diagramming time-current-characteristic curves keyed to overcurrent protective devices.
 1. Additional fault current reportss:
 - a. Arcing faults.
 - b. Simultaneous faults.
 - c. Explicit negative sequence.
 - d. Zero sequence.
- D. Arc flash calculations: Software program shall calculate Arc Flash Incident Energy levels and flash protection boundary distances.
 1. Arc flash energy shall be based on the worst case exposed bus or cable termination in each switchgear/switchboard vertical section and panelboard.

2.4 ARC FLASH WARNING LABELS

- A. Vinyl: 4 mil thick with tapered edge. Full resin thermal print on a multi-layer scratch resistant substrate.
- B. Comply with OSHA standards.
- C. Label shall identify the following:
 1. Equipment Identification
 2. Who performed the study
 3. Date of the study
 4. Approach Distances
 5. Flash Hazard

- a. Boundary
- b. Incident heat energy
6. Additional warnings appropriate to arc flash safety for the particular item of equipment
7. Requirements of owner's safety program, relative to arc flash hazards

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.
 1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.
- B. Provide the study based on the actual electrical equipment supplied for the project.

3.2 POWER SYSTEM DATA

- A. Gather and tabulate the following input data to support coordination study:
 1. Product Data for overcurrent protective devices specified in other electrical Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
 2. Impedance of utility service entrance.
 3. Electrical Distribution System Diagram: In hard-copy and electronic-copy formats, showing the following:
 - a. Circuit-breaker and fuse-current ratings and types.
 - b. Relays and associated power and current transformer ratings and ratios.
 - c. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R ratios, inrush current.
 - d. Generator kilovolt amperes, size, voltage, and source impedance.
 - e. Cables: Indicate conduit material, sizes of conductors, conductor material, insulation, and length.
 - f. Busway ampacity and impedance.
 - g. Motor horsepower and code letter designation according to NEMA MG 1.
 4. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:
 - a. Special load considerations, including starting inrush currents and frequent starting and stopping.
 - b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
 - c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve. Where electronic drives are in use determine if they will prevent or permit rotating energy to be directed toward system faults, coordinate with the work of this and other specification divisions as necessary.

- d. Generator thermal-damage curve.
- e. Ratings, types, and settings of utility company's overcurrent protective devices.
- f. Special overcurrent protective device settings or types stipulated by utility company.
- g. Time-current-characteristic curves of devices indicated to be coordinated.
- h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
- i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
- j. Panelboards, switchboards, motor-control center ampacity, and interrupting rating in amperes rms symmetrical.

3.3 FAULT-CURRENT STUDY

- A. Calculate the maximum available short-circuit current in amperes rms symmetrical at circuit-breaker positions of the electrical power distribution system. The calculation shall be for a current immediately after initiation and for a three-phase bolted short circuit at each of the following:
 - 1. Switchgear and switchboard bus.
 - 2. Distribution panelboard.
 - 3. Branch circuit panelboard.
- B. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions.
- C. Calculate momentary and interrupting duties on the basis of maximum available fault current.
- D. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with IEEE 242.
 - 1. Transformers:
 - a. ANSI C57.12.10.
 - b. ANSI C57.12.22.
 - c. ANSI C57.12.40.
 - d. IEEE C57.12.00.
 - e. IEEE C57.96.
 - 2. Medium-Voltage Circuit Breakers: IEEE C37.010.
 - 3. Low-Voltage Circuit Breakers: IEEE 1015 and IEEE C37.20.1.
 - 4. Low-Voltage Fuses: IEEE C37.46.
- E. Study Report:
 - 1. Show calculated X/R ratios and equipment interrupting rating (1/2-cycle) fault currents on electrical distribution system diagram.
 - 2. Medium Voltage Systems:
 - a. Show interrupting (5-cycle) and time-delayed currents (6 cycles and above) on medium-voltage breakers as needed to set relays and assess the sensitivity of overcurrent relays.
 - b. Verify performance of current transformer accuracy and saturation for the determined fault current.

- F. Equipment Evaluation Report:
 - 1. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
 - 2. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
 - 3. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

3.4 COORDINATION STUDY

- A. Perform coordination study using approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.
 - 1. Calculate the maximum and minimum 1/2-cycle short-circuit currents.
 - 2. Calculate the maximum and minimum interrupting duty (5 cycles to 2 seconds) short-circuit currents.
 - 3. Calculate the maximum and minimum ground-fault currents.
 - 4. Plot time current characteristic curves and tabulate manufacturer tested combinations of equipment
- B. Comply with IEEE 242 recommendations for fault currents and time intervals.
- C. Transformer Primary Overcurrent Protective Devices:
 - 1. Device shall not operate in response to the following:
 - a. Inrush current when first energized.
 - b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
 - c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.
 - 2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.
- D. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.
- E. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:
 - 1. Tabular Format of Settings Selected for Overcurrent Protective Devices:
 - a. Device tag.
 - b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.
 - c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.
 - d. Fuse-current rating and type.
 - e. Ground-fault relay-pickup and time-delay settings.
 - 2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists

between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

- a. Device tag.
- b. Voltage and current ratio for curves.
- c. Three-phase and single-phase damage points for each transformer.
- d. No damage, melting, and clearing curves for fuses.
- e. Cable damage curves.
- f. Transformer inrush points.
- g. Maximum fault-current cutoff point.

F. Completed data sheets for setting of overcurrent protective devices.

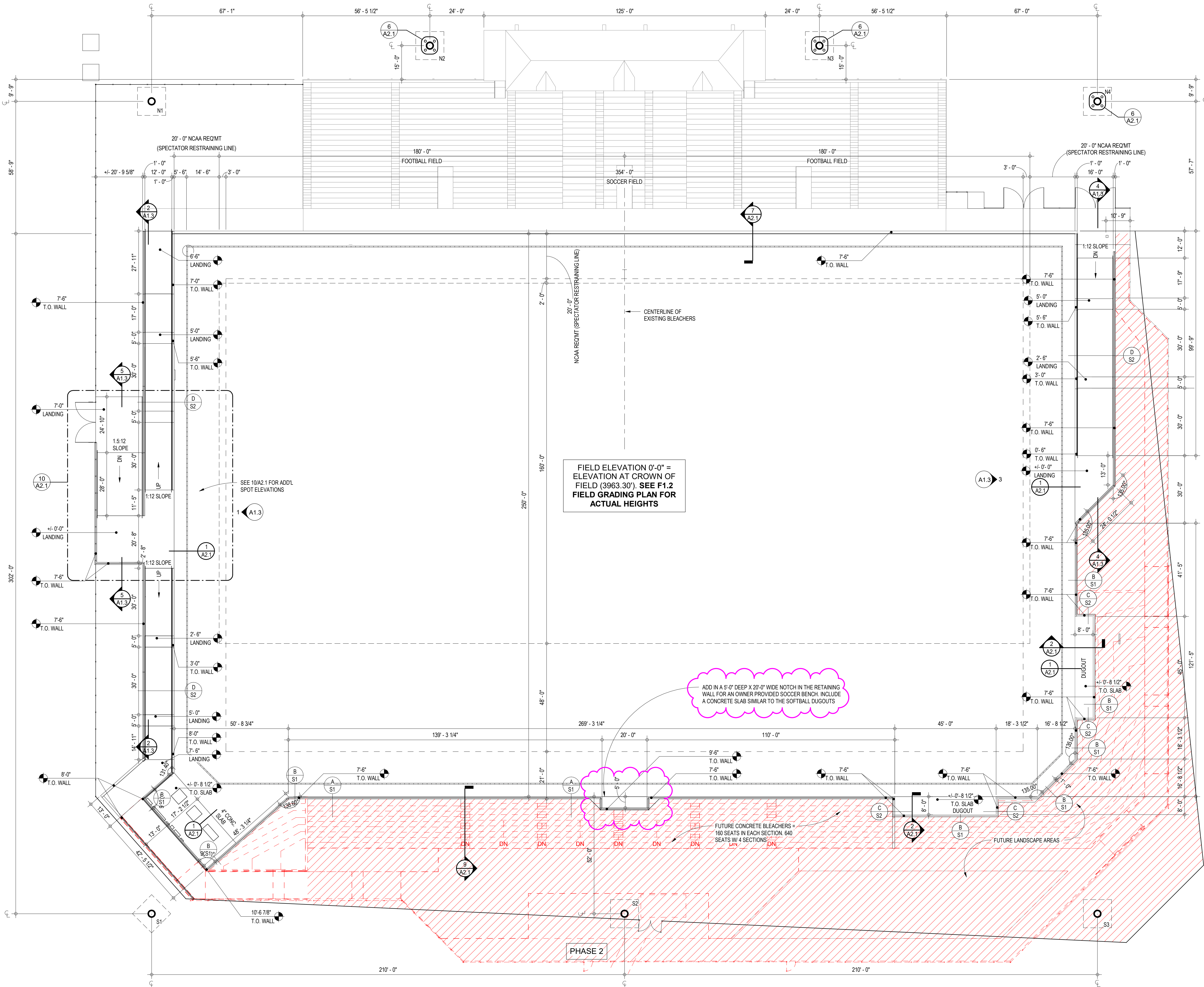
3.5 OVERCURRENT PROTECTIVE DEVICE SETTING

- A. Manufacturer's Field Service: Engage a factory-authorized service representative, of electrical distribution equipment being set and adjusted, to set overcurrent protective devices within equipment. Set equipment in accordance with the recommendations of the report required here in.
- B. Testing: Perform the following device setting and prepare reports:
 1. After installing overcurrent protective devices and during energizing process of electrical distribution system, perform the following:
 - a. Verify that overcurrent protective devices meet parameters used in studies.
 - b. Adjust devices to values listed in study results.

3.6 ARC FLASH STUDY

- A. Study shall model worst-case arc flash conditions, and the final report shall describe, when applicable, how these conditions differ from worst case bolted fault conditions.
- B. Provide study results in tabular form, and include:
 1. Device or bus name
 2. Bolted fault and arcing fault currents levels
 3. Arc Flash Incident Energy Level in cal/cm²
 4. Shock and Flash Hazard boundary distances
- C. Furnish and apply arc flash warning labels to the following items of equipment:
 1. Switchgear
 2. Switchboards
 3. Transformers
 4. Panelboards
 5. Generators
 6. Transfer Switches
 7. Individually mounted overcurrent protective devices
 8. Elevator control panels
 9. Utilization equipment rated 60 amps and above.

END OF SECTION



FIELD ELEVATION 0'-0" =
ELEVATION AT CROWN OF
FIELD (3963.30') SEE F1.2
FIELD GRADING PLAN FOR
ACTUAL HEIGHTS

ADD IN A 5'-0" DEEP X 20'-0" WIDE NOTCH IN THE RETAINING
WALL FOR AN OWNER PROVIDED SOCCER BENCH. INCLUDE
A CONCRETE SLAB SIMILAR TO THE SOFTBALL DUGOUTS

FUTURE CONCRETE BLEACHERS =
180 SEATS IN EACH SECTION 640
SEATS W/ 4 SECTIONS

COORDINATION NOTE
IT IS ABSOLUTELY NECESSARY THAT ALL TRADES COORDINATE WITH EACH OTHER AND VERIFY THAT THERE ARE NO CONFLICTS IN LOCATION OF DUCTS, CONDUITS, SPRINKLER HEADS, DIFFUSERS, ELECTRICAL BOXES, EQUIPMENT, AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.

COGNIZANT NOTE:
THE CONTRACTOR SHALL BE COGNIZANT THAT THIS IS A REMODEL PROJECT AND AS SUCH, CERTAIN ITEMS CANNOT BE FULLY ILLUSTRATED NOR EXPLAINED WITHOUT FIELD OBSERVATION. THEREFORE BEFORE SUBMITTING A PROPOSAL, THE CONTRACTOR SHALL VISIT AND EXAMINE THE PROJECT IN EVERY DETAIL AS PERTAINS TO THIS PROJECT AND MAKE ALLOWANCES IN THEIR PROPOSAL FOR ALL CONDITIONS THAT WILL AFFECT THE WORK INDICATED IN THE PROJECT MANUAL AND CONTRACT DOCUMENTS.

NOTE: CONTRACTOR TO VERIFY FINAL LOCATION OF ALL LIGHT POLES WITH EXISTING CONDITIONS PRIOR TO NECESSARY WORK FOR POLE INSTALLATION.

NOTE: CONTRACTOR TO VERIFY SPRINKLER LINE LOCATIONS AND EXISTING ELECTRICAL LOCATIONS PRIOR TO WORK.



C.W.G. Architects, Inc.
P.O. Box 1188
Helena, MT 59624
cwg@cwg-architects.com
(406)443-2340

REVISIONS

#	DATE
1	Date 1

**CARROLL COLLEGE
PHASE 1 NELSON STADIUM - FIELD & LIGHTING**
1857 N. Benton Ave. Helena, MT 59601

OVERALL PLAN - SPOT ELEVATION

704103
DRAWN BY Author
APPROVED Checker
DATE 4-1-2020

A1.2R

1 UPPER BLEACHERS - SPOT ELEVATIONS
1" = 20'-0"

POLE IDENTIFICATION AND RESULTANT FORCES

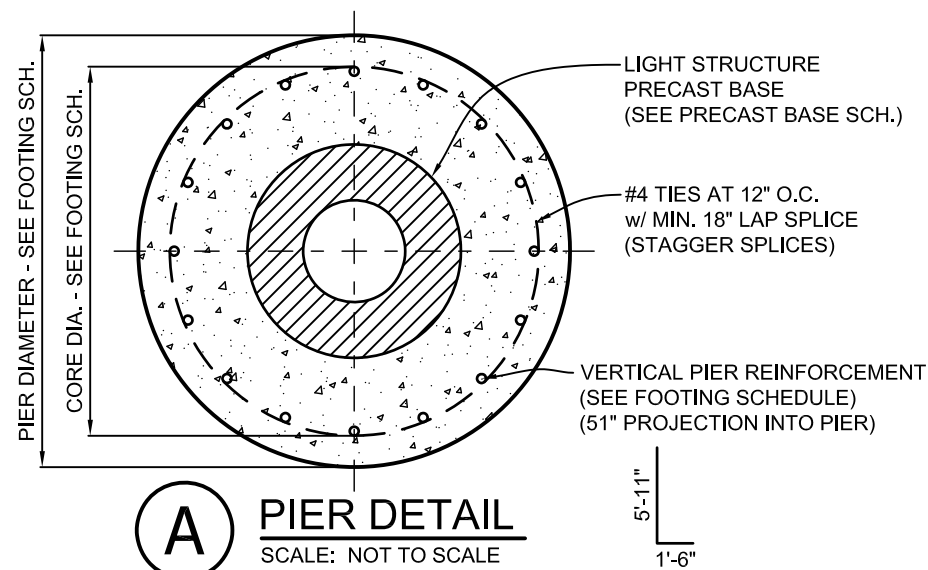
POLE DESIGNATION	POLE TYPE	PRECAST BASE TYPE	FIXTURE CONFIGURATION (FIX. PER XARM)	FIXTURE AND ACCESSORIES EPA (FT ²)	FORCES (1.)		
					MOMENT (M) FT-LBS	SHEAR (V) LBS	VERTICAL (P) LBS
N1, N4	LSS100C	7B	11 (5+4) / (2)	28.8	216,928	3,450	6,177
N2, N3	LSS100C	7B	11 (5+5) / (1)	29.8	219,976	3,483	6,219
S1, S3	LSS90B	6B	11 (5+4) / (2)	28.8	167,128	2,824	4,303
S2	LSS90C	7B	16 (6+4+4) / (2)	43.0	219,760	3,600	6,572

1. ASD LOAD COMBINATION D + 0.6W.
VERTICAL FORCE IS WEIGHT OF DRESSED POLE.

PRECAST BASE ID FOR SPREAD FOOTING

PRECAST BASE TYPE	PRECAST BASE WEIGHT (1.)	PRECAST BASE LENGTH (1.)	PROJECTION ABOVE TOP OF PIER	STANDARD EMBEDMENT (1.)	OUTSIDE DIAMETER	CUT LENGTH OFF BOTTOM (2.)	EMBEDMENT INTO PIER & FOOTING (3.)
6B	6,930 LBS	26'-1"	8'-1"	18'-0"	20.56"	12'-0"	6'-0"
7B	10,160 LBS	27'-10"	7'-10"	20'-0"	23.75"	14'-0"	6'-0"

1. PRECAST BASE WEIGHT, LENGTH AND STANDARD EMBEDMENT ARE PRECUT PROPERTIES
2. EPOXY COAT NEW BOTTOM SURFACE OF PRECAST BASE AFTER CUTTING
3. EMBEDMENT EQUALS 4'-6" PIER HEIGHT PLUS 1'-6" DEPTH INTO FOOTING



CONCRETE/REINFORCEMENT NOTES

CONCRETE SHALL COMPLY WITH THE FOLLOWING ASTM STANDARDS: MIXTURE WITH ASTM C-94, PORTLAND CEMENT WITH ASTM C-150 TYPE 1-A, AGGREGATES (MAX 0.75") WITH ASTM C-33 AND BE IN CONFORMANCE WITH ACI 318. CONCRETE SHALL BE AIR-ENTRAINED (COMPLY WITH ASTM C-260), HAVE A MAXIMUM WATER-CEMENT RATIO, w/cm = 0.45 AND HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF 4,500 PSI.

DESIGN SLUMP LIMITS ARE 4" MINIMUM AND 6" MAXIMUM. THE JOB SITE SLUMP MAY BE INCREASED BY THE USE OF A WATER REDUCING AGENT MEETING ASTM C494-92.

CONCRETE REINFORCEMENT SHALL COMPLY WITH ASTM A615 GRADE 60 AND BE IN CONFORMANCE WITH ACI 315 & 318.

CONCRETE MUST ATTAIN DESIGN STRENGTH PRIOR TO POLE INSTALLATION AND FIXTURE MOUNTING.

DESIGN NOTES

DESIGN PARAMETERS:

WIND: $V_{ult} = 120$ MPH, $V_{asd} = 93$ MPH (EXPOSURE C, RISK CATEGORY III) PER INTERNATIONAL BUILDING CODE, 2018 EDITION (ASCE 7-16). DESIGN WIND PARAMETERS ARE AS NOTED, ACTUAL EXPOSURE MUST BE VERIFIED FOR THE SITE BY THE PROPER GOVERNING OFFICIAL.

GEOTECHNICAL PARAMETERS:

ALLOWABLE END BEARING SOIL PRESSURE: 2,700 PSF
IN ACCORDANCE WITH THE 2018 EDITION OF THE INTERNATIONAL BUILDING CODE, CHAPTER 18.

DESIGN SOIL PARAMETERS ARE AS NOTED. ACTUAL ALLOWABLE SOIL PARAMETERS MUST BE VERIFIED ON SITE. REFERENCE SOILS AND FOUNDATION REPORT, NO. 15807, PREPARED BY PIONEER TECHNICAL SERVICES, INC.; HELENA, MT.

A GEOTECHNICAL ENGINEER OR REPRESENTATIVE OF IS RECOMMENDED (NOT REQUIRED) TO BE AVAILABLE AT THE TIME OF THE FOUNDATION INSTALLATION TO VERIFY THE SOIL DESIGN PARAMETERS AND TO PROVIDE ASSISTANCE IF ANY PROBLEMS ARISE IN FOUNDATION INSTALLATION.

ENCOUNTERING SOIL FORMATIONS THAT WILL REQUIRE SPECIAL DESIGN CONSIDERATIONS OR EXCAVATION PROCEDURES MAY OCCUR. POLE FOUNDATIONS WILL NEED TO BE ANALYZED ACCORDING TO THE SOIL CONDITIONS THAT EXIST. IF ANY DISCREPANCIES OR INCONSISTENCIES ARISE, NOTIFY THE ENGINEER OF SUCH DISCREPANCIES. FOUNDATIONS WILL THEN BE REVISED ACCORDINGLY. REVISIONS WILL BE ANALYZED PER RECOMMENDATIONS DIRECTED BY A REGISTERED ENGINEER.

ALL EXCAVATIONS MUST BE FREE OF LOOSE SOIL AND DEBRIS PRIOR TO FOUNDATION INSTALLATION AND CONCRETE BACKFILL PLACEMENT.

CONTRACTOR MUST BE FAMILIAR WITH THE COMPLETE SOIL INVESTIGATION REPORT AND BORINGS, AND CONTACT THE GEOTECHNICAL FIRM (IF NECESSARY) TO UNDERSTAND THE SOIL CONDITIONS AND THE POSSIBILITY OF GROUND WATER PUMPING AND EXCAVATION STABILIZATION OR BRACING DURING PRECAST BASE INSTALLATION AND PLACEMENT OF CONCRETE BACKFILL.

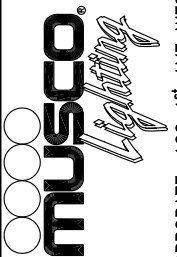
GENERAL NOTES:

FIXTURES MUST BE LOCATED TO MAINTAIN 10'-0" MINIMUM HORIZONTAL CLEARANCE FROM ANY OBSTRUCTION. ENGINEER MUST BE NOTIFIED IF FOUNDATIONS ARE NEAR ANY RETAINING WALLS OR WITHIN / NEAR ANY SLOPES STEEPER THAN 3H : 1V. POLES, FIXTURES, PRECAST BASES, ELECTRICAL ITEMS AND INSTALLATION PER MUSCO LIGHTING.

PRELIMINARY

FOR BID PURPOSES ONLY

CARROLL COLLEGE
NELSON STADIUM
FIELD LIGHTING
HELENA, MT



CORPORATE: 100 1st AVE WEST
 OSKALOOSA, IA 52577
 (800) 825-6020

STRUCTURAL
ENGINEERS, P.C.

114 NICHOLAS DRIVE
 MARSHALLTOWN, IOWA 50158
 PHONE NUMBER: 641-752-6334
 EMAIL: MSL.INFO@SEPC.BIZ

DRAWING TITLE:
 POLE AND FOUNDATION
 SCALE: SEE PLAN
 NOTES:
 SCAN #151917C

PROJECT NUMBER
 151917

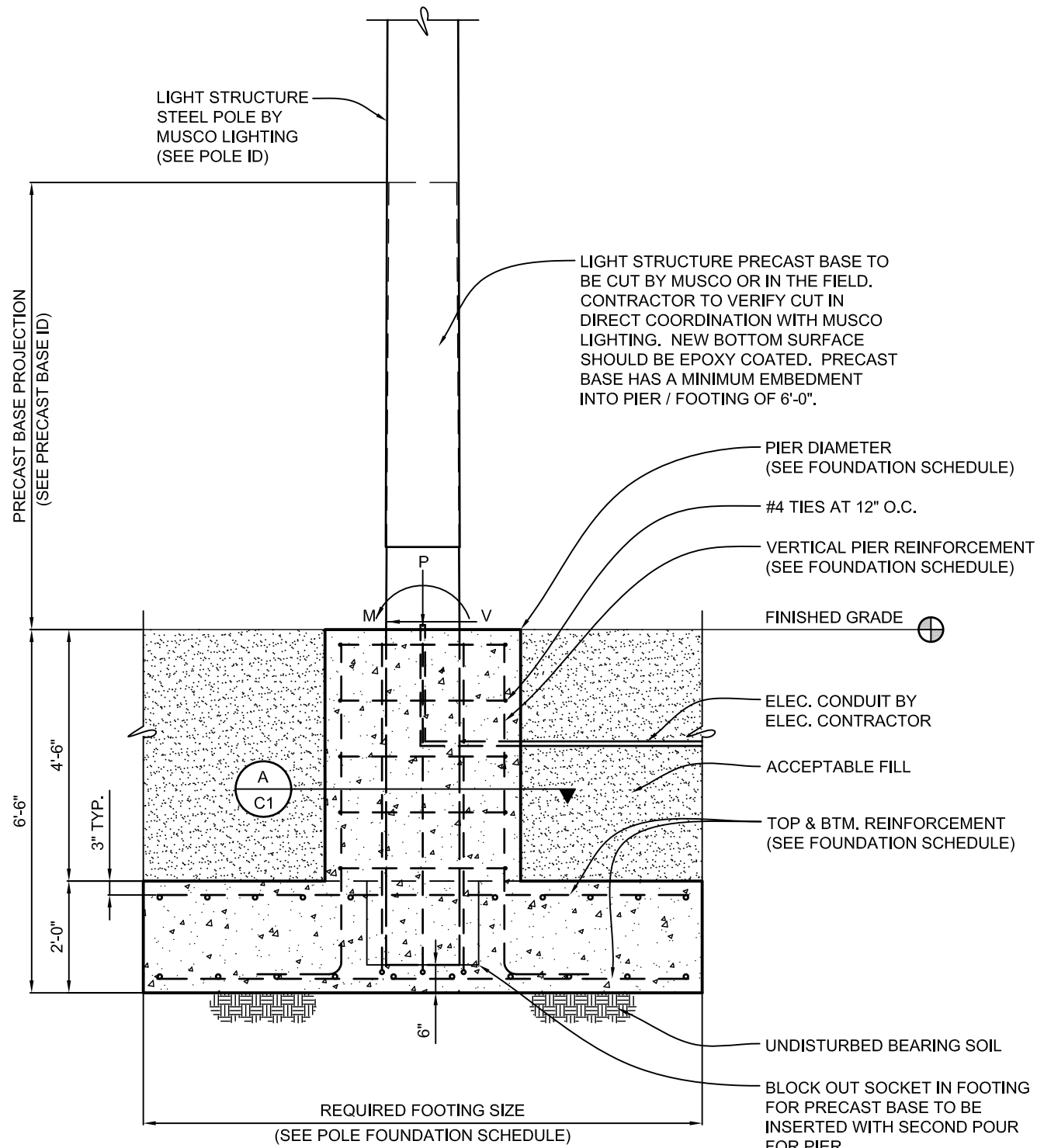
DATE
 25 MARCH 2020

DRAWING NUMBER
C1 - SF

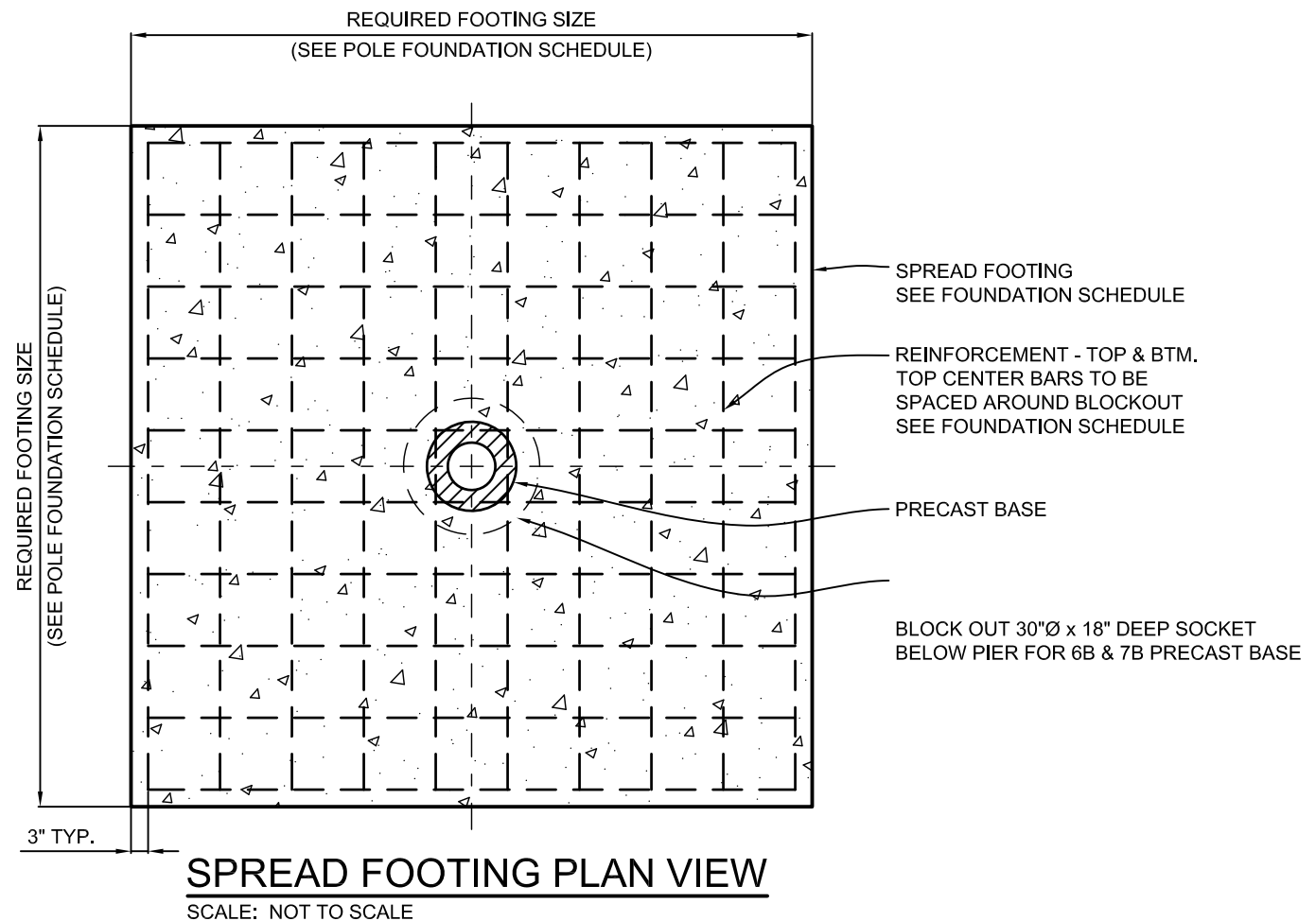
OF TWO

POLE FOUNDATION SCHEDULE							
POLE DESIGNATION	FOOTING			PIER			
	SIZE	THICKNESS	REINFORCEMENT TOP & BOTTOM (TOTAL) QUANTITY - SIZE	DIAMETER INCHES	CORE DIA. INCHES (1.)	VERTICAL REINFORCING	HORIZONTAL TIES
N1 - N4, S1 - S3	12'-6" x 12'-6"	2'-0"	(48) 12 - #7's EACH WAY	48	41	18 - #7	#4 @ 12"

1. CORE DIAMETER EQUAL TO INSIDE DIAMETER OF TIES.



POLE FOUNDATION ELEVATION
SCALE: NOT TO SCALE



SPREAD FOOTING PLAN VIEW
SCALE: NOT TO SCALE

PRELIMINARY
FOR BID
PURPOSES ONLY

CARROLL COLLEGE
NELSON STADIUM
 FIELD LIGHTING
 HELENA, MT


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 OSKALOOSA, IA 52577
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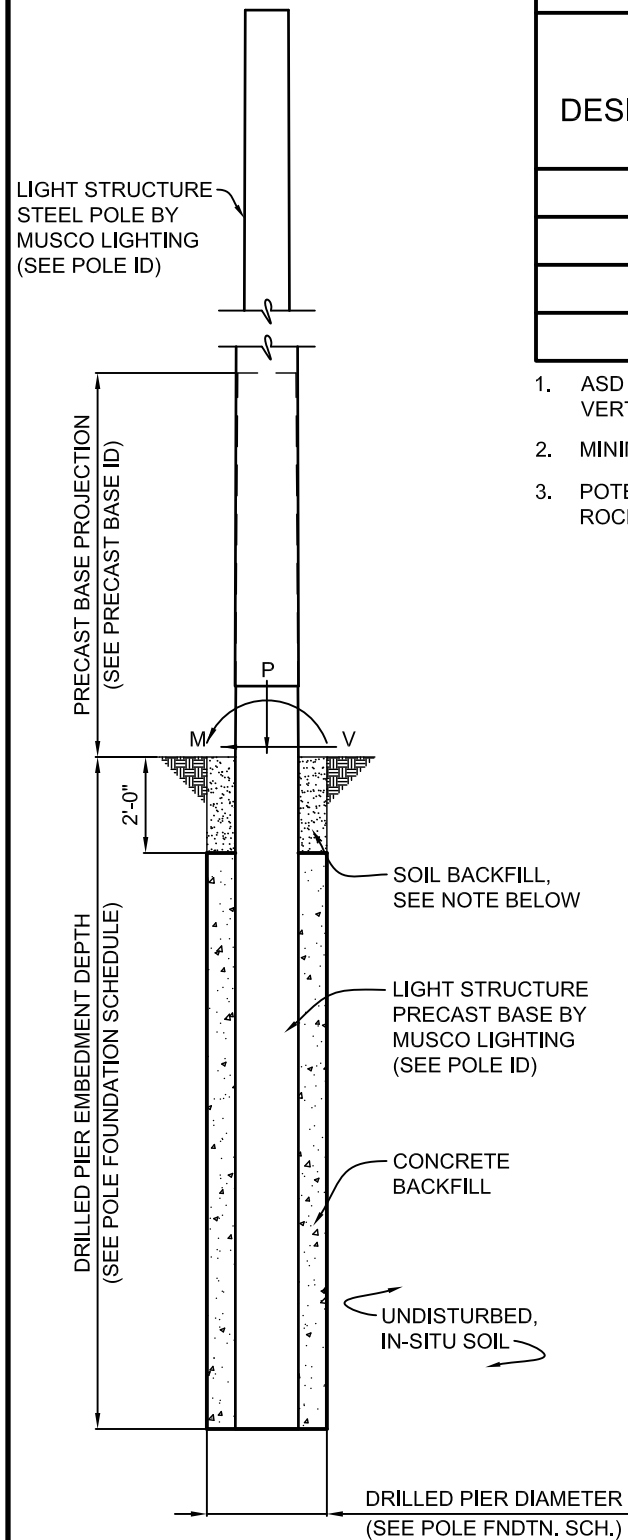
DRAWING TITLE:
 POLE AND FOUNDATION
 SCALE: SEE PLAN
 NOTES:
 SCAN #151917C

PROJECT NUMBER
 151917

DATE
 25 MARCH 2020

DRAWING NUMBER
C2 - SF

OF TWO



POLE FOUNDATION ELEV.

SCALE: NOT TO SCALE

SOIL BACKFILL NOTE:

THE TOP TWO FEET OF ANNULUS SHALL BE BACKFILLED WITH SOIL, WITH A CLASSIFICATION OF CLASS 5 (TABLE 1806.2) OR BETTER. COMPACTION, 95% FOR COHESIVE SOIL AND 98% FOR A COHESIONLESS SOIL BASED UPON STANDARD PROCTOR TESTING (ASTM D698).

POLE FOUNDATION SCHEDULE						
POLE DESIGNATION	FORCES (1.)			DRILLED PIER		
	MOMENT (M) FT-LBS	SHEAR (V) LBS	VERTICAL (P) LBS	DIAMETER INCHES	EMBEDMENT DEPTH (3.)	CONCRETE BACKFILL YD ³ (2.)
N1, N4	216,928	3,450	6,177	36	20'-0"	2.7
N2, N3	219,976	3,483	6,219	36	20'-0"	2.7
S1, S3	167,128	2,824	4,303	36	18'-0"	2.9
S2	219,760	3,600	6,572	36	20'-0"	2.7

1. ASD LOAD COMBINATION D + 0.6W. VERTICAL FORCE IS WEIGHT OF DRESSED POLE (DOES NOT INCLUDE PRECAST BASE WEIGHT).
2. MINIMUM CONCRETE BACKFILL VOLUME, SITE CONDITIONS MAY REQUIRE ADDITIONAL BACKFILL.
3. POTENTIAL FOR ENCOUNTERING ROCK BEFORE REACHING EMBEDMENT DEPTH. ROCK AUGERING EQUIPMENT MAY BE REQUIRED.

PRECAST BASE IDENTIFICATION

PRECAST BASE TYPE	PRECAST BASE WEIGHT	PRECAST BASE LENGTH	PROJECTION ABOVE GRADE	STANDARD EMBEDMENT	OUTSIDE DIAMETER
6B	6,930 LBS	26'-1"	8'-1"	18'-0"	20.56"
7B	10,160 LBS	27'-10"	7'-10"	20'-0"	23.75"

POLE IDENTIFICATION

POLE DESIGNATION	POLE TYPE	PRECAST BASE TYPE	FIXTURE CONFIGURATION (FIX. PER XARM)	FIXTURE AND ACCESSORIES EPA (FT ²)
N1, N4	LSS100C	7B	11 (5+4) / (2)	28.8
N2, N3	LSS100C	7B	11 (5+5) / (1)	29.8
S1, S3	LSS90B	6B	11 (5+4) / (2)	28.8
S2	LSS90C	7B	16 (6+4+4) / (2)	43.0

DESIGN NOTES

DESIGN PARAMETERS:

WIND: $V_{ult} = 120$ MPH, $V_{asd} = 93$ MPH (EXPOSURE C, RISK CATEGORY III) PER INTERNATIONAL BUILDING CODE, 2018 EDITION (ASCE 7-16). DESIGN WIND PARAMETERS ARE AS NOTED, ACTUAL EXPOSURE MUST BE VERIFIED FOR THE SITE BY THE PROPER GOVERNING OFFICIAL.

GEOTECHNICAL PARAMETERS:

ALLOWABLE END BEARING SOIL PRESSURE: 2,700 PSF
 ALLOWABLE LATERAL SOIL BEARING PRESSURE:
 0 PSF/FT (GRADE TO -2'-0"); 150 PSF/FT (-2'-0" TO -4'-0"); 300 PSF/FT (BELOW -4'-0")
 IN ACCORDANCE WITH THE 2018 EDITION OF THE INTERNATIONAL BUILDING CODE, CHAPTER 18.

DESIGN SOIL PARAMETERS ARE AS NOTED. ACTUAL ALLOWABLE SOIL PARAMETERS MUST BE VERIFIED ON SITE. REFERENCE SOILS AND FOUNDATION REPORT, NO. 15807, PREPARED BY PIONEER TECHNICAL SERVICES, INC.; HELENA, MT.

A GEOTECHNICAL ENGINEER OR REPRESENTATIVE OF IS RECOMMENDED (NOT REQUIRED) TO BE AVAILABLE AT THE TIME OF THE FOUNDATION INSTALLATION TO VERIFY THE SOIL DESIGN PARAMETERS AND TO PROVIDE ASSISTANCE IF ANY PROBLEMS ARISE IN FOUNDATION INSTALLATION.

ENCOUNTERING SOIL FORMATIONS THAT WILL REQUIRE SPECIAL DESIGN CONSIDERATIONS OR EXCAVATION PROCEDURES MAY OCCUR. POLE FOUNDATIONS WILL NEED TO BE ANALYZED ACCORDING TO THE SOIL CONDITIONS THAT EXIST. IF ANY DISCREPANCIES OR INCONSISTENCIES ARISE, NOTIFY THE ENGINEER OF SUCH DISCREPANCIES. FOUNDATIONS WILL THEN BE REVISED ACCORDINGLY. REVISIONS WILL BE ANALYZED PER RECOMMENDATIONS DIRECTED BY A REGISTERED ENGINEER.

ALL EXCAVATIONS MUST BE FREE OF LOOSE SOIL AND DEBRIS PRIOR TO FOUNDATION INSTALLATION AND CONCRETE BACKFILL PLACEMENT. TEMPORARY CASINGS OR DRILLERS SLURRY MAY BE USED TO STABILIZE THE EXCAVATION DURING INSTALLATION. CASINGS MUST BE REMOVED DURING CONCRETE BACKFILL PLACEMENT. CONCRETE BACKFILL MUST BE PLACED WITH A TREMIE WHEN SLURRY OR WATER IS PRESENT WITHIN THE EXCAVATION OR WHEN THE FREE DROP EXCEEDS 6'-0".

CONTRACTOR MUST BE FAMILIAR WITH THE COMPLETE SOIL INVESTIGATION REPORT AND BORINGS, AND CONTACT THE GEOTECHNICAL FIRM (IF NECESSARY) TO UNDERSTAND THE SOIL CONDITIONS AND THE POSSIBILITY OF GROUND WATER PUMPING AND EXCAVATION STABILIZATION OR BRACING DURING PRECAST BASE INSTALLATION AND PLACEMENT OF CONCRETE BACKFILL.

CONCRETE:

CONCRETE SHALL BE AIR-ENTRAINED AND HAVE A MINIMUM COMPRESSIVE DESIGN STRENGTH AT 28 DAYS OF 3,000 PSI. 3,000 PSI CONCRETE SPECIFIED FOR EARLY POLE ERECTION, ACTUAL REQUIRED MINIMUM ALLOWABLE CONCRETE STRENGTH IS 1,000 PSI. ALL PIERS AND CONCRETE BACKFILL MUST BEAR ON AND AGAINST FIRM UNDISTURBED SOIL.

GENERAL NOTES:

FIXTURES MUST BE LOCATED TO MAINTAIN 10'-0" MINIMUM HORIZONTAL CLEARANCE FROM ANY OBSTRUCTION. ENGINEER MUST BE NOTIFIED IF FOUNDATIONS ARE NEAR ANY RETAINING WALLS OR WITHIN / NEAR ANY SLOPES STEEPER THAN 3H : 1V. POLES, FIXTURES, PRECAST BASES, ELECTRICAL ITEMS AND INSTALLATION PER MUSCO LIGHTING.

PRELIMINARY
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PURPOSES ONLY

CARROLL COLLEGE
 NELSON STADIUM
 FIELD LIGHTING
 HELENA, MT

MUSCO
 Lighting
 CORPORATE: 100 1st AVE WEST
 OSKALOOSA, IA 52577
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 114 NICHOLAS DRIVE
 MARSHALLTOWN, IOWA 50158
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DRAWING TITLE:
 POLE AND FOUNDATION
 SCALE: SEE PLAN
 NOTES:
 SCAN #151917C

PROJECT NUMBER
 151917

DATE
 25 MARCH 2020

DRAWING NUMBER
C1 - DP

OF ONE



Addendum

Addendum No. 2

Date 5/13/2021

Project Number: 70-41-03

Project: Carroll College
Phase 1 Nelson Stadium – Field and Lighting
185 N. Benton Ave. Helena, MT 59625

Bidders for the above-captioned project are hereby informed that the drawings and/or specifications are modified, corrected or supplemented as follows. Acknowledge receipt of Addenda on Bid Form. **Contractor to take special care in reading attached notes and to coordinate with all trades.**

General Notes:

ITEM G-1 The new fence and gate sections are to be painted to match existing. Existing fence to remain as is.

ITEM G-2 **FIELD TURF RFP** is included for bidding multiple turf suppliers with a standard of quality listed in the RFP document. Note changes include new turf drawings with a wider soccer lines and an alternate lettering in the endzones.

Amendments to the Project Manual:

ITEM M-1 **SECTION 263213 – ENGINE GENERATORS:**

1. Change fuel type from natural gas to diesel. Fuel tank shall be 12" tall nominal and sized for a minimum of 12 hours of run time at full load. Contractor shall provide 35 gallons of fuel.
2. Change capacity from 36KW to 40KW. Generator must meet this rating at site elevation of 4,000 feet.
3. Change generator output breaker to from 60A-3P to 70A-3P.
4. Delete elastomeric isolator pads.
5. Delete requirement for generator enclosure heater. Provide block heater and battery warmer (120 volt).
6. Provide 4 hour load bank test on-site during generator commissioning. Provide owner training after commissioning.

ITEM M-2 **SECTION 262826 – ENCLOSED TRANSFER SWITCHES:**

1. Delete requirement for in-phase monitoring.
2. Delete requirement for 5 years preventative maintenance.

ITEM M-3 **FIELD TURF RFP:**

1. See attached documents and new drawings regarding the option to bid the turf work in a RFP fashion to multiple suppliers.

Amendments to the Drawings:

ITEM D-1 **SHEET E0.1: ELECTRICAL SERVICE AND GENERATOR PLANS AND DETAILS:**

1. Delete specific sheet note 3.
2. Add emergency off pushbutton (EPO) for generator and locate adjacent to automatic transfer switch. Provide clear plastic waterproof cover

CWG
Architecture

Architecture
Engineering
Design

(406) 443-2340

650 Power St
P.O. Box 1198
Helena, MT 59624

cwg-architects.com

over EPO. Coordinate wiring requirements with generator manufacturer.

3. Provide (2) 20A-1P circuits to generator enclosure, one for block heater and one for battery charger/battery warmer. Connect via 2#12 and #12 ground in 3/4" conduit from panel '2A1'. Provide two additional 20A-1P breakers in panel. Refer to detail on sheet E0.2 for additional connections to generator.

END OF ADDENDUM



Jason Egeline, AIA, NCARB, AIA

Attachments:

- 00 00 05 Synthetic Turf Proposal Requirements
- 00 02 05 Turf Technical Product Data Form
- 32 18 23 Synthetic Turf Surfacing
- Carroll College Addendum 2 5-12-21 REV Turf Drawings

SECTION 00 00 05

SYNTHETIC TURF PROPOSAL REQUIREMENTS

1.1 INTRODUCTION

- A. Carroll College is seeking proposals from pre-qualified Turf Vendors for a synthetic turf surfacing system at Nelson Stadium in Helena, MT. The Turf Contractor shall furnish and install a complete infilled synthetic turf field system over a permeable aggregate base constructed under a separate contract.

1.2 GENERAL REQUIREMENTS

A. Qualifications

1. Proposals will be received by firms directly invited to participate only. Invitation to Propose in no way infers equal status among invited firms. While invitation to Propose on this project is generally indicative of pre-qualification, the Owner, Architect, or Field Design Consultant may require additional proof of qualifications at any time.
2. Proposing firms shall have the following information prepared in advance, for electronic transmittal within 24 hours (one business day) of request by the Owner, Architect, or Field Design Consultant. Do not submit these documents except as directed.
 - a. Proof of Surety, single source third party warranty insurance coverage of the installation covering 100% of the Contracted value for a period not less than eight (8) years from the Date of Substantial Completion, non-pro-rated, inclusive of all materials and workmanship.
 - b. Proof of Surety, Payment & Performance Bonding capability for 100% of the value of the Bid Amount including labor, equipment, materials, and overhead.
 - c. Project Staffing Roster. Submit key staff information detailed below including proof of relevant experience in the form of a list of completed projects claimed including current contact information (name, title, and phone of current Owner Representative or Facility Manager). Include Project Name, Location, Date of Completion, and a brief description of the facility type and the staff person's responsibilities to the project.
 - d. Firm Experience. Provide a detailed list of recent relevant projects. List only projects completed within the past three (3) years. Include current contact information (name, title, and phone of current Owner Representative or Facility Manager), Project Name, Location, Date of Completion, and a brief description of the facility type. Identify the specific product supplied and the installer (individual if payrolled, corporate name if third party).

For each Section noted, provided a record of experience as required by the Technical Specification for that work.

B. Term of the Proposal

Proposing Firms agree to hold all conditions of their written proposal for a period of no less than 90 calendar days from the Proposal Due Date.

C. Staffing

70-41-03 / Carroll College Phase 1 Nelson Stadium - Field & Lighting

Proposing Firms understand and agree to the following requirements for Staffing the project with well qualified individuals possessing a documented history of success in all relevant areas of performance.

1. Project Manager: The Turf Contractor shall appoint a Project Manager who is authorized to act on behalf of the Vendor on reasonably expected day to day matters. The Project Manager will be available to the Owner, General Contractor, and Field Design Consultant full time. While not required to be on site full time, the Project Manager is expected to be intimately familiar with the physical details of the site and adjacent work as it progresses through completion. This will necessitate a frequent presence. When specifically directed, the Project Manager will attend scheduled meetings in person.
 2. Project Administrator: The Turf Contractor shall assign a Project Administrator who will be and will remain knowledgeable as to the day-to-day status of the Turf Contractors Submittals, Applications for Payment, Change Order Requests, and general Correspondence.
 3. Construction Superintendent: The Turf Contractor shall name and assign a qualified Construction Superintendent who will be available full time on the site throughout the duration of the of the work, including that of the Turf Contractors Subcontractors and Suppliers, and who shall be equipped with complete, up-to-date contract documents and drawings and who shall be empowered to represent the Contractor in matters pertaining to the sequencing and scheduling of the contract work, as well a make purchasing and staffing decisions as might reasonably be expected to be required to meet the Contract requirements for timely completion and coordination with the Owners work under other Contracts.
- D. The Turf Contractor shall submit detailed work histories including specific project references complete with size/area of installation, completion date, and up-to-date Owner/Owner-Rep Contact information for both the assigned Project Manager and Construction Superintendent.
- E. The Turf Contractor's appointed staff described above shall be subject to the written approval of the Owner, Architect, and/or Field Design Consultant.
- 1.3 SYNTHETIC TURF SYSTEM PROPOSAL SUBMITTAL
- A. Proposal must be signed by an officer of the submitting firm with the authority to commit the firm as proposed.
 - B. Proposals for the synthetic turf system shall include the following information, indexed as per the following numbered sequence:
 1. Letter of Introduction: Provide a two-page maximum, single-spaced cover letter explaining the firm's interest and distinguishing characteristics. Describe the Firm's resume and successful product installations in football and soccer fields at all levels, in particular other NCAA and NAIA facilities. Indicate Schedule & Availability: Discuss your firm's ability to commence work on the project and complete all turf installation activities as specified.
 2. Lump Sum Pricing (on the Form of Proposal provided) Proposals will include a firm fixed price for each scope of work. Each fixed price shall be fully inclusive of all labor and materials, including general conditions, mobilizations, insurance & bonding, administration and overhead, and profit required to complete the described work.

3. Turf Technical Product Data Form(s): Fill out the attached Product Data Form for each synthetic turf surfacing system proposed and include it with the proposal. This data will comprise the product specifications to which the Field & Turf Contractor will be held.
4. Field System Performance: Describe the performance characteristics of the proposed field system for football and soccer activities. The description should include applicable test results and testimonials.
5. Subcontractor & Supplier Roster: Provide a listing of key subcontractors and suppliers for the project. The listing shall include a brief description of the role each subcontractor and supplier as well as their experience with athletic field construction. Listing must include the material suppliers and installers associated with each Technical Specification not proposed to be self-performed.
6. Exceptions to the RFP Document: On a separate and clearly marked document, list any and all exceptions taken to the requirements of RFP Document including Administrative and Technical Specifications, Plan Drawings, and Details. Identify the source of the exception by Specification Number and Document Title, Drawing Number and Title, or Detail Title, Number, and Sheet. Describe the proposed alternative or substitution included in the Proposal.
7. Warranty: Provide a copy of the warranty provided with the proposed synthetic turf and supplemental pad systems. Outline or clearly highlight and explain under separate cover any exceptions taken to the Form of Warranty required by the RFP Technical Specifications.
8. Supplemental Information (Optional): Provide up to 12 additional pages (maximum) of information that helps distinguish the Proposing Firm from others in the market, including business practices, experience, product quality and performance, research & development, etc. Use this space to provide information that is important for Carroll College to know, that may not have been otherwise requested.

E. Failure to comply with all of the requirements listed above may constitute grounds for disqualification at the Owner's discretion.

F. Product Samples:

Assemble and have prepared to ship via FedEx or equivalent the following physical material samples on request (Do Not Ship Physical Product Samples unsolicited);

1. Two 12"x 12" rag (unfilled) samples each of each green turf product proposed
2. Two 12"x 12" rag (unfilled) samples each of other color turf product proposed
3. Two boxed infilled synthetic turf samples with the proposed green turf product
4. Two approximately 1-pound samples of proposed In-fill materials, bagged or contained separately and securely.

1.4 PROPOSAL EVALUATION

A. The Owner will generally evaluate each proposal on the basis of response to each of the categories listed in 1.02 and 1.03.

- B. The Owner will review the responses to the RFP. While no detailed process, criteria, or grading system is identified to guide the Proposals or the Review, prospective Proposers can assume the following considerations, in no particular order, will carry significant importance in the decision-making process;
1. The Proposing Firm's demonstrated history of success in Football and Soccer and at the highest levels of all sport, with regard to Player Safety and Performance
 2. Pricing of the Proposed products and services
 3. Conformance with the requirements of the RFP Process and Completeness of the Proposal
- C. The Owner may request additional, specific information from any Proposer without notification to any other Proposing firm.
- D. The Owner may or may not opt to interview one or more Proposing firms at the time and place of their choosing, with all reasonable accommodations made for schedule and logistics. The specifics requested for any particular interview or presentation may vary from Proposing firm to Proposing firm should more than one request be made, with no bias implied or intended to any party.
- E. The Owner retains the right to reject any or all proposals for any reason without Notice.

END OF SECTION 00 00 05

Section 00 02 05

Technical Product Data Form

This form is to be submitted for each proposed product – copy as necessary and attach to the Form of the Proposal / Bid Form.

PRODUCT TRADE NAME

Product Trade Name / Product Code

SYNTHETIC TURF FIELD SURFACING

Pile Yarn Type (Slit Film) or (Monofilament) or (Blend) – circle one

Backing Type (Permeable) or (Perforated) – circle one

Property	Minimum Spec.	Units	ASTM
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Synthetic Turf Material

Pile Yarn Composition	_____		
Minimum Pile Yarn Denier	_____	gm/9000m	D1577
Maximum Pile Yarn Denier	_____	gm/9000m	D1577
Pile Yarn Breaking Strength	_____	lbs/force	D2256
Pile Yarn Melting Point	_____	degrees F	D789
Minimum Pile Height	_____	inches	D418
Maximum Pile Height	_____	inches	D418
Yarn Ends per Stitch	_____	-	D418
Pile Weight	_____	oz./sq. yd	D418
Does the turf system include supplemental infill stabilization fiber	(Yes) _____ (No) _____		
Infill Stabilization Fiber Composition	_____		
Infill Stabilization Fiber Weight	_____	oz./sq. yd	D418
Primary Backing Weight	_____	oz./sq. yd	D418
Secondary Backing Weight	_____	oz./sq. yd	D418

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Total Weight	_____	oz./sq. yd	D418
Tuft or Stitch Spacing	_____	per inch	D418
Gauge	_____	per inch	D418
Tuft Bind (without infill)	_____	lbs.	D1335
Grab Tear Strength	_____	lbs.	D1682
Impact Attenuation (max)	_____	Gmax	D355
Pill Burn Test	_____	-	D2859

Synthetic Turf Infill Material

Total Depth of Infill Material _____ millimeters (minimum)

Minimum Number of Infill Material Applications _____

Maximum Depth of Infill Material per Application _____ millimeters

Rubber Content of Infill Material _____% by volume (minimum)

Granulated Rubber Type (circle one) Ambient Grind Cryogenically Ground

Granulated Rubber Size Distribution

_____ mm - ___ mm _____ % - _____ %

_____ mm - ___ mm _____ % - _____ %

_____ mm - ___ mm _____ % - _____ %

Sand Content of Infill Material _____% by volume (minimum)

The sand gradation shall meet the following wet sieve analysis:

<u>Sieve Size</u>	<u>% Passing (max – min)</u>		
#8	_____	#40	_____
#16	_____	#50	_____
#20	_____	#100	_____
#30	_____	#200	_____

Additive Alternate Bid Supplemental Pad System

Supplemental Pad System Product Description: _____

Primary Materials: _____

Product Thickness _____mm (minimum)

Maximum Surface Loading Capacity _____PSI (pounds per square inch)

Permeability (cm/sec, DIN 18035-6) _____

(in/hr) _____

Density (lb/cf, ASTM D3676) _____

Tensile Strength (psi, ASTM D412) _____

Elongation (% , ASTM D412) _____

Force Reduction (% , DIN 18032-2) _____

END OF TECHNICAL DATA SHEET _____ of _____

SECTION 32 18 23
SYNTHETIC TURF SURFACING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Scope of work to include all labor, material, equipment, transportation and services to install complete new vertically draining in-filled synthetic turf surfacing system as shown and described. System to be as herein specified including, but not specifically limited to the following:

Base Proposal:

1. The field shall be manufactured from either long parallel slit film and monofilament fibers or a combination as documented on the Product Data Form included with each proposal.
2. Markings shall include football, soccer, softball, as well as a mid-field logo.
3. Field Infill System shall consist of a combination of sand and SBR rubber.

Proposal Additive Alternate:

4. Installation of field underlayment/supplemental pad system consisting of either a 23mm polypropylene panels or a 25mm paved in place elastic layer pad at the field area.

- B. Other requirements of synthetic turf surfacing system shall include:

1. Product submittals including samples, technical data, shop drawings etc.
2. Independent testing of the synthetic turf materials prior to shipment to the project site;
3. Delivery of the synthetic turf materials (not including infill) a minimum of 1 week prior to the scheduled installation of the materials;
4. Review and acceptance or certification of the existing permeable aggregate as it applies to installation of turf system, permeability and warranty implementation;
5. Installation of complete vertical draining synthetic turf surfacing system.
6. Installation of tufted and inlaid field lines and markings as indicated on the drawings.
7. Provide extra turf materials to the Owner for future repair and protective purposes.
8. Provide all appropriate maintenance and repair manuals and warranty package to Owner.
9. Provide warranty package to Owner. Warranty shall include a pre-paid insurance policy in support of the warranty required for the field, for the entire warranty period from an A-rated domestic insurance carrier.

1.02 SYNTHETIC TURF SURFACING PERFORMANCE & PAYMENT BOND

- A. The Synthetic Turf Contractor shall provide a performance and payment bond to the General Contractor for the full subcontract amount of the synthetic turf surfacing system including materials, assembly, shipping, and installation. A copy of the performance and payment bond must be provided to the Owner within 14 days of the issuance of the notice to proceed.
- B. The performance and payment bond must be provided in the name of the same corporate entity that provides the warranty for the synthetic turf surfacing system to the Owner.

1.03 SYNTHETIC TURF SURFACING PRODUCTS

- A. The following vendors and corresponding products are pre-approved for the Synthetic Turf Field surface:

1. AstroTurf
2. FieldTurf
3. Hellas
4. Shaw

B. All vendors that are not included as a pre-approved product shall submit a request. The request must be submitted a minimum of 6 business days prior to the submittal date for the Synthetic Turf Surfacing proposals. Requests must include the following information for evaluation :

1. Vendor Background and Experience: Describe your firm's history. Include information identifying the firm's annual volume and the firm's stability in the marketplace. Also include the firm's record relating to installation schedules and performance.
2. Provide information regarding local representation, and post-installation support.
3. Provide proof of bondability.
4. Product Manufacturer Background and Experience: Describe the history and experience of the product manufacturer with this specific product including years of experience and a count and listing of North American and worldwide synthetic turf field installations. The list shall include field locations, client, client contact names, address, telephone, material installed, date of installation, and general contractor (if any).
5. Product Installer Background and Experience: Describe the history and experience of the product installer with this specific product including years of experience and a count and listing of field installations. The list shall include field locations, client, client contact names, address, telephone, material installed, date of installation, and general contractor (if any). If the installer is not the manufacturer or vendor of the product, describe the experience the installer has with this specific product.
6. Product Samples: Provide the following samples with the substitution request.
Two 8"x 12" samples each of green turf without infill material showing backing with perforations.
Two 8" x 12" samples each of turf with the infill material.
Two samples of the proposed in-fill material.
7. Product Specification: Provide specification for the proposed synthetic turf product.
8. Product Performance: The samples submitted with the proposal will be reviewed and evaluated. As a supplement to the samples, provide a written description of the following performance criteria for the proposed synthetic turf surfacing system:
 - a. Abrasive characteristics
 - b. Weekly, Monthly, and Annual Maintenance Requirements
 - c. Playability for Football and Soccer
 - d. Wet and Dry Traction
9. References: Supply a minimum of ten references, including contact name and telephone number, for other installations of this product.

1.04 APPROVED FIBER MANUFACTURERS

A. The following fiber manufacturers are pre-approved for the In-filled Synthetic Turf Systems:

Astroturf, Bonar, Fieldturf, Hellas, Polytex, Shaw, Tencate

B. The synthetic turf vendor shall provide written documentation in the form of a signed affidavit certifying the source of the fiber used for the field including both green and any other colors used for the lines and markings.

C. Fiber shall be certified in writing to have less than 50 ppm or less of lead from both the fiber supplier and the turf vendor.

1.05 MINIMUM QUALIFICATIONS FOR SYNTHETIC TURF SYSTEM

- A. Approved Synthetic Turf System shall be manufactured, sold, and warranted by a single vendor. Manufacture of the system shall include, at a minimum, assembly of the constituent components, i.e. tufting, of the specified fiber into an approved backing.
- B. The manufacturer of the synthetic turf system must have produced a minimum of fifty (50) successful in-filled fields of full size and outdoors within the past two (2) years.
- C. Installer of the synthetic turf system must have installed either a minimum of ten (10) successful in-filled synthetic turf football or soccer fields of full size within the past two (2) years or a minimum of twenty (20) successful in-filled synthetic turf football or soccer fields of full size within the past five (5) years. The installer shall have installed a minimum of five (5) successful in-filled synthetic turf football or soccer fields of full size with the product vendor.

1.06 RELATED WORK SPECIFIED IN OTHER SECTIONS

33 46 23 Field Permeable Aggregate

1.07 STANDARD SPECIFICATIONS

American Society for Testing Materials (ASTM), (latest edition) for material and testing standards
NCAA Rules for Football
NCAA Rules for Soccer
NCAA Rules for Softball

1.08 POST AWARD SUBMITTALS

- A. Shop Drawings: submit to the Engineer complete and detailed drawings showing all component parts of the synthetic turf system. The shop drawings shall be drawing to scale (1"=20') and shall include:
 - 1. total depth of infill
 - 2. edge details
 - 3. insert details including backing material
 - 4. seam details
 - 5. seam layout
 - 6. gluing patterns
 - 7. dimensional shop drawing for all field lines, markings and boundaries
- B. Synthetic Turf Samples: submit to the Owner:
 - 1. Two 12"x 12" samples each of each color turf showing backing with perforations.
 - 2. Two 12" x 12" samples each of turf showing method of seam makeup with perforations. One sample to have example of inlaid lines.
 - 3. Two 12" x 12" samples each of the other colors proposed for use on the field for lines and markings.
 - 4. Two 1-pound samples of the proposed In-fill material(s).
- C. Manufacturer's Specifications and Warranty:

1. Submit to the Engineer selected manufacturer's material specifications and installation instructions. Include detailed specifications of manufacturer's provisions for achieving permeability, stating rate in infiltration and permeability in inches per hour of system materials for the vertical draining system.
 2. Submit to the Engineer warranty package herein specified for review.
- D. Testing and Quality Control: Submit to the Engineer the following test results for the system specified. An independent testing laboratory experience with testing of synthetic turf or carpeting materials shall certify these tests. The qualifications of the testing laboratory to be utilized for the submittal and the pre-shipment testing shall be submitted to the Engineer for approval. Applicable minimum material ASTM tests:
1. Dynamic Cushion Test - ASTM F355, Procedure A, (system); ASTM F355 procedure A at the 24" drop.
 2. Yarn and fabric characteristics.
 3. Pill Burn Test – ASTM D2859
- E. Maintenance and Operating Data:
1. Prior to acceptance and/or occupancy by the Owner, furnish to the Owner two (2) copies in hard cover form of maintenance and operating data with imprinted Project, Owner, Engineer, Contractor and Turf Subcontractor names, and date of turf system installation.
 2. In addition, provide descriptions of any equipment recommended for maintenance and repair, citing specific vendors for each unit.
 3. Use and Limitations - Provide a separate page stating approved activity usage for the turf and activities not recommended relative to warranty.
 4. Index - Index with tab dividers for data as follows: Materials installed with their characteristics:
 - a. General maintenance
 - b. Small repair procedures
 - c. Minor seam repair
 - d. Discussion of precautions to be practiced, general maintenance, and uses to avoid to protect turf surface and to maintain installation's warranty
 - e. Recommendations for paint application and removal of lines and markings.

1.09 PRE-SHIPMENT SUBMITTALS

- A. Prior to shipment of the synthetic turf materials to the job site, synthetic turf material from every sixth roll shall be randomly sampled and the tested by an independent testing laboratory experience with testing synthetic turf materials. The testing laboratory shall be completely independent with no ties to the turf manufacturer. The testing shall include the following:

<u>Item</u>	<u>ASTM</u>	<u>Property</u>
1.	FTIR Spectrograph	Pile Composition
2.	D418	Pile Weight
3.	D418	Total Weight
4.	D418	Pile Height
5.	D418	Backing Perforation Diameter and Spacing
6.	D1335	Tuft Bind (without infill)
7.	D1682	Grab/Tear Strength.

- B. Copies of the test results shall be transmitted to the Owner and Engineer directly from the

testing laboratory. The synthetic turf materials shall not be shipped to the site without written authorization from the Engineer after the Owner and Engineer have approved the test results.

- C. Samples of the synthetic turf material tested from every sixth (6th) roll shall also be transmitted to the Engineer for approval by the independent testing laboratory prior to shipment of the synthetic turf materials to the job site. Sample size shall be minimum 12" x 12".
- D. All fees and costs associated with the pre-shipment sampling and testing shall be paid by the Contractor.

1.10 CERTIFICATION OF THE BASE

- A. The Synthetic Turf Surfacing Contractor shall furnish to the Owner, prior to the synthetic turf system installation as applicable, a written certification of the acceptability by the turf vendor of the permeable aggregate for installation and warranty validation.

1.11 TURF SYSTEM HOLD HARMLESS

- A. The synthetic turf manufacturer and installer shall not infringe upon any current or pending patents held by other synthetic turf manufacturers or installers.
- B. The Contractor, their synthetic turf subcontractor, and the synthetic turf manufacturer shall hold the Owner, Owner's Representative, and the Engineer harmless from infringement of any current or future patent issued for the synthetic turf surfacing system, installation methods and vertical draining characteristics. A notarized statement shall be provided as part of the submittal package.

1.12 WARRANTY OF SYNTHETIC TURF

- A. Warranty shall cover, in general, the usability of the turf surface, accessories, use characteristics, and suitability of the installation. All items covered by warranty are to be replaced or repaired with new materials, including installation at the sole expense of the warranting contractor for the period of eight (8) years to the Owner, for the designated uses enumerated as follows:
 - Football
 - Soccer
 - Lacrosse
 - Softball
 - Ultimate
 - Physical exercises
 - Snow removal
 - Pneumatic rubber-tired maintenance and service vehicles
 - Pedestrian traffic and other similar uses
 - Ceremonial and Entertainment Events
- B. A principal of the applicable firm, duly-authorized to make contracts, shall sign the turf vendor warranty. If the turf vendor is not the manufacturer, the manufacturing firm shall also sign the warranty. The term "Contractor" contained herein means the firm furnishing warranty. "Owner" is the Carroll College. Warranty period shall be a minimum of eight years from date of acceptance of the installed system by the Owner.
- C. Furnish a pre-paid insurance policy in support of the warranty required for the field, for the entire warranty period from an A-rated domestic insurance carrier. The warranty shall be

secured to the Owner with an insurance policy of not less than \$300,000 per claim and an aggregate of \$5,000,000.

1.13 FORM OF WARRANTY OF SYNTHETIC TURF SYSTEM

- A. Contractor hereby warrants to Owner, subject to the limitations and conditions set forth below, that its synthetic turf system consisting of synthetic turf described as _____, and the adhesives used in the installation, is free from defects in material and workmanship and shall, for a period of eight years as applicable from the date of acceptance by the Owner, remain serviceable for multiple sports activities.
- B. Contractor warrants to the Owner that its synthetic turf materials shall not fade, fail, shrink, wrinkle, or reflect excessive wear. Contractor shall, at their sole expense and cost, replace such areas of the synthetic turf system not performing to these standards for the life of the warranty.
- C. Definitions
1. The term "not fade" in the context of this warranty shall mean that the synthetic turf material shall remain a uniform shade of green, or other colors installed, with no significant loss of color.
 2. The term "not fail" or "excessive wear" as used in the context of this warranty shall mean that the length and weight of the face yarn or pile material in the synthetic turf surface above the infill materials shall not have been decreased by more than 10% per year according to ASTM D418, nor exceed 50% during the warranty period. In the event that the synthetic turf system does not retain its fiber height or shock absorbency and is consequently no longer serviceable during the warranty period, the Contractor shall, at their sole expense, replace such portion of the system that is no longer serviceable.
 3. The term "serviceable" in the context of this warranty shall mean that the synthetic turf system for the soccer field shall have a maximum "G" value according to ASTM F1936-10 and Procedure A, ASTM F355, not to exceed 120G's at any location upon installation and shall not exceed 160G's throughout life of the warranty period. This shall be determined by conducting dynamic cushioning tests at the locations designated in ASTM F1936-10 and at corners of the soccer penalty boxes at opposite sides of the field. Any increase from 120G's to allowable 160-G's maximum shall be at a relative uniform rate not to exceed 15 G's in any single yearly period.
- D. Where applicable, the fabric seams shall remain attached to the underlying surface over the warranty period and shall not separate or become unglued or unattached, as applicable.
- E. Contractor warrants to the Owner that the permeable synthetic system shall drain vertically a minimum of 20 inches precipitation per hour without visible surface ponding.
- F. Contractor shall replace with new materials, at their sole expense, any damage to the synthetic turf system that extends more than 3 feet beyond the location of foreign combustibles, which may ignite and fire-damage the synthetic turf system. The Contractor shall not be held liable for any incidental or consequential damages. These warranties and the Contractor's obligations here-under are expressly conditioned upon;
1. The Owner making all minor repairs to the synthetic turf system upon the discovery of the need for such repairs;

2. The Owner maintaining and properly caring for the synthetic turf system in accordance with the Contractor's maintenance manual and instructions;
 3. The Owner complying with the dynamic and static load specifications established by the Contractor.
- G. The warranty is not to cover any defect, failure, damage or undue wear in or to the synthetic turf system caused by or connected with abuse, neglect, deliberate acts, act of God, casualty, static or dynamic loads exceeding Contractor's recommendations, footwear having cleats, spikes, or similar projections other than conventional baseball, football, soccer, or rugby shoes having cleats of not more than 1/2" in length, and other conventional running track shoes having spikes of not more than 1/4" in length, or use of improper cleaning methods.
- H. Contractor shall be allowed to examine the synthetic turf system regarding any claim that the Owner makes to be present at any time, to analyze the results of all tests conducted by the Owner or others, and to conduct such tests of their own. Contractor shall not be responsible for any costs or expenses incurred by the Owner or others with respect to such tests, except the Contractor shall pay for costs of all tests and analysis conducted or directed by their representative.
- I. In the event the Contractor does not respond to the Owner's written notice within 10 days of receipt of notice or does not submit, schedule and execute corrective work within 30 days for any material replacement and within 5 days for work limited to repairs of existing materials or repair that can be made with attic stock materials, the Owner has the option of having the work performed at the expense of the Contractor.
- J. Sample form of warranty herein set forth is a suggested form for use for the work under this section. Manufacturer's standard form of warranty may be used provided all conditions specified are incorporated. All claims by the Owner under this warranty must be made in writing to Contractor's address at _____ within 30 days after the Owner learns of the defect giving rise to the claim. This warranty shall constitute a contract made in the State of Montana and shall be governed by the laws thereof.

1.14 FORM OF WARRANTY FOR SUPPLEMENTAL PAD SYSTEM (ADDITIVE ALTERNATE)

- A. Contractor hereby warrants to Owner, subject to the limitations and conditions set forth below, that field underlayment system consisting of _____, is free from defects in material and workmanship and shall, for a period of eight years from the date of acceptance by the Owner, remain serviceable for multiple sports and snow removal activities.
- B. Contractor warrants to the Owner that its field underlayment materials shall remain permeable and shall not fail, shrink or buckle. Contractor shall, at their sole expense and cost, replace such areas of the field underlayment system not performing to these standards for the life of the warranty.
- C. Definitions
1. The term "permeable" in the context of this warranty shall mean that the field underlayment material shall provide a minimum vertical drainage rate of 20 inches per hour.
 2. The term "not shrink" in the context of this warranty shall mean that the field underlayment panels shall remain butted together without gaps exceeding ¼ inch in any location across the field.

3. The term "buckle" in the context of this warranty shall mean that the field underlayment shall lay flat on the base without warping or creating surface irregularities in excess of ¼ inch.
- D. Contractor shall replace with new materials, at their sole expense, any field underlayment materials that do not comply with these warranty requirements.
- E. These warranties and the Contractor's obligations here-under are expressly conditioned upon;
 1. The Owner maintaining and properly caring for the synthetic turf and field underlayment system in accordance with the Contractor's maintenance manual and instructions;
 2. The Owner complying with the dynamic and static load specifications established by the Contractor.
- F. The warranty is not to cover any defect, failure, damage caused by or connected with abuse, neglect, deliberate acts, act of God, casualty, static or dynamic loads exceeding Contractor's recommendations.
- G. Contractor shall be allowed to examine the field underlayment system regarding any claim that the Owner makes to be present at any time, to analyze the results of all tests conducted by the Owner or others, and to conduct such tests of their own. Contractor shall not be responsible for any costs or expenses incurred by the Owner or others with respect to such tests, except the Contractor shall pay for costs of all tests and analysis conducted or approved by the Owner's Representative.
- H. In the event the Contractor does not respond to the Owner's written notice within 10 days of receipt of notice or does not submit, schedule and execute corrective work within 30 days, the Owner has the option of having the work performed at the expense of the Contractor.
- I. Sample form of warranty herein set forth is a suggested form for use for the work under this section. Manufacturer's standard form of warranty may be used provided all conditions specified are incorporated. All claims by the Owner under this warranty must be made in writing to Contractor's address at _____ within 30 days after the Owner learns of the defect giving rise to the claim. This warranty shall constitute a contract made in the State of California and shall be governed by the laws thereof.

1.15 WARRANTY TESTING

- A. The turf for the football/soccer field is to be tested for dynamic cushioning ("G" Test) by an experienced independent testing laboratory acceptable to the Engineer or Owner at the completion of the installation shortly prior to acceptance inspection by the Owner/Engineer, at the anniversary date of the first year, second year, fourth year, sixth year, and 60 days prior to the anniversary date of the warranty expiration. If conditions of the Specifications and/or Warranty are not met, the Contractor has the option of corrective work or replacement. In the event corrective work does not meet the requirements of the Specifications after a second attempt to bring the system within these limits, then the Contractor is to replace non-conforming areas or sections solely at the Owner's discretion and direction.
- B. Tests shall be performed in accordance with ASTM F-1936-10 and F355.
- C. Test locations as designated in F-1936-10, Paragraph 8.1. Included in the report shall be the measured depth of the infill material at all test locations.

- D. All costs for the stated testing shall be paid by the Synthetic Turf Surfacing Contractor.
- E. If the Contractor does not have the tests performed within 10 days of specified times listed, the Owner has the option of ordering the testing work at the expense of the Synthetic Turf Surfacing Contractor.

PART 2 - MATERIALS

2.01 GENERAL

- A. Infilled Synthetic Turf: The turf system shall be a vertical-draining permeable synthetic turf system. The turf system shall consist of a synthetic grass-like surface pile, which shall be tufted into a synthetic backing.
- B. All backing layers and coatings shall be firmly bonded together. Coating materials must be completely cured and bonded to the other backing layers. Synthetic turf panels or rolls that do not meet this requirement will be rejected.
- C. The entire system shall be resistant to weather, insects, rot, mildew, and fungus growth, and be non-allergenic and non-toxic. The entire system shall be constructed to maximize dimensional stability, to resist damage and normal wear and tear from its designated use, and to minimize ultraviolet degradation.
- D. All adhesives used in bonding the system together shall be resistant to moisture, bacterial and fungus attacks, and resistant to ultraviolet rays at any location upon installation.

2.02 DYNAMIC CUSHIONING REQUIREMENTS

- A. The dynamic cushioning of the system shall not exceed a maximum value of 130 G's per ASTM, F1936-10 and ASTM, F355, procedure A at any location upon installation.

2.03 SUPPLEMENTAL PAD COMPOSITION (ADDITIVE ALTERANTE)

- A. The supplemental pad system shall be either an interlocking polypropylene panels or a paved in place elastic layer pad. The shock-absorbing pad shall become part of the base for the synthetic turf surfacing system where noted.
- B. Polypropylene Panels:
 - 1. The panels shall be interlocking with gaps that allow for thermal expansion and contraction but do not exceed 0.25 inches. The panels shall be designed and manufactured specifically for in-filled synthetic turf underlayment applications. The panels shall meet the following minimum requirements:
 - Size: 61 x 42 inches interlocking panels
 - Area: Net coverage per panel 16.90+/- ft²
 - Thickness: 0.90" (23mm) +/- .18"
 - Panel Weight: approximately 4.1 lbs / panel
 - 2. Company must demonstrate successful installations totaling a minimum of 5 million square feet of manufacturer's material.
 - 3. The panels shall provide the following minimum performance requirements:
 - Surface contact: 50% minimum with synthetic turf backing,

Friction coefficient: movement of artificial turf over 50mm distance 8.92N maximum force ISO 8295
 Shock Absorption: 60-70% per EN 14808
 Vertical Deformation: less than 4 mm per EN14809
 Repeated impact compression resistance: 106psi, repeated load, 20,000 cycle's system test with infilled turf; not to exceed 3%
 Bacteria and Fungi resistance: Pass per ASTM G22-76/G21-96
 Water Quality: ESSM 105-d/1997 Pass

Material must be 100% recyclable, recycling for energy through combustion is not acceptable. Manufacturer must demonstrate recycling process as part of the pre-approval process.

4. Manufacturer Reference: Brock International Power Base or pre-approved equal
 Brock International
 2840 Wilderness Place
 Boulder, CO 80301
 Telephone: (303) 544-5800
5. Manufacturer Warranty: The interlocking polypropylene panels shall include a 20 year manufacturer's warranty.

C. Polyurethane Elastic Layer Pad

1. The shock-absorbing pad shall be a paved-in-place (in-situ) porous elastic layer and shall become part of the base for the system.
2. The elastic layer shall be porous and shall resist the effects of adhesives, water, freeze-thaw, heavy loads associated with athletic fields, compression/deflection, rot, mold, mildew, bacteria, and air-borne pollution.
3. Single Layer Installation: The paved-in-place (in-situ) elastic layer shall be installed in one lift to a minimum thickness of 25mm. The elastic layer shall contain only the following:

Components	% by Weight
Granulated SBR rubber (1-5mm)	43-47%
Clean-washed "bird's-eye" aggregate (3-6mm)	44-48%
Single component high quality polyurethane binder	6-8%

4. The exact material mix ratio may be altered to provide strength, shock attenuation (in conformance with the 120G limit specified herein) and to provide permeability as approved by the Engineer. Installer may submit an elastic layer formulation with minor modification for Engineer's consideration and approval.

2.04 PERMEABILITY REQUIREMENTS OF THE SYNTHETIC TURF SYSTEM

- A. The system including the synthetic turf, infill materials and the supplemental pad shall drain vertically a minimum of 20 inches precipitation per hour without visible surface ponding.

2.05 SYNTHETIC TURF PILE SURFACE

- A. The pile surface shall provide good traction in all types of weather with the use of conventional "sneaker-type shoes" and composition, molded-sole athletic shoes.
- B. The pile surface shall be suitable for both temporary and permanent line markings using rubber-base paint where applicable.

- C. Pile surface shall be nominally uniform in length for all portions of the field. Synthetic turf panels or rolls with irregular pile heights or with "J hooked" fibers that extend more than 1/4 inch above the surrounding fibers will be rejected.

2.06 SYNTHETIC TURF FABRIC SURFACE

- A. The fabric surface shall be constructed and installed in minimum 15-foot widths with no longitudinal or transverse seams, except for head or tee seams at field boundaries and inlaid lines within a finished roll assembly. The seams shall be 15'-0" spacing.
- B. Rolls that do not lay evenly and with full dimension width will be rejected. No fitted pieces or relief cuts will be allowed to true alignment.
- C. The color shall be uniform with no visible deviations in shade permitted. Rolls that do not meet this requirement will be rejected.

2.07 SYNTHETIC TURF SYSTEM MATERIAL COMPONENTS

- A. Pile fibers shall resemble freshly-grown natural grass in appearance, texture and colors.
- B. Fabric backing for the in-filled synthetic turf systems can be loose laid and anchored at the perimeter of the fields as shown in the details or adhered to the base.
- C. No transverse or "head" seams will be permitted within the football field grid (160' width x 360' length)
- D. All panel seams shall be secured with either sewing or adhesive with a supplemental fabric. Sewn turf seams shall utilize a high strength polyester fiber cord or nylon. Adhered seams shall include a minimum 12" width seam backing shall be utilized with adhesive to extend the width and length of the seam.

2.08 SYNTHETIC TURF PERFORATIONS

- A. Synthetic turf with tufted fibers and a coated backing must include either perforations in the backing for vertical drainage, or the turf shall include a partially coated backing providing permeability without the use of perforations. Certified independent test results indicating a minimum drainage rate of 40 inches per hour for the permeable backing must be provided.
- B. Perforations in turf backing to be a minimum of 3/16" diameter clear opening and shall be spaced a maximum of 4" uniformly on-center. The turf shall be perforated with a minimum of 95% integrity over entire surface. Holes must be full diameter, completely through the underside of the turf backing with no material residue or fragmented fibers remaining.
- C. Engineer shall approve the turf perforations prior to shipment, upon shipment onsite, or during on-site perforating operations as applicable.
- D. If the non-permeable backing material exceeds 12 inches in width it shall be perforated in accordance with paragraph 2.7 of this section. Perforations shall be drilled from the surface after the adhesive has set.

2.09 LINES AND MARKINGS

- A. A complete field lining, marking and field boundary system with team area limits, etc., shall be provided with the initial installation of the surfacing system. Layouts shall be accurately surveyed and marked prior to installation.

- B. All lines and field markings shall be tufted in or installed as synthetic turf inlays. Wherever possible, lines shall be tufted into the turf panels in lieu of inlays. All markings shall be uniform in color, providing a sharp contrast with the turf color, and shall have sharp and distinct edges. Markings shall be true and shall not vary more than 7/32" from specified width and location.
- C. Manufacturer shall guarantee the synthetic turf is adaptable to painted lines in the event painting is utilized in the future.
- D. For cemented seams, use supplemental backing material. The supplemental backing material shall bridge all inlaid lines and markings a minimum of 4 inches on each side of the seam. Supplemental backing material that is greater than 12 inches in width shall be perforated in accordance with paragraph 2.7 of this section. Perforations shall be drilled from the surface after the adhesive has set.

Football:

- | | | |
|-----|---------------------------|---|
| 1. | Playing field boundaries: | 12" wide white line and 60" purple boarder except between 25 yl, where the boundary shall be a 72" wide white panel |
| 2. | Goal line: | 8" wide white lines |
| 3. | Each 5-yard line: | 4" wide white lines |
| 4. | 50 yard line: | 4" wide white framed in 4" wide yellow |
| 5. | Each 1-yard inbound line: | 4" x 2' white lines |
| 6. | Each 5-yard inbound line: | 4" x 6" white line (each side of yard line) |
| 7. | Each 1-yard marker: | 4" x 2' white line |
| 8. | 3-yard line: | 4" x 6' wide white line |
| 9. | Team box lines: | 4" wide white lines extending from the 25 yard line |
| 10. | Number size: | 6' high x 4' wide |
| 11. | Number face: | 12" |
| 12. | Number arrows: | 6" high and 18" wide white turf |
| 13. | Number color: | white |
| 14. | Mid Field Logo: | white & purple as shown on the plans |
| 15. | End zone panels: | purple as shown on the plans |
| 16. | End zone letters: | white letters for "CARROLL COLLEGE" and "FIGHTING SAINTS" as shown on the plans |

Soccer:

- | | | |
|----|-----------------------------|------------------------|
| 1. | Playing field boundaries: | 4" wide yellow lines |
| 2. | Mid-field line: | 4" wide yellow line |
| 3. | Goal and penalty boxes: | 4" wide yellow lines |
| 4. | Center circle & penalty arc | 4" wide yellow lines |
| 5. | Corner kick arc | 4" wide yellow lines |
| 6. | Corner kick hash marks | 4" wide x yellow lines |
| 7. | Center spot: | 9" diameter yellow dot |

2.10 MINIMUM SPECIFICATIONS FOR SYNTHETIC TURF SYSTEM MATERIALS

- A. The minimum material specifications shall be provided by each vendor/manufacturer with their

RPF proposal documents as listed on the Material Product Data Sheet that must be included with each proposal. The material specifications included with each proposal shall be considered minimum values and will be verified and enforced and will be the basis for Owner's testing. Material that fails to meet these minimum specifications will be rejected. The manufacturer of the synthetic turf fiber and fabric may elect to exceed these specifications to ensure compliance with all requirements and the warranty as specified in this section.

- B. Color of synthetic turf to be medium green as approved by Owner. Additional turf colors shall be as called for in Section 2.8 for lines and markings. The fiber used for the lines and markings shall be of the same composition as that used for the green areas.
- C. Pile fiber shall be either long parallel slit film, monofilament, or a combination thereof with athletic quality yarn designed specifically for outdoor use and stabilized to resist the effects of ultra-violet degradation, heat, wear, water and airborne pollution.
- D. Fiber shall be certified to have less than 50 ppm or less of lead from both the fiber supplier and the turf vendor.
- E. Fiber Wear Simulation: Fiber shall exhibit no splitting or appreciable degradation after a minimum of 20,000 cycles of simulated Lisport wear testing and shall remain serviceable without appreciable face weight loss after a minimum of 40,000 cycles of simulated Lisport wear testing.
- F. Fabric Composition: Shall consist of 100% polyethylene yarn tufted into polypropylene backings coated with high-grade polyurethane. Coating and backing materials shall assure suitable tuft bind strength, dimensional stability, and long-term wearing properties.

2.11 INFILL MATERIALS

- A. The synthetic turf shall utilize a combination of sand and rubber infill materials. The maximum sand content shall not exceed 30% by volume and shall not be less than 20% by volume. Proprietary infill volumes with greater than 30% sand will be considered on a product by product basis. The exact in-fill material ratio may be altered to provide strength, shock attenuation, and to provide permeability by the vendor/installer as approved by the Engineer, however the minimum sand by volume shall not be less than 20%.
- B. Infill material shall be applied in a dried condition when the turf is dry. It shall be applied in uniform layers effectively dragged and/or brushed to distribute the material uniformly onto the backing of the turf.
- C. The sand infill material shall be graded silica sand, sub-round to round, compaction resistant, washed and dried. The sand shall meet the following criteria:

Percent Silica	80-95%
Shape	Round to Sub-round
Sphericity	0.65 – 0.85
Roundness	0.60 – 0.70
Hardness (Moh)	7

The sand gradation shall meet the following wet sieve analysis:

<u>Sieve Size</u>	<u>Percent Retained</u>
#16	0% – 5%

#20	10% – 20%
#30	50% – 70%
#40	15% – 25%
#50	0% – 10%
#100	0% – 5%
Pan	0% – 2%

D. Rubber Infill:

- The rubber shall be 100% SBR ambient or cryogenically processed free of any tire cord and steel materials or kevlar. SBR rubber shall be manufactured from North American automotive or truck tires and shall be generated from California based tires. Tires more than 10 years old from date of production are not allowed. The rubber infill material gradation shall meet the following size requirements:

2.0 – 1.5 mm	0% - 10%
1.5 – 1.0 mm	10% - 30%
1.0 – 0.5 mm	40% - 80%
0.5 – 0.0 mm	0% - 10%

- SBR rubber shall be certified in writing to have less than 50 ppm or less of lead from both the rubber supplier and the turf vendor.
- Infill material shall be applied in a dried condition when the turf is dry. It shall be applied in uniform layers effectively dragged to distribute the material uniformly to the backing of the turf.
- The application rate shall provide a total minimum weight of 3.0 lbs of rubber infill material per square foot of the turf area.
- Maximum exposed fiber height shall range from ¾" to ½" after infill placement, settling, and compaction, however in no instance shall exposed pile height conflict with any known patents.

2.12 MAINTENANCE EQUIPMENT – SWEEPER UNIT

- The Contractor shall provide one tow behind sweeper/ provide ground driven rotary brush for the cleaning and maintenance of the infilled synthetic turf. Unit shall:
 - Provide for metered re-application of infill material with simultaneous dirt removal through 2 sieve trays
 - Provide sieve trays with variable settings from 4-10MM;
 - Adjustable depth row of tines for decompact infill material
 - Working width to be nominally 6 ft.
 - Rear mounted drag brush.
 - Provide connections for tow behind standard tractor or utility vehicle.
- Manufacturer's Reference: The sweeper unit shall be SMG TurfCare TCA 2000 or approved equal. Contact SMG Equipment LLC, (253) 350-8803 / www.smgequipment.com.

2.13 MAINTENANCE EQUIPMENT – DRAG BRUSH UNIT

- One tow-behind drag unit shall be furnished to the Owner with the surfacing system.

- B. The drag brush unit shall include 3-point hitch, rear-mount with tow coupling.
- C. Include four specially-arranged brush rows to level surface of turf with infilling granulate
- D. Working width to be nominally 5 ft.
- E. Manufacturer's Reference: The unit shall be SMG Turftuner TT1600 or approved equal. Contact SMG Equipment LLC, (253) 350-8803 / www.smgequipment.com.

2.14 ALTERNATE FIELD EQUIPMENT

- A. The synthetic turf vendor may request to substitute equipment for those specific units specified, provided an equivalent function is provided to the specified equipment.

PART 3 - INSTALLATION

3.01 CERTIFICATION OF FIELD BASE INSTALLATION

- A. The Contractor or the Contractor's subcontractor shall perform an inspection of the permeable aggregate and submit written certification of acceptance of the base for the installation of the synthetic turf system.
- B. Summary of certification shall include, but not be limited to:
 - 1. Acceptance of the base construction "finish surfaces" as totally suitable for the application of work specified under this section.
 - 2. Verification and certification of the infiltration and permeability rates of the permeable aggregate as applying to the warranty.
- C. All discrepancies between the required materials, application and tolerance requirements noted by the turf installer shall be brought immediately to the attention of the Contractor and the Engineer. Failure of the turf installer to immediately inform the Contractor and Engineer of any prior work that does not meet the required specifications will result in the turf installer being required to perform any work needed to bring the base to acceptable condition.

3.02 SUPPLEMENTAL PAD INSTALLATION (ADDITIVE ALTERNATE)

- A. Polypropylene Panel Installation:
 - 1. Acceptance of the base construction "finish surfaces" as totally suitable for the application of work specified under this section.
 - 2. Use only new materials manufactured and shipped for the specific installation. No used, recycled or refurbished materials are to be installed. Manufacturer must provide documentation of material content and MSDS sheet for submittal package.
 - 3. Product to be shipped as flat panels on prepackaged pallets. Pallets to be wrapped with heavy-duty barrier for protection from moisture and UV exposure.
 - 4. Seams should be mechanically locked into place by hand without use of additional materials, glue, fasteners or secondary processes or equipment.
 - 5. Material must be installed using manufacturers guidelines.
 - 6. Manufacturer must provide written procedures to selected turf supplier for the installation of turf on top of underlayment.

7. Surplus materials to be determined by the Owner prior to order and delivery of product to the installation site. Surplus quantities to be identified in writing by the General Contractor at the time of order placement.
8. Upon completion of installation, a walk-through will be conducted to inspect the quality of work and ensure all details meet specifications.
9. Perform all work in strict accordance to the drawings, shop drawings and manufacturer's installations and instructions.

B. Elastic Layer Pad Installation

1. The Superintendent shall thoroughly inspect all materials delivered to site both for quality and quantity to assure that the entire installation shall have sufficient material to maintain proper mixing ratios.
2. Installation of the elastic layer shall not take place if the ambient temperature is below 50 degrees F, if the material is wet, or if rain is falling or pending.
3. The material to be placed shall be mechanically mixed to obtain a homogeneous mixture. Extreme care shall be taken under the immediate supervision of the Superintendent in the weighing and mixing of the components to maintain a uniform mixture with predictable and consistent performance characteristics across the entire field area. The polyurethane shall be of sufficient volume to obtain satisfactory long-term bonding of the components but shall not be of such volume as to render the elastic layer hard and uncomfortable for athletic use.
4. The elastic layer shall be installed with a paving machine that utilizes an electrically heated finish surface screed bar. The paving machine must be operated by a minimum of two skilled technicians at all times.
5. All seams shall be hand rolled and cold pad joints shall be primed with a polyurethane primer supplied by the binder manufacturer.
6. The Superintendent must consistently monitor thickness of the elastic layer and supervise all mixing ratios by means of component weight checks.
7. The elastic layer pad must cure free of foot and equipment traffic for 48 hours after placement.
8. The finished elastic layer must be properly compacted, uniform in texture, density, thickness, and tolerance to grade and suitable as a shock attenuation pad providing dynamic cushioning for the turf system.
9. The elastic layer shall have minimum thickness of 25 mm. The finished surface shall not vary more than 1/4" in 10' (6.25mm in 3.0 meters) measured in any direction as gauged from a string line or straight edge.
10. The Contractor shall test the permeability of the in-situ pad prior to synthetic turf installation. The pad shall be tested in a minimum of six (6) representative locations. The test results shall be submitted to the Engineer prior to synthetic turf installation.

3.03 SYNTHETIC TURF INSTALLATION

- A. Perform all work in strict accordance to the drawings, specifications, shop drawings and manufacturer's specifications and instructions.
- B. Verification: The Contractor is responsible for inspecting, verifying, and accepting all installed work of this section.
- C. Environmental Conditions: Do not apply adhesive materials or infill material when:
 1. Ambient air temperature is below 50 degrees F.
 2. Material temperatures are below 50 degrees F.

3. Rain is falling or pending
4. Conditions exist, or are pending, that will be unsuitable to the installation of the system.

D. Preparation:

1. Accept base onto which the synthetic turf surfacing system and the anchoring system are to be applied, as specified above.
2. Immediately prior to application of the synthetic turf, the base shall be thoroughly cleaned of all foreign material, soil, or any other substances that may be detrimental to permeability and the installation of the turf system.

3.04 INSPECTION OF MATERIALS

A. Prior to installation, and immediately upon delivery of synthetic turf system materials to the project site, the Synthetic Turf Surfacing Contractor shall inspect material as follows:

1. For damaged or defective items;
2. Measure turf pile height and thickness of each roll;
3. Measure backing perforation diameter and spacing;
4. Reject damaged materials and all materials out of tolerance with this specification.

B. After installation, inspect project area for acceptable seaming, adhesive bonding, uniformity of color of turf, bubble- and wrinkle-free surface smoothness as laid, field lines and markings, insert installations, edge details. Remove and/or repair deficient workmanship in a manner consistent with these specifications prior to requesting the Engineer's inspection pursuant to completion and acceptance of the work.

3.05 OWNER'S TEST

A. Owner may have samples of the turf submitted and tested for verification of conformance to specifications. Turf system acceptance is subject to the results of these tests.

B. Any material so tested and found not conforming to specification will be rejected and replaced with material conforming to the specification at Synthetic Turf Surfacing Contractor's expense. Re-submittal shall be required.

3.06 SYNTHETIC TURF INSTALLATION

A. Perform all work in strict accordance to the drawings, shop drawings and manufacturer's specifications and instructions.

B. Verification: The Contractor is responsible for inspecting, verifying, and accepting all installed work of this section.

C. Environmental Conditions: Do not apply adhesive materials or infill material when:

1. Ambient air temperature is below 40 degrees F.
2. Material temperatures are below 40 degrees F.
3. Rain is falling or pending
4. Conditions exist, or are pending, that will be unsuitable to the installation of the system.

D. Preparation:

1. Accept base onto which the synthetic turf surfacing system and the anchoring system are to be applied, as specified above.
 2. Immediately prior to application of the synthetic turf, the base shall be thoroughly cleaned of all foreign material, soil, or any other substances that may be detrimental to permeability and the installation of the turf system.
- E. Equipment and Access:
1. Passenger vehicles shall not be allowed to park or staged upon the completed aggregate surface either prior to or during installation of the synthetic turf.
 2. Equipment utilized during construction including compressors, generators, etc. shall be in complete working order, with exhaust systems oriented vertically and away from the synthetic turf surface. At any location where equipment is parked and/or staged on the turf surface during installation, adequate protection of the finish turf surface will be required including, but not limited to heat resistant panels to ensure 100% viability of the finish turf surface and fibers. Should a portion of the turf be damaged as a result of installation techniques, the entire turf panel may be subject to rejection and replacement at the direction of the Owner's Representative.
- F. The fabric surface shall be constructed and installed in 15 -foot minimum widths with no longitudinal or transverse seams, except for head or tee seams at field boundaries and inlaid lines within a finished roll assembly.
- G. Rolls that do not lay evenly and with full dimension width will be rejected. No fitted pieces will be allowed to true alignment.
- H. Bonding of Material Surfaces: The bonding or fastening of all system material components shall provide a permanent, tight, secure and hazard-free, athletic playing surface. System material components include:
1. Bonding all seams and inlaid line and markings
 2. Bonding and seaming must maintain their integrity for total length of warranty period.
- I. Seams:
1. All turf seams shall be either sewn with high strength polyester fiber cord or nylon or adhered to a supplemental backing material.
 2. Backing layers must lie flat on the field base to provide a uniform pile surface.
 3. The width between fiber rows at the seam locations shall not exceed that of the tufting gauge of the turf materials.
 4. All sewn seams shall be brushed to provide full coverage of fiber over the thread.
- J. Turf Edges: Turf edges to be as shown on the edge fastening detail and nailed at the perimeter.

3.07 LINING / MARKING INSTALLATION

- A. Complete field markings shall be provided with the initial installation of the surfacing system. Provide lines and markings in conformance with these specifications. Layouts shall be accurately surveyed and marked prior to installation.

- B. If overlapping backing materials are utilized for the inlaid lines and markings resulting in a non-permeable surface in excess of 12 inches wide, the backing materials shall be perforated in conformance with section 2.08 after gluing and prior to installation of the infill material.
- C. Painted lines and markings shall be crisp and distinct, with no weeping or overspray. Application of paint shall be exactly aligned with required dimensions and a guide wire/string line shall be used to produce straight lines.
- D. Contractor shall reapply paint if markings exhibit any appreciable fading or degradation within three months of initial application.

3.08 SYNTHETIC TURF EDGE ANCHOR INSTALLATION

- A. Anchor synthetic turf along the sides and ends with the existing edge nailer board as shown in the details. Complete any adjustments/additions to the turf nailer board to ensure the top of the infill meets and matches the top of the concrete or rubberized surface edge directly adjacent to the synthetic turf.

3.09 IN-FILL INSTALLATION

- A. The in-fill material shall be applied in a dry condition and when the synthetic turf is dry.
- B. The synthetic turf installer shall not infringe upon any current or pending patents held by other synthetic turf manufacturers or installers with the installation of the in-fill materials.
- C. The infill materials will be installed with a minimum of 12 applications. The infill installation shall not result in fiber material trapped below the surface of the infill material. If fiber is trapped below the surface, a portion or all of the infill material must be removed and reinstalled.
- D. The infill material shall be installed at a uniform depth across the entire field area. Infill depths shall not vary by more than +/- 5 mm from the design infill level indicated in the approved submittals across the entire synthetic turf surfacing area.
- E. The in-fill materials shall be water settled to provide accelerated consolidation of the in-fill material prior to use by the Owner. Water is available from quick coupling valves located around the field, as well as the washwater/spray system. The Synthetic Turf Contractor shall utilize existing equipment to evenly apply a minimum of 1 inch of water over the entire field area for water settlement. Upon completion of the initial water settlement, the surface will be inspected the Owner and Engineer for footing stability and in-fill consolidation. The Synthetic Turf Contractor shall provide any additional water settling as required by the Owner and Engineer to achieve the desired level of in-fill stability and consolidation.

3.10 CLEANING

- A. Remove all excess materials of all types, equipment, debris, etc., from the site immediately after completion of the work. Remove all stains and other blemishes from all finished surfaces. Leave work in clean, new appearing condition, ready for use by Owner.
- B. The Contractor shall inspect the entire field area with a hand held metal detector to identify any construction materials or tools left on the field. All such materials shall be removed prior to Owner occupancy of the field.

3.11 PROTECTION

- A. Adequate protection of materials and work from damage will be the responsibility of the installer during installation and until acceptance of their work. Synthetic Turf Surfacing Contractor will be responsible for protection after the acceptance of the work until final acceptance of all contract work by the Owner. All material damaged prior to acceptance by the Owner shall be replaced at no cost to the Owner.

3.12 EXTRA MATERIALS

- A. Deliver to Owner all extra materials herein specified. Receive Owner's written receipt for all materials. Deliver receipt to Engineer.
- B. Infill Materials: Provide four (4) 33-gallon rubber trash containers with lids of each infill material used.
- C. Turf for Future Repairs: Material may be roll ends or cutoffs; however, each piece of fabric shall be at least 5' x 10'. At least one green piece shall be at least 10' x 15'. The following are minimum areas for the extra synthetic turf materials to be provided by the Synthetic Turf Surfacing Contractor to the Owner:

1. Green Turf:	1000 sf
2. White Turf:	100 LF 4" lines
3. Yellow Turf:	100 LF 4" lines
4. White Turf	500 SF
5. Purple Turf	500 SF

3.13 MAINTENANCE EQUIPMENT

- A. Contractor shall uncrate, assemble and demonstrate operation of equipment to Owner and Owner's Representatives.
- B. Following assembly of equipment, Contractor shall complete a minimum four (4) hour training session utilizing the equipment with a variety of maintenance personnel from the Sweetwater Union High School District and Olympian High School staff.

3.14 MAINTENANCE

- A. Vendor shall complete maintenance of the synthetic turf field at both 6 months and 1 year after the date of Substantial Completion. Minimum maintenance activities shall include:
 - 1. Inspect and repair as required each inlay and seam.
 - 2. Brush and remove surface debris, loose fibers and any other deleterious material. Use of a rotating, mechanical brush is recommended.
 - 3. Decompact and re-level infill materials. Import and place /top dress new infill material matching original infill materials as needed to establish original infill depth, with original installation height of exposed fiber.
- B. All maintenance activities shall be as approved and directed by the original manufacturer. All maintenance activities shall be coordinated with scheduled use of the facility and completed at the convenience of the owner and applicable user groups.

END OF SECTION

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COORDINATION NOTE

IT IS ABSOLUTELY NECESSARY THAT ALL TRADES COORDINATE WITH EACH OTHER AND VERIFY THAT THERE ARE NO CONFLICTS IN LOCATION OF DUCTS, CONDUITS, SPRINKLER HEADS, DIFFUSERS, ELECTRICAL BOXES, EQUIPMENT, AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.

COGNIZANT NOTE:

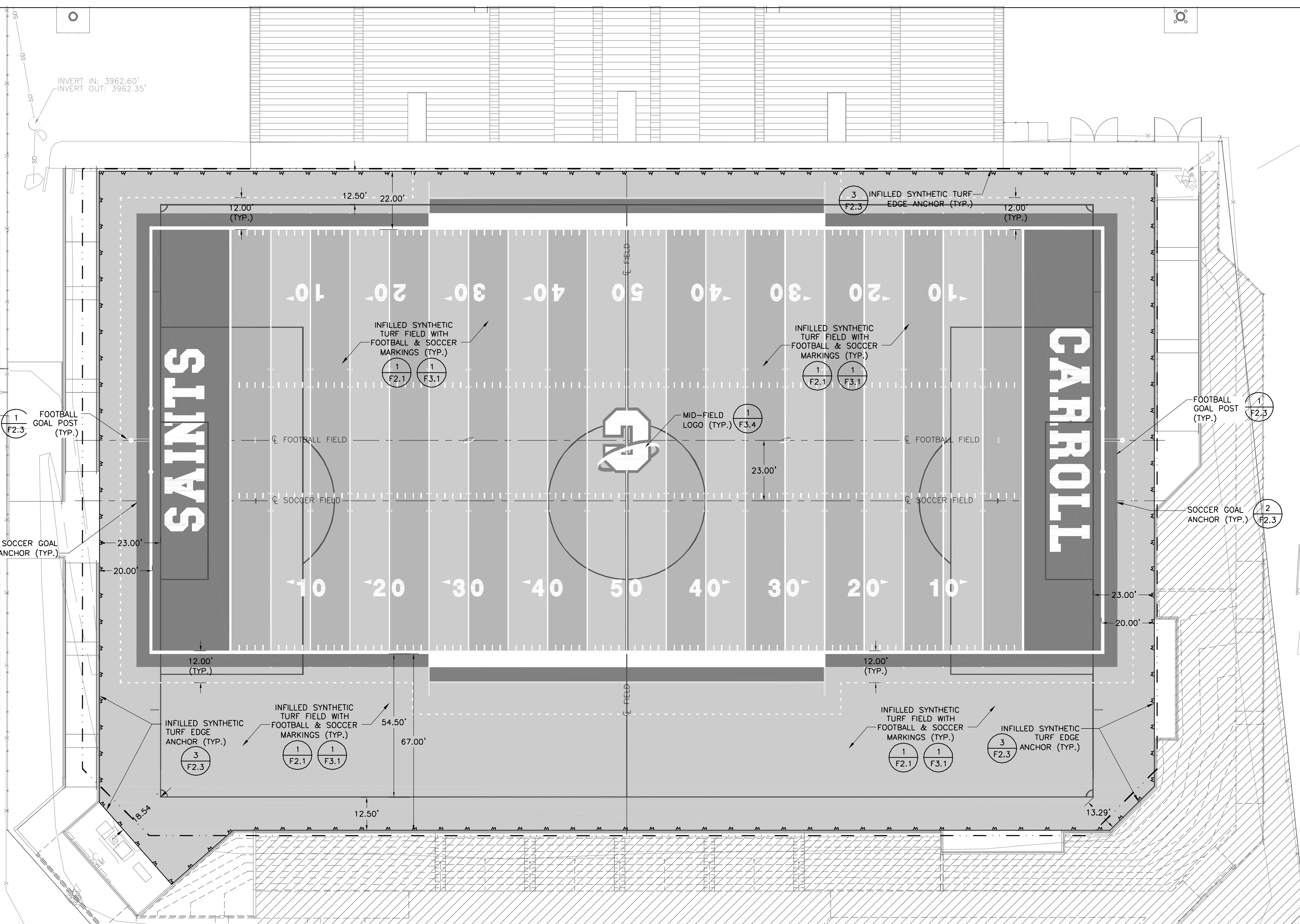
THE CONTRACTOR SHALL BE COGNIZANT THAT THIS IS A REMODEL PROJECT AND AS SUCH, CERTAIN ITEMS CANNOT BE FULLY ILLUSTRATED WORK EXPLORED WITHOUT FIELD OBSERVATION. THEREFORE BEFORE SUBMITTING A PROPOSAL, THE CONTRACTOR SHALL VISIT AND EXAMINE THE PROJECT IN EVERY DETAIL AS PERTAINS TO THIS PROJECT AND MAKE ALLOWANCES IN THEIR PROPOSAL FOR ALL CONDITIONS THAT WILL AFFECT THE WORK INDICATED IN THE PROJECT MANUAL AND CONTRACT DOCUMENTS.



CWG Architects
1650 Park
P.O. Box 1199
Helena, MT 59624
cwg@cwg-architects.com
(406)443-2340
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REVISIONS

#	DATE



LAYOUT NOTES

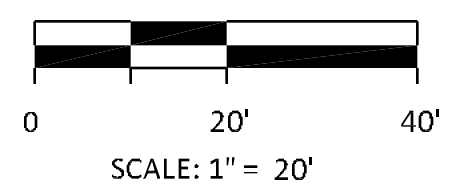
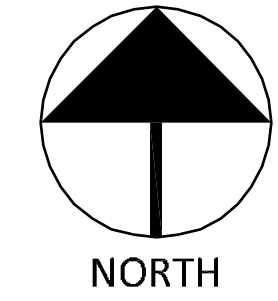
1. FURNISH AND INSTALL CONCRETE EDGE ANCHOR AROUND THE ENTIRE PERIMETER OF THE SYNTHETIC TURF FIELD AREA
2. FURNISH AND INSTALL SYNTHETIC TURF COVERS WITH SYNTHETIC TURF FOR ALL CATCH BASINS LOCATED IN THE SYNTHETIC TURF FIELD AREA.
3. FURNISH AND INSTALL RUBBERIZED SURFACING ON ALL TURF COOL BOXES FOR ALL QUICK COUPLING VALVES, BALL VALVES AND WASHWATER SPRINKLERS LOCATED IN THE SYNTHETIC TURF FIELD.
4. FURNISH AND INSTALL TWO PORTABLE SOCCER GOALS. PROVIDE 1 GROUND ANCHOR WITH TURF COVER FOR EACH SOCCER GOAL
5. ALIGN GOAL POST FOOTING LOCATION WITH OFF-SET DIMENSION.

ADDITIVE ALTERNATE BID

INCLUDE FIELD UNDERLAYMENT / SUPPLEMENTAL PAD SYSTEM CONSISTING OF EITHER A 23MM POLYPROPYLENE PANELS OR A 25MM PAVED IN PLACE ELASTIC LAYER PAD AT THE FIELD AREA.

LAYOUT LEGEND

- SYNTHETIC TURF AND PERMEABLE AGGREGATE AND AGGREGATE SUBBASE
- LIMIT OF SYNTHETIC TURF AND CONCRETE EDGE ANCHOR



CARROLL COLLEGE
PHASE 1 NELSON STADIUM - FIELD & LIGHTING
Benton Ave. Helena, MT
FIELD LAYOUT

704103
DRAWN BY REF
APPROVED DLARSH
DATE 6-2-2020

F1.1

COORDINATION NOTE

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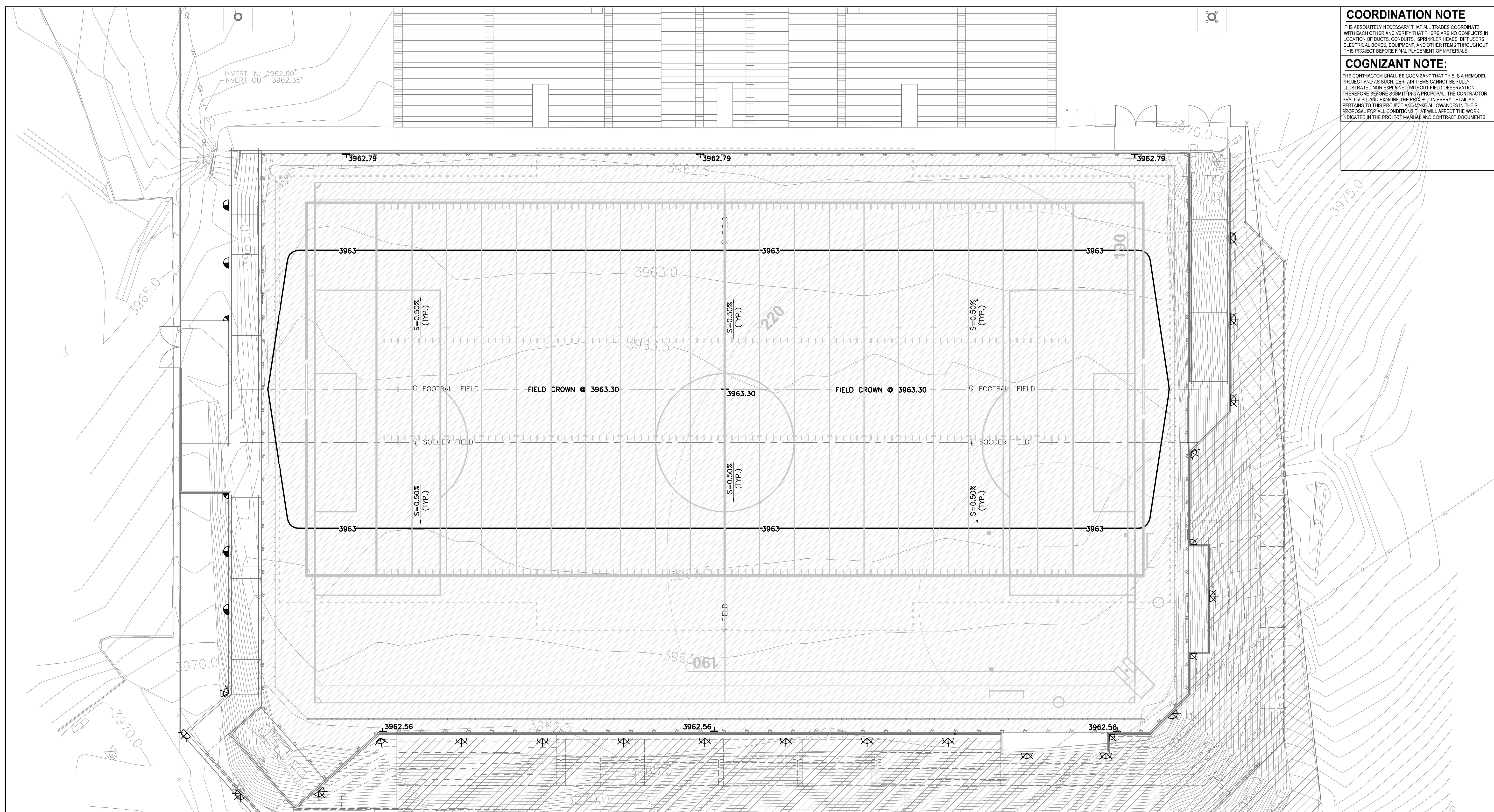
THE CONTRACTOR SHALL BE COGNIZANT THAT THIS IS A REMODEL PROJECT AND AS SUCH, CERTAIN ITEMS CANNOT BE FULLY ILLUSTRATED NOR EXPANDED WITHOUT FIELD OBSERVATION. THEREFORE BEFORE SUBMITTING A PROPOSAL, THE CONTRACTOR SHALL VISIT AND EXAMINE THE PROJECT IN EVERY DETAIL AS PERTAINS TO THIS PROJECT AND MAKE ALLOWANCES IN THEIR PROPOSAL FOR ALL CONDITIONS THAT WILL AFFECT THE WORK INDICATED IN THE PROJECT MANUAL AND CONTRACT DOCUMENTS.



CWG Architects
1650 Park
P.O. Box 1199
Helena, MT 59624
cwg@cwg-architects.com
(406)443-2340
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REVISIONS

#	DATE



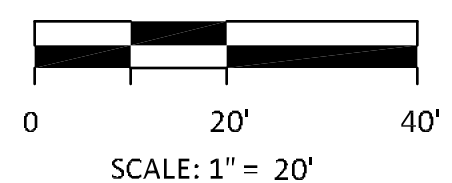
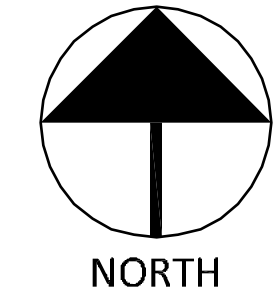
GRADING NOTES

1. THE CONTRACTOR SHALL CALL AND NOTIFY U-DIG AT 1-800-551-8344 A MINIMUM OF 2 WORKING DAYS BEFORE DEMOLITION, DIGGING, OR GRADING OPERATIONS OCCUR.
2. NEW CONTOURS SHOWN ARE FINISH GRADE ELEVATIONS.
3. BACKFILL AND COMPACT EXCAVATED AREAS RESULTING FROM DEMOLITION ACTIVITIES WITH SELECT FILL TO 95% WITH 12 INCH MAX LIFTS.
4. STRIP FIELD AREA OF EXISTING SOD AND ORGANIC MATERIALS AND DISPOSE OF OFF SITE. ALL UNSUITABLE SOIL MATERIALS SHALL BE REMOVED AND DISPOSED OF OFF SITE.
5. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN THE EVENT OR DISCOVERY OF POOR SOILS, GROUNDWATER OR DISCREPANCIES IN THE EXISTING CONDITIONS AS NOTED ON THE PLANS.
6. EXCAVATE ALL EXISTING LOAM AND TOP SOIL DOWN TO EXISTING PERMEABLE SUBGRADE SOILS AS DIRECTED BY THE OWNER'S GEOTECHNICAL ENGINEER (REFER TO GEOTECHNICAL REPORT FOR ANTICIPATED EXCAVATION DEPTH).
7. EXISTING LOAM AND TOP SOIL MATERIALS SHALL BE PLACED AND FINE GRADED ON THE EXISTING PRACTICE FIELD AREA AS DIRECTED BY OWNER.
8. THE OWNER'S GEOTECHNICAL ENGINEER SHALL APPROVE THE FIELD'S SUBGRADE INFILTRATION/ PERCOLATION RATE PRIOR TO PLACEMENT OF THE AGGREGATE SUBBASE.

9. THE FIELD SUBBASE SHALL BE SCARIFIED TO A DEPTH OF 6 INCH PRIOR TO PLACEMENT OF THE IMPORTED AGGREGATE SUBBASE.
10. THE FIRST LIFT OF AGGREGATE SUBBASE MATERIAL SHALL NOT EXCEED 6 INCHES IN COMPACTED DEPTH AND SHALL BE COMPACTED TO 92% MINIMUM AND 95% MAXIMUM.
11. SUBSEQUENT AGGREGATE SUBBASE LIFTS SHALL NOT EXCEED 12 INCH IN COMPACTED DEPTH AND SHALL BE COMPACTED TO 92% MINIMUM AND 95% MAXIMUM.
12. ALL PERIMETER PAVING SHALL MEET AND MATCH ADJACENT SURFACES.
13. SEE ARCHITECTURAL DRAWINGS FOR GRADING AT PERIMETER OF FIELD.
14. TWO OPTIONS ARE PROVIDED FOR THE CONTRACTOR'S SELECTION WITHIN THE PLANS FOR FIELD DRAINAGE AS FOLLOWS:
 OPTION 1: FURNISH AND INSTALL 12-INCH DEPTH OF ADDITIONAL AGGREGATE BASE FOR WATER STORAGE AND INFILTRATION INTO THE SUBGRADE SOILS.
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GRADING LEGEND

- 3985 EXISTING CONTOUR LINES
- 3963.75 SPOT ELEVATION
- 3962 NEW CONTOUR LINES
- S=1.56% SURFACE SLOPE
- X MATCH TO EXISTING
- LIMIT OF IMPORTED AGGREGATE SUBBASE AND PERMEABLE AGGREGATE
- LIMIT OF SYNTHETIC TURF AND CONCRETE EDGE ANCHOR



CARROLL COLLEGE
PHASE 1 NELSON STADIUM - FIELD & LIGHTING
 Benton Ave. Helena, MT
FIELD GRADING

704103
 DRAWN BY CPW
 APPROVED DLARSH
 DATE 6-2-2020
F1.2

COORDINATION NOTE

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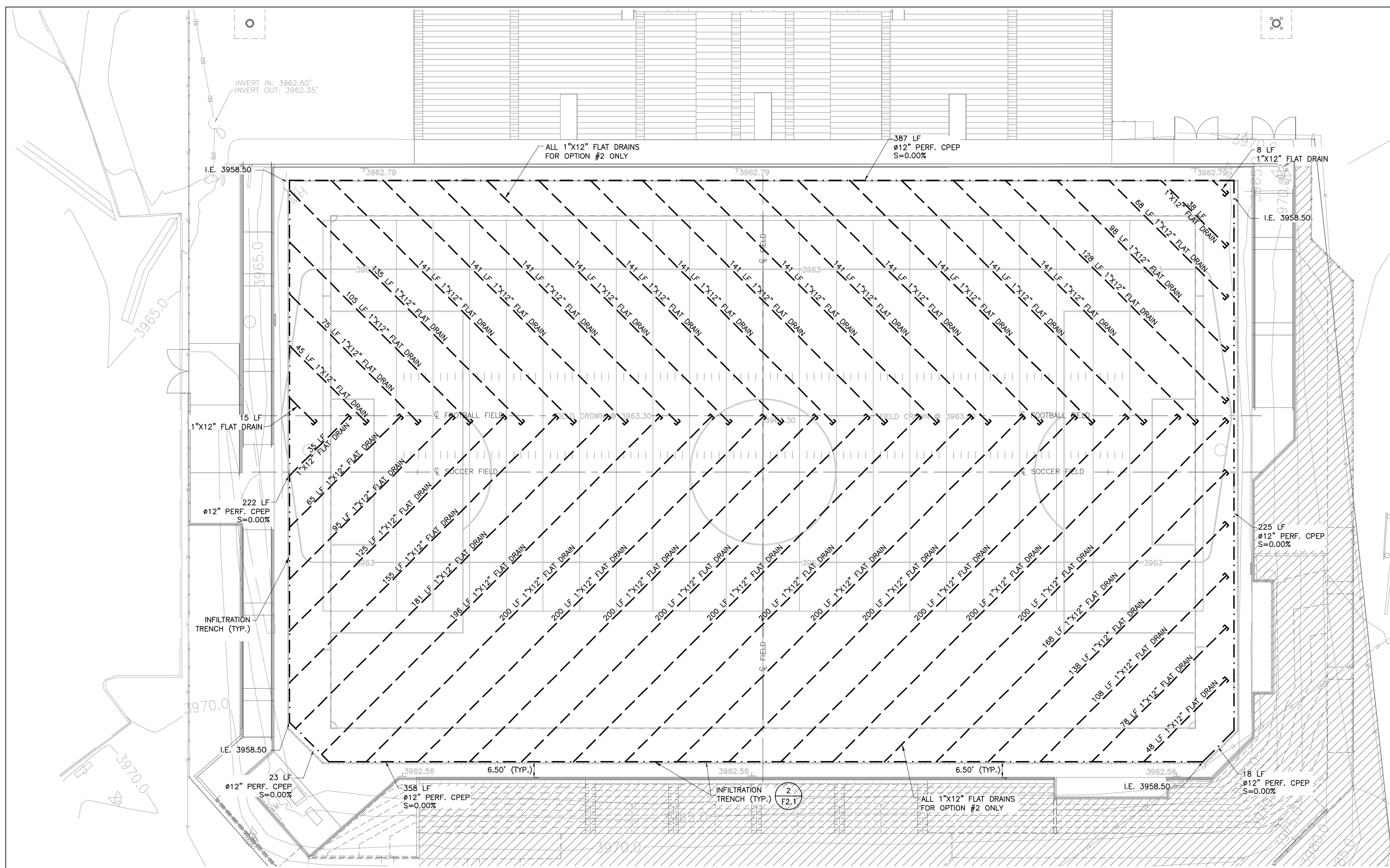
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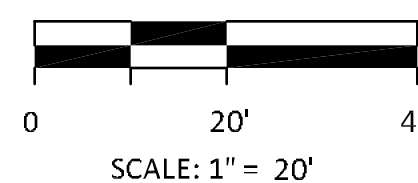
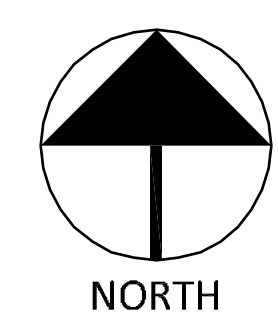
DRAINAGE NOTES

- COORDINATION: IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT THE IRRIGATION PIPING IS INSTALLED AT A SUFFICIENT DEPTH BELOW SUBGRADE BEFORE THE TRENCHING FOR THE SUBSURFACE DRAINAGE SYSTEMS TO AVOID CONFLICTS BETWEEN SYSTEMS.
- TRENCH EXCAVATION SHALL BE MADE TO THE ALIGNMENT, ELEVATION, GRADE AND SLOPE AS INDICATED ON THE DRAWINGS. TRENCHING SHALL BE ACCOMPLISHED UTILIZING EQUIPMENT WITH SLOPE AND DEPTH CONTROL, SUCH AS "LASER PLANE CONTROL SYSTEM", SO AS TO ENSURE ACCURACY IN THE BOTTOM OF THE TRENCH.
- NO HIGH POINTS ABOVE DESIGNATED INVERT OR CALCULATED TRENCH BOTTOM ELEVATION WILL BE PERMITTED. NO SLOUGHING OF SITE MATERIAL OR LOOSE EXCAVATED SOIL WILL BE PERMITTED TO REMAIN IN THE TRENCHES.
- SURPLUS EXCAVATED SOIL SHALL BE REMOVED FROM THE FIELD AREA. EXCAVATED MATERIAL MAY NOT REMAIN ON SUBGRADE.
- PROVIDE A SMOOTH, EVEN SUBGRADE AFTER REMOVAL OF THE TRENCH MATERIAL. SUBGRADE. LEAVE NO LOOSE MATERIAL ON THE SUBGRADE.
- EXCAVATION BELOW INVERT GRADE MUST BE ESTABLISHED TO A DEPTH SO AS TO PROVIDE FOR SPECIFIED PLACEMENT OF PEA GRAVEL BEDDING AT BOTTOM OF PIPE ELEVATION PRIOR TO LAYING THE PERFORATED PIPE.

- NO FOREIGN MATERIAL WILL BE PERMITTED INSIDE, ALONGSIDE, UNDER, OR ON TOP OF THE PERFORATED DRAIN PIPE.
- THE BACKFILL FOR ALL PERFORATED PIPE SHALL BE CLEAN WASHED PEA GRAVEL. REFER TO THE SPECIFICATIONS FOR THE GRADATION REQUIREMENTS.
- TOP OF CATCH BASIN COVERS MUST ACCOMMODATE SYNTHETIC TURF OR RUBBERIZED SURFACING PER DETAILS. GRADE SHOWN FOR COVER IS FINISH GRADE.
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DRAINAGE LEGEND

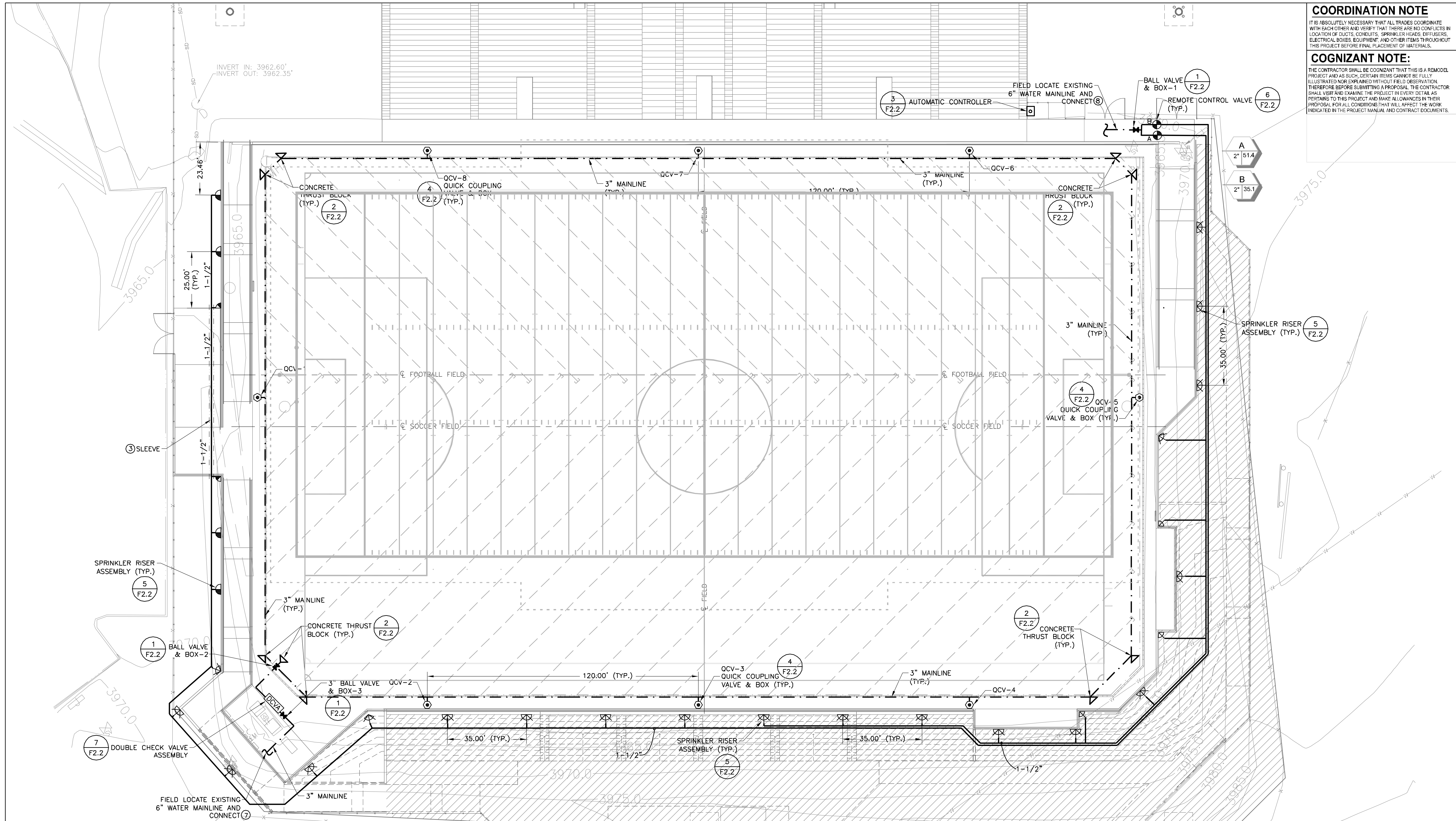
- Ø12" PERF. CORR. POLY DRAIN PIPE AND INFILTRATION TRENCH
- CPEP STORM DRAIN PIPE
- S=0.50% SLOPE
- IE 414.30 INVERT ELEVATION
- CIE 413.00 COLLECTOR INVERT ELEVATION
- 1"X12" FLAT DRAIN TUBING, FOR OPTION #2 ONLY
- END CAP



CARROLL COLLEGE
PHASE 1 NELSON STADIUM - FIELD & LIGHTING
Benton Ave. Helena, MT
FIELD DRAINAGE

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APPROVED DLARSH
DATE 6-2-2020

F1.3



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DAI HOGAN
 ARCHITECTURE
 655 PINE ST.
 HELENA, MT 59624
 (409) 443-2340
 cwg@cwghogandai.com

REVISIONS

IRRIGATION NOTES

- COORDINATE QUICK COUPLING VALVE LOCATIONS TO CORRESPOND TO THE CONCRETE EDGE ANCHOR.
- MAIN LINES AND GATE VALVES ARE SHOWN IN SCHEMATIC LOCATIONS.
- ALL PIPE CROSSING UNDER PAVED SURFACES SHALL BE SLEEVED.
- FIELD ALIGNMENT FOR FIELD QUICK COUPLERS AND FIELD SPRAY HEADS SHALL BE LOCATED 24" INSIDE THICKENED CONCRETE EDGE. PIPING IS INDICATED SCHEMATICALLY FOR GRAPHIC CLARITY. COMBINE PIPING IN COMMON TRENCHES WHEREVER PRACTICAL.
- ELECTRICAL CONDUIT WITHIN FIELD LIMIT MAY UTILIZE COMMON TRENCH WITH IRRIGATION MAINLINE. SEE FIELD LIGHTING PLAN.
- ALL IRRIGATION MAIN LINE AND LATERALS SHALL HAVE TRACER WIRE TAPED TO TOP OF PIPE.
- FIELD LOCATE THE EXISTING 6 INCH DOMESTIC WATER LINE. CONNECT NEW 3 INCH WATER LINE FOR FIELD WASHWATER TO EXISTING WATER LINE. INSTALL 2-1/2 INCH ISOLATION VALVE AND 2 1/2 INCH DOUBLE CHECK VALVE ASSEMBLY ADJACENT TO THE POINT OF CONNECTION. COORDINATE ANY REQUIRED SERVICE INTERRUPTIONS WITH THE COLLEGE.
- FIELD LOCATE THE EXISTING IRRIGATION SUPPLY LINE. CONNECT NEW 2 INCH IRRIGATION LINE FOR THE PERIMETER LAWN AREA IRRIGATION SYSTEM. FURNISH AND INSTALL AN ISOLATION VALVE AT THE CONNECTION LOCATION. INTERCEPT THE EXISTING IRRIGATION SYSTEM CONTROL WIRES FOR THE EXISTING FIELD ZONES THAT ARE BEING REMOVED. CONNECT TWO OF THE CONTROL WIRES PLUS THE COMMON WIRE TO THE TWO NEW REMOTE CONTROL VALVES.

IRRIGATION LEGEND

	ADJUSTABLE ROTARY POP UP SPRINKLER, 45 PSI, 35' RADIUS, 3.81 GPM	HUNTER I-20-04-SS-MPR-35		DOUBLE CHECK VALVE ASSEMBLY	FEBCO 850 MASTER SERIES
	ADJUSTABLE ROTARY POP UP SPRINKLER, 45 PSI, 35' RADIUS, 2.46 GPM	HUNTER I-20-04-SS-MPR-35		SCH 40 PVC IRRIGATION MAIN LINE (3")	
	ADJUSTABLE ROTARY POP UP SPRINKLER, 45 PSI, 35' RADIUS, 1.92 GPM	HUNTER I-20-04-SS-MPR-35		SCH 40 PVC IRRIGATION LATERAL LINE-2" UNLESS OTHERWISE NOTED	
	ADJUSTABLE ROTARY POP UP SPRINKLER, 55 PSI, 25' RADIUS, 2.21 GPM	HUNTER I-20-04-SS-MPR-25		24 VOLT ENERGIZER WIRE, #14 UF, SEPARATE WIRES PLUS COMMON TO CONNECT IRRIGATION REMOTE CONTROL VALVES TO CONTROLLER	
	ADJUSTABLE ROTARY POP UP SPRINKLER, 55 PSI, 25' RADIUS, 1.11 GPM	HUNTER I-20-04-SS-MPR-25		SCH 40 SLEEVING PIPE 6"	
	3" BALL VALVE AND BOX	MATCO-NORCO 758 OR APPROVED EQUAL		CONCRETE THRUST BLOCK	
	1" QUICK COUPLING VALVE AND BOX	RAINBIRD 44-LRC W/ LOCKING VINYL LID		VALVE STATION	VALVE GALLONS PER MINUTE (GPM)
	12 STATION AUTOMATIC CONTROLLER	HUNTER ICC-1200M		VALVE SIZE	2" 447
	REMOTE CONTROL VALVE IN INDIVIDUAL BOX	WEATHERMATIC 8200 SERIES OR APPROVED EQUAL			

LICENSED LANDSCAPE ARCHITECT
 ROBERT S. HARDING
 NO. 256
 STATE OF MONTANA

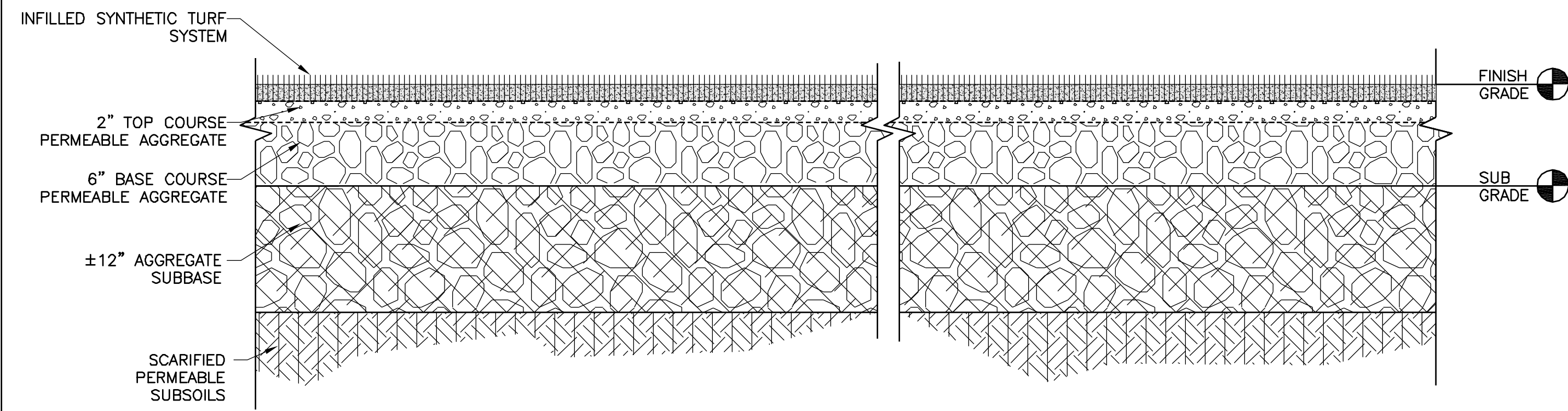
NORTH

SCALE: 1" = 20'

CARROLL COLLEGE
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FIELD IRRIGATION

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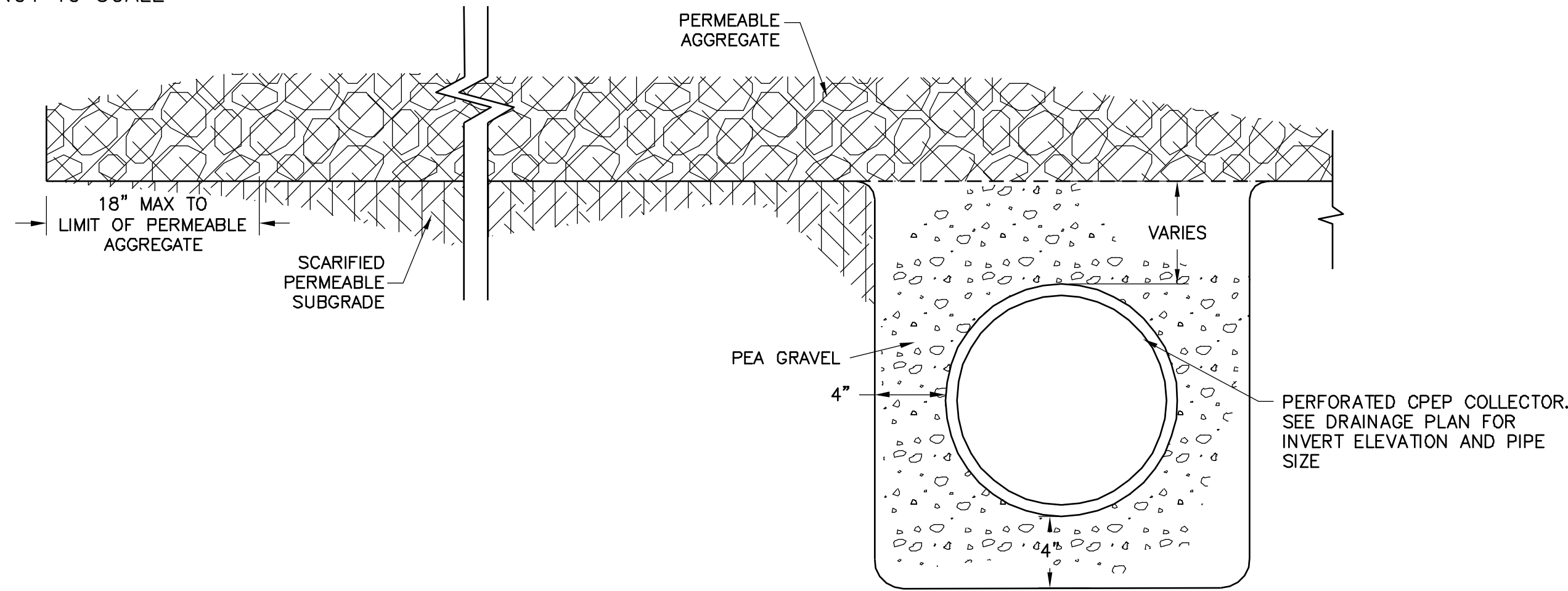


1 FIELD & DRAINAGE SECTION OPTION #1
 F2.1 NOT TO SCALE

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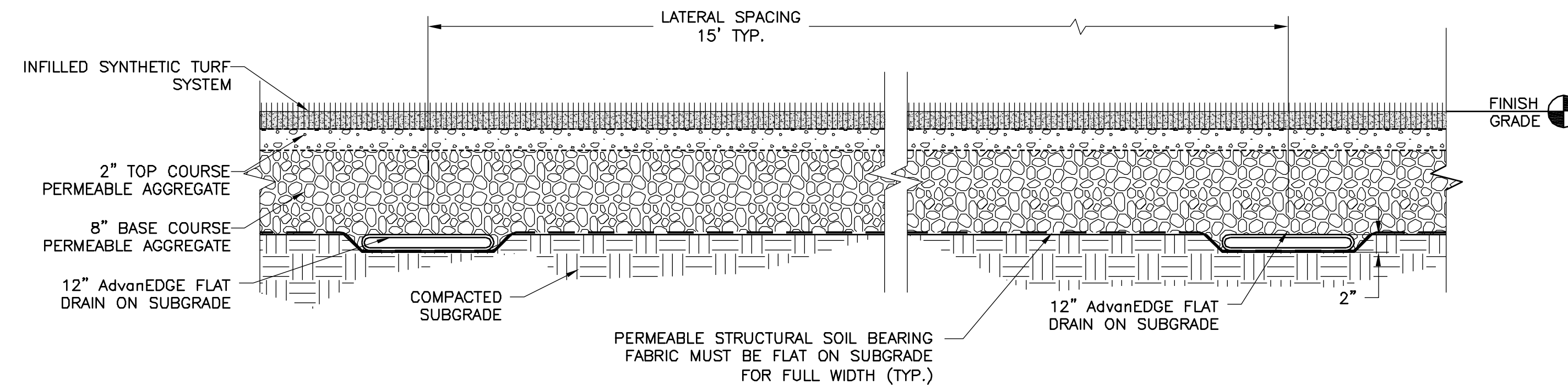


2 FIELD PERIMETER INFILTRATION TRENCH
 F2.1 NOT TO SCALE

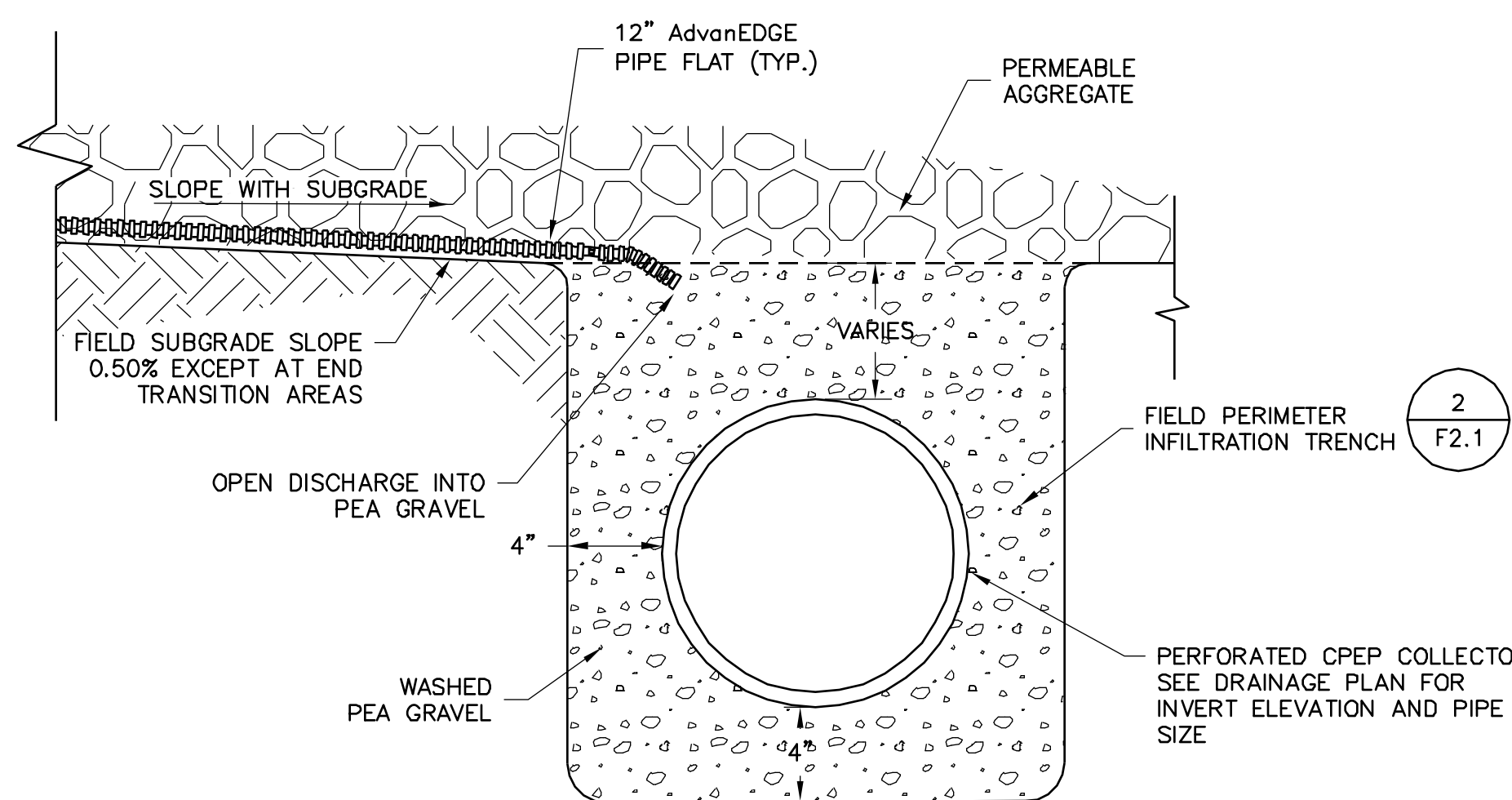
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3 FIELD & DRAINAGE SECTION OPTION #2
 F2.1 NOT TO SCALE

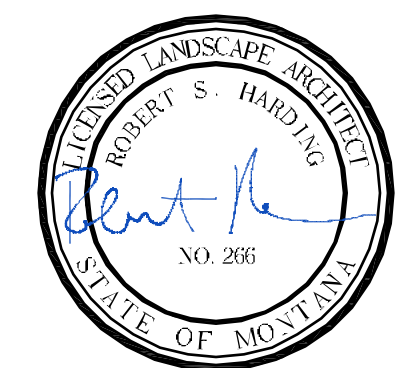


4 SUBSURFACE DRAINAGE CONNECTION
 F2.1 NOT TO SCALE

CROSSMAN WHITNEY GRIFFIN P.C.
 ARCHITECTS A.I.A.
 650 POWER STREET
 P.O. BOX 1196, HELENA, MT 59624
 (406) 443-2340 (PHONE) (406) 442-8865 (FAX)
 cwg@cwg-architects.com



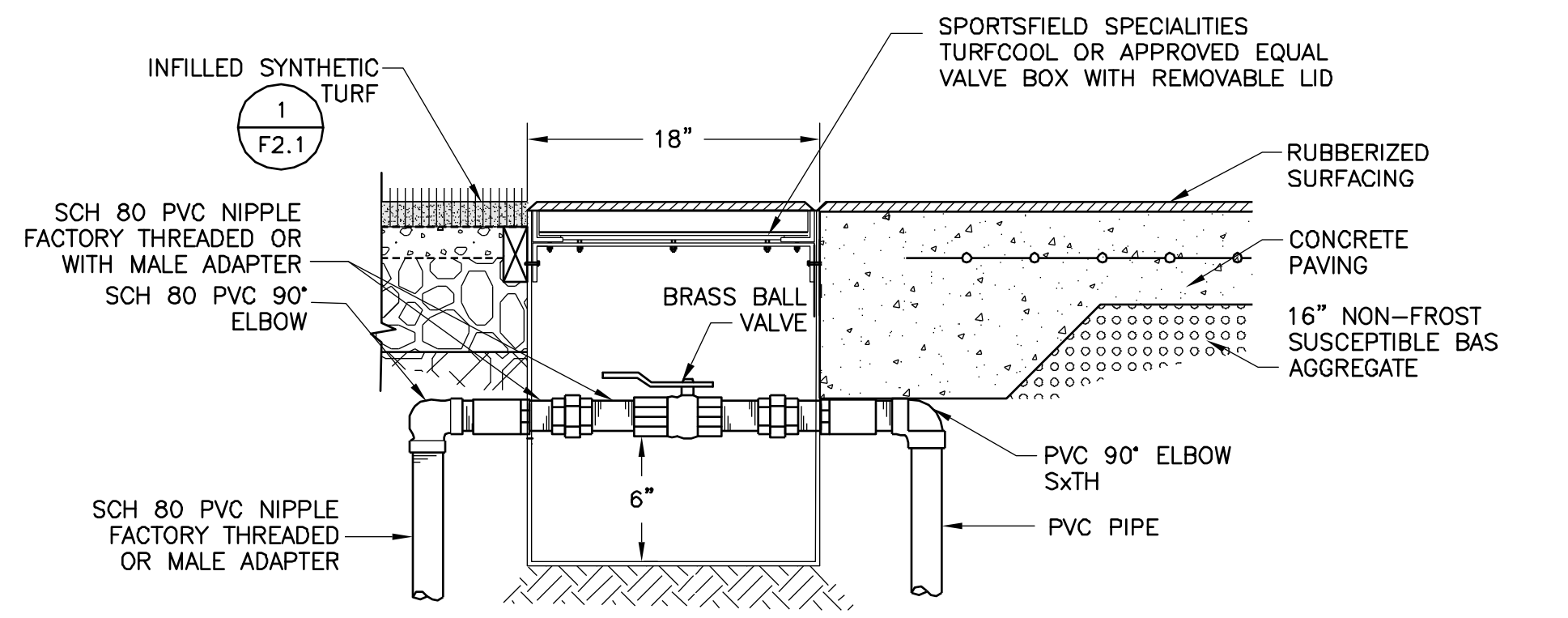
CARROLL COLLEGE
PHASE 1 NELSON STADIUM - FIELD & LIGHTING
 Benton Ave. Helena, MT
FIELD SECTION & DRAINAGE DETAILS



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 APPROVED: DL/RS
 DATE: 6-2-2020

F2.1

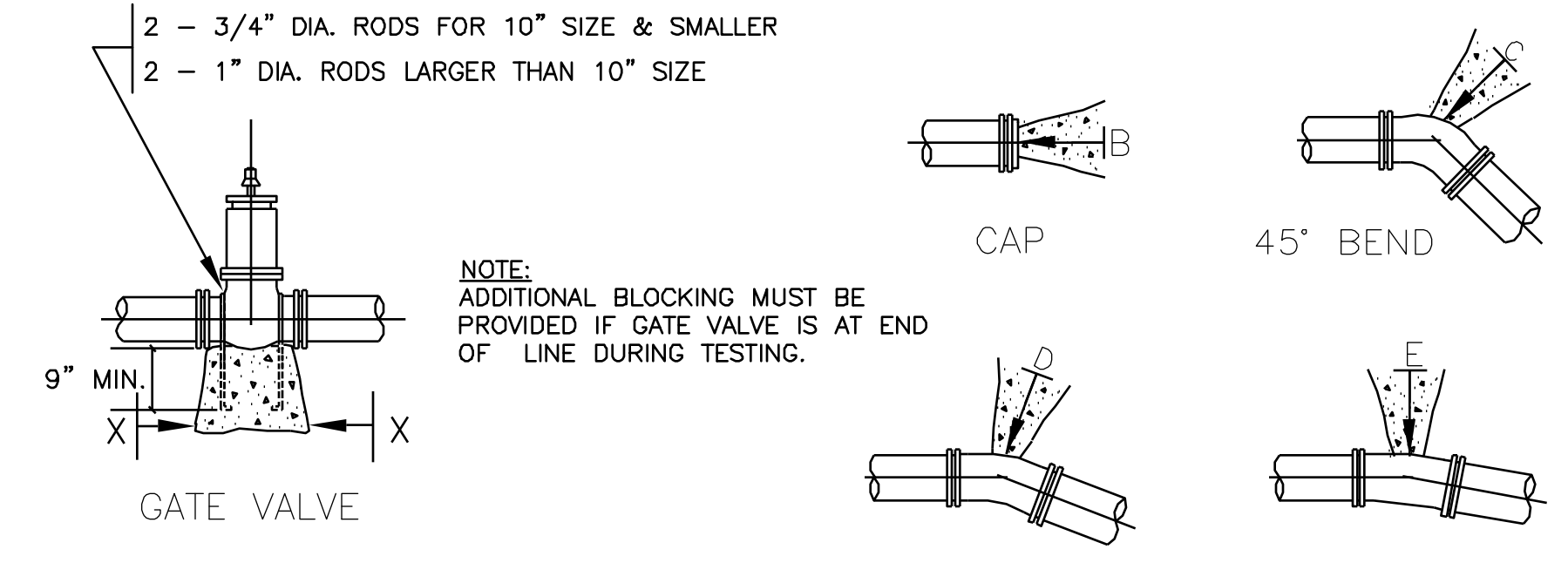
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1 BALL VALVE & BOX
 F2.2 NOT TO SCALE

THRUST BLOCK - TABLE

PIPE SIZE	PRESSURE PSI	MINIMUM BEARING AREA AGAINST UNDISTURBED SOIL SQUARE FEET					
		A	B	C	D	E	X (100 PSI)
3"	200	2/(1)	1/(NONE)	1/(NONE)	NONE	NONE	NONE
	300	2/(2)	2/(2)	2/(1)	1/(1)	NONE	NONE

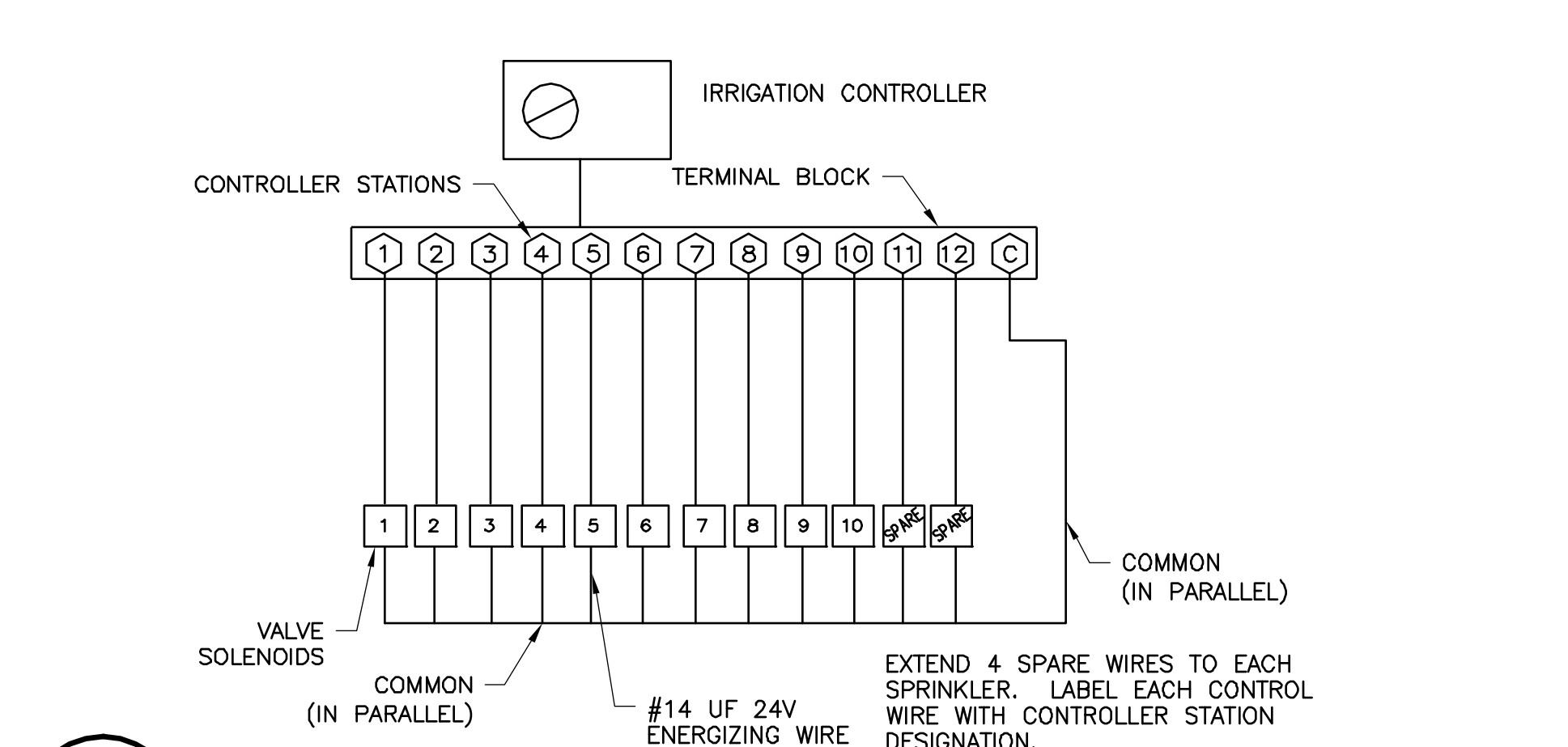


SAFE BEARING LOADS IN LB./SQ. FT.
 THE SAFE BEARING LOADS GIVEN IN THE FOLLOWING TABLE ARE FOR HORIZONTAL THRUSTS WHEN THE DEPTH OF COVER OVER THE PIPE EXCEEDS 2 FEET.

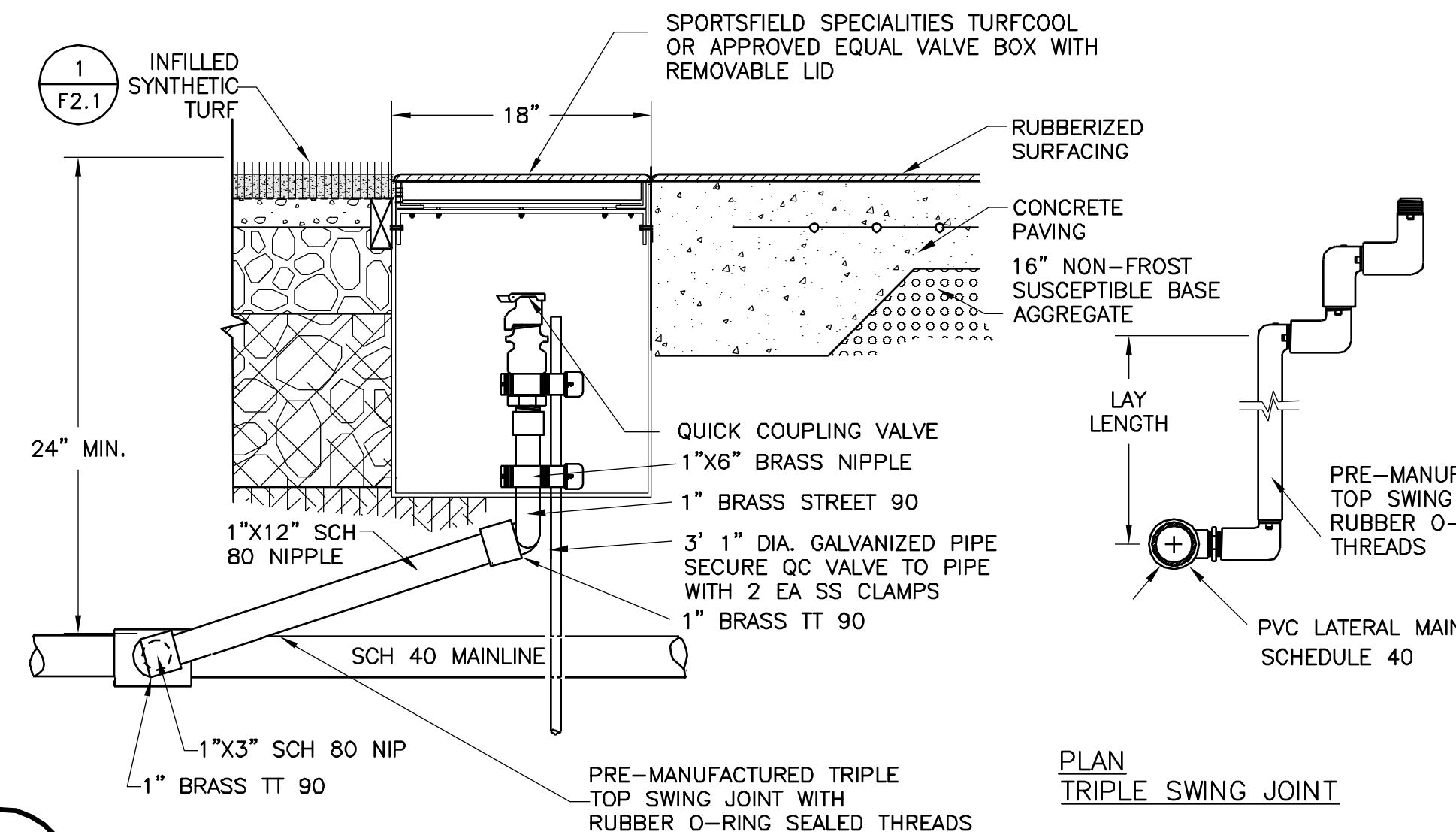
SOIL	SAFE BEARING LOAD LB. PER SQ. FT.
* MUCK, PEAT, ETC.	0
SOFT CLAY	1,000
SAND	2,000
SAND & GRAVEL	3,000
SAND & GRAVEL CEMENTED WITH CLAY	4,000
HARD SHALE	10,000

NOTES:
 1. SQUARE FEET OF CONCRETE THRUSTS - BLOCK AREA BASED ON SAFE BEARING LOAD OF 2000/(3000) POUNDS PER SQUARE FOOT.
 2. AREAS MUST BE ADJUSTED FOR OTHER SIZE PIPE, PRESSURES & SOIL CONDITIONS.
 3. CONCRETE BLOCKING SHALL BE CAST IN PLACE & HAVE MINIMUM OF 1/4 SQUARE FOOT BEARING AGAINST THE FITTING.
 4. BLOCK SHALL BEAR AGAINST FITTINGS ONLY & SHALL BE CLEAR OF JOINTS TO PERMIT TAKING UP OR DISMANTLING JOINT.
 5. CONTRACTOR SHALL INSTALL BLOCKING ADEQUATE TO WITHSTAND FULL TEST PRESSURE AS WELL AS TO CONTINUOUSLY WITHSTAND OPERATING PRESSURE UNDER ALL CONDITIONS OF SERVICE.

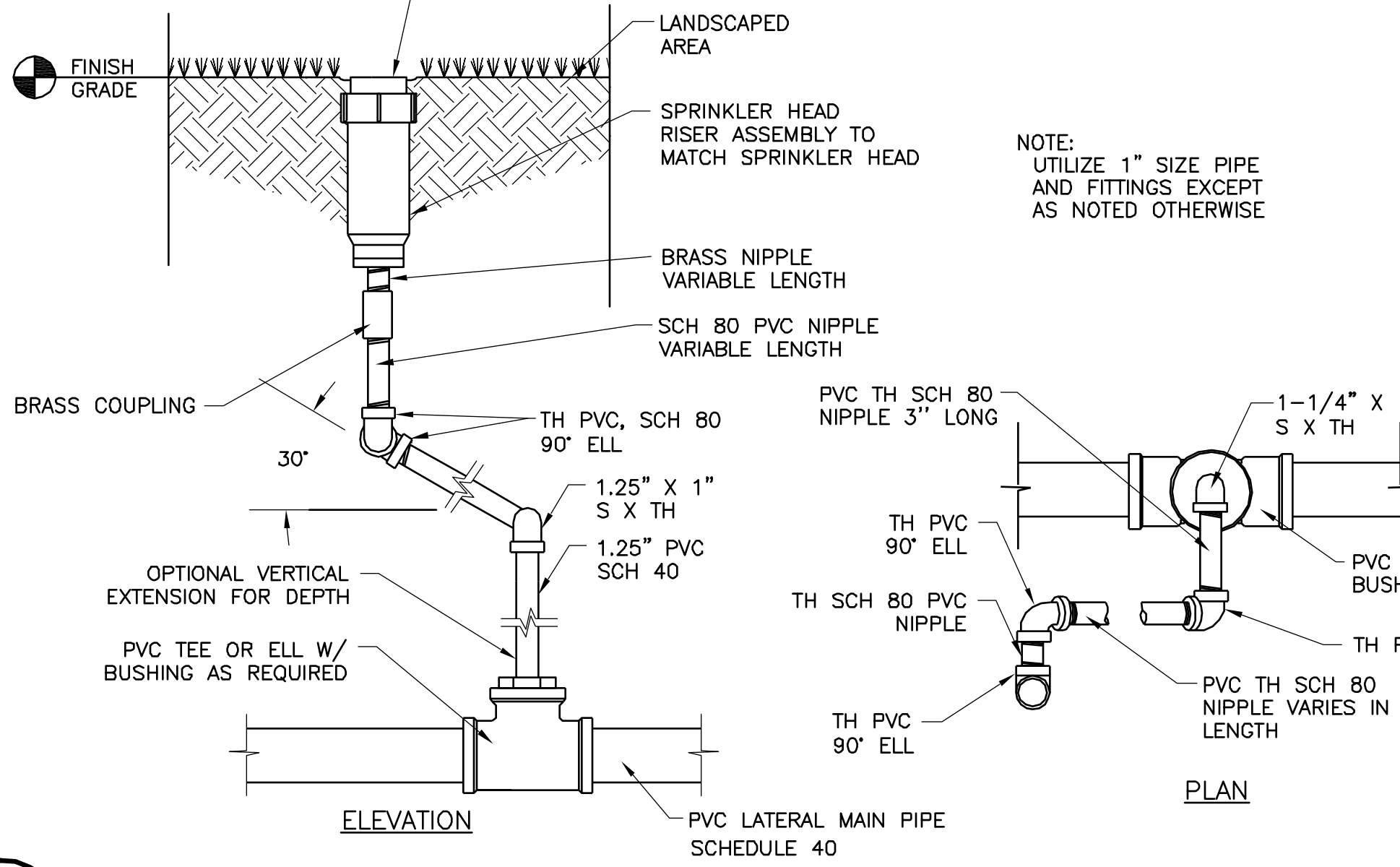
2 MAINLINE THRUST BLOCKS & NOTES
 F2.2 NOT TO SCALE



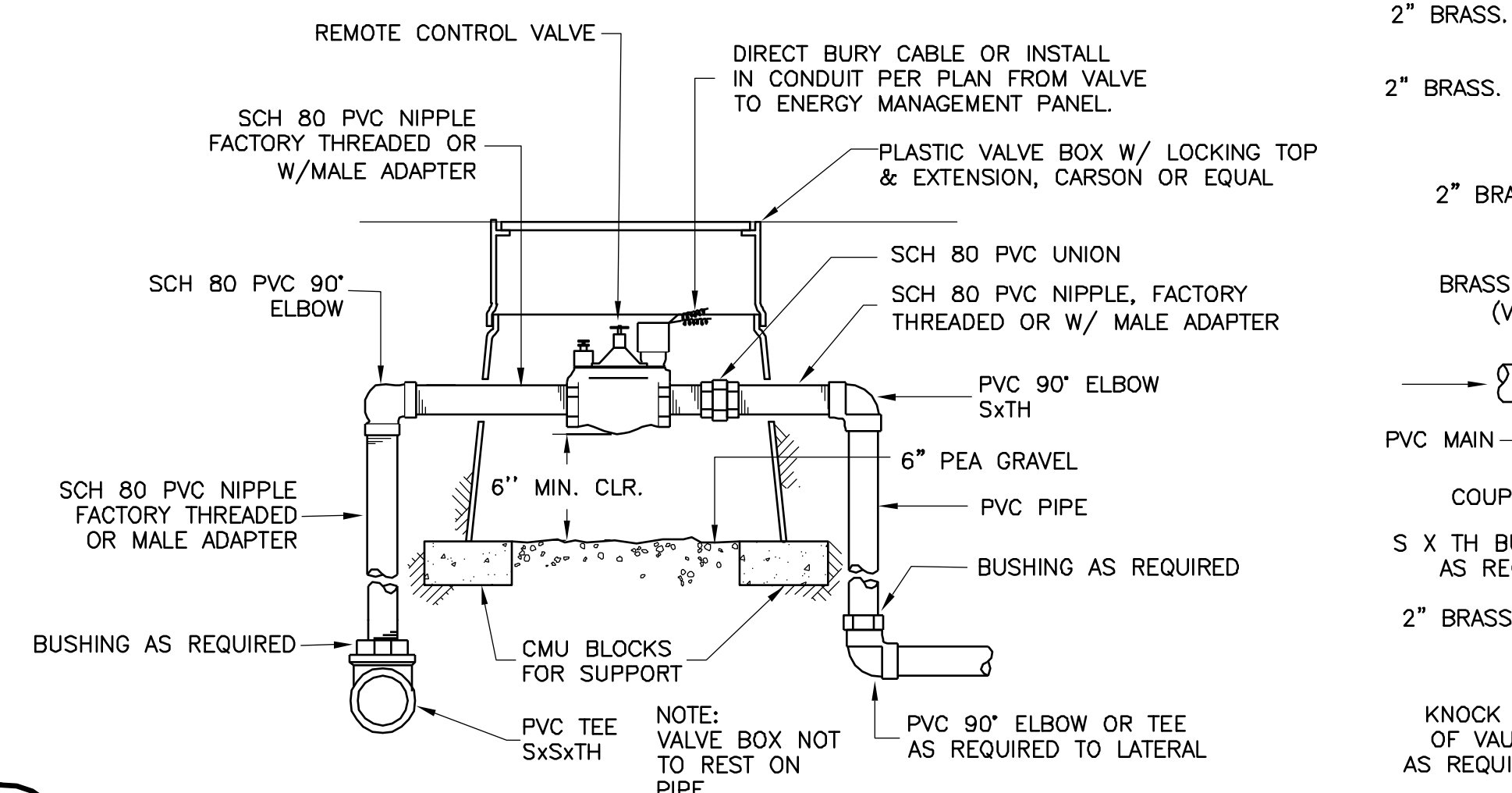
3 IRRIGATION CONTROLLER SCHEMATIC
 F2.2 NOT TO SCALE



4 QUICK COUPLING VALVE AND BOX
 F2.2 NOT TO SCALE



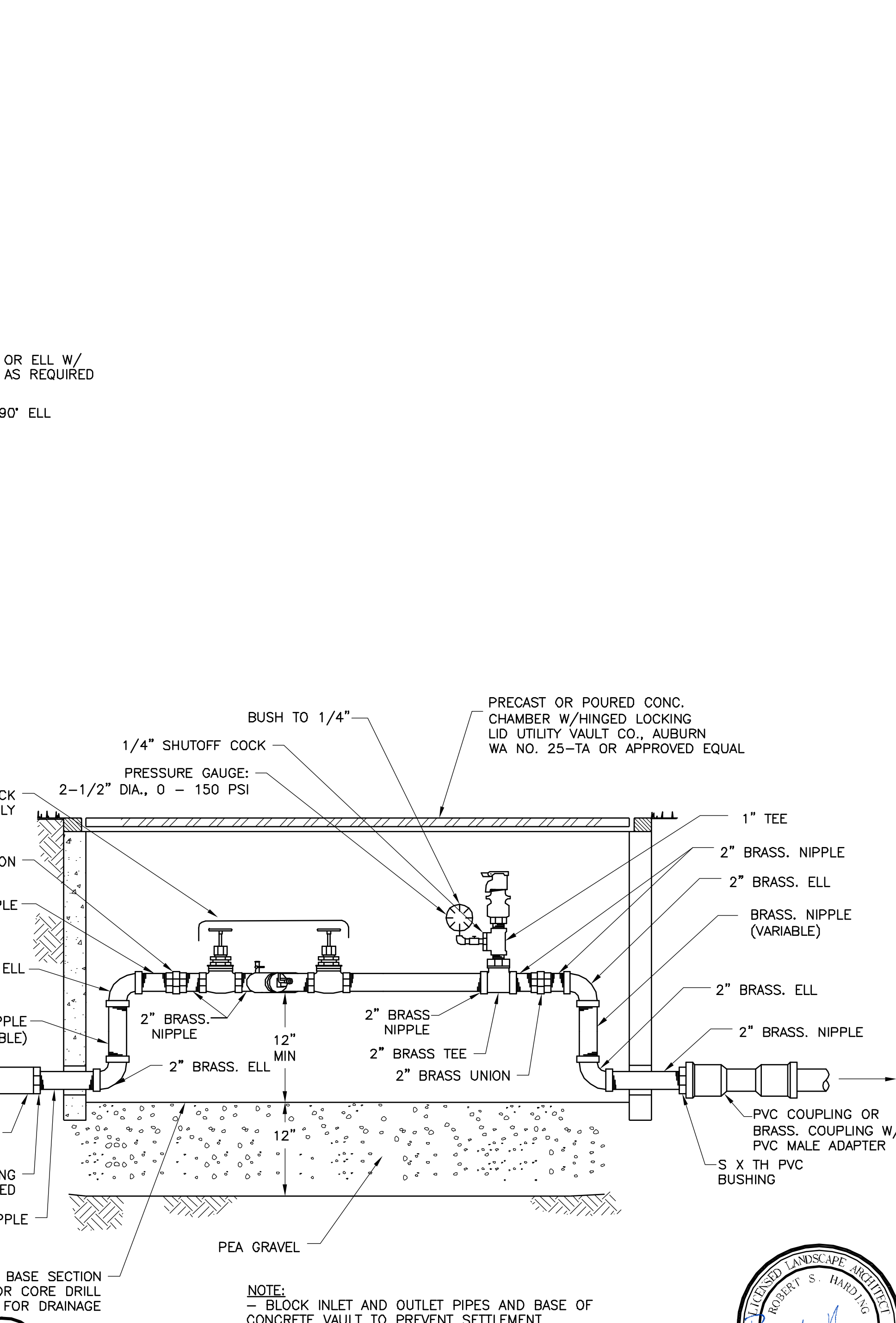
5 LANDSCAPE SPRINKLER RISER & ASSEMBLY
 F2.2 NOT TO SCALE



6 LANDSCAPE REMOTE CONTROL VALVES & BOX
 F2.2 NOT TO SCALE



7 DOUBLE CHECK VALVE ASSEMBLY
 F2.2 NOT TO SCALE



8 FIELD IRRIGATION DETAILS
 F2.2 NOT TO SCALE

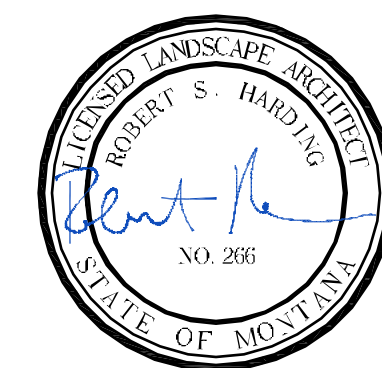
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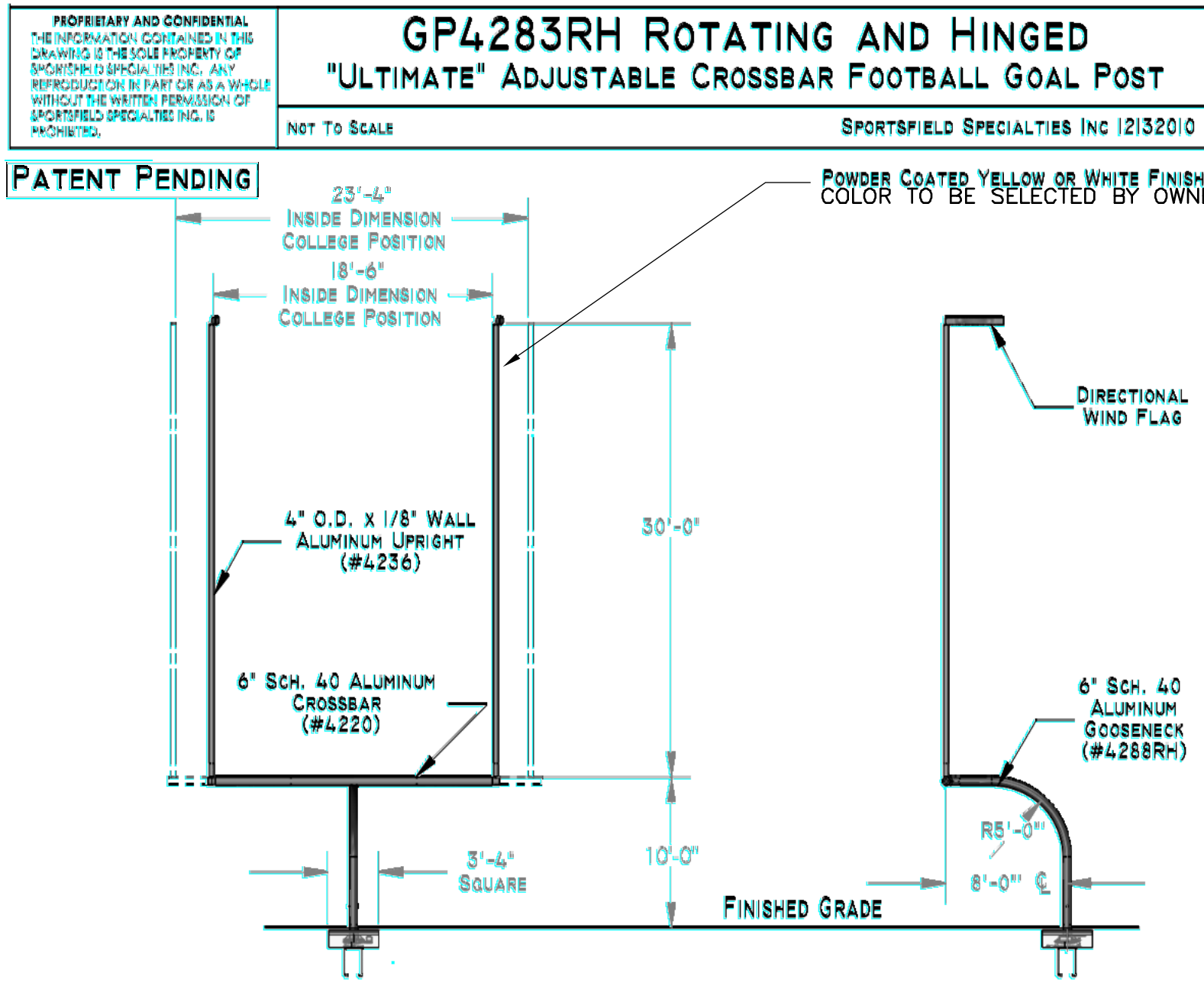
DA HOGAN
 LANDSCAPE ARCHITECTS
 1000 N. WASHINGTON
 HELENA, MT 59601
 (406) 261-1111

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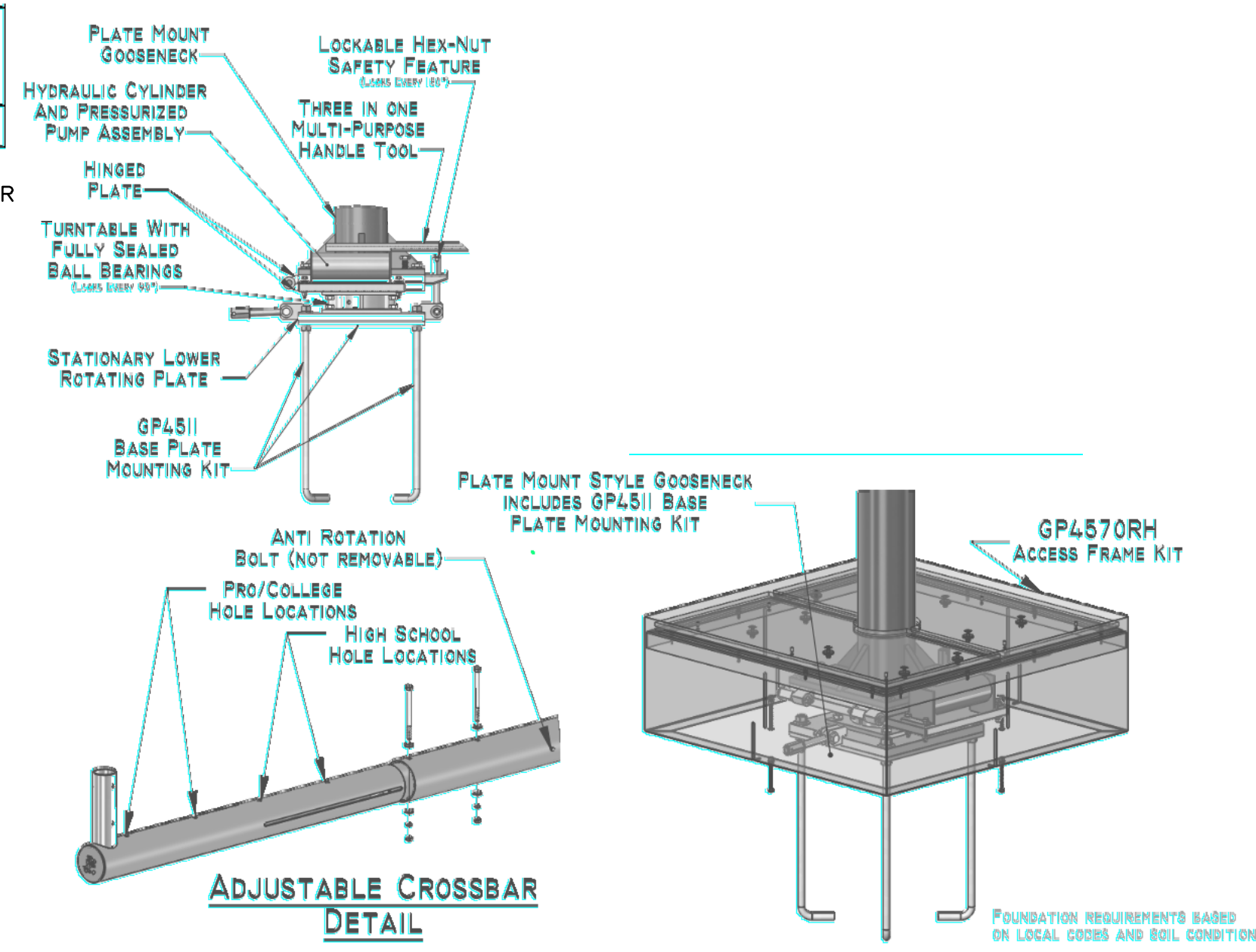
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 APPROVED: DLA/RS
 DATE: 6-2-2020
F2.2

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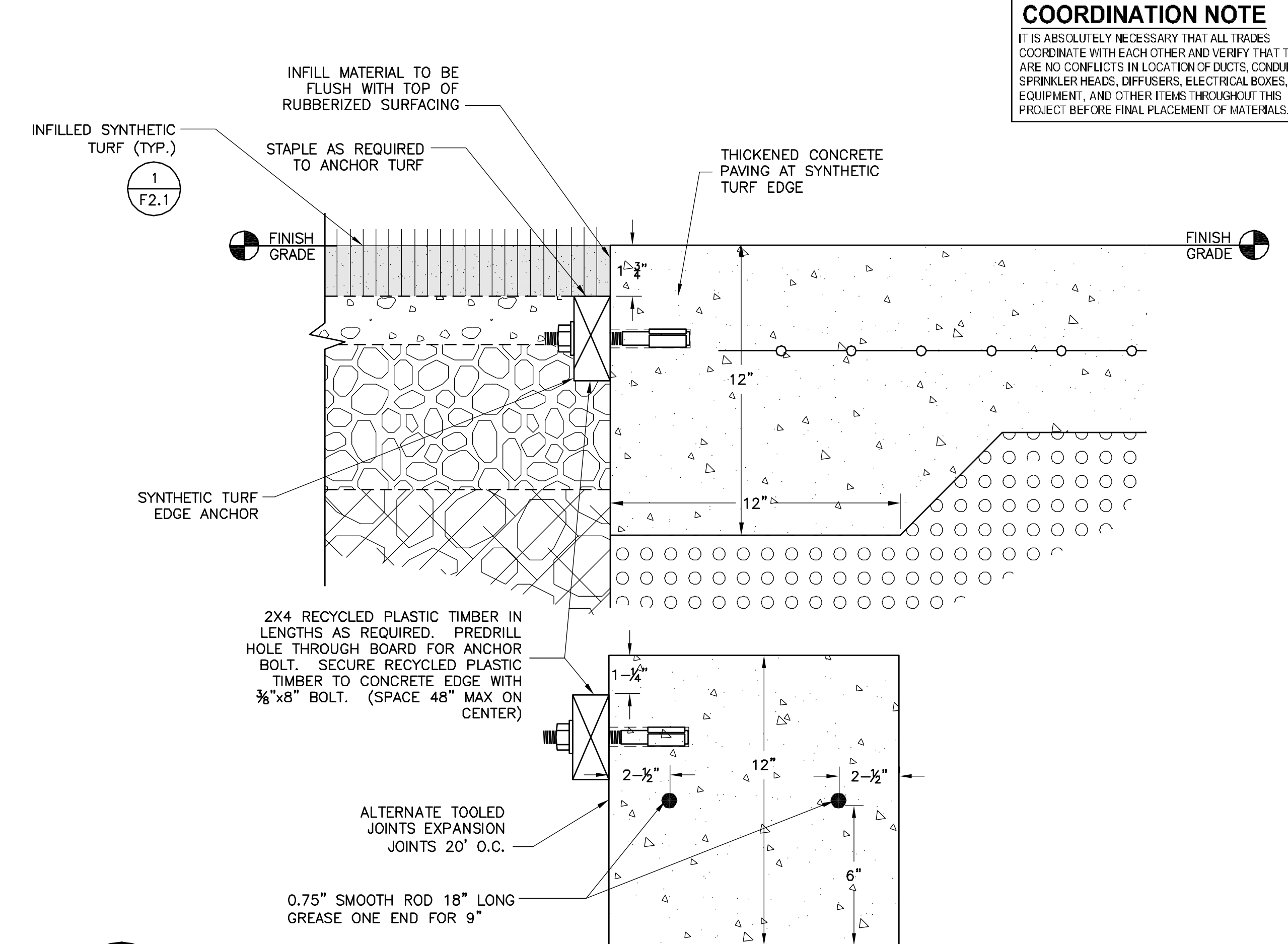




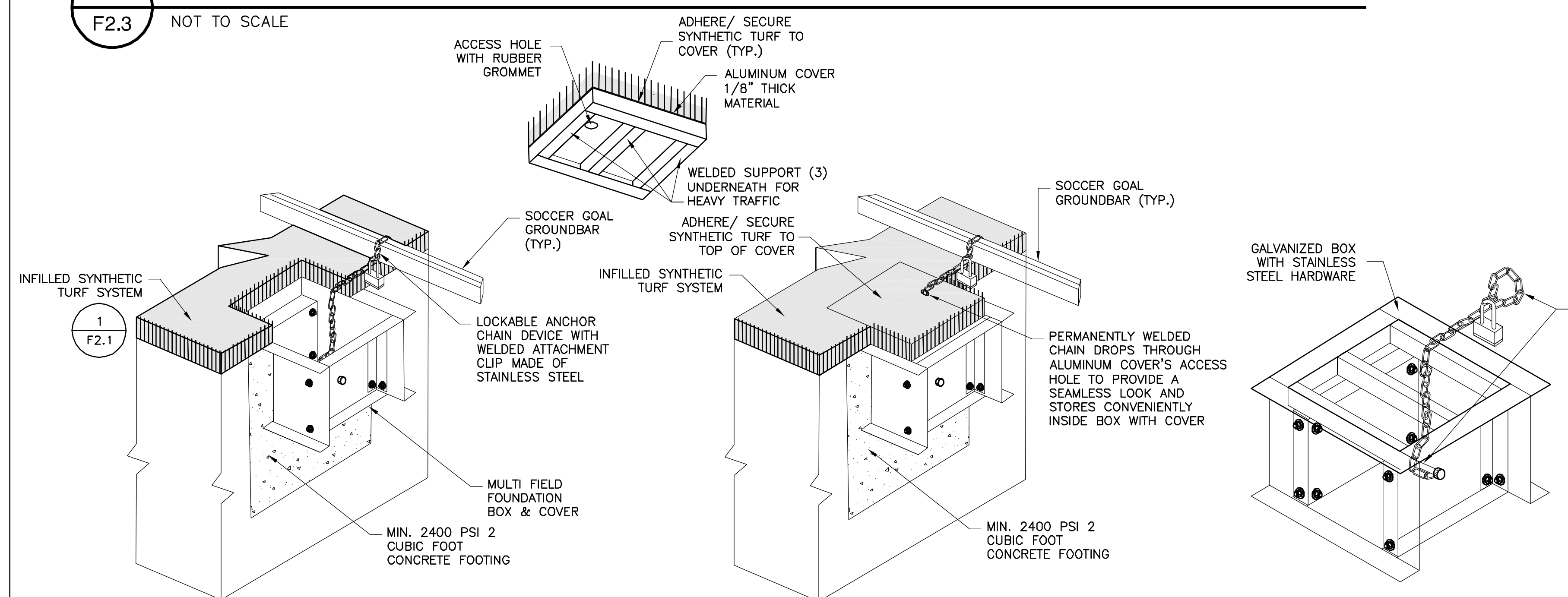
1 FOOTBALL GOAL POST & FOOTING
F2.3 NOT TO SCALE



**ADJUSTABLE CROSSBAR
DETAIL**



3 SYNTHETIC TURF EDGE ANCHOR
F2.3 NOT TO SCALE



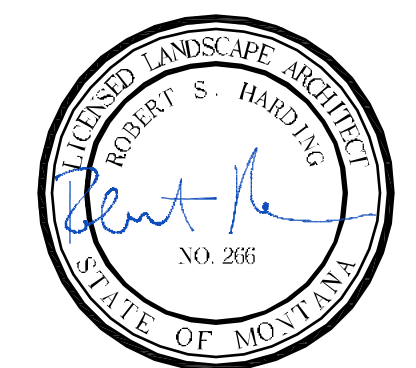
2 SOCCER GOAL ANCHOR
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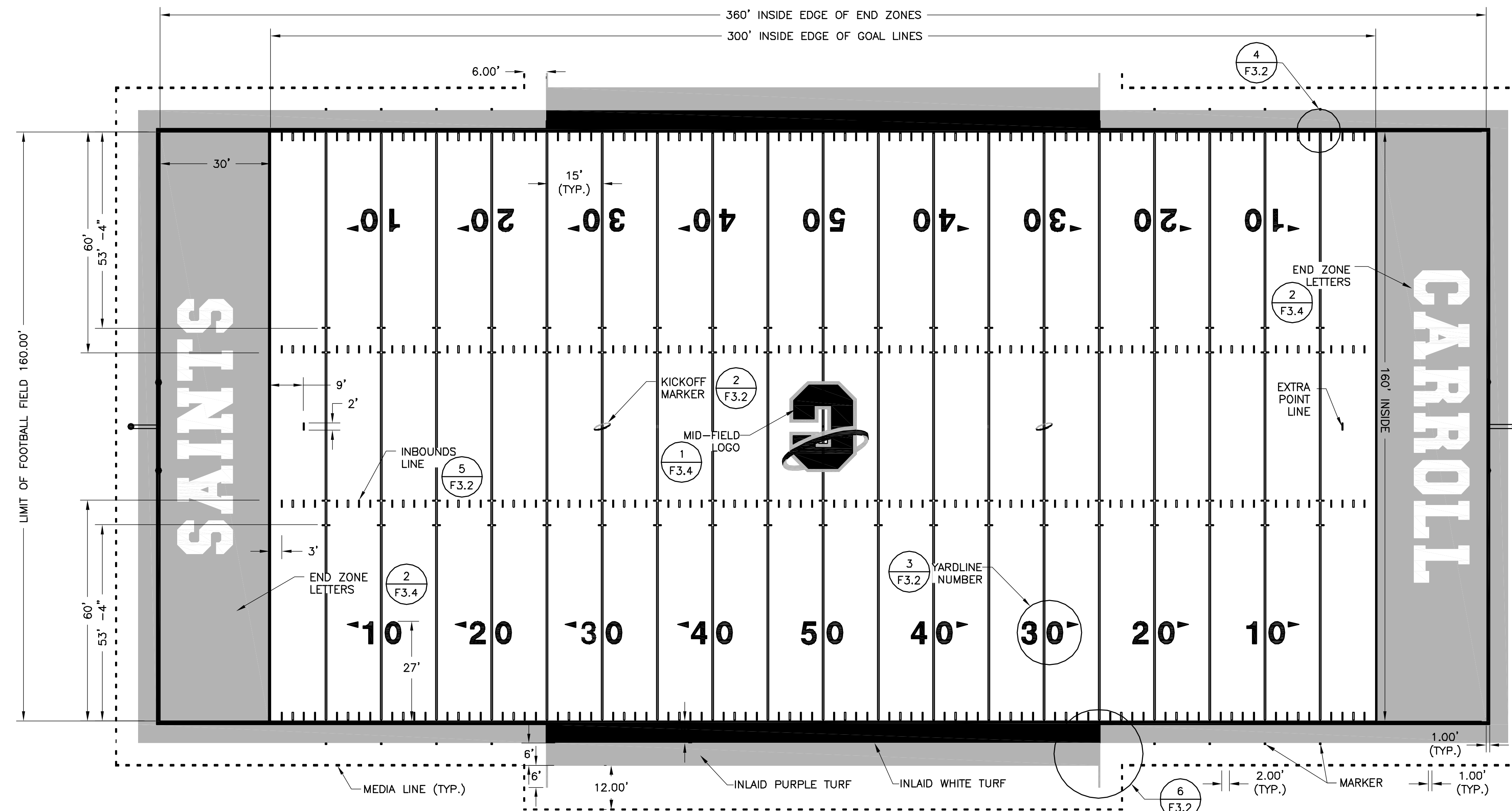
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APPROVED: DLARSH
DATE: 6-2-2020

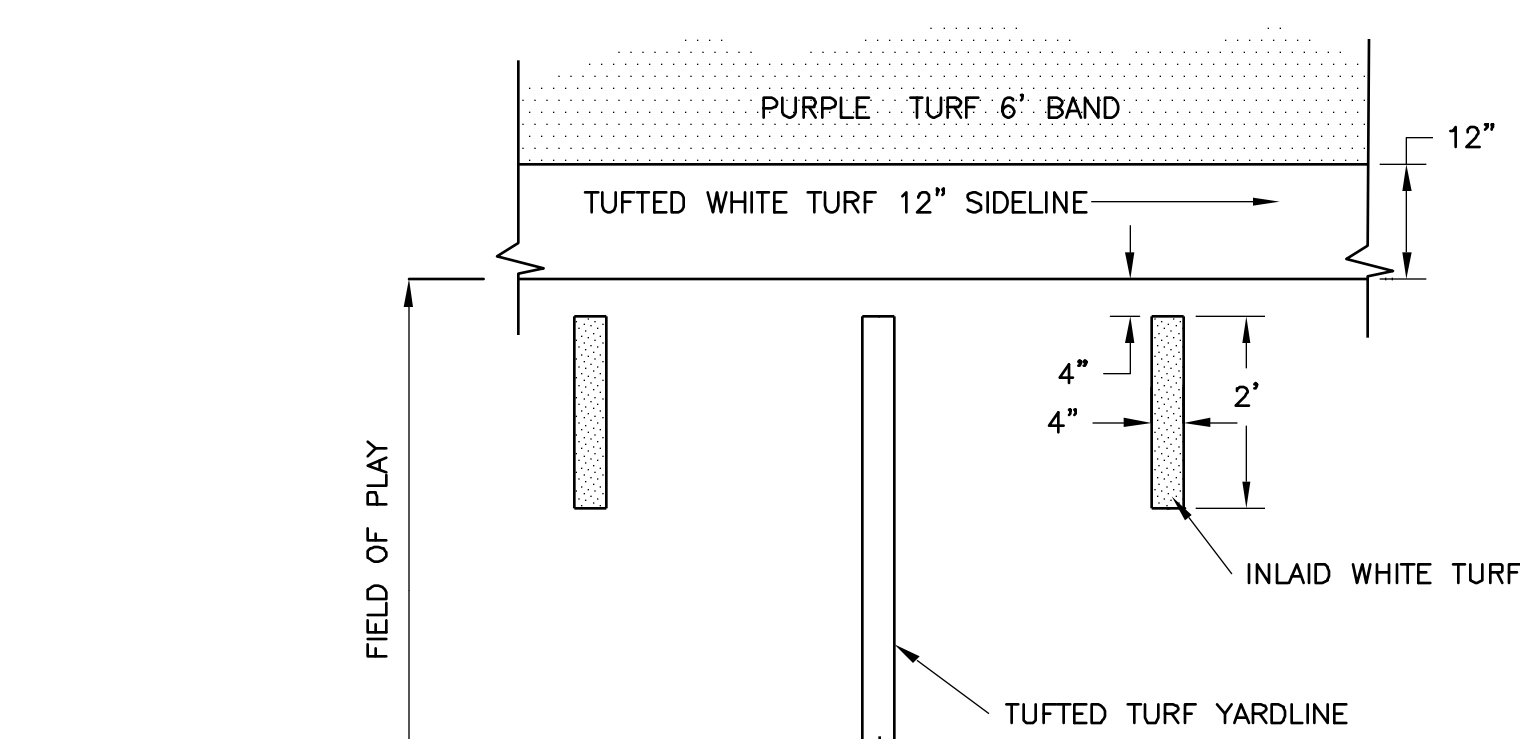
F2.3

COORDINATION NOTE
 IT IS ABSOLUTELY NECESSARY THAT ALL TRADES COORDINATE WITH EACH OTHER AND VERIFY THAT THERE ARE NO CONFLICTS IN LOCATION OF DUCTS, CONDUITS, SPRINKLER HEADS, DIFFUSERS, ELECTRICAL BOXES, EQUIPMENT, AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.

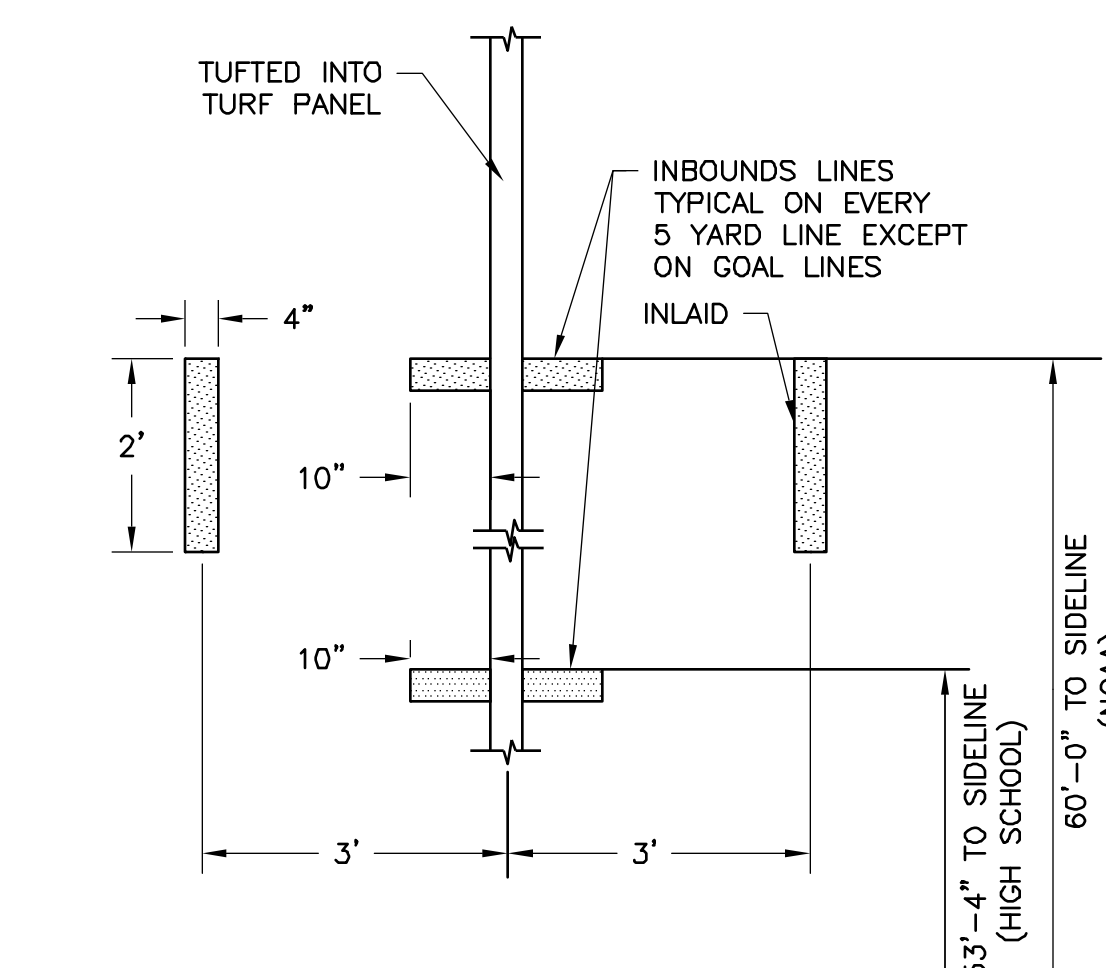


FOOTBALL LAYOUT NOTES

- CONTRACTOR SHALL VERIFY ALL DIMENSIONS.
- ALL LINE WORK IS TO BE LAID OUT WITH A TOLERANCE OF 1/4 INCH.
- ALL YARDLINES SHALL BE 4 INCH, WHITE, TUFTED INTO THE TURF PANELS, THE GOAL LINES WILL BE 8 INCH TUFTED INTO THE TURF PANELS.
- A 12 INCH WHITE LINE, TUFTED INTO THE TURF, WILL SURROUND THE ENTIRE PLAYING FIELD.
- 24 INCH SHORT YARDLINE EXTENSIONS, 4 INCHES FROM THE SIDELINES SHALL BE 4 INCHES WIDE, WHITE, INLAID LINES.
- THE COACHING BOX AND TEAM AREA SHALL BE PER NCAA RULES.
- THE TWO SETS OF INBOUNDS LINES ARE 60 FEET AND 53 FEET 4 INCHES FROM THE SIDELINES. INBOUNDS LINES AND SHORT YARDLINE EXTENSIONS SHALL BE 24 INCHES LONG AND 4 INCHES WIDE, INLAID, WHITE LINES. SHORT YARDLINE EXTENSIONS SHALL BE 60 FEET FROM THE SIDELINE.
- THE EXTRA POINT LINES ARE 2 FEET LONG, 4 INCHES WIDE, WHITE INLAID LINES AT THE CENTERLINE OF THE FIELD AND THE 3 YARDLINE ON EACH END OF THE FIELD. REFER TO PLAN FOR LOCATION.
- WHITE YARDLINE NUMBERS MEASURING 6 FEET IN HEIGHT AND 4 FEET IN WIDTH WITH THE TOP OF THE NUMBERS 27 FEET FROM THE INBOUND LINES ARE INLAID TURF.
- DIRECTIONAL ARROWS POINT TOWARD RESPECTIVE ENDZONES. ARROWS ARE WHITE, THERE ARE NO ARROWS ON THE 50 YARDLINE.
- AN X WILL MARK THE SPOT OF THE KICKOFF AT THE 40 YARDLINE ON EACH END OF THE FIELD. THE 40 YARDLINE SHALL BE WHITE TURF TUFTED INTO THE TURF PANELS AND THE EXTENSIONS FROM THE X SHALL BE INLAID WHITE TURF.
- THE MEDIA LINE SHALL BE A 4" WHITE LINE 12' OUTSIDE THE SIDELINES AND END LINES. 12" LONG DASHES WILL BE SPACED AT 24" INTERVALS.
- A 4"x4" MARKER IS MANDATORY AT EACH FIVE-YARD LINE EXTENDED BETWEEN THE GOAL LINE AS AN EXTENSION OF THE COACHING LINE.
- YARD LINE MARKERS WILL BE PLACED 12' FROM THE SIDELINE AT THE 20, 15, 10 AND 5 YARD LINES.

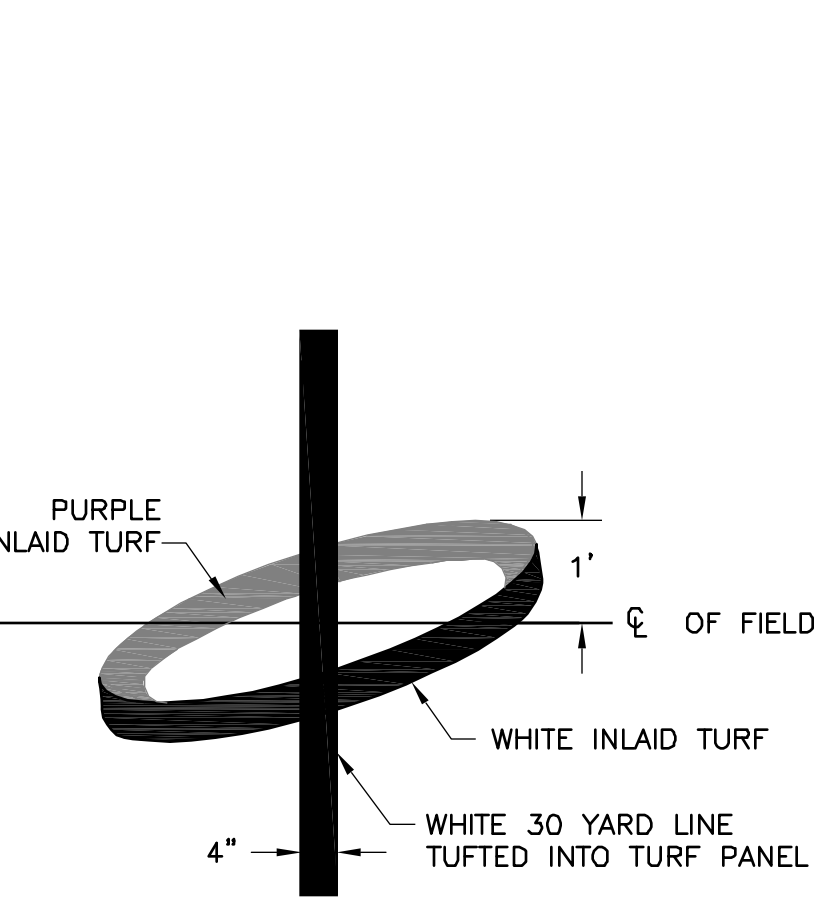


4 SIDE LINE DETAIL
 F3.2 NOT TO SCALE

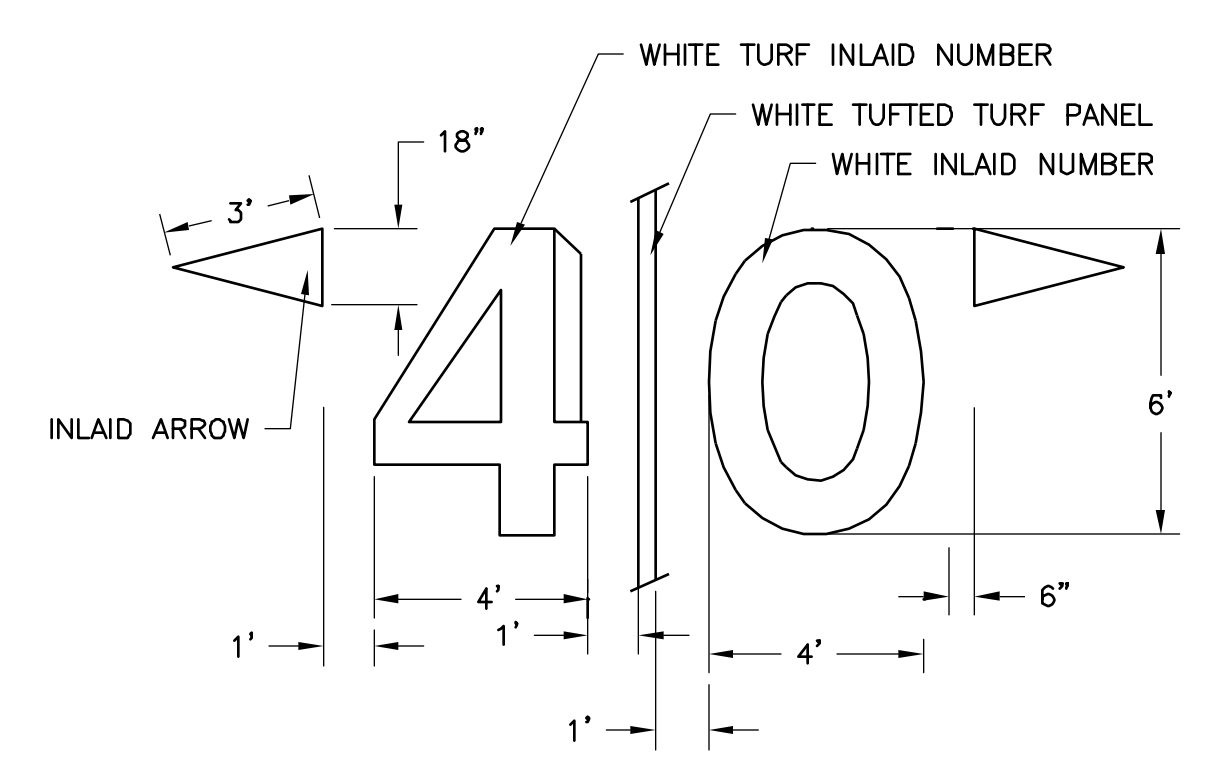


5 INBOUND LINE DETAIL
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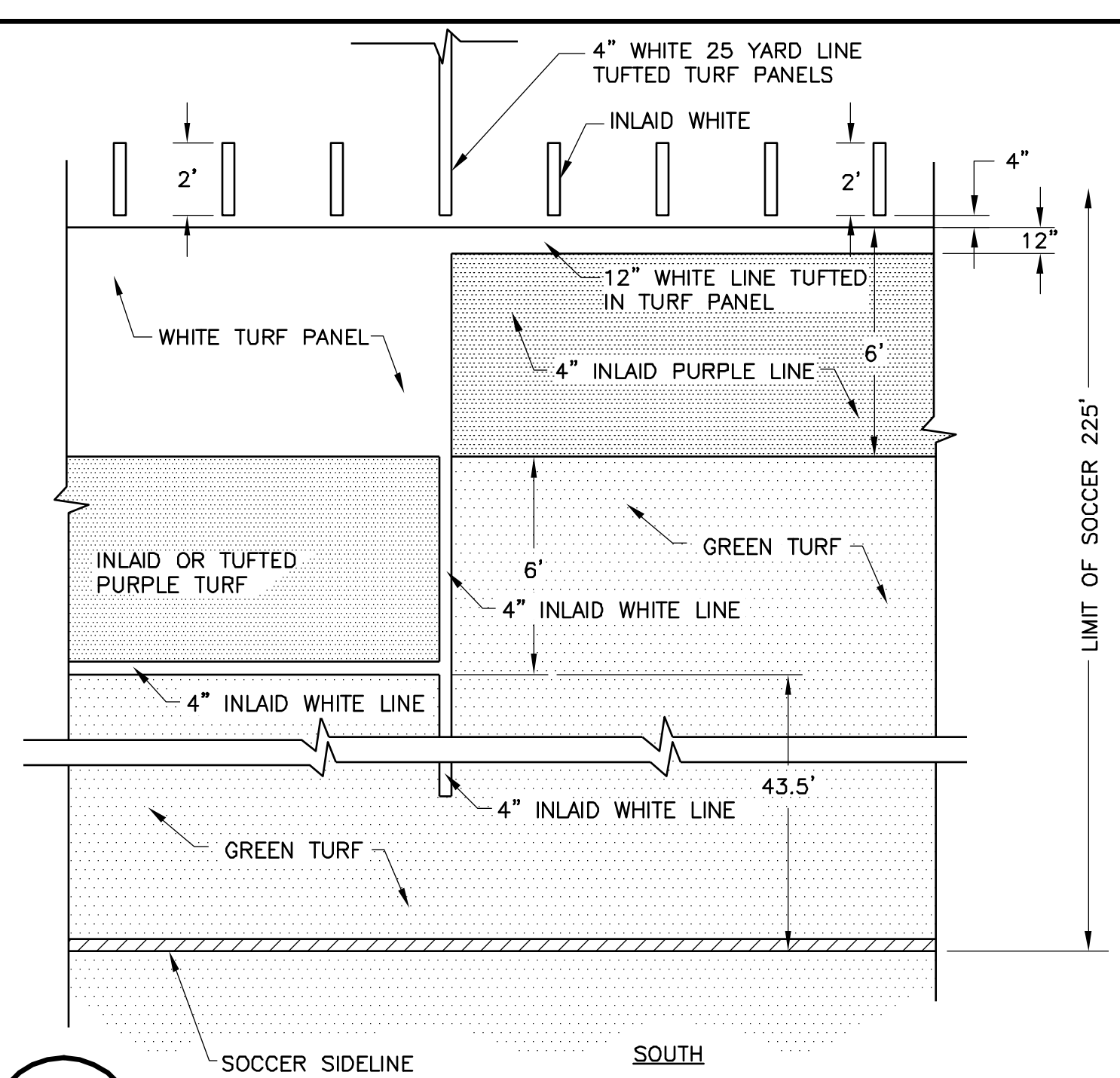
1 FOOTBALL FIELD LAYOUT MARKING PLAN
 F3.2 SCALE 1"=20'



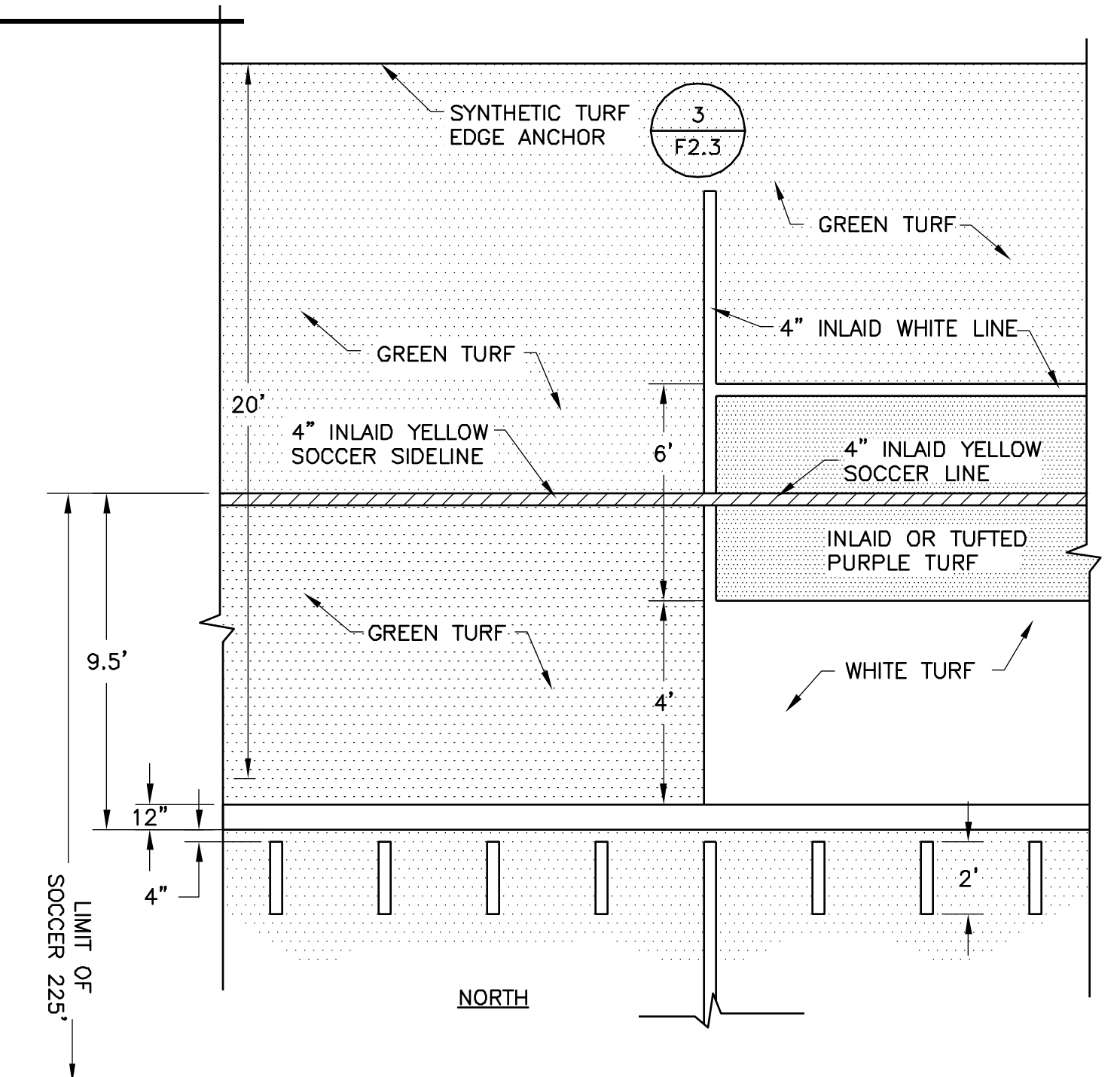
2 KICK-OFF MARKER
 F3.2 NOT TO SCALE



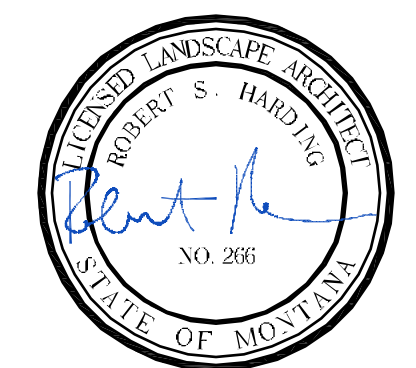
3 YARDLINE NUMBER DETAIL
 F3.2 NOT TO SCALE



6 COACHES BOX DETAIL
 F3.2 NOT TO SCALE



3 SYNTHETIC TURF FOOTBALL MARKINGS
 F3.2 NOT TO SCALE



CROSSMAN WHITNEY GRIFFIN P.C.
 ARCHITECTS A.I.A.
 650 POWER STREET
 P.O. BOX 1196, HELENA, MT 59624
 (406) 443-2340 (PHONE) (406) 442-8665 (FAX)
 cwg@cwg-architects.com



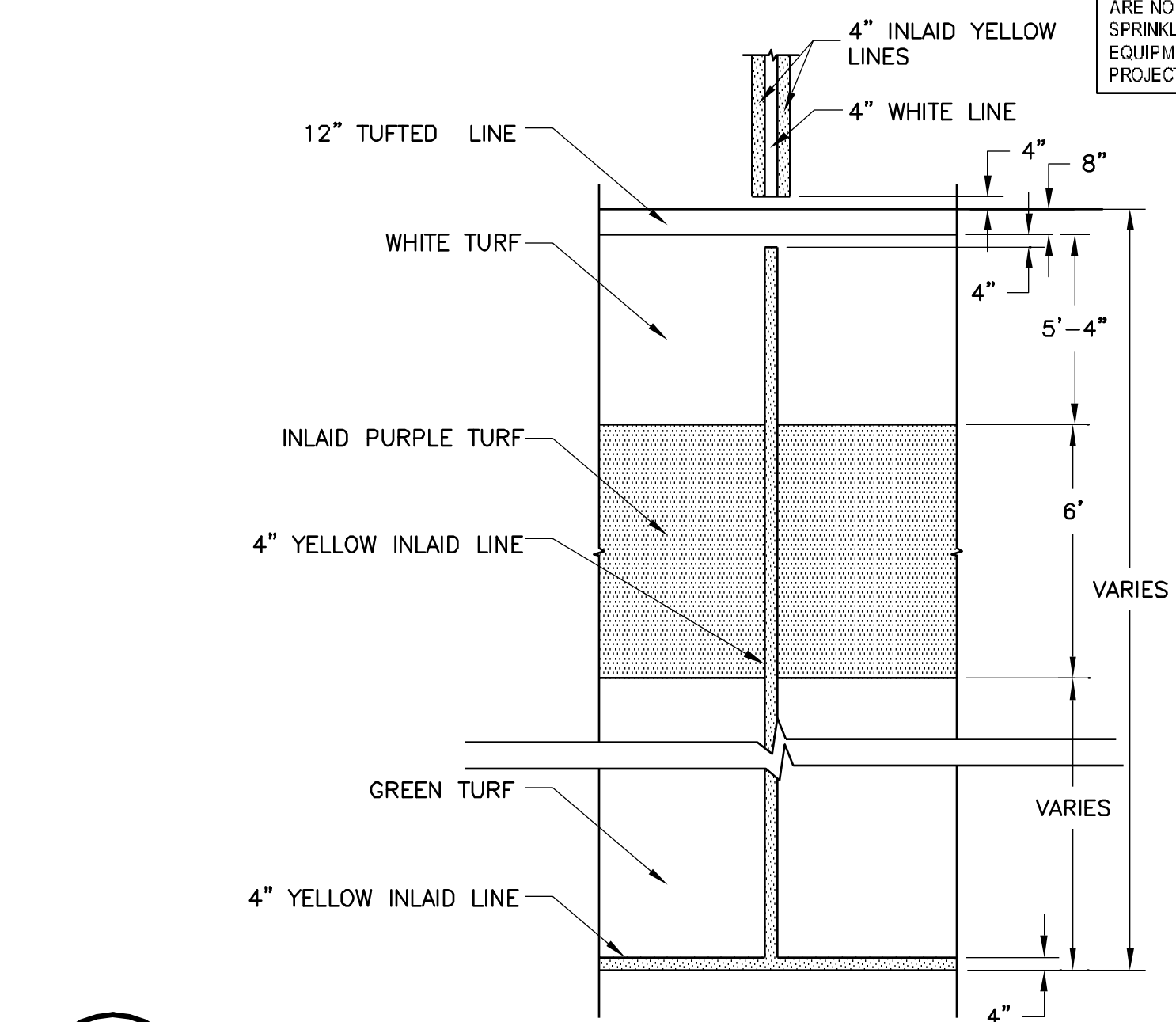
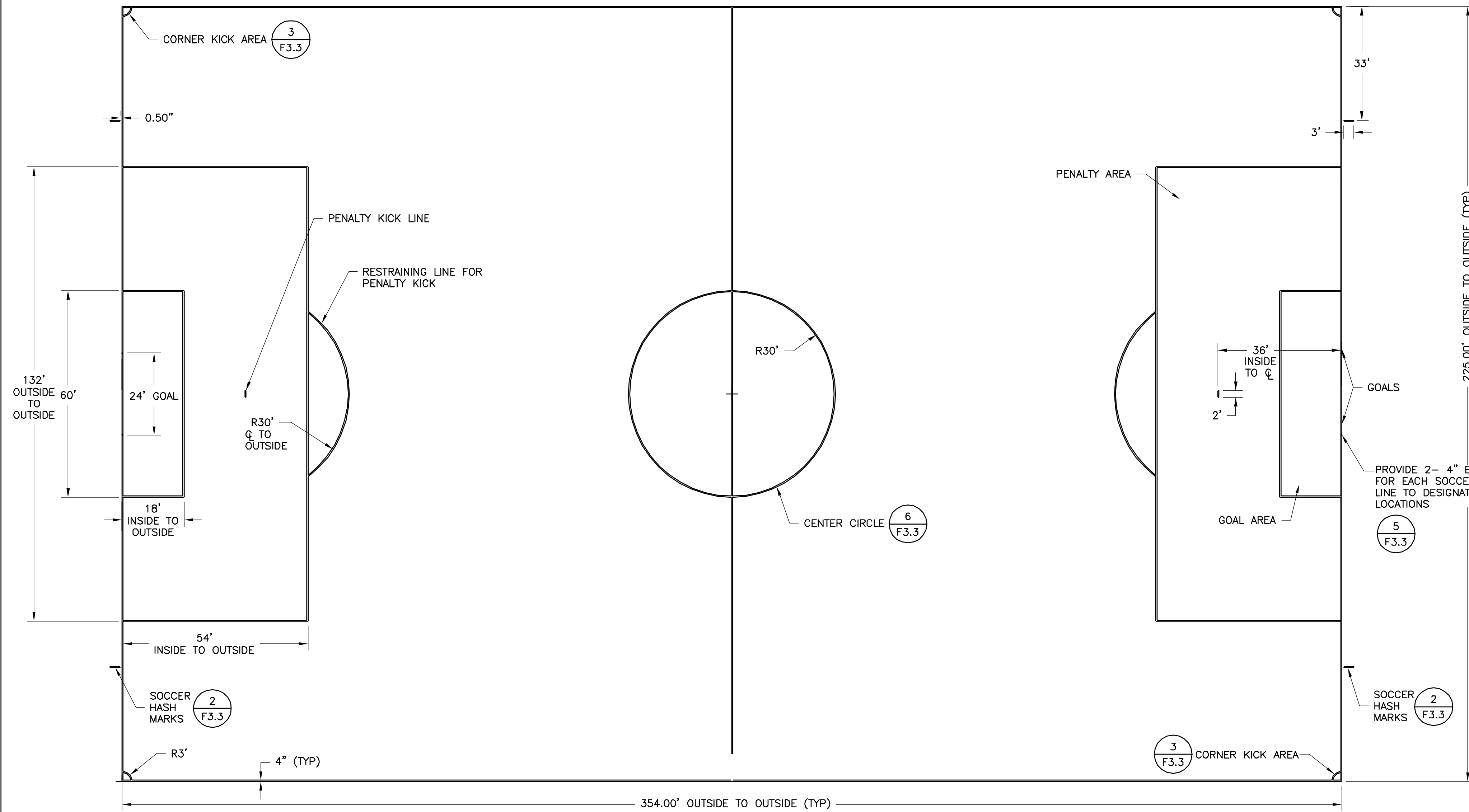
CARROLL COLLEGE
PHASE 1 NELSON STADIUM - FIELD & LIGHTING
 Benton Ave. Helena, MT
SYNTHETIC TURF FOOTBALL MARKINGS

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 APPROVED DLARSH
 DATE 6-2-2020
F3.2

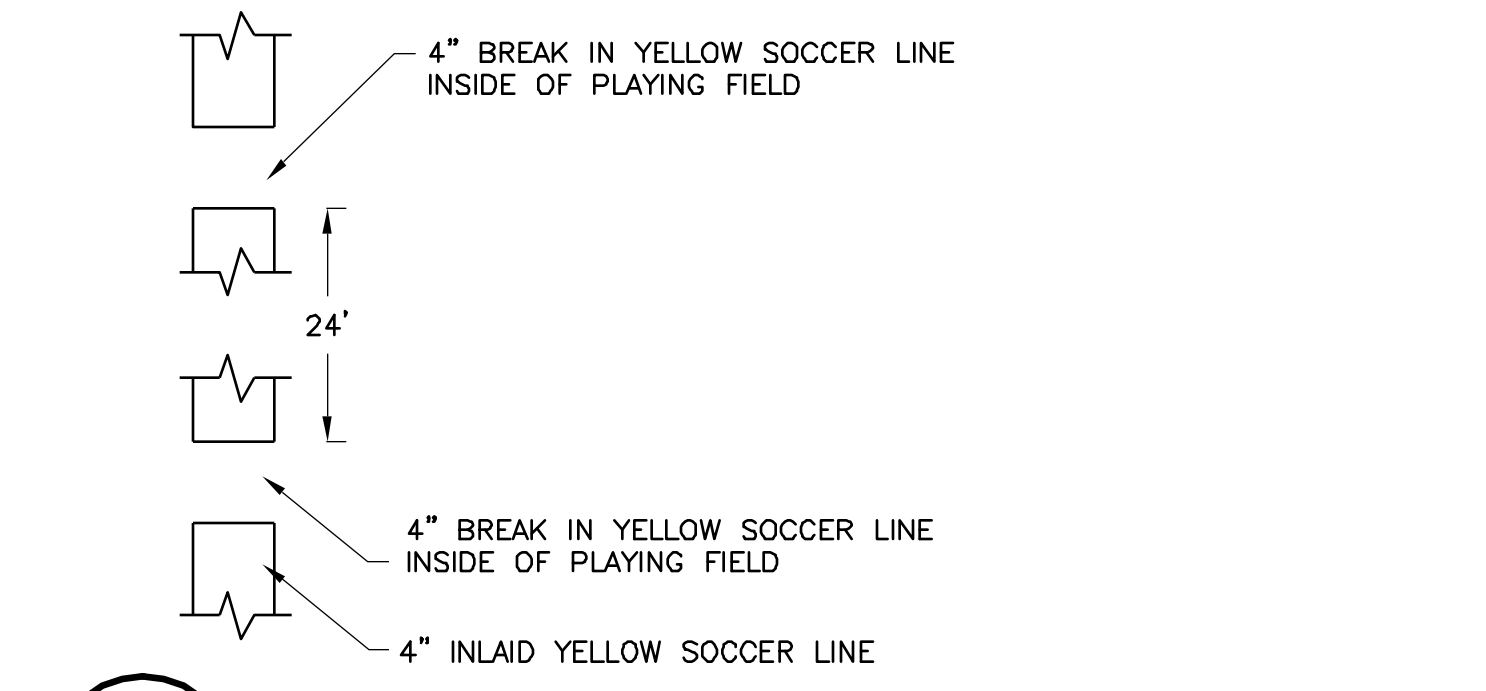
File: F3.2 Synthetic Turf Football Markings.dwg Plotted by: reneef Date: 12-May-21 9:36:27am

COORDINATION NOTE

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4 MID-FIELD LINE AT SIDELINE
F3.3 NOT TO SCALE

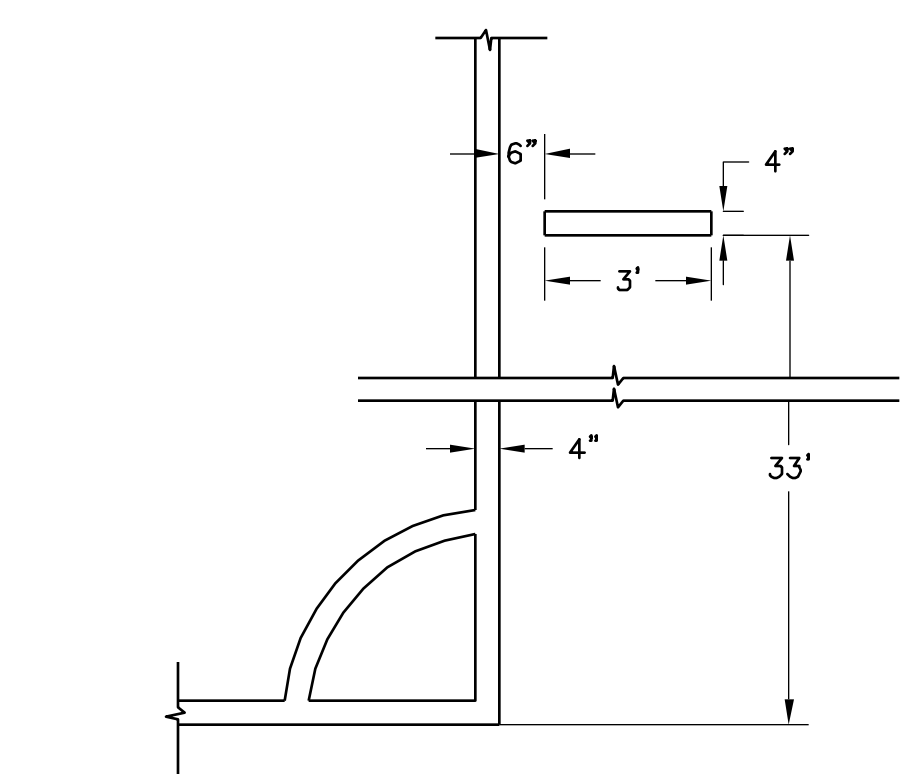


5 SOCCER GOAL ALIGNMENT SQUARES
F3.3 NOT TO SCALE

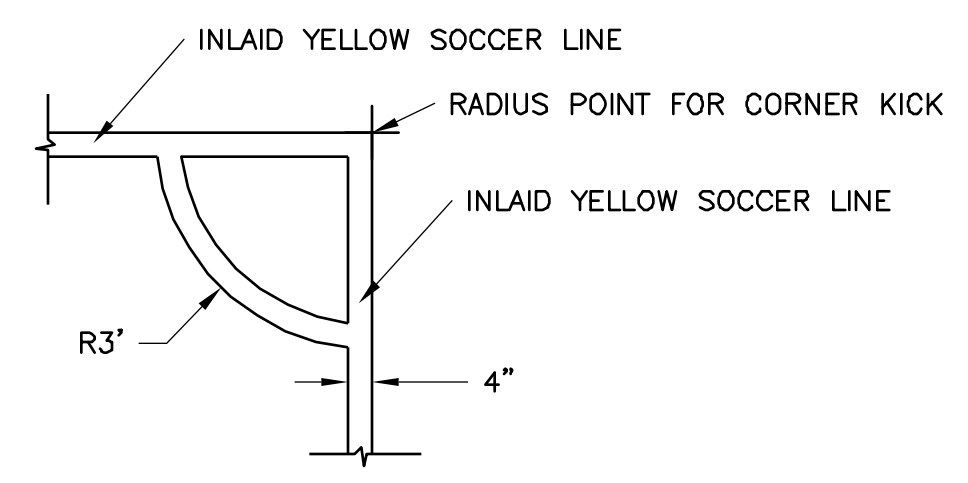
SOCCER LAYOUT NOTES

- CONTRACTOR SHALL VERIFY ALL DIMENSIONS. ALL LINE WORK IS TO BE LAID OUT WITH A TOLERANCE OF 1/4 INCH.
- ALL SOCCER LINES ARE 4 INCH YELLOW INLAID OR TUFTED TURF AS DIMENSIONED ON SOCCER LAYOUT PLAN.
- THE SOCCER GOAL AREA IS 18 FEET BY 60 FEET.
- THE SOCCER PENALTY AREA IS 54 FEET BY 33 FEET.
- THE PENALTY MARK IS A 2 FOOT LINE, 4 INCHES WIDE, 36 FEET FROM THE END LINE AND CENTERED ON THE GOAL. THE RESTRAINING LINE FOR PENALTY KICK IS AN ARC 30 FEET FROM THIS MARK OUTSIDE OF THE PENALTY AREA.
- THE HALFWAY LINE FOR THE SOCCER FIELD IS A 4 INCH YELLOW INLAID LINE WITH A CIRCLE, 30 FEET IN RADIUS IN THE CENTER OF THE FIELD. THE RADIUS POINT OF THE MIDFIELD CIRCLE WILL BE INLAID YELLOW DOT WITH A 9 INCH DIAMETER. THE FOOTBALL LINES WILL PASS THROUGH THE SOCCER LINES. THE 50 YARD LINE OF THE FOOTBALL FIELD WILL BE WHITE WITH 4 INCHES OF YELLOW INLAID TURF ON EACH SIDE AND WILL EXTEND TO THE SIDELINE OF THE FOOTBALL FIELD.
- THE SOCCER LINE WILL EXTEND BEYOND THE FOOTBALL SIDELINE BEGINNING 4 INCHES OUTSIDE THE 12 INCH SIDELINE AND EXTENDING THROUGH THE OFFICIALS, COACHES AND TEAM BOX.
- THE CORNERS OF THE SOCCER FIELD SHALL HAVE A 3 FOOT RADIUS IN YELLOW TURF DESIGNATING THE CORNER KICK AREA. THE HASH MARK IS A 3 FOOT LINE, 4 INCHES WIDE, 33 FEET FROM THE SIDE LINE AND EXTENDS AWAY FROM THE FIELD OF PLAY.

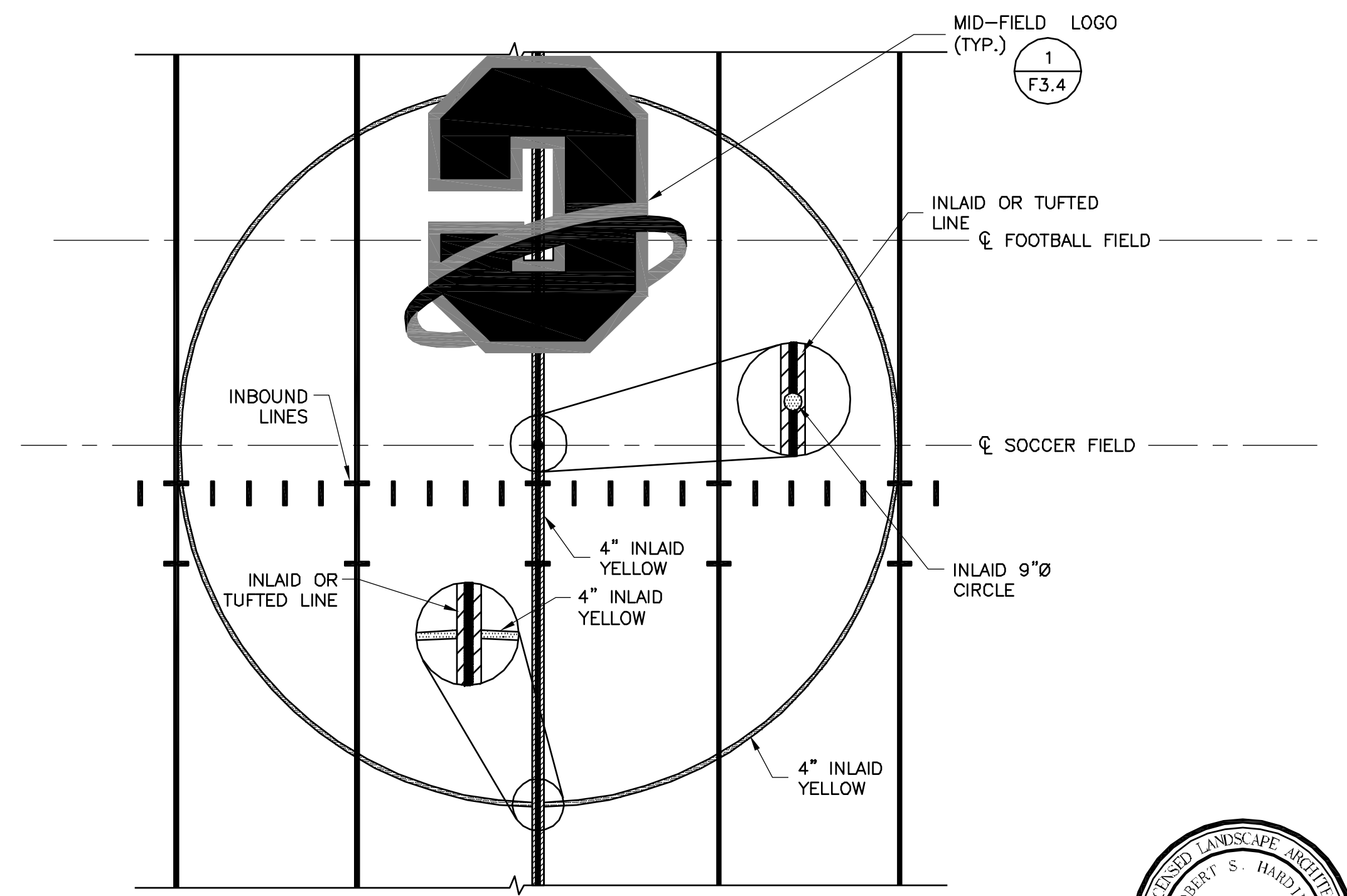
1 SOCCER FIELD LAYOUT MARKING PLAN
F3.3 SCALE 1"=20'



2 SOCCER HASH MARKS
F3.3 NOT TO SCALE



3 CORNER KICK DETAIL
F3.3 NOT TO SCALE

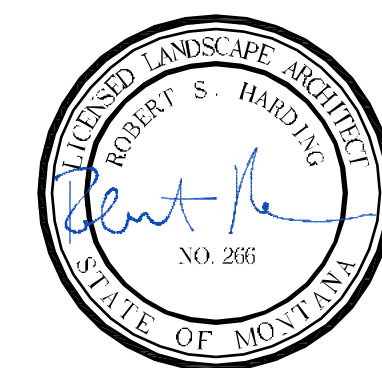


6 SOCCER CIRCLE AND MID-FIELD LINE
F3.3 NOT TO SCALE

CROSSMAN WHITNEY GRIFFIN P.C.
ARCHITECTS A.I.A.
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cwg@cwg-architects.com



CARROLL COLLEGE
PHASE 1 NELSON STADIUM - FIELD & LIGHTING
Benton Ave. Helena, MT
SYNTHETIC TURF SOCCER MARKINGS



704103
DRAWN BY REF
APPROVED DLARSH
DATE 6-2-2020

F3.3

COORDINATION NOTE

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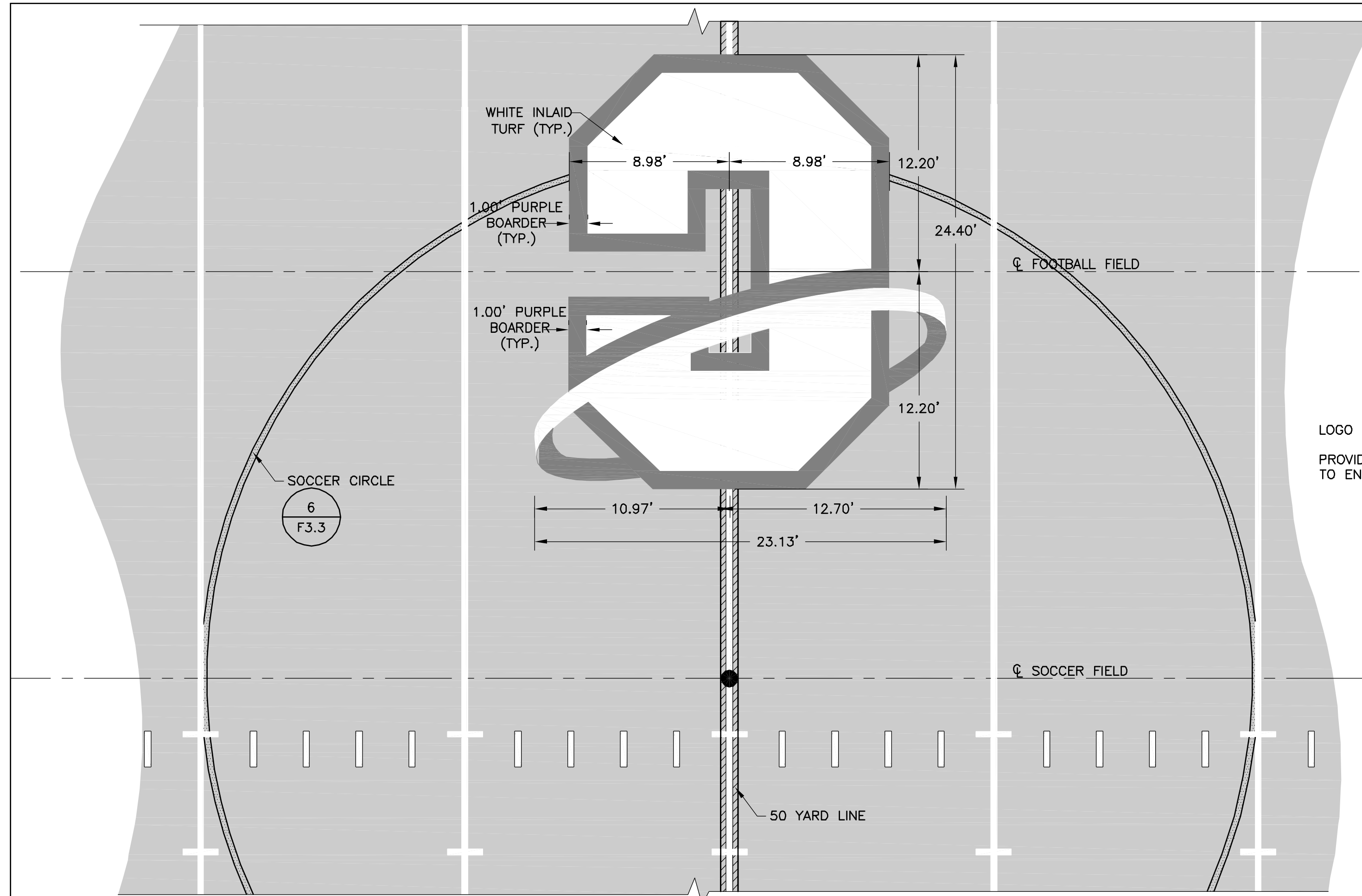
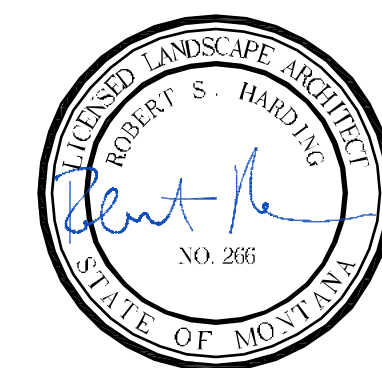
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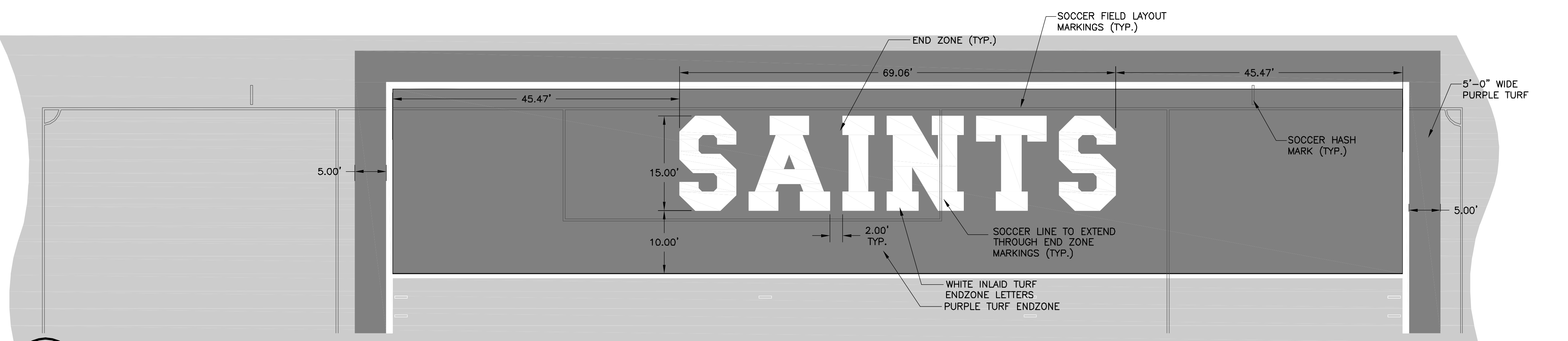
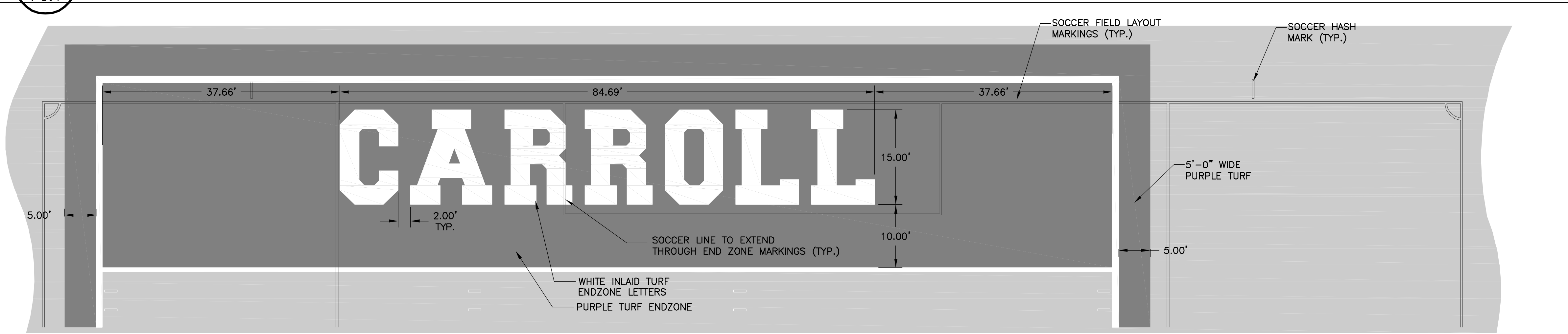
CARROLL COLLEGE
PHASE 1 NELSON STADIUM - FIELD & LIGHTING
 Benton Ave. Helena, MT
SYNTHETIC TURF LOGO & END ZONE DETAILS

704103
 DRAWN BY REF
 APPROVED DL/RSR
 DATE 6-2-2020

F3.4



1 MID-FIELD LOGO
 F3.4 NOT TO SCALE



2 ENDZONE
 F3.4 NOT TO SCALE

File: F3.4 Synthetic Turf Logo- End Zone Details.dwg Plotted by: rvenef Date: 12-May-21 9:26:40am

BIDDING DOCUMENTS FOR CONSTRUCTION OF:

PHASE 1 NELSON STADIUM—FIELD AND LIGHTING

1857 North Benton Ave.
Helena, Montana

for:

CARROLL COLLEGE
1601 N. Benton Ave.
Helena, Montana 59625



Architecture

Crossman-Whitney-Griffin P.C.—Architect
Helena, Montana

Robert Peccia & Associates – Civil
Helena, Montana

CWG Architects & Engineering – Structural
Helena, Montana

GPD Engineering – Mechanical
Great Falls, Montana

D.A. Hogan & Associates – Field & Turf
Seattle, Washington

Stantec – Stadium Lighting
Lynwood, Washington

PROJECT NO.
70-41-03

April, 2020

SECTION 000101
PROJECT TITLE PAGE
FOR
CARROLL COLLEGE PHASE 1 NELSON STADIUM - FIELD & LIGHTING
1857 N. BENTON AVENUE, HELENA, MT 59601
CROSSMAN-WHITNEY-GRIFFIN, P.C. ARCHITECTS A.I.A.
650 POWER STREET
HELENA, MONTANA
APRIL, 2020

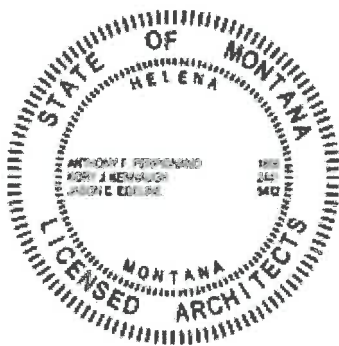
Robert Peccia & Associates Inc.
Civil Engineering
Helena, MT 59601

CWG Architects & Engineering
Structural Engineering
Helena, Montana

GPD Engineering
Electrical Engineering
Great Falls, Montana

Stantec Engineering, Inc.
Lighting Engineering
Lynwood, Washington

D.A. Hogan & Associates, Inc.
Turf & Field Engineering
Seattle, Washington



APPROVED: Jason Egeline
JASON EGELINE, A.I.A., NCARB

SECTION 000110

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- 007300 - Supplementary Conditions
- Supplemental Attachment for Acord Certificate of Insurance(AIA G715)
- Acord Certificate of Insurance
- 007400 - Special Conditions
- Certificate of Required Inspections

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- 012000 - Price and Payment Procedures
- 012300 - Alternates
- 013000 - Administrative Requirements
- 014000 - Quality Requirements
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END OF SECTION

**SECTION 002113
INSTRUCTIONS TO BIDDERS**

NO MISUNDERSTANDING

THE ATTENTION OF BIDDERS IS SPECIFICALLY CALLED TO THE FOLLOWING PARAGRAPHS WHICH DEBAR A CONTRACTOR FROM PLEADING A MISUNDERSTANDING OR DECEPTION BECAUSE OF QUANTITIES, CHARACTER, LOCATION, SOURCE OF MATERIAL SUPPLY, ACCESSIBILITY OR OTHER CONDITIONS SURROUNDING THE FURNISHING AND ERECTING AND COMPLETION OF THIS WORK.

ALL SUB-CONTRACTORS ARE ESPECIALLY WARNED TO SEARCH THOROUGHLY ALL SHEETS OF DRAWINGS AND RELATED SPECIFICATION SECTIONS FOR WORK PERFORMED BY THEIR TRADES BUT NOT NECESSARILY REPEATED ON EACH SHEET. ALTHOUGH CARE IS TAKEN IN PREPARATION OF THE DRAWINGS, IT IS NOT ALWAYS POSSIBLE TO THOROUGHLY CROSS-REFERENCE ALL TRADE ITEMS SHOWN OR SPECIFIED IN ONE PLACE; HOWEVER, EACH REFERENCE WILL BE CONSIDERED BINDING AND AS IF IT WERE SHOWN ELSEWHERE.

GENERAL

2.01 INTENT

- A. The intent of this Bid request is to obtain an offer to perform work to complete a project located at Helena, MT for a Stipulated Sum contract, in accordance with the Contract Documents.

2.02 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS

- A. Work of this proposed Contract comprises site development and demolition, including, general construction, structural, electrical, stadium lighting and turf field work.

2.03 CONTRACT TIME

- A. Perform the Work within the time stated in Section 011000 - Summary.
 - 1. The work is to be started immediately after the written "Notice to Proceed" and be completed on, or before the dates called for in Section 01010 - SUMMARY OF WORK.
 - 2. **The anticipated Notice to Proceed date is April, 2021.**
- B. The bidder, in submitting an offer, accepts the Contract Time period stated for performing the Work. The completion date in the Agreement shall be the Contract Time added to the commencement date.

2.04 COLD WEATHER CONSTRUCTION

- A. Contract time might span winter months. Contractor shall include anticipated cold weather related construction costs in their bid. **Change order requests for cold weather construction will not be accepted.**

2.05 CONTRACTOR'S QUALIFICATIONS

- A. Contractors are to comply with the registration laws as required by the State of Montana or the county of jurisdiction.
- B. Subcontractors, for work greater than \$5,000.00, are to hold a proper Montana Public Contractor's Registration for the class of work proposed. (Title 15-50-101 Montana Code Annotated.)

BID DOCUMENTS AND CONTRACT DOCUMENTS

3.01 BORROWING OF DOCUMENTS

- A. Bid Documents may be obtained at the office of Architect, Crossman Whitney Griffin, P.C., 650 Power Street (59601), P.O. Box 1198, Helena, Montana 59624.
 - 1. A One Hundred dollar (\$100.00) deposit is required. Seventy five dollars (\$75.00) of the deposit will be returned upon receipt of the documents in good condition within 10 calendar days after the bid opening date. Plan deposit will be forfeited if plans are not returned on time.

- B. **BOUND COPY OF CONTRACT DOCUMENTS** None of the Instructions to Bidders, Proposal Form, Contract Stipulations or Specifications are to be removed from this bound copy of contract documents.
- C. **ELECTRONIC DRAWING FILES** Electronic drawing files are available from the Architect, Structural, Mechanical and Electrical Engineers, at \$100.00 per drawing file. These drawings will be stripped of all data except for basic plan or section information. A waiver must also be signed and received by Architect or Engineer prior to release of drawing files.
- D. Bid Documents are made available only for the purpose of obtaining offers for this project. Their use does not grant a license for other purposes.

3.02 INQUIRIES/ADDENDA

- A. Direct questions to Jason Egeline, CWG Architects, telephone: (406)-443-2340 e-mail: jason@cwg-architects.com
- B. Addenda may be issued during the bidding period. All Addenda become part of the Contract Documents. Include resultant costs in the Bid Amount.
- C. Verbal answers are not binding on any party.
- D. Clarifications requested by bidders must be in writing not less than **10** days before date set for receipt of bids. The reply will be in the form of an Addendum, a copy of which will be forwarded to known recipients and planholders.

3.03 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS

- A. Where the Bid Documents stipulate a particular product, **substitutions will be considered up to 10 days before receipt of bids.** Use the Substitution Request Form included in the Project Manual.
- B. When a request to substitute a product is made, Architect may approve the substitution and will issue an Addendum to known bidders.
- C. The submission shall provide sufficient information to determine acceptability of such products.
- D. Provide complete information on required revisions to other work to accommodate each proposed substitution.
- E. Provide products as specified unless substitutions are submitted in this manner and accepted.

3.04 SITE EXAMINATION

- A. **EXAMINATION OF SITE OF WORK - Before submitting a proposal, each bidder is to make a careful examination of the proposed contract documents, the plans and specifications, and make all necessary investigations to inform themselves thoroughly as to building conditions, available facilities, and to all difficulties involved in completing all work in a satisfactory manner, in accordance with the plans and specifications.**
- B. No plea of ignorance of conditions that exist, or of conditions, or difficulties that may be encountered in the execution of the work under this contract, as a result of failure to make necessary examinations and investigations, will be accepted as an excuse for any failure or omission on the part of the Contractor to fulfill in every detail all of the requirements of said contract, specifications and plans, or will be accepted as a basis for any claims whatsoever for extra compensation.

3.05 INTERPRETATION OF CONTRACT DOCUMENTS

- A. **Bidders are to promptly notify the Architect of any ambiguity, inconsistency, or error which they may discover upon examination of the Contract Documents or of the site and local conditions.**
- B. Bidders requiring clarification or interpretation of the Contract Documents are to request, in writing, clarification from the Architect at least seven days prior to the date set for receipt of bids.
- C. Any interpretations, correction or change in the Contract Documents prior to the bid opening will be made by written addendum, issued by the Architect. The Architect will endeavor to notify all

plan holders of any addenda issued but it is the responsibility of the individual bidders to insure they have received all addenda prior to the submission of their bid.

- D. Requests for approvals or substitutions of materials are to be made, in writing on copies of the form bound in the specifications, to the Architect at least **ten** days prior to the date for receipt of bids. Information submitted must contain adequate specifications, drawings or other data to enable the Architect to compare the material or product with the specified item. Bidders submitting materials or products for approval will be notified, in writing, of the acceptance or rejection of the item submitted prior to the bid date.

3.06 PREBID CONFERENCE

- A. The non-mandatory bidders conference has been scheduled for **11:00 a.m. on the 15th day of April** at the project site.
- B. Representatives of Architect and General Contractor will be in attendance.
- C. Summarized minutes of this meeting will be circulated to attendees. These minutes will not form part of the Contract Documents.
- D. Information relevant to the Bid Documents will be recorded in an Addendum, issued to General Contractor and Known Planholders.

BID SUBMISSION

4.01 DESCRIPTION AND METHOD OF BIDDING

- A. The work covered by these contract documents includes all Civil, Architectural, Structural, Electrical, Field Lighting and Turf Design work as called for on the drawings and in the specifications.

4.02 SUBMISSION PROCEDURE

- A. **Sub-contractor bids are to be received by Dick Anderson Construction by 3:00 P.M. MDT May 1st, 2020.**
- B. Bidders shall be solely responsible for the delivery of their bids in the manner and time prescribed.

4.03 SECURITY DEPOSIT

- A. Bids shall be accompanied by a security deposit as follows:
 - 1. Bid Bond of a sum no less than 10 percent of the Bid Amount on AIA A310 Bid Bond Form.
- B. Endorse the Bid Bond in the name of the Owner as obligee, signed and sealed by the principal (Contractor) and surety.
- C. The security deposit will be returned after delivery to the Owner of the required Performance and Payment Bond(s) by the accepted bidder.
- D. After a bid has been accepted, all securities will be returned to the respective bidders .
- E. If no contract is awarded, all security deposits will be returned.

4.04 PROPOSALS

- A. Before making his proposal, the Contractor is to assure himself that he is in possession of addenda issued.
- B. Proposals entitled to consideration must be made in accordance with the following instructions:
 - 1. One copy of the proposal form will be furnished to each prime bidder. One completed and signed form is to be submitted in a sealed envelope.
 - 2. Numbers are to be stated in both writing and in figures;
 - 3. Completed forms are to contain no additions, conditional or alternate bids, erasures or other irregularities;
 - 4. Is to acknowledge receipt of all addenda issued on both the proposal and on the outside of the envelope enclosing the bid;
 - 5. No oral, telephonic proposals or modifications will be considered;
 - 6. The Contractor's license number must be shown on both the proposal and on the outside of the envelope enclosing the bid;

7. Proposals entitled to consideration are to be signed in longhand by the proper representative of the firm submitting the proposal as follows:
 - a. The principal of a single-owner firm,
 - b. A principal of a partnership firm,
 - c. An officer of an incorporated firm who is authorized to bind the bidder and who is to also affix the corporate seal of such corporation.
8. Address Envelope to:

ATTENTION: Reagan Meredith
Dick Anderson Construction
3424 Highway 12 East
East Helena, MT 59601
and plainly marked on the outside:
Proposal for Carroll College Phase 1 Nelson Stadium - Field & Lighting, 1857 N.
Benton Avenue, Helena, MT 59601
FROM:
CONTRACTOR _____
MONTANA PUBLIC CONTRACTOR'S REGISTRATION NO. _____
ACKNOWLEDGE RECEIPT OF ADDENDUM NO. ___ ___ ___
9. Sub-contractor bids are to be received by Dick Anderson Construction by 3:00 P.M. MDT May 1st, 2020.

4.05 SELECTION AND AWARD OF ALTERNATES

- A. Bids will be evaluated on the total of the base bid price and all of the Alternates. After determination of the successful bidder, consideration will be given to which Alternates will be included in the Work.

4.06 LIST OF SUBCONTRACTORS

- A. The Contractor is to submit, within forty-eight (48) hours after bid time, a list of the major Subcontractors (over \$1,000) he proposes to employ during the construction of the building. The listed Subcontractors cannot be changed after the opening of proposals, without just cause, and without the consent of the Owner. Proposed Subcontractors Forms received after such time shall be considered void, and Contractor's bid will be considered nonresponsive.
- B. NOTE: The Owner reserves the right to accept or reject any or all Subcontractors submitted. Should a Subcontractor be rejected by the Owner, the bid price is to be adjusted as required to include the lowest acceptable Subcontractor bidding the work.

4.07 AWARD OF CONTRACT

- A. The Bidder to whom the award is made will be required to execute a written contract and to furnish good and approved bonds as hereinafter specified within ten (10) days after receiving such contract for execution.

4.08 CONTRACT

- A. The Contract for this work will be American Institute of Architects Contract form AIA Document A101, "Standard Form of Agreement Between Owner and Contractor". Contract form may be examined at the office of the Architect.

4.09 PERFORMANCE, LABOR AND MATERIAL PAYMENT BONDS

- A. The successful Contractor is to furnish a Performance Bond in the amount of 100% of the contract price as security for the faithful performance of his contract. In addition, the successful Contractor is to furnish a Labor and Material Payment Bond in the amount of 100% of the contract price as security for the payment of all persons performing labor and furnishing materials.
- B. Bond forms will be American Institute of Architects Bond forms AIA A-312 "Performance Bond" and "Payment Bond."
- C. The bonds are to be signed by the attorney-in-fact and countersigned by a Montana resident agent.

- D. Bonds are to be secured from a state licensed bonding company listed on the U.S. Treasury list of acceptable bonding companies.
- E. The General Contractor, Electrical Contractor, Lighting Contractor and Turf Contractor are to assign a foreman for each of their respective trades. The foreman for each trade is to remain on this project throughout.

4.10 TIME OF COMPLETION

- A. The work is to be started immediately after the written "Notice to Proceed" and be completed on, or before the dates called for in Section 011000 - SUMMARY OF WORK with the **anticipated construction start being Spring of 2021.**

OFFER ACCEPTANCE/REJECTION

5.01 DURATION OF OFFER

- A. Any bidder may withdraw his bid at any time prior to the scheduled closing time for receipt of bids.
- B. Bids shall remain open to acceptance and shall be irrevocable for a period of thirty (30) days after the bid closing date.

5.02 ACCEPTANCE OF OFFER

- A. The Owner reserves the right to accept any, or to reject any, or all proposals or alternates, or to waive minor technicalities as may be deemed for the best interest of the Owner.
- B. After acceptance by Owner, Architect on behalf of Owner, will issue to the successful bidder, a written Notice To Proceed.

END OF SECTION



SUBSTITUTION REQUEST FORM

(Fill in all Blanks – failure to do so will result in disapproval)
(One specification section per form)

****Must be submitted no less than 10 days prior to bid date****

Project:

Carroll College Phase 1 Nelson Stadium - Field & Lighting
1857 N. Benton Ave.
Helena, MT 59601

We hereby submit for your review the following substitution for the following specified material for the above project:

Specified Item:

Specification Section: Paragraph No. Drawing & Detail(s) No.

Proposed Substitution *(Attach complete technical data, including laboratory tests, if applicable, in duplicate)*

Include complete information on changes to Drawings and/or Specifications which proposed substitution will require for its proper installation.

- 1. Will Substitution affect dimensions indicated on Drawings? _____ (Yes) _____ (No)
- 2. Will the undersigned pay for any changes to the building design, including engineering and detailing costs caused by the requested substitution?
_____ (Yes) _____ (No)
- 3. What effect does the substitution have on other trades?
- 4. Difference between proposed and specified item?
- 5. Manufacturer's guarantee/warranty? _____ (Same) _____ (Different)

Explain:

In signing this form, the Proposer understand the burden of proof of the proposed substitute is upon the Proposer – that function, appearance and quality and equivalent or superior to the specified item.

Submitted By:

Firm:

Address:

Phone:

E-mail:

Fax:

A & E Review:

Date:

Accepted

Remarks

Not Accepted

Accepted as noted

Signature

(authorized official)

(Printed Name)

Date:

**CWG
Architecture**

Architecture
Engineering
Design

(406) 443-2340

650 Power St
P.O. Box 1198
Helena, MT 59624

cwg-architects.com

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General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

Carroll College Phase 1 Nelson Stadium - Field & Lighting
1857 N. Benton Ave.
Helena, MT 59601

THE OWNER:

(Name, legal status and address)

Carroll College
1601 N. Benton Ave.
Helena, MT 59625

THE ARCHITECT:

(Name, legal status and address)

Crossman-Whitney-Griffin, P.C. Architects
Professional Corporation of the State of Montana
650 Power St. (59601)
PO Box 1198
Helena, MT 59624

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

Init.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™-2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™-2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document

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G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

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§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

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§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

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§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

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§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and

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delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will

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specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

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§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

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§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

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§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

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§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

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- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

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§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

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§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of special warranties required by the Contract Documents; or
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

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- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will

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promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 **Notice of Cancellation or Expiration of Contractor's Required Insurance.** Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or

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expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 **Failure to Purchase Required Property Insurance.** If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 **Notice of Cancellation or Expiration of Owner's Required Property Insurance.** Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

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§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during

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that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

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§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

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§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;

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- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

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§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

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§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

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§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

**SECTION 007300
SUPPLEMENTARY CONDITIONS**

1.01 SUMMARY

The Supplementary General Conditions hereinafter described contain changes and additions to the AIA General Document A201, 2017 edition. Where any part of the AIA General Conditions is modified or voided by the Supplementary Conditions, the unaltered provisions remain in effect; in event of conflict between the General Conditions and the Supplementary General Conditions, the most stringent requirements are to be followed, as determined by Architect, and without cost to Owner. In event of conflict between the Agreement and either the General or Supplementary Conditions, the Agreement is to be followed.

ARTICLE 1 - CONTRACT DOCUMENTS

1.1.1 THE CONTRACT DOCUMENTS. Delete the last sentence and add the following:
"The Contract Documents are to include the Bidding Information; Instruction To Bidders; Sample Forms and the Proposal."

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities.

- a. The Agreement.
- b. Addenda, with those of later date having precedence over those of earlier date.
- c. The Supplementary Conditions.
- d. The General Conditions of the Contract for Construction.
- e. Drawings and Project Manual.

In the case of an inconsistency between Drawings and Specifications, or within either Document not clarified by addendum, the better quality or greater quantity of Work is to be provided in accordance with the Architect's interpretation.

Failure to report a conflict in the Contract Documents is deemed evidence that the Contractor has elected to proceed in the more expensive manner.

All Sub-contractors are especially warned to search thoroughly all sheets of drawings and related specification sections for work performed by their trades but not necessarily repeated on each sheet. Although care is taken in preparation of the drawings, it is not always possible to thoroughly cross-reference all trade items shown or specified in one place; however, each reference will be considered binding and as if it were shown elsewhere.

ARTICLE 3 - DOCUMENTS AND SAMPLES AT THE SITE

3.11 RECORD DRAWINGS. Add the following:

"At project completion and prior to final payment the Contractor shall submit complete as-built record drawings to the Architect, including all subcontractor as-built record drawings and modifications made by change order, supplemental instructions and construction directives. Final payment will not be processed until the contractor's as built drawings have been approved by the Architect."

ARTICLE 7 - CHANGES IN THE WORK

Add the following sections 7.2.2 thru 7.2.5:

7.2.2: The Contractor shall not submit any Change Order, response to requested cost proposals, or requested changes which are incomplete and do not contain full breakdown and supporting documentation in the following three areas:

1. Direct costs (only those listed in Subparagraph 7.3.7). Since the Superintendent must be on the project site with or without the Change Order, Superintendent costs may not be included as costs in Change Orders unless additional contract days are required for the Change Order.
2. Indirect costs (Generally considered to be overhead and profit):

- a. For the General Contractor, for Work performed by the General Contractor's own forces, 10% of the total cost. Superintendent costs may not be included as a cost since he must be on the project with or without the change order. Superintendent costs may not be included as a cost in Items B, C and D as follows:
 - b. For the General Contractor, for Work performed by the General Contractor's Subcontractor, 5% of the amount due the Subcontractor.
 - c. For each Subcontractor or Sub-subcontractor involved, for Work performed by that subcontractor's or Sub-subcontractor's own forces, 10% of the cost.
 - d. For each Subcontractor, for Work performed by the Subcontractor's Sub-subcontractors, 5% of the amount due the Sub-subcontractor.
3. Consequential items (e.g. time extensions, credits, logic, reasonableness, impacts, disruptions, dilution)

7.2.3: Any Change Order, responses to requested proposals, or requested changes submitted by the Contractor which, in the opinion of the Architect, are incomplete, may be rejected and returned to the Contractor without comment. It is the responsibility of and incumbent upon the Contractor to ensure and confirm that all Change Orders, responses to requested proposals, or requested changes are complete prior to submission.

7.2.4: Overhead, applicable to all areas and sections of the Contract Documents, means "Indirect Costs" as referenced in Subparagraph 7.2.2. Indirect costs are inclusive of, but not limited to, the following: home office overhead; off-site supervision; change order and/or proposal preparation, design, research, negotiation and associated travel; effects of disruption and dilution of management and supervision whether on or off-site; time delays; coordination of trades; postage and shipping; and, effective increase in guarantee and warranty durations. Indirect costs applicable to any and all changes in the work, either through Change Order or Construction Change Directive, are limited to the percentage allowance for overhead in Subparagraph 7.2.2.

7.2.5: By signature on any change order, the Contractor certifies that the signed change order is complete and includes all direct costs, indirect costs and consequential items (including additional time, if any) and is free and clear of all claims or disputes (including, but not limited to, claims for additional costs, additional time, disruptions, and impacts) in favor of the contractor, subcontractors, material suppliers, or other persons or entities concerning the signed change order and on all previously contracted Work and does release the Owner from such.

ARTICLE 9 – PAYMENTS AND COMPLETION

Periodic estimates for partial payment are to be submitted to the Architect for payment by the Owner. Payment is to be requested for 90 percent of the labor and material incorporated in the work to date and for materials suitably stored at the project site less the aggregate of previous payments.

Progress payments do not constitute acceptance of any portion of the work.

ARTICLE 11 - INSURANCE AND BONDS

The Contractor is to provide Owner with evidence of coverage required in this document, and give Owner forty five days written notice of cancellation or material change in coverage. Insurance is to be provided as shown in these Supplementary Conditions. **If the insurance certificate holder is an additionally Insured, an additional insured insurance certificate endorsement must be submitted.**

GENERAL LIABILITY

All certificates indicating insurance coverage required by these General Conditions of the Contract for Construction (AIA A201-2017) are to be filed with the Owner along with the Owner-Contractor Agreement.

Insurance required herein and in Article 11 of the General Conditions (AIA A201-20177) is to be provided by insurance policies issued only by insurance companies currently authorized to do business in the State of Montana. No Contractor or Subcontractor is to commence work under this contract until all required insurance has been obtained and has been approved by the Owner and the Architect. During the term of this contract, the Contractor is to deliver to the Owner and the Architect a Certificate of Insurance with respect to the renewal of insurance policies not less than 15 days prior to the expiration date of any policy for which a Certificate of Insurance is required.

The Contractor is to provide the Owner and Architect Certificates of Insurance signed by authorized representatives of the insurance company, or any companies evidencing that insurance as required herein is in force and will not be canceled, limited or restricted without ten days written notice by registered or certified mail to the Contractor, Owner and Architect.

Insurance coverage is to be filed on the ACORD Certificate of Insurance form modified as required by the Instruction Sheet (AIA Document G715) attached to these Supplementary Conditions.

Contractor's General Liability Insurance shall include premises-operations; independent contractor's operations protection; personal injury, and completed operations and product liability coverages. The General Aggregate Limit shall apply separately to each of the Contractor's projects.

The Contractor is to maintain comprehensive general liability insurance (including coverage for completed operations) and comprehensive automobile liability insurance with not less than the following limits of liability. Policy is to include Premises-Operations, Independent Contractors' Protective, Products and Completed Operations, and Broad Form Property Damage coverages. Insurance coverage is to be on a per project site aggregate.

- | | | |
|-----|--|-----------------------|
| 1. | GENERAL AGGREGATE PER PROJECT | <u>\$2,000,000.00</u> |
| 2. | Products - Completed Operations Aggregate | <u>\$2,000,000.00</u> |
| | Products and Completed Operations Insurance is to be maintained for a minimum period of 2 years after final payment and the Contractor is to continue to provide evidence of such coverage to the Owner on an annual basis. | |
| 3. | Personal and Advertising Injury (Each Occurrence) | <u>\$1,000,000.00</u> |
| 4. | Bodily Injury and Property Damage (Each Occurrence) | <u>\$1,000,000.00</u> |
| 5. | Umbrella Excess Liability | |
| | Over primary insurance | <u>\$4,000,000.00</u> |
| | Retention | <u>\$25,000.00</u> |
| 6. | Comprehensive Automobile Liability (owned, non-owned, hired): | |
| | Combined Single Limit (Bodily Injury and Property Damage) | <u>\$1,000,000.00</u> |
| | or | |
| | Bodily Injury: Each Person | <u>\$1,000,000.00</u> |
| | Each Accident | <u>\$1,000,000.00</u> |
| | Property Damage: Each Occurrence | <u>\$1,000,000.00</u> |
| 7. | Contractor's Liability Insurance may be satisfied by primary insurance or a combination of primary and excess insurance. | |
| 8. | In the event the General Aggregate Limit is diminished by an amount greater than \$500,000, Contractor shall provide notice to Owner of this fact, and shall again provide such notice on each subsequent occasion on which the General Aggregate Limit is again diminished by an amount greater than \$500,000. | |
| 9. | In addition to other requirements in the General Conditions, coverage will include Per Project Aggregate Endorsement. | |
| 10. | Property Damage Liability Insurance is to include coverage for Explosion, Collapse and Underground (XCU) hazards. | |
| 11. | Liability insurance shall name Architect and Owner as additional insured. | |

- a. Use additional insured endorsement CG32 88 05 10 if the architect is not engaged by the name insured, use additional insured endorsement CG 32 86 05 10 if the architect is engaged by the named insured.
- b. With respect to insurance required by Article 11.C.1-9 inclusive, include as additional insureds OWNER (Carroll College), ARCHITECT (CWG, P.C. Architects), ARCHITECTS' Consultants (Robert Peccia & Associates, GPD, Inc., D.A. Hogan (turf consultant), Sparling (lighting consultant)) and any other persons or entities identified in the Special Provisions, all of whom shall be listed as additional insureds, and include coverage for the respective directors, officers, employees and agents of all such additional insureds:

Owners and Contractors Protective Policy: In addition to the insurance required to be provided by CONTRACTOR under Article 11.C.1-9 CONTRACTOR shall purchase and maintain a separate Owners and Contractors Protective Policy (OCP) to protect OWNER Carroll College) against claims which may arise from operations under the Contract Documents, with limits of liability as specified below. This liability insurance shall include as additional insureds the ENGINEER (CWG P.C., Architects) and the ARCHITECTS' Consultants (Robert Peccia & Associates, GPD, Inc., D.A. Hogan (turf consultant), Sparling (lighting consultant)) and includes coverage for the respective directors, officers, employees and agents of all such additional insureds.

General Aggregate	<u>\$2,000,000.00</u>
Each Occurrence	<u>\$1,000,000.00</u>

- c. Also use additional insured endorsement CG 32 90 05 10 to provide products-completed operations coverage.
- d. Bodily Injury and Property Damage:

Each Occurrence	<u>\$1,000,000.00</u>
Aggregate	<u>\$2,000,000.00</u>

- e. Property Insurance: The Owner will purchase with the following modifications:
 Owner is to purchase and maintain property insurance upon the entire work at the site to the full insurable value thereof. This insurance is to be an all-risk policy form.

AUTOMOBILE LIABILITY

Combined Single Limit (bodily injury and property damage) Each Accident \$1,000,000.00

Coverage to be written on a Symbol 1 (one) any auto basis, to include all owned, hired, and non-owned vehicles.

Contractor's Automobile Liability Insurance may be satisfied by primary insurance or a combination of primary and excess insurance.

Worker's Compensation Insurance:

The Contractor is to familiarize himself with the provisions of the Montana Worker's Compensation Act. He is to insure his liability under this act as provided in the law, and he is to require all of his Subcontractors to insure their liabilities under the Act. The Contractor is required to furnish to the Owner a written affidavit from his carrier showing his compliance with the provisions of the Act. He is to require all of his Subcontractors to insure their liabilities under the Act.

- a. State Statutory
- b. Applicable Federal (e.g. Longshoremen's) Statutory
- c. Employer's Liability \$1,000,000.00
- d. Benefits required by Union Labor Contracts - comply with local union wage scale.

General Policy Information:

Insurance required herein and in Article 11 is to be provided by insurance policies issued only by insurance companies currently authorized to do business in the State of Montana. No

Contractor or Subcontractor is to commence work under this contract until all required insurance has been obtained and has been approved by the Owner and the Architect. During the term of this contract, the Contractor is to deliver to the Owner and Architect, a Certificate of Insurance with respect to the renewal insurance policy not less than 15 days prior to the expiration date of any policy for which a Certificate of Insurance is required.

The Contractor is to provide the Owner and Architect Certificates of Insurance signed by authorized representatives of the insurance company, or any companies evidencing that insurance as required herein is in force and will not be canceled, limited or restricted without forty five (45) days written notice by registered or certified mail to the Contractor, Owner and Architect.

PROPERTY INSURANCE (PURCHASED BY CONTRACTOR)

- A. Contractor shall purchase and maintain property insurance on the work at the site in the amount of the full replacement cost. This insurance shall;
- B. Include the interest of the Owner, Contractor, Sub-Contractors, Architect and Architect's Consultants and any other entity identified in the contract, each of whom must have insurable interest and be named as an additional insured.
- C. Be written on a "Builder's Risk" policy form. Such insurance will include coverage for physical loss to the work at the site including machinery, electrical and computer units, and including the testing and startup of machinery, electrical and computer units. Coverage must be afforded for materials and equipment in transit and in temporary storage. Such coverage will provided on a Special Cause of Loss coverage form and also include the perils of earthquake, collapse, debris removal and demolition.
- D. Include expenses incurred in the repair or replacement including fees and charges of the Architect and soft costs.
- E. Be endorsed to allow occupancy and partial utilization by the Owner
- F. All policies of insurance will be endorsed to not be cancelled or materially altered or non-renewed without a 45 day prior written notice to the Owner.
- G. Include a Waiver of Subrogation providing that the insurer or contractor will have no right of recovery against the Owner or any additional insured.
- H. Any deductible will be the sole responsibility of the Contractor.

END OF SECTION



AIA[®] Document G715[™] – 1991

Supplemental Attachment for ACORD Certificate of Insurance 25-S

PROJECT (Name and address): _____

INSURED _____

- | | Yes | No | N/A |
|---|--------------------------|--------------------------|--------------------------|
| A. General Liability | | | |
| 1. Does the General Aggregate apply to this Project only? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Does this policy include coverage for: | | | |
| a. Premises - Operations? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Explosion, Collapse and Underground Hazards? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Personal Injury Coverage? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Products Coverage? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e. Completed Operations? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f. Contractual Coverage for the Insured's obligations in A201? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. If coverage is written on a claims-made basis, what is the: | | | |
| a. Retroactive Date? | | | |
| b. Extended Reporting Date? | | | |
| B. Worker's Compensation | | | |
| 1. If the Insured is exempt from Worker's Compensation statutes, does the Insured carry the equivalent Voluntary Compensation coverage? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| C. Final Payment Information | | | |
| 1. Is this certificate being furnished in connection with the Contractor's request for final payment in accordance with the requirements of Sections 9.10.2 and 11.1.3 of AIA Document A201, General Conditions of the Contract for Construction? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. If so, and if the policy period extends beyond termination of the Contract for Construction, is Completed Operations coverage for this Project continued for the balance of the policy period? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| D. Termination Provisions | | | |
| 1. Has each policy shown on the certificate and this Supplement been endorsed to provide the holder with 30 days notice of cancellation and/or expiration? List below any policies which do not contain this notice. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| E. Other Provisions | | | |

Authorized Representative

Date of Issue

**SECTION 007400
SPECIAL CONDITIONS**

GENERAL: THESE SPECIAL CONDITIONS ARE HEREBY MADE A PART OF THE CONTRACT AND ANY EXTRA WORK OR COST MADE OR CAUSED BY THESE SPECIAL CONDITIONS ARE TO BE ABSORBED IN THE LUMP SUM BID.

1.01 DEFINITIONS AND TERMS: WHENEVER IN THESE SPECIFICATIONS AND CONTRACT, THE FOLLOWING TERMS OR PRONOUNS IN PLACE OF THEM ARE USED, THE INTENT AND MEANING ARE TO BE INTERPRETED AS FOLLOWS:

- A. A.S.T.M.: American Society for Testing Materials.
- B. LABORATORY: The Testing Laboratory which may be designated to make tests of materials of work involved.
- C. ARCHITECT'S REPRESENTATIVE: An authorized representative of the Architect, assigned to make any or all necessary observations of the work performed and the materials furnished by the Contractor.
- D. SUBCONTRACTOR: The individual, firm or corporation undertaking the execution of a part of the work under terms of the contract by virtue of an agreement between himself and the Contractor, subject to the approval of the Owner.
- E. General Requirements: Provisions or requirements of the Division 1 Sections applies to the entire work of the Contract.
- F. Indicated Directed, Requested, Furnish, Install Provide, etc: See Section 014216 Definitions for definitions of these terms.

1.02 DESIGNATION OF PARTIES:

- A. OWNER: Where the word "Owner" is used, such is to be understood to refer to Carroll College, 1601 Benton Avenue, Helena, MT 50625.
- B. OWNER'S REPRESENTATIVE: Where the words "Owner's Representative" are used, they refer to Mr. Charlie Gross, Athletic Director (406) 447-5480.
- C. CONTRACTOR: Where the word "Contractor" is used, it refers to the Dick Anderson Construction, Inc., 3424 Highway 12 East, Helena, MT 59601, having a direct contract with the Owner, and who is engaged in completing the work as specified herein.
- D. ARCHITECT: Where the word "Architect" is used, it refers to Crossman-Whitney-Griffin, P.C., Architects, 650 Power Street, Helena, Montana, 59601 (406) 443-2340.

1.03 AWARD OF CONTRACT:

- A. The bidder to whom the award is made will be required to execute a written contract and to furnish good and approved bonds as hereinafter specified within ten (10) days after receiving such contract for execution.
- B. The Contract is the American Institute of Architects (A.I.A.) document number A101, 2017 edition, "Standard Form of Agreement Between Owner and Contractor." The bond forms are the American Institute of Architects document number A312 "Performance Bond" and "Labor and Material Payment Bond." Copies of documents A101 and A312 are not bound in these bidding documents, but are to be made a part of these instructions as if they were written herein in full. Copies of the above-mentioned documents are available to the Contractor on request.

1.04 OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA):

- A. All Contractors and Subcontractors engaged in the work are to observe all of the rules and regulations of the Occupational Safety and Health Act, insofar as they apply to the work.

1.05 SOCIAL SECURITY ACT AND UNEMPLOYMENT COMPENSATION LAW:

- A. The Contractor is to comply with, and require all of his Subcontractors to comply with, all the provisions of the Act of Congress approved August 14, 1935, known and cited as the "Social Security Act" and also the provisions of the Act of the Montana Legislature, and known as the Unemployment Compensation Law of Montana, and all amendments of such Acts.

1.06 AMERICANS WITH DISABILITIES ACT (ADA):

- A. The Contractor is to comply with, and require all of his subcontractors to comply with, the provisions of the Act of Congress effective January 26, 1992, known and cited as the "Americans with Disabilities Act (ADA)" and all amendments of this act.

1.07 PERMITS AND REVIEWS:

- A. The Owner is to obtain necessary building permit(s) from the local and/or state building officials, and pay all fees for said permits and plan reviews. Contractor is to obtain and pay all fees for mechanical, electrical, and plumbing permits and any inspection fees during the course of construction, and is to include these fees in his bid. Contractor is to furnish copies of permits obtained to the Owner's Representative and the Architect. Contractor is to submit attached "Certification of Required Inspections" at time of substantial completion.
- B. Contractor shall be responsible for furnishing, installing, and maintaining all required BMPs in order to comply with the MDEQ General Construction Storm Water Permit. The Contractor will complete the Notice of Intent (NOI) and Storm Water Pollution Prevent Plan (SWPPP), pay applicable fees associated with obtaining the permit, and complete required self-inspections and documentation utilizing a Registered Stormwater Administrator. The Contractor shall be listed and sign the NOI and SWPPP as the Applicant (Owner/Operator). Contractor shall be responsible for coordinating with Civil Engineer to help ensure compliance with permit requirements. If the Contractor fails to comply with general storm water permit requirements and/or fails to maintain necessary BMPs in a manner acceptable to Owner and/or MDEQ, items out of compliance or acceptable working order may be repaired by Owner, and Contractor will be responsible for costs incurred for such repairs.
- C. The Contractor is notified that in concurrence with Title 17, Chapter 30 Administrative Rules of Montana and the Federal Clean Water Act, this project site will require construction disturbance that exceeds one (1) acre.

Contact: Montana Department of Environmental Quality
Water Protection Bureau Storm Water Program
PO Box 200901
1520 East Sixth Avenue
Helena, MT 59620-0901
Phone: 406.444.3080

1.08 LAYOUT OF WORK:

- A. The Contractor is to establish all lines and levels necessary to the location and erection of the building elements and related work. He is also required to take his measurements of the site, verifying same with the drawings, and be responsible for the proper fit of completed work.
- B. Contractor to complete a full utility verification survey and mark items prior to begging of any work.
- C. Prior to beginning site excavation, the contractor is to place all necessary elevation markers and plan locations for finished grade of field turf, retaining walls, ramps, slabs and light pole base elevations and notify the owner and design team of any inconsistency's prior to beginning of work. If not completed it is the responsibility of the contractor to repair, move or replace any inconsistencies in the layout.

1.09 ASSIGNMENTS:

- A. The Contractor may not assign the whole or any part of this contract or any moneys due, or to become due hereunder, without written consent of the Owner. In case the Contractor assigns all or any part of any moneys due, or to become due under this contract, the instrument of assignment is to contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any moneys due, or to become due the Contractor is subject to prior claims of all persons, firms, and corporations for services rendered or materials supplied for the performance of the work called for in this contract.

1.10 SUBSURFACE AND PHYSICAL CONDITIONS

- A. In preparation of the Drawings and Specifications, Engineer relied on the following reports of explorations and tests of subsurface conditions at the site:
- B. "Geotechnical and Materials Addendum Report, Carroll College - Nelson Stadium " dated February 2011 - by Pioneer Technical Services, Inc. The report is available for review at the office of CWG Architects and the office of Dick Anderson Construction.

This report was prepared and /or utilized for the purpose of Engineering Design and may not contain complete information necessary for the CONTRACTOR's purposes, including but not limited to any aspect of the means, methods, techniques, sequences or procedures of construction and safety precautions and programs incident thereto. **These reports and drawings are not part of the Contract Documents.** CONTRACTOR may not rely upon or make any claim against the Owner, Engineer or any of Engineer's Consultants with respect to:

1. Completeness of such reports and drawings for CONTRACTOR's purposes; or
2. Other data, interpretations, opinions, and information contained in such reports outside of the "technical data" identified above; or
3. Any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any other data interpretations, opinions, or information.

1.11 COLD WEATHER CONSTRUCTION

- A. Contract time is anticipated to span fall/winter months. Contractor shall include anticipated cold weather related construction costs in their bid including all temporary heat and blanketing that may be necessary to protect CONSTRUCTION materials against injury from dampness and cold.

1.12 CONSTRUCTION AREA: A STAGING AREA WILL BE DESIGNATED FOR THE PARKING OF JOB TRAILERS, AND FOR THE STORAGE OF MATERIALS. THIS AREA IS TO BE FENCED OFF WITH WITH MATERIAL SUITABLE TO THE OWNER.

1.13 SUPERINTENDENT: THE GENERAL, ELECTRICAL, LIGHTING AND TURF SUPERINTENDENT'S SHALL REMAIN WITH THE PROJECT THROUGHOUT SUBSTANTIAL COMPLETION. SUBSTITUTION OF SUPERINTENDENT'S DURING THE PROGRESS OF WORK WILL NOT BE ALLOWED WITHOUT 30 DAYS WRITTEN NOTICE FOR APPROVAL TO THE OWNER AND ARCHITECT.

1.14 SEQUENCE OF CONSTRUCTION: TO BE DETERMINED BY CONTRACTOR, OWNER AND ARCHITECT.

1.15 TIME OF COMPLETION: TIMES OF COMPLETION SHALL BE AS LISTED IN SECTION 01010 - " SUMMARY OF WORK."

END OF SPECIAL CONDITIONS

**Carroll College
1601 N. Benton Avenue
Helena, MT 59625**

Certification of Required Inspections

Project Name _____

Project Owner _____

Project Operator _____

Address of Establishment _____

Address of Owner _____

1 Electrical Insp. Date _____ Name of Inspector _____

2 Building Insp. Date _____ Name of Inspector _____

3 Dept. of J. Insp. Date _____ Name of Inspector _____

A COO or Certificate of Occupancy has been issued by the governing unit for this establishment.
Date _____

By the City of _____

SECTION 011000

SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Carroll College Phase 1 Nelson Stadium - Field & Lighting
- B. Owner: Carroll College
- C. The Project consists of:
 - 1. Adding a new retaining wall, ramps, guardrails and handrails around the field.
 - 2. Installing a new turf field system with new irrigation/watering system
 - 3. Installing new stadium lighting and associated power and emergency backup lighting systems.
 - 4. Excavation, utility work and site grading for items above.
 - 5. Modifying existing systems to work with new design.

1.02 DESCRIPTION OF ALTERATIONS WORK

- A. Scope of demolition and removal work is indicated on drawings and specified in Section 024100.

1.03 COORDINATION

- A. Coordinate construction to assure efficient and orderly installation of each part of the Work. Coordinate operations that depend on each other for proper installation, connection, and operation.
 - 1. Schedule operations in the sequence required to obtain the best results where installation of one part depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to assure maximum accessibility for maintenance, service, and repair. Make provisions to accommodate items scheduled for later installation.
 - 3. Coordination Drawings: Prepare coordination drawings if needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space necessitates maximum utilization of space for efficient installation of different components.
 - 4. Inspection of Conditions: Require Installers of major components to inspect substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected.
 - 5. **It is absolutely necessary for all trades involved to coordinate with each other and verify that there are no conflicts in location of conduits, sprinkler heads, diffusers, boxes, and other items throughout this project.**

1.04 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations which might be impacted by this project.

1.05 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to site area under this contract.
 - 1. Locate and conduct construction activities in ways that will limit disturbance to site.
- B. Arrange use of site and premises with owner to allow:
 - 1. Owner occupancy.
 - 2. Work by Others.
 - 3. Use of adjacent buildings by the college and students.
- C. Provide access to and from site as required by law and by Owner:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.

- D. Existing building spaces may not be used for storage.
- E. Utility Outages and Shutdown:
 - 1. Limit shutdown of utility services to 2 hours at a time, arranged at least 24 hours in advance with Owner.
 - 2. Contactor shall be responsible for contacting, coordinating and scheduling with local utility providers.
 - 3. Contractor shall be responsible for contacting, coordinating and scheduling with utility companies. Any temporary interruptions of services occurring as a result of this work must be closely coordinated between utility providers, the Owner, and/or the Architect/Engineer, as appropriate.

1.06 PROGRESS SCHEDULE

- A. A critical path schedule is to be established by the General Contractor in order to insure completion of this building within the completion time accepted by the Owner. The schedule shall reflect the beginning of the project to the close of the project, including all divisions of construction. A copy of the schedule shall be furnished to the Architect / Engineer Team and the Owner's Representative **prior to the pre-construction meeting**. The general Contractor's site Superintendent shall also furnish the Owner's Representative with a three week short term construction schedule, which will be revised at the end of each work week and sent to the Owner's Representative. The short term construction schedule will be furnished at the preconstruction meeting.

1.07 COMPLETION

- A. Completion Dates: **The new building is to be completed and turned over to the Owner on, or before August 27th 2021** w/ anticipated start in Spring 2021.
 - 1. Punch list items are to be completed within fourteen (14) days after the substantial completion date.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 012000
PRICE AND PAYMENT PROCEDURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Procedures for preparation and submittal of application for final payment.

1.02 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Form to be used: AIA G702 and G703.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- E. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Percentage of Completion.
 - 9. Balance to Finish.
 - 10. Retainage.
- F. Execute certification by signature of authorized officer.
- G. Submit one electronic and no hard-copies of each Application for Payment.
- H. **Include the following with the application:**
 - 1. Transmittal letter as specified for submittals in Section 013000.
 - 2. Construction progress schedule, revised and current as specified in Section 013000.
 - 3. Current construction photographs specified in Section 013000.
 - 4. Partial release of liens from major subcontractors and vendors.
 - 5. Affidavits attesting to off-site stored products.
- I. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.03 INITIAL APPLICATION FOR PAYMENT:

- A. Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:
 - 1. List of subcontractors.
 - 2. List of principal suppliers and fabricators.
 - 3. Schedule of Values.
 - 4. Contractor's Construction Schedule (preliminary if not final).
 - 5. Submittal Schedule (preliminary if not final).
 - 6. List of Contractor's staff assignments and major subcontractor contact personnel, including addresses and telephone numbers.
 - 7. Copies of building permits.
 - 8. Copies of licenses from governing authorities.
 - 9. Certificates of insurance and insurance policies.
 - 10. Performance and payment bonds.

1.04 APPLICATION FOR PAYMENT AT SUBSTANTIAL COMPLETION:

- A. Following issuance of the Certificate of Substantial Completion, submit an Application for Payment. This application is to reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- B. Administrative actions and submittals that are to precede or coincide with this application include the following:
 - 1. Occupancy permits - submit completed Certification of Required Inspections.
 - 2. Warranties and maintenance agreements.
 - 3. Test/adjust/balance records.
 - 4. Maintenance instructions.
 - 5. Changeover information related to Owner's occupancy.
 - 6. Final cleaning.
 - 7. Application for reduction of retainage and consent of surety.

1.05 APPLICATION FOR FINAL PAYMENT

- A. Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include the following:
 - 1. Completion of Project closeout requirements.
 - 2. Completion of items specified for completion after Substantial Completion.
 - 3. Transmittal of Project construction records to the Owner.
 - 4. Removal of temporary facilities and services.
 - 5. Change of door locks to Owner's access.
 - 6. Filing of a notarized affidavit by the Contractor indicating that all bills have been paid and all claims against this project have been satisfied.
 - 7. Proof that taxes, fees, and similar obligations were paid.
 - 8. Filing of acceptance of the Bonding Company to final payment.

END OF SECTION

**SECTION 012300
ALTERNATES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Description of Alternates.
- B. Procedures for pricing Alternates.

1.02 RELATED REQUIREMENTS

- A. Document 002113 - Instructions to Bidders: Instructions for preparation of pricing for Alternates.
- B. See attached turf drawings and specifications and related documents for base turf design and related alternates.

1.03 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 013000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electronic document submittal service.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Progress photographs.
- F. Submittals for review, information, and project closeout.
- G. Number of copies of submittals.
- H. Requests for Interpretation (RFI) procedures.
- I. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 016000 - PRODUCT REQUIREMENTS: General product requirements.

1.03 PROJECT COORDINATOR

- A. Project Coordinator: Architect and Carroll College Project Manager.
- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for vehicular and delivery access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 011000 - Summary.
- F. Governing Authority Inspections: Schedule all City/State governing authority inspections with the Owner's Representative to ensure Owner is present.
- G. Coordination Drawings: Prepare coordination drawings if needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space necessitates maximum utilization of space for efficient installation of different components.
- H. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- I. Coordinate scheduling and timing of required procedures with other activities to avoid conflicts and assure orderly progress. Such activities include, but are not limited to, the following:
- J. Make the following types of submittals to Architect through the Project Coordinator:
 - 1. Requests for Interpretation.
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 - 1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
 - 2. Contractor and Architect are required to use this service.
 - 3. It is Contractor's responsibility to submit documents in allowable format.
 - 4. Subcontractors, suppliers, and Architect's consultants will be permitted to use the service at no extra charge.
 - 5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
 - 6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
 - 7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
- B. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner from the contractor and their electronic document service. Contractor is to release all documents stored in service as part of closeout services.

3.02 PRECONSTRUCTION MEETING

- A. Project Coordinator will schedule a meeting after Notice of Award.
- B. **Attendance Required:**
 - 1. **Owner.**
 - 2. **Architect.**
 - 3. **Contractor.**
 - 4. Excavator, Concrete, Metal Fabricator, General Electrical, Field Lighting and turf sub contractors.
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 - 5. Submission of initial Submittal schedule.
 - 6. Designation of personnel representing the parties to Contract, Contractor, Owner and Architect.
 - 7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 8. Review of site mobilization schedule and proposed location.
 - 9. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required:
 - 1. Contractor.
 - 2. Owner.
 - 3. Architect.
 - 4. Special consultants.
 - 5. Contractor's superintendent.
 - 6. Major subcontractors.
- D. Agenda:
 - 1. Review of work progress.
 - 2. Field observations, problems, and decisions.
 - 3. Identification of problems that impede, or will impede, planned progress.
 - 4. Review of submittals schedule and status of submittals.
 - 5. Review of RFIs log and status of responses.
 - 6. Review of off-site fabrication and delivery schedules.
 - 7. Maintenance of progress schedule.
 - 8. Corrective measures to regain projected schedules.
 - 9. Planned progress during succeeding work period.
 - 10. Coordination of projected progress.
 - 11. Maintenance of quality and work standards.
 - 12. Effect of proposed changes on progress schedule and coordination.
 - 13. Other business relating to work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 CONSTRUCTION PROGRESS SCHEDULE

- A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 - 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

3.05 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. **Submit new photographs at the end of each week with each three week schedule, within 3 days after exposure.**
- C. Photography Type: Digital; electronic files.
- D. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.
- E. In addition to periodic, recurring views, take photographs of each of the following events:
 - 1. Excavations in progress.
 - 2. Foundations in progress and upon completion.
 - 3. Structural framing in progress and upon completion.

- F. Views:
 1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
 2. Consult with Architect for instructions on views required.
 3. Provide factual presentation.
 4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
- G. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
 1. Delivery Medium: Via email.
 2. File Naming: Include project identification, date and time of view, and view identification.
 3. PDF File: Assemble all photos into printable pages in PDF format, with 2 photos per page, each photo labeled with file name; one PDF file per submittal.

3.06 REQUESTS FOR INTERPRETATION (RFI)

- A. Definition: A request seeking one of the following:
 1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
 2. A resolution to an issue which has arisen due to field conditions and affects design intent.
- B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.
- C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
 1. Prepare a separate RFI for each specific item.
 - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
 2. Prepare using software provided by the Electronic Document Submittal Service.
 3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
 1. Unacceptable Uses for RFIs: Do not use RFIs to request the following:
 - a. Approval of submittals (use procedures specified elsewhere in this section).
 - b. Approval of substitutions (see Section - 016000 - PRODUCT REQUIREMENTS)
 2. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
- E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
 1. Indicate current status of every RFI. Update log promptly and on a regular basis.
 2. Note dates of when each request is made, and when a response is received.
- G. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
 1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

3.07 SUBMITTAL SCHEDULE

- A. Submit to Architect for review a schedule for submittals in tabular format.

1. Submit at the same time as the preliminary schedule.
2. Format schedule to allow tracking of status of submittals throughout duration of construction.
3. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.

3.08 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 017800 - Closeout Submittals.

3.09 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 1. Design data.
 2. Certificates.
 3. Test reports.
 4. Inspection reports.
 5. Manufacturer's instructions.
 6. Manufacturer's field reports.
 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

3.10 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 017800 - Closeout Submittals:
 1. Project record documents.
 2. Operation and maintenance data.
 3. Warranties.
 4. Bonds.
 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.11 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 1. After review, produce duplicates.
 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.12 SUBMITTAL PROCEDURES

- A. General Requirements:
 1. Transmit using approved form.

2. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
 3. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 4. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
 5. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
 6. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 7. Provide space for Contractor and Architect review stamps.
 8. When revised for resubmission, identify all changes made since previous submission.
 9. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
 10. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
 11. Submittals not requested will not be recognized or processed.
- B. Product Data Procedures:
1. Submit only information required by individual specification sections.
 2. Collect required information into a single submittal.
 3. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 2. Do not reproduce Contract Documents to create shop drawings.
 3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Samples Procedures:
1. Transmit related items together as single package.
 2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
 3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval. Provide separate submittal page for each item image.

END OF SECTION

SECTION 014000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Control of installation.
- E. Mock-ups.
- F. Tolerances.
- G. Defect Assessment.

1.02 RELATED REQUIREMENTS

- A. Section 014216 - Definitions.

1.03 REFERENCE STANDARDS

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).
- B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2016.
- C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2015a.
- D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.
- E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2014a.
- F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2015.
- G. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2010.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Test Reports: After each test/inspection, promptly submit one copy of report to Owner's Representative, Architect and to Contractor.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Compliance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
 - 2. **Submit copies of the test reports via e-mail to the following individuals:**
Mr. Jason Egeline, NCARB, AIA
Crossman-Whitney-Griffin, P.C.
P.O. Box 1198
Helena, Montana 59624

For compaction reports please submit to Structural engineer, Turf Consultant and Stadium Lighting Consultant as necessary for work associated with their engineering work as seen in the Construction Documents.

General Contractor

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 - 3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

1.06 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.07 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. As indicated in individual specification sections and drawings, Owner or Contractor shall employ and pay for services of an independent testing agency to perform specified testing and inspection.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. Contractor Employed Agency:
 - 1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.
 - 2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
 - 3. Laboratory: Authorized to operate in Montana.
 - 4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
 - 5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.

- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect *before* proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

- A. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups shall be a comparison standard for the remaining Work.

3.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect *before* proceeding.
- C. Adjust products to appropriate dimensions; position *before* securing products in place.

3.04 TESTING AND INSPECTION

- A. See individual specification sections for testing required.
- B. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.

4. Notify Architect and laboratory 7 days prior to expected time for operations requiring testing/inspection services.
 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION

SECTION 014216
DEFINITIONS

PART 1 GENERAL

1.01 SUMMARY

- A. This section supplements the definitions contained in the General Conditions.
- B. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

- A. **Furnish:** To supply, deliver, unload, and inspect for damage.
- B. **Install:** To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.
- C. **Product:** Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.
- D. **Project Manual:** The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.
- E. **Provide:** To furnish and install.
- F. **Supply:** Same as Furnish.
- G. "Indicated" refers to graphic representations, notes, or schedules on the Drawings, or other paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as "shown", "noted", "scheduled," and "specified" are used to help the reader locate the reference. Locations is not limited.
- H. "Directed," requested," "authorized," "selected," "approved," "required," AND "permitted" mean directed by the Owner's representative or architect, and similar phrases.
- I. "Approved," when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.
- J. "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- K. "Installer" is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.
- L. "Project Site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction, with others performing other work as part of the Project. The extent of the Project Site is to be determined by the Owner's Representative and may or may not be identical with the description of the land on which the Project is to be built.
- M. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.
- N. **Specification Format:** These Specifications are organized into Divisions and Sections based on CSI's 48-Division format and MasterFormat's numbering system.
 - 1. **Abbreviated Language:** Language used in Specifications is abbreviated. Implied words and meanings are to be interpreted as appropriate. Singular words are interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Streamlined Language: The Specifications generally use the imperative mood and streamlined language. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.
 - a. The words "shall be" are implied where a colon (:) is used within a sentence or phrase.
- O. Copies of Standards: Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed to perform a required construction activity, the Contractor is to obtain copies directly from the publication source.
- P. Abbreviations and Names: Where acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Gale Research Co.'s "Encyclopedia of Associations," available in most libraries.
- Q. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

END OF SECTION

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Security requirements.
- F. Vehicular access and parking.
- G. Waste removal facilities and services.
- H. Project identification sign.
- I. Field offices.

1.02 TEMPORARY UTILITIES

- A. Owner will provide the following:
 - 1. Electrical power and metering, consisting of connection to existing facilities.
 - 2. Water supply, consisting of connection to existing facilities.
- B. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.03 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
 - 2. Internet Connections: Minimum of one; DSL modem or faster.
 - 3. Email: Account/address reserved for project use.

1.04 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Use of existing facilities is not permitted.
- C. Maintain building and site in a clean and sanitary condition.

1.05 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way .
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING

- A. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.07 SECURITY

- A. Provide security and facilities to protect Work, and Owner's operations from unauthorized entry, vandalism, or theft.

1.08 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets (see civil and jurisdictional requirements).
- E. Existing on-site roads may be used for construction traffic.
- F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.
- G. Existing parking areas may not be used for construction parking, coordinate with Owner.

1.09 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.10 PROJECT IDENTIFICATION

- A. Provide project identification sign of design and construction indicated on drawings.
- B. Erect on site at location established by Owner.

1.11 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
- C. Locate offices a minimum distance of 30 feet from existing and new structures.

1.12 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing facilities used during construction to original condition.
- D. Restore new permanent facilities used during construction to specified condition.

END OF SECTION

**SECTION 016000
PRODUCT REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.
- C. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. **Do not use products having any of the following characteristics:**
 - 1. **Materials containing PCB or Asbestos or Lead.**

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.
- C. See individual spec sections for additional requirements and products allowed.

PART 3 EXECUTION

3.01 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.02 STORAGE AND PROTECTION

- A. Provide protection of stored materials and products against theft, casualty, or deterioration.

- B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- C. Store and protect products in accordance with manufacturers' instructions.
- D. Store with seals and labels intact and legible.
- E. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- F. For exterior storage of fabricated products, place on sloped supports above ground.
- G. Provide off-site storage and protection when site does not permit on-site storage or protection.
- H. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- I. Comply with manufacturer's warranty conditions, if any.
- J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- K. Prevent contact with material that may cause corrosion, discoloration, or staining.
- L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 017000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Surveying for laying out the work.
- F. Cleaning and protection.
- G. Starting of systems and equipment.
- H. Demonstration and instruction of Owner personnel.
- I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- J. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 013000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- B. Section 014000 - Quality Requirements: Testing and inspection procedures.
- C. Section 017800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- D. Section 024100 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

1.03 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Perform dewatering activities if required, for the duration of the project.
- E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
- F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. Minimize amount of bare soil exposed at one time.
- G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 - 1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
- H. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.04 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.

- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of turf, lighting and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000 - PRODUCT REQUIREMENTS.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect and Engineer seven 7 days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 1. Review conditions of examination, preparation and installation procedures.

- 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- E. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- G. Utilize recognized engineering survey practices.
- H. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements, turf grade, ramps, retaining walls and light pole spot elevations and coordinates; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
- J. Periodically verify layouts by same means.
- K. Maintain a complete and accurate log of control and survey work as it progresses.
- L. On completion of retaining wall walls and major site improvements such as turf sub grade, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction .

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

- A. **Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.**
 - 1. **Verify that construction and utility arrangements are as indicated.**
 - 2. **Report discrepancies to Architect before disturbing existing installation.**
 - 3. **Beginning of alterations work constitutes acceptance of existing conditions.**
- B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 015000 .
- C. Remove existing work as indicated and as required to accomplish new work.
- D. Services (Including but not limited to electrical, irrigation piping and control panels and city water service lines): Remove, relocate, and extend existing systems to accommodate new construction.

1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. Provide temporary connections as required to maintain existing systems in service.
 4. Verify that abandoned services serve only abandoned facilities.
 5. Remove abandoned pipe, ducts, conduits, and equipment; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- E. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
- F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
 2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
- G. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- H. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- I. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. Perform whatever cutting and patching is necessary to:
1. Complete the work.
 2. Fit products together to integrate with other work.
 3. Provide openings for penetration of mechanical, electrical, and other services.
 4. Match work that has been cut to adjacent work.
 5. Repair areas adjacent to cuts to required condition.
 6. Repair new work damaged by subsequent work.
 7. Remove samples of installed work for testing when requested.
 8. Remove and replace defective and non-complying work.
- C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- F. Restore work with new products in accordance with requirements of Contract Documents.
- G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. Patching:

1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
2. Match color, texture, and appearance.
3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.
- G. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- C. Verify that wiring and support components for equipment are complete and tested.
- D. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- E. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

- A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.
- D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

3.12 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
 - 1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
- B. Use cleaning materials that are nonhazardous.
- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean site; sweep paved areas, rake clean landscaped surfaces.
- F. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect and Owner.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- F. Closeout requirements for specific construction activities are included in the appropriate sections in Divisions 2 through 16.
- G. **Substantial Completion: Before requesting inspection for certification of Substantial Completion, complete the following:**
 - 1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the Work claimed as substantially complete.
 - a. Include supporting documentation for completion and an accounting of changes to the Contract Sum.
 - 2. Advise the Owner of pending insurance changeover requirements.
 - 3. Submit completed Certification of Required Inspections.
 - 4. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
 - 5. Submit record drawings, maintenance manuals, and similar final record information.
 - 6. Deliver tools, spare parts, extra stock, and similar items.
 - 7. Changeover locks and transmit keys to the Owner.
 - 8. Complete start up testing of systems and instruction of operation and maintenance personnel. Remove temporary facilities, mockups, construction tools, and similar elements.
 - 9. Complete final cleanup requirements, including touch up painting.
 - 10. Touch up and repair and restore marred, exposed finishes.
- H. Inspection Procedures: On receipt of a request for inspection, the Architect and Owner's Representative will proceed to advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. Results of the completed inspection will form the basis of requirements for final acceptance.
- I. Final Acceptance: Before requesting inspection for certification of final acceptance and final payment, complete the following:
 1. Final payment request with releases and supporting documentation. Include insurance certificates where required.
 2. Submit a statement, accounting for changes to the Contract Sum.
 3. Submit a copy of the final inspection list stating that each item has been completed or otherwise resolved for acceptance.
 4. Submit consent of surety to final payment (AIA G707-1994 & G707A-1994).
 5. Submit evidence of continuing insurance coverage complying with insurance requirements.
 6. Submit Affidavit of indebtedness (AIA G706-1994 & AIA G706A-1994)

3.15 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 017400
WARRANTIES

1.01 GENERAL

- A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner
- B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.
 - 1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.
- C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.
- D. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
- E. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- F. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- G. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods are not to be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.
 - 1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - 2. Where the Contract Documents require a special warranty, or similar commitment, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.
- H. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion, submit written warranties upon request of the Architect.
- I. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.
 - 1. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- J. Submit warranties and bonds in electronic .pdf format on a disc.
 - 1. Provide a description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
 - 2. Identify each section of warranty in individual PDF files. Project title or name, and name of the Contractor.

3. When warranted construction requires operation and maintenance manuals, reference in file name to spec section.
4. Submit warranties in electronic .pdf format on a disc.

END OF SECTION

**SECTION 017800
CLOSEOUT SUBMITTALS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.

1.02 RELATED REQUIREMENTS

- A. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 017000 - Execution and Closeout Requirements: Contract closeout procedures.
- C. Section 017400 - Warranties
- D. Individual Product Sections: Specific requirements for operation and maintenance data.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit one copy of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit one set of revised final documents in final form within 10 days after final inspection.
 - a. Include one copy of electronic final documents in .pdf format. O&M's for all disciplines shall be included on a single disc.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. **Maintain on site one set of the following record documents; record actual revisions to the Work:**
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the contract documents.
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. **Record information concurrent with construction progress.**

- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Changes made by Addenda, Supplemental Instructions, Change Orders, Construction Change Directives and other modifications.
- F. **Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:**
 - 1. **Measured depths of foundations in relation to finish first grade datum.**
 - 2. **Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.**
 - 3. **Field changes of dimension and detail.**
 - 4. **Details not on original Contract drawings.**
 - 5. **Changes made by Addenda, Supplemental Instructions, Change Orders, Construction Change Directives and ALL other modifications.**

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 - 1. Product data, with catalog number, size, composition, and color and texture designations.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Additional information as specified in individual product specification sections.
- D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- E. Provide servicing and lubrication schedule, and list of lubricants required.
- F. Include manufacturer's printed operation and maintenance instructions.

- G. Include sequence of operation by controls manufacturer.
- H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- I. Provide control diagrams by controls manufacturer as installed.
- J. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble final approved operation and maintenance data into a single PDF on disc for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- D. Prepare data in the form of an instructional manual.
- E. Binders for review: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings. Final approved O&M manual to be PDF format on CD.
- F. Cover: Identify with typed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- G. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- H. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- I. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab by spec section; immediately following the divider tab include a description of product and major component parts of equipment.
- J. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- K. **Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.**
 - 1. Operating instructions.
 - 2. Maintenance instructions for equipment and systems.
 - 3. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
- L. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data. Tabbed dividers listed in sequence by spec section.
- M. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

END OF SECTION

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete formwork.
- B. Floors and slabs on grade.
- C. Concrete retaining walls.
- D. Concrete reinforcement.
- E. Joint devices associated with concrete work.
- F. Miscellaneous concrete elements, including equipment pads.
- G. Concrete curing.

1.02 RELATED REQUIREMENTS

- A. Section 079200 - Joint Sealant: Sealants for saw cut joints and isolation joints in slabs.
- B. Section 071113 - Bituminous Dampproofing

1.03 REFERENCE STANDARDS

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- B. ACI 301 - Specifications for Structural Concrete; 2016.
- C. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.
- D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- E. ACI 305R - Guide to Hot Weather Concreting; 2010.
- F. ACI 308R - Guide to External Curing of Concrete; 2016.
- G. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).
- H. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.
- I. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
- J. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016.
- K. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2016b.
- L. ASTM C150/C150M - Standard Specification for Portland Cement; 2016.
- M. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.
- N. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).
- O. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
 - 1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.

- C. Mix Design: For each proposed concrete mix, submit a minimum of 15 days prior to concreting. Production shall not begin until mixes have been reviewed and approved by Architect.
- D. Samples: Submit samples of underslab vapor retarder to be used.
- E. Test Reports: Submit report for each test or series of tests specified.
- F. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.
- G. Shop Drawings: For fabrication, bending and placement of concrete reinforcement.
- H. Laboratory tests reports or evaluation reports: For concrete materials and concrete mix design.
- I. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
 - 1. Maintain one copy of each document on site.
- B. Follow recommendations of ACI 305R when concreting during hot weather.

PART 2 PRODUCTS

2.01 FORMWORK

- A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances, unless otherwise noted.
 - 1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
 - 2. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings. Coating must be placed on forms before forms are set into final position. Form oils are not permitted on the reinforcing.
 - 3. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.
 - 4. Forms for exposed concrete surfaces: Suitable panel-type material to provide continuous, straight, smooth surfaces.

2.02 REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M Grade 60 (420). Unless otherwise noted.
 - 1. Type: Deformed billet-steel bars.
 - 2. Finish: Unfinished, unless otherwise indicated.
- B. Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain type.
 - 1. Form: Flat Sheets.
 - 2. Mesh Size and Wire Gage: As indicated on drawings.
- C. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type I/II Moderate Portland type.
 - 1. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C 33. Except local aggregates of proven durability may be used when acceptable to Architect.
 - 1. Acquire aggregates for entire project from same source.
- C. Water: Potable, clean and not detrimental to concrete.

2.04 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. Water-reducing, retarding and accelerating chemical admixtures; ASTM C494.

2.05 ACCESSORY MATERIALS

- A. Membrane-Forming Curing Compound: ASTM C 309, Type I. Moisture loss not more than 0.55 kg/sq. meter when applied at 200 sq. ft./gal.
- B. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.
- C. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, non-metallic aggregate, and activator.

2.06 BONDING AND JOINTING PRODUCTS

- A. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
 - 1. Material: ASTM D1751, cellulose fiber.
- B. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.

2.07 CONCRETE MIX DESIGN

- A. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- C. Normal Weight Structural and Non-Structural Concrete:
 - 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.
 - 2. Cement Content: 6 sack minimum per cubic yard.
 - 3. Water-Cement Ratio: Maximum 45 percent by weight. Maximum 40 percent by weight for concrete exposed to de-icing salts or brackish water.
 - 4. Total Air Content: 4 to 6 percent, determined in accordance with ASTM C173/C173M for concrete subject to freeze/ thaw action.
 - 5. Maximum Slump: 4 inches.
 - 6. Maximum Aggregate Size: 3/4 inch.
- D. Adjust mix designs when material characteristics, job conditions, weather, placement methods, test results, or other circumstances warrant. Do not use revised concrete mixes until laboratory test data and strength results have been submitted to, and reviewed by Architect.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
- B. Verify that forms are clean and free of rust before applying release agent.
- C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
- E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Comply with requirements of ACI 301. Clean reinforcement of any oils, grease or loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces. Do not "stab" dowels or other reinforcing into wet concrete. All reinforcing must be tied in place prior to concrete placement.
- B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.
- D. Installation of Embedded Items: Set and build anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting diagrams, templates, and instructions provided by others for locating and setting.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. In cold weather comply with ACI 306.
- D. In hot weather comply with ACI 305.
- E. Notify Structural Engineer not less than 24 hours prior to commencement of placement operations.
- F. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.
- G. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

- A. Locate joints as indicated on drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
 - 1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, ramps, manholes, sumps, and drains.
- D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Maximum Variation of Surface Flatness:
 - 1. Exposed Concrete Floors: 1/4 inch in 10 feet.
 - 2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
 - 3. Under Carpeting: 1/4 inch in 10 feet.
- B. Correct the slab surface if tolerances are less than specified.
- C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

- A. Repair surface defects, immediately after removing formwork.
- B. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:

1. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
- C. Formed Finish: Provide an straight, even finish for concrete. Repair and patch defective areas, with fins and other projections completely removed and pockets filled.
- D. Exterior ramps, slabs and pads: Apply a very heavy broom finish after floating and prior to surface achieving final set. Broom perpendicular to primary direction of traffic.

3.08 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury. In hot, dry and windy conditions, apply an evaporation-control compound according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 1. Normal concrete: Not less than seven days.
 2. High early strength concrete: Not less than 3 days.
- C. Surfaces Not in Contact with Forms:
 1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
 - a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.
 - b. Spraying: Spray water over floor slab areas and maintain wet.
 - c. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.
 2. Final Curing: Begin after initial curing but before surface is dry.
 - a. Curing Compound: Apply BASF "KURE-N HARDEN" curing compound in two coats at right angles, using application rate and method as recommended by manufacturer.

3.09 FIELD QUALITY CONTROL

- A. An independent testing agency hired by the Contractor will perform field quality control tests.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Perform sampling and testing during concrete placement, as follows:
 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
 - a. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 - b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air entrained concrete.
 - c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and one test for each set of compressive strength specimens.
 - d. Compression Test Specimen: ASTM C 31; one set of three standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cured test specimens are required.
 - e. Compressive Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than the first 25 cu. yd. placed in any one day; one specimen tested at 7 days, one specimen tested at 28 days, and one specimen retained in reserve for later testing if required.
 2. When strength of field cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in place concrete.

3. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
4. Test results are to be reported electronically to the Owner's Representative, Architect, Structural Engineer, ready mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7 day tests and 28 day tests.
5. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.
6. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

3.10 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

3.11 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 055000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel items.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 099000 Painting and Coating

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
- D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.
- E. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015a.
- F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015 (with March 2016 Errata).
- H. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2011.
- I. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
- J. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).
- K. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Plates: ASTM A283/A283M.
- C. Pipe: ASTM A53/A53M, Grade B Schedule 40, black and hot-dip galvanized finish, as indicated.
- D. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
- E. Concrete inserts: Threaded or wedge type: galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/ A 27M cast steel. Provide bolts, washers, and shims as required, hot-dipped galvanized per ASTM A 153.
- F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

- G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- A. General: Form from materials of type, size, thickness, and shapes indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support.
 - 1. Shear and punch metals cleanly and accurately. Remove sharp or rough areas and ease exposed edges.
 - 2. Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. Finish exposed welds and surfaces smooth and blended.
 - 3. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
- B. Fit and shop assemble items in largest practical sections, for delivery to site.
- C. Fabricate items with joints tightly fitted and secured.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

- A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish. see civil drawings and specs.
- B. Miscellaneous Framing and Supports: Provide as required to complete the Work but not included with structural steel framework. Fabricate as indicated and required to receive adjacent construction. Fabricate from structural steel of welded construction. Drill and tap to receive hardware, hangers, and similar items. Include anchors for building into other work, spaced not more than 24 inches (600 mm) o.c.
- C. Miscellaneous Steel Trim: Fabricate from steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages; coordinate assembly and installation with other work.
- D. Pipe railing for handrails and guardrails.

2.04 FINISHES - STEEL

- A. Prime paint steel items.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.
- E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements.
- F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.05 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.

- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Fit exposed connections accurately together and weld, unless otherwise indicated. Do not weld, cut, or abrade the surfaces of galvanized units that are intended for bolted connections.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.
- D. Set loose items on cleaned bearing surfaces using wedges or other adjustable devices. After the items have been positioned and plumbed, tighten the anchor bolts and pack space with grout.
 - 1. Use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
- E. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- F. Obtain approval from Engineer prior to site cutting or making adjustments not scheduled.
- G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

END OF SECTION

SECTION 055213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall mounted handrails for stairway.
- B. Ramp railings and guardrails.
- C. Free-standing railings and guardrails.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 055000 - Metal Fabrications
- C. Section 099000 - Painting and Coating

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.
- D. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.
- B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.
- C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.
- D. Allow for expansion and contraction of members and building movement without damage to connections or members.
- E. Dimensions: See drawings for configurations and heights.
- F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
- G. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

- A. Steel Tube: ASTM A500/A500M, Grade B cold-formed structural tubing.
- B. Steel Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

- C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- D. Exposed Fasteners: No exposed bolts or screws.
- E. Straight Splice Connectors: Steel concealed spigots.

2.03 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- D. Welded Joints:
 - 1. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be placed in partitions with setting templates, for installation as work of other sections.

3.03 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- B. Install railings in compliance with ADA Standards for accessible design at applicable locations.
- C. Anchor railings securely to structure.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 071113
BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Bituminous dampproofing.

1.02 REFERENCE STANDARDS

- A. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2011).
- B. ASTM D1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing; 2013.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide properties of primer, bitumen, and mastics.
- C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.04 FIELD CONDITIONS

- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until dampproofing has cured.

PART 2 PRODUCTS

2.01 BITUMINOUS DAMPPROOFING

- A. Bituminous Dampproofing: Cold-applied water-based emulsion; asphalt with mineral colloid or chemical emulsifying agent; with or without fiber reinforcement; asbestos-free; suitable for application on vertical and horizontal surfaces.
 - 1. Composition - Vertical Application: ASTM D1227 Type III or ASTM D1187/D1187M Type I.
 - 2. Composition - Horizontal and Low-Slope Application: ASTM D1227 Type II or III.
 - 3. VOC Content: Not more than permitted by local, State, and federal regulations.
 - 4. Applied Thickness: 1/16 inch, minimum, wet film.
 - 5. Products:
 - a. BASF Masterseal 615.
 - b. Deco Products, Inc.; www.decoproducts.com; DECO 20 Seal Damproof Coating
 - c. Substitutions: See Section 016000 - PRODUCT REQUIREMENTS.
- B. Primers, Mastics, and Related Materials: Type as recommended by dampproofing manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions are acceptable prior to starting this work.
- B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.
- C. Verify that items penetrating surfaces to receive dampproofing are securely installed.

3.02 PREPARATION

- A. Protect adjacent surfaces not designated to receive dampproofing.
- B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.
- C. Do not apply dampproofing to surfaces unacceptable to manufacturer.
- D. Apply mastic to seal penetrations, small cracks, or minor honeycombs in substrate.

3.03 APPLICATION

- A. Foundation Walls: Apply two coats of asphalt dampproofing.

- B. Prime surfaces at a rate approved by manufacturer for application indicated, and allow primer to dry thoroughly.
- C. Seal items watertight with mastic, that project through dampproofing surface.

END OF SECTION

**SECTION 079200
JOINT SEALANTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Joint backings and accessories.

1.02 REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014a.
- C. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.
- D. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2008 (Reapproved 2012).
- E. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2014.
- F. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2002 (Reapproved 2013).

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

- A. Scope:
 - 1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
 - a. Joints between door, window, and other frames and adjacent construction.
 - b. Joints between different exposed materials.
 - 2. Do not seal the following types of joints.
 - a. Joints where installation of sealant is specified in another section.
- B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.

2.02 JOINT SEALANTS - GENERAL

- A. Contractor to verify that all sealants used for various applications are approved by the manufacturer of the substrate and finish material(s) that sealant is applied to.

2.03 NONSAG JOINT SEALANTS

- A. Type General Purpose Exterior Sealant - Non-Staining Silicone Sealant: Polyurethane; ASTM C920, Grade NS, Uses M, G and A; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Non-Staining To Porous Stone: Non-staining to light-colored materials when tested in accordance with ASTM C1248.
 - 3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 - 4. Color: Match adjacent finished surfaces.
 - 5. Applications:
 - a. Control, expansion, and soft joints in masonry.
 - b. Joints between concrete and other materials.

- c. Joints between metal frames and other materials
 - d. Other exterior joints for which no other sealant is indicated
- B. Butyl Sealant: Solvent-based; ASTM C1311; single component, solvent release, non-skinning, non-sagging, non-staining, fungus resistant; not expected to withstand continuous water immersion or traffic.
- 1. Hardness Range: 10 to 30, Shore A, when tested in accordance with ASTM C661.
 - 2. Color: Standard colors to match adjacent finished surfaces.
 - 3. Service Temperature Range: Minus 13 to 180 degrees F.
 - 4. Movement Capability: Plus and Minus 12-1/2 percent.

2.04 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
- 1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
 - 2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
 - 3. Open Cell: 40 to 50 percent larger in diameter than joint width.
 - 4. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- D. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Install bond breaker backing tape where backer rod cannot be used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- G. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

- H. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends and intersections; install with face 1/8" to 1/4" below adjoining surfaces.

3.04 FIELD QUALITY CONTROL

- A. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

SECTION 099000
PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish all exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - 1. Exposed surfaces of steel (such as guardrails, handrails, fencing and ledge angles).
 - 2. Mechanical and Electrical:
 - a. In finished areas, paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - b. In finished areas, paint shop-primed items.
 - c. Paint all exposed exterior gas pipe and electrical conduit.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne, and lead items.
 - 6. Ceramic and other tiles.
 - 7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 055000 - Metal Fabrications: Shop-primed items.
- B. Section 055213 - Pipe and Tube Railings

1.03 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2015.
- C. SSPC (PM1) - Good Painting Practice: SSPC Painting Manual, Vol. 1; Society for Protective Coatings; Fourth Edition.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of all products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 4. Manufacturer's installation instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions aside from the food grade concrete sealer product listed below.
- B. Paints:
 - 1. Base Manufacturer: Sherwin-Williams Company: www.sherwin-williams.com.
 - 2. Benjamin Moore & Co: www.benjaminmoore.com/#sle.
 - 3. Rodda Paint Company: <https://www.roddapaint.com>.
- C. Primer Sealers: Same manufacturer as top coats.
- D. Block Fillers: Same manufacturer as top coats.
- E. Substitutions: See Section 016000 - PRODUCT REQUIREMENTS.

2.02 PAINTS AND COATINGS - GENERAL

- A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
 - 1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Supply each coating material in quantity required to complete entire project's work from a single production run.
 - 3. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- B. Primers: As follows unless other primer is required or recommended by manufacturer of top coats; where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
- C. Volatile Organic Compound (VOC) Content:
 - 1. Provide coatings that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- D. Colors: As indicated on drawings
 - 1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Paint E-OP - All Exterior Surfaces Indicated to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry, primed wood, and primed metal.
 - 1. Preparation as specified by manufacturer.

2. Two top coats and one coat primer recommended by manufacturer.
- B. Paint ME-OP-3A - Ferrous Metals, Unprimed, Alkyd, 3 Coat:
 1. One coat of alkyd primer. B50WZ0001 Kem Kromik Universal Metal Primer Off White
 2. Semi-gloss: Two coats of alkyd enamel; B53W01151 PI WB ALK UR SG EW.
- C. Paint ME-OP-2A - Ferrous Metals, Primed, Alkyd, 2 Coat:
 1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
 2. Semi-gloss: Two coats of alkyd enamel; B53W01151 PI WB ALK UR SG EW.
- D. Paint MgE-OP-3A - Galvanized Metals, Alkyd, 3 Coat:
 1. One coat galvanize primer.
 2. Semi-gloss: Two coats of alkyd enamel; B66W00351 Sher-Cryl HPA High Performance Acrylic Semi-Gloss Coating Extra White.

2.04 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- D. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing coatings that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- H. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- I. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-SP 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).
- J. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand or power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.

- K. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's instructions.
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance.
- E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- F. Sand wood and metal surfaces lightly between coats to achieve required finish.
- G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finished coatings until completion of project.
- B. Touch-up damaged coatings after Substantial Completion.

3.06 PAINT SCHEDULE

- A. Interior: As indicated on drawings.
- B. Exterior: As indicated on drawings.

END OF SECTION

SECTION 11 68 24
OUTDOOR ATHLETIC EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY OF WORK

- A. The work consists solely of the supply, shipping, technical support, and warranty service of various athletic equipment components as further specified and approved.
- B. Where specifically stated, it is the responsibility of the vendor to certify that the products or assemblies supplied meet or exceed the reference standards when installed per the manufacturers printed instructions, previously provided as a condition of approval.
- C. The supplier is responsible for shipping all equipment to the Contract site in a new condition. Products received in a condition that is in any way deficient shall be replaced by the vendor in a timely manner, generally shipping within 72 hours of notice by any means.
- D. The vendor shall provide technical support to the Contractor where necessary and as requested.
- E. Equipment includes the following, as further described elsewhere;

Football

- 1. (2) Hinged Goal Post
- 2. (2) Ground Kit
- 3. (2) Goal post pad
- 4. (12) pylons

Soccer

- 1. (2) Portable Soccer Goals
- 2. (4) Ground Anchor Kits
- 3. (4) Corner flags

1.02 REFERENCE STANDARDS

NCAA Football Rules (Latest edition)
NCAA Soccer Rules (Latest edition)

1.03 QUALITY ASSURANCE

- A. Equipment supplied must be as previously approved. Inclusion of product data in the formal proposal shall constitute a product submittal. Execution of a qualified purchase order shall qualify as approval of the submittal.
- B. Dimensional Accuracy
 - 1. It is the Vendors responsibility to insure that the dimensions of any product supplied meet those required by the Reference Standard claimed.
 - 2. Unit Conversion

Where not otherwise stated, 1 meter shall be converted as 3.280839'.

- C. Products must be received in a like new condition. Any materials that are scratched, dented, misshapen, missing parts or otherwise deficient upon unpacking shall be replaced by the vendor within 72 hours of notice by the Contractor.

PART 2 - PRODUCTS

2.01 FOOTBALL GOAL POSTS

- A. Mounting Style: Rotating and Hinged Base Plate Mounting Style
- B. Anchor Plate: The anchor plate shall consist of four (4) "J" hook anchor bolts with anchor plate welded to main standard.
- C. Main Standard (Gooseneck): The main standard shall be constructed from 6 inch outside diameter Schedule 40, 6061-T6 aluminum or Schedule 40 steel pipe. The pipe shall be curved to provide an 6 foot horizontal offset from the ground sleeve to the crossbar with a 5 foot radius bend.
- D. Crossbars: The crossbar shall be constructed from minimum 6 inch outside diameter Schedule 40 6061-T6 aluminum pipe. The crossbar shall extend 18'-6" in accordance with NCAA requirements.
- E. Uprights: The upright shall be constructed from minimum 4 inch outside diameter Schedule 40 6061-T6 aluminum pipe. The uprights shall extend 30 feet above the crossbar.
- F. Provide two (2) round post protector pads for 6" diameter posts. Pads to be 6" thick cylindrically high-density polyurethane foam with rear cut out for fitting onto post. A minimum nylon reinforced vinyl covert is to be provided to completely enclose foam pad with Velcro closure. Pads to be 6' high. Color shall be as selected by Owner from the approved manufacturers standard color range, to include contrasting 9" vinyl lettering arranged vertically, verbiage to be determined.
- G. Posts, crossbars and uprights to have two-coat catalyzed polyurethane finish. Color to be selected by Owner. Manufacturer Reference:

Football Goal Posts to be Sportsfield Specialties Inc. GP4103RH, with anchors, and GP4570RH Access Frame Kit, or equal.

2.02 PORTABLE SOCCER GOALS

- A. General: Soccer goals to be in full compliance with NCAA regulations in all respects. Goals to provide an 8' x 24' front inside opening. Goals to be portable.
- B. Crossbar and Uprights: The crossbars and uprights shall consist of a single length of 4.5 inch OD 6063 T-5 aluminum D shaped tubing or 4-3/8 inch OD Rams Aluminum tubing.
- C. The goal frame and supports shall be finished with a white polyester powder coat finish.
- D. Each goal shall have a wheel kit.
- E. All hardware and fasteners shall be stainless steel.
- F. The goals shall include white 4mm polyethylene or polypropylene twine nets.
- G. Warranty: Goals to be warranted by manufacturer for a minimum period of 5 years.

H. Manufacturer Reference:

Kwik Goal 2B3406SW EVO 2.1.
Sportsfield Specialties Model SG4950.
Or approved equal.

2.03 SOCCER GOAL ANCHOR

- A. Unit shall be pre-manufactured unit consisting of an access box, cover and tethering assembly suitable for securing the backbar/backstay of a soccer goal unit. Provide two per goal.
- B. Access box to be fabricated of .125" aluminum and 16 ga. stainless steel.
- C. Cover to be fabricated of .25" aluminum and 3/4" marine plywood.
- D. Tethering to be coated aircraft cable.
- E. All connections to be welded or secured with stainless steel hardware.
- F. Manufacturer Reference: Soccer Goal Anchor shall be Aluminum Athletic Equipment or approved equal.
- G. Synthetic Turf Cover to identically match synthetic turf system used for field surfaces.

2.04 PYLON MARKERS

- A. Furnish at each corner of football field end zone and at the inbounds locations, a total of twelve (12) pylons required. The pylon markers furnished shall be weighted base, portable type which will topple over on impact. The pylons to be 4" x 4" x 18" high covered with red-orange vinyl.
- B. Furnish at each corner of soccer field, four (4) weighted soccer flags. The soccer flags shall be weighted base, portable type which will topple over on impact. The soccer flags shall be 70" high and shall meet NCAA requirements.
- C. Football pylons to be Gilman WP12, or approved equal.
- D. Soccer pylons to be Gilman WSF, or approved equal.

PART 3 - EXECUTION

3.01 SHIPPING

- A. Unless negotiated otherwise, the supplier is responsible for shipping directly to the project site.
- B. All products must be received in their original manufacturers shipping packaging, in new condition. Products received scratched, dented, marred, discolored, or otherwise defective shall be re-shipped within 72 hours of notice by the Contractor.
- C. Return shipping of defective items will be paid for by the supplier.

3.02 WARRANTY

- A. All products shall be covered by a 1-year warranty covering replacement and shipping.

3.03 INSTALLATION

- A. Installation of all elements shall be in accordance with the manufacturer's instructions and as shown in the details.

END OF SECTION

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**SECTION 260500
COMMON WORK RESULTS FOR ELECTRICAL**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This section includes general electrical requirements for all Division 26 work and is supplemental and in addition to the requirements of Division 1.
- B. It is the intention of this Division of the Specifications and the Contract Drawings to describe and provide for the furnishing, installing, testing and placing in satisfactory and fully operational condition all equipment, materials, devices and necessary appurtenances to provide a complete electrical system. Provide all materials, appliances and apparatus not specifically mentioned herein or shown on the drawings, but which are necessary to make a complete, fully operational installation of all electrical systems shown on the contract drawings or described herein. Connect equipment and devices furnished and installed under other Divisions of this specification (or the Owner) under this Division.
- C. Workmanship shall be of the best quality and competent and experienced electricians shall be employed and shall be under the supervision of a competent and experienced foreman.
- D. The drawings and specifications are complimentary and what is called for (or shown) in either is required to be provided as if called for in both. Where conflicting information occurs within the drawings and specifications or between the drawings and specifications, the more expensive alternative shall be used as a basis for bidding and construction.
- E. Branch Circuit Wiring: Where the drawings identify circuit numbers for items requiring electrical power, but do not indicate the manner of the wiring between the item and its source, the manner of the wiring shall be devised by the contractor utilizing the following provisions:
1. Wire sizes:
 - a. Derate wiring for thermal restrictions imposed by the National Electrical Code.
 - b. If wire sizes are not otherwise indicated, wire sizes shall limit the voltage drop for circuits serving general purpose receptacles (180VA per strap) to less than 3%, based on the receptacle in the circuit that is farthest from the source being utilized with a load of 14 amps at 80% power factor. The following wire sizes and circuit lengths comply with this requirement:
 - 1) #12 up to 90 feet
 - 2) #10 up to 125 feet
 - 3) #8 up to 190 feet
 - c. Wire sizes for other loads shall limit the voltage drop to less than 3% based on the load indicated on the panel schedule.
 2. Multiwire circuits: Multiwire circuits shall not be used unless specifically indicated or noted on the drawings. Provide a dedicated neutral conductor for each single pole circuit breaker.
 3. Do not combine wiring of different source panels in the same raceway system, unless the panels are interconnected with sub feed or through feed lugs with no intervening disconnecting means.
 4. Outlet and junction boxes: Arrange wiring extensions from junction boxes to outlet boxes to restrict the number of wires in an outlet box as required by NEC Article 314.
 5. Single tubular raceways extending into panels or switchboards shall not contain more than 20 wires.

1.03 CODES, PERMITS, INSPECTION FEES

- A. The following codes and standards are referenced in the Division 26 specifications. Perform all work and provide materials and equipment in accordance with the latest referenced codes and standards of the following organizations:
 - 1. American National Standards Institute (ANSI)
 - 2. National Electrical Manufacturer's Association (NEMA)
 - 3. National Fire Protection Association (NFPA)
 - 4. Underwriter's Laboratories (UL)
 - 5. National Electrical Contractor's Association (NECA)
 - 6. Occupational Safety and Health Administration (OSHA)
 - 7. Illumination and Engineering Society of North America (IESNA)
 - 8. American's with Disabilities Act (ADA)
 - 9. Institute of Electrical and Electronics Engineers (IEEE)

- B. Install the electrical systems based on the following:
 - NFPA 70 National Electrical Code as adopted and amended by the Local Jurisdiction.
 - IBC International Building Code as adopted and amended by the Local Jurisdiction.

- C. The referenced codes establish a minimum level of requirements. Where provision of the various codes conflict with each other, the more stringent provision shall govern. If any conflict occurs between referenced codes and this specification, the codes are to govern. Compliance with code requirements shall not be construed as relieving the Contractor from complying with any requirements of the drawings or specifications which may be in excess of requirements of the governing codes and rules and not contrary to same.

- D. Obtain and pay for all licenses, permits and inspections required by laws, ordinances and rules governing work specified herein. Arrange for inspection of work by the inspectors and give the inspectors all necessary assistance in their work of inspection.

1.04 COORDINATION

- A. Coordination during the bidding and pricing aspects of the contract includes determining where the work of other Divisions relies on the work of this Division for electricity and including the electrical system to match the requirements.

- B. Coordinate work with that of the other Contractors and/or other trades doing work on the project. Examine all drawings and specifications of other trades for construction details and coordination. Make every reasonable effort to provide timely notice of work affecting other trades to prevent conflicts or interference as to space requirements, dimensions, openings, block-outs, sleeving or other matters which will cause delays or necessitate work-around methods.

- C. Obtain submittals and shop drawings of all equipment with electrical connections furnished under other divisions of the specification and by the Owner. Provide all wiring in accordance with specific equipment requirements. Immediately advise the Architect of any changes which may affect the contract price.

- D. Special attention is called to the following items. Coordinate all conflicts prior to installation:
 - 1. Location of conduit routing and junction boxes.
 - 2. At each switchboard, panelboard and controller location the Contractor shall monitor the work of all trades to assure that the space and clearance requirements of code are met.
 - 3. Review specifications for other Divisions of the work to determine where other Divisions are requiring electrical connections. Verify electrical provisions shown on contract drawings by examining shop drawing submittals of other Divisions prior to submission to the owner. Do not proceed with ordering of supporting electrical equipment, such as circuit breakers, until electrical characteristics are verified. Proceed with rough-in only after verification of shop drawings.

- E. Furnish, install and place in satisfactory condition all raceways, boxes, conductors and connections and all other materials required for the electrical systems shown or noted in the contract documents to be complete, fully operational and fully tested upon completion of the project. Raceways, boxes and ground connections are shown diagrammatically only and indicate the general character and approximate location. The layout does not necessarily show the total number of raceways or boxes for the circuits required, nor are the locations of indicated runs intended to show the actual routing of the raceways.
- F. Where routings of major raceways and telecommunication pathways are indicated on plan sheets, the routing information supplements the information on diagrams. If no routing information is shown, route the systems in a manner that will coordinate with new and existing infrastructure and the work of other trades.
- G. Provide inserts or sleeves for outlet boxes, conductors, cables and/or raceways as required. Coordinate the installation thereof with other trades.
- H. The Contractor will not be paid for relocation of work, cuttings, patching and finishing required for work requiring reinstallation due to lack of coordination prior to installation.

1.05 WARRANTY

- A. Refer to General Conditions and Division 1 of the Contract.

1.06 CORRECTION OF WORK

- A. Within one year after the date of Substantial Completion of the work, the Contractor shall correct any work found to be not in conformance with the Contract Documents promptly after written notice from the owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. This obligation shall survive acceptance of the work under this Contract and termination of the Contract. The Owner shall give such notice promptly after discovery of the condition.

1.07 SUBMITTALS AND SHOP DRAWINGS

- A. Within one year after the date of Substantial Completion of the work, the Contractor shall correct any work found to be not in conformance with the Contract Documents promptly after written notice from the owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. This obligation shall survive acceptance of the work under this Contract and termination of the Contract. The Owner shall give such notice promptly after discovery of the condition.
- B. Submittals and Shop Drawings: Schedule so as not to delay construction schedule and no later than 60 days after award of contract, submit common brochure(s) with index and divider tabs by specification section, containing all required catalog cuts. Allow two weeks for review for each submittal and resubmittal. Incomplete submittals and shop drawings which do not comply with these requirements will be returned for correction, revision and resubmittal. Provide submittals for each product proposed for the project. See General Conditions for format, quantity, etc.
- C. Submit in a three ring binder with hardboard covers. Submittals shall show:
 - 1. Indicate listing by UL or other approved testing agency.
 - 2. Highlight with yellow or blue marker adequate information to demonstrate materials being submitted fully comply with contract documents.
 - 3. Review and check all material prior to submittal and stamp "Reviewed and Approved".
- D. Shop drawings shall show:
 - 1. Ratings of items and systems.
 - 2. How the components of an item or system are assembled, interconnected, function together and how they will be installed on the project.
 - 3. System layout floor plans with complete device layout, point-to-point wiring connection between all components of the system, wire sizes and color coding.
 - 4. Riser diagrams showing vertical wiring between components.

5. Line diagrams and or logical/control schematics including interface to other systems as applicable. Provide point to point wiring diagrams, indicate terminal identification at item of equipment. Typical diagrams may be used when accompanied by wire schedules that are specific to each product.
 6. Coordinate with other division shop drawings and submittals. Identify interface points and indicate method of connection.
- E. The Contractor agrees:
1. Submittals and shop drawings processed by the Architect are not change orders.
 2. The purpose of submittals and shop drawings by the Contractor is to demonstrate to the Engineer that the Contractor understands the design concept.
 3. Submittals demonstrate equipment and material Contractor intends to furnish and install and indicate detailing fabrication and installation methods Contractor intends to use.
 4. To accept all responsibility for assuring that all materials furnished under this Division of the specifications meet, in full, all requirements of the contract documents.
 5. The Engineer's review is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Corrections or comments made during this review do not relieve contractor from compliance with the requirements of the drawings and specifications. Contractor is responsible for: Dimensions which shall be confirmed and correlated at the job site; fabrication process and techniques of construction; coordination of his work with that of all other trades; performing his work in a safe and satisfactory manner.
- F. Submittals and shop drawings are required per the submittals schedule at the end of this Section.

1.08 PROJECT CLOSE-OUT

- A. Coordinate with close-out provisions in Division 01 - General Requirements.
- B. Request For Final Punchlist
1. To request a final electrical punch list, forward a letter to the Architect. stating; "The electrical work on this project is complete, all punch list items to date are complete, items a. - n. in the Punchlist Procure paragraph in Section 260500 - Common Work Results For Electrical are complete and the project is ready for final punch list observation."
 2. Project Punchlist Procedure: Perform the following procedures for project closeout of electrical portions of work.
 - a. Perform testing, tests and documentation.
 - b. Provide engraved nameplates on electrical equipment.
 - c. Refinish electrical equipment finishes which are damaged.
 - d. Insert word processed (typed) Panel Schedules in all new and existing panelboards with actual "as-built" circuit descriptions.
 - e. Number all circuit breakers.
 - f. Obtain final electrical permit inspection. Include copies in O & M manual.
 - g. Provide written warranty in O & M per the General Conditions of the Contract.
 - h. Furnish Record Drawings per this section. Obtain signature on Job Completion Form.
 - i. Furnish O & M Manuals per this section. Obtain signature on Job Completion Form.
 - j. Give instruction periods to owner's personnel.

1.09 ELECTRICAL EQUIPMENT OPERATION AND MAINTENANCE (O&M) MANUALS

- A. Provide O&M manuals required in Division 01 - General Requirements for all equipment furnished under Division 26 - Electrical of the specifications. Submit a preliminary copy, complete except for the bound cover, 60 days prior to completion of the project for checking and review. Deliver final bound corrected copies as noted in Division 1 - General

Requirements 20 days prior to scheduled instruction periods. Obtain a receipt for the manuals and forward a copy of the receipt to the Engineer with the Job Completion Form.

- B. The information included must be the exact equipment installed. Where sheets show the equipment installed and other equipment, the installed equipment shall be neatly and clearly identified on such sheets.
- C. These O&M manuals shall contain all the information needed to operate and maintain all systems and equipment provided in the project. Present and arrange information in a logical manner for efficient use by the Owner's operating personnel. The information provided shall include but not be limited to the following:
 - 1. Equipment manufacturer, make, model number, size, nameplate data, etc.
 - 2. Description of system configuration and operation including component identification and interrelations. A master control schematic drawing(s) may be required for this purpose.
 - 3. Dimensional and performance data for specific unit provided as appropriate.
 - 4. Manufacturer's recommended operation instructions.
 - 5. Manufacturer's recommended lubrication and servicing data including frequency.
 - 6. Complete parts list including reordering information, recommended spares and anticipated useful life (if appropriate). Parts lists shall give full ordering information assigned by the original parts manufacturer. Relabeled and/or renumbered parts information as reassigned by equipment supplier not acceptable. Include the parts list and part diagram that was included with the product's packaging, note that a "catalog cut" will not meet this criterion.
 - 7. Shop drawings.
 - 8. Wiring diagrams.
- D. Furnish complete wiring diagrams for each system for the specific system installed under the contract. "Typical" line diagrams will not be acceptable unless revised to indicate the exact field installation.
- E. Group the information contained in the manuals in an orderly arrangement by specification index. Provide a typewritten index and divider sheets between categories with identifying tabs. Bind the completed manuals with hard board covers not exceeding 5" thick. (Provide two or more volumes if required.) Signal and communication systems shall be in separate volumes. Imprint the covers with the name of the job, Owner, Architect, Electrical Engineer, Contractor and year of completion. Imprint the back edge with the name of the job, Owner and year of completion. Hard board covers and literature contained may be held together with screw post binding.

1.10 RECORD DRAWINGS

- A. Record drawings shall be kept on: the contract drawings, shop drawings indicating field wiring, vendor diagrams indicating field wiring, and similar documents.
- B. Continually record the actual electrical system(s) installation on a set of prints kept readily available at the project during construction. These prints shall be used for this purpose alone.
 - 1. Mark record prints with red erasable pencil. Mark the set to show the actual installation where the installation varies substantially from the work as originally shown.
 - 2. Accurately locate with exact dimensions all underground and underslab raceways and stub-outs.
 - 3. Note changes of directions and locations, by dimensions and elevations, as utilities are actually installed.
 - 4. Include addenda items and revisions made during construction.
 - 5. Erase conditions not constructed or "X-out" and annotate "not constructed" to clearly convey the actual "as constructed" condition.
 - 6. Organize record drawings sheets in manageable sets, bind and print suitable titles, dates and other identification on the cover of each set.
 - 7. Where "typical" wiring diagrams were used during submittals the record drawings shall indicate exact point to point wiring with exact terminal number designations.

- C. Transmit the record drawing set to the Architect at the completion of the work. Final payment to the contractor will not be authorized until these prints have been submitted to and accepted by the Architect.

PART 2 PRODUCTS

2.01 GENERAL

- A. All materials and equipment installed shall have been tested and listed by Underwriters Laboratories or other approved testing organization and shall be so labeled unless otherwise permitted by the Authority Having Jurisdiction (Inspector).
- B. All materials to be new, free from defects and not less than quality herein specified. Materials shall be designated to ensure satisfactory operation and operational life in the environmental conditions which will prevail where they are being installed.
- C. Each type of materials furnished shall be of the same make, be standard products of manufacturers regularly engaged in production of such materials and be the manufacturer's latest standard design.
- D. All materials, equipment and systems furnished that include provisions for storing, displaying, reporting, interfacing, inputting, or functioning using data specific information shall perform properly in all respects regardless of the century. Any interface to other new or existing materials, equipment or systems shall function properly and shall be century compliant, both in regard to information sent and received.

2.02 SUBSTITUTION OF MATERIALS

- A. No Substitute:

Where a specified product is indicated "no substitute", it is the intent of this specification to require new materials to be compatible with the existing installation or as specifically requested by the owner. To this end certain materials and systems no substitution will be allowed.

- B. Prior to Bid Opening:

Acceptance of products other than those specified will be issued by addendum to the bid documents only after the following requirements are met and the proposed listed material is determined to meet or exceed the requirements:

1. Requests for listing to be original material, clearly indicating the product fully complies with contract documents and be neatly marked with yellow felt tip marker to clearly define and describe the product for which listing is requested.
2. Include certified laboratory test report for lighting fixtures.
3. Samples shall be submitted if requested.
4. Requests shall be received 10 days prior to bid opening.
5. Requests containing insufficient information to confirm compliance with contract documents will not be considered.

- C. After Award of Contract:

Substitution of products will be considered after award of contract only under the following conditions:

1. The Contractor shall have placed orders for specified materials promptly after contract is awarded and the specified products cannot be delivered to the project to meet the Owner's construction schedule.
 2. The reason for the unavailability is beyond the Contractor's control, i.e., due to strikes, bankruptcy, discontinuance of manufacturer, acts of God.
 3. The specified product is no longer manufactured.
 4. There is compelling economic advantage to the Owner.
- D. In all cases, should a substituted material result in requiring electrical system or building modifications; the Contractor alone shall pay all costs to provide these modifications including

all costs to the Engineer and Architect for redesign, and updating of record drawings required to accommodate the required modifications.

2.03 NAMEPLATES

- A. Provide nameplates per Section 260553 - Identification for Electrical Systems.

PART 3 EXECUTION

3.01 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft. Handle all equipment carefully to prevent damage, breakage, denting, and scoring of finishes. Do not install damaged equipment.
- B. Store products subject to damage by the elements above ground, undercover in a weather tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instruction.

3.02 PENETRATION OF BUILDING ELEMENTS

- A. General:
 - 1. Penetrations of building elements by electrical systems shall not compromise the performance and integrity of the building element (structural, fire, smoke, waterproof, etc.)

3.03 PAINTING

- A. Items furnished under this Division that are scratched or marred in shipment or installation shall be refinished with touchup paint selected to match installed equipment finish.

3.04 EQUIPMENT CONNECTION

- A. For equipment furnished under this or other Divisions of the specifications, or by owner, provide all electrical connections necessary to serve such equipment and provide required control connections to all equipment so that the equipment is fully operational upon completion of the project. Provide disconnect switch as required by code whenever an equipment connection is shown on the drawings.
- B. Investigate existing equipment to be relocated and provide new connections as required.
- C. Obtain rough-in requirements for equipment furnished under other divisions of this specification prior to roughing-in. Review shop drawings and submittals of other Divisions to determine requirements.

3.05 CLEAN UP

- A. Contractor shall continually remove debris, cuttings, crates, cartons, etc., created by his work. Such clean up shall be done daily and at sufficient frequency to eliminate hazard to the public, other workmen, the building or the Owner's employees. Before acceptance of the installation, Contractor shall carefully clean cabinets, panels, lighting fixtures, wiring devices, cover plates, etc., to remove dirt, cuttings, paint, plaster, mortar, concrete, etc. Blemishes to finished surfaces of apparatus shall be removed and new finish equal to the original applied.

3.06 TESTING AND DEMONSTRATION

- A. Demonstrate that all electrical equipment operates as specified and in accordance with manufacturer's instructions. Perform tests in the presence of the Architect, Owner or Engineer. Provide all instruments, manufacturer's operating instructions and personnel required to conduct the tests. Repair or replace any electrical equipment that fails to operate as specified and or in accordance with manufacturer's requirements.

END OF SECTION

**SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.
- B. Related Requirements:
 - 1. Section 271500 "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.03 DEFINITIONS

- A. VFC: Variable frequency controller.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Field quality-control reports.

1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 PRODUCTS

2.01 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Alcan Products Corporation; Alcan Cable Division.
 - 2. Alpha Wire.
 - 3. Belden Inc.
 - 4. Encore Wire Corporation.
 - 5. General Cable Technologies Corporation.
 - 6. Southwire Incorporated.
- B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for **Type THW-2**, Type THHN-THWN, Type XHHW-2, Type UF, Type USE, and Type SO.
- D. Multiconductor Cable: Not allowed for this project.
- E. VFC Cable:
 - 1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.
 - 2. Type TC-ER with oversized crosslinked polyethylene insulation, spiral-wrapped foil plus 85 percent coverage braided shields and insulated full-size ground wire, and sunlight- and oil-resistant outer PVC jacket.

2.02 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following] [provide products by one of the following:
1. AFC Cable Systems, Inc.
 2. Gardner Bender.
 3. Hubbell Power Systems, Inc.
 4. Ideal Industries, Inc.
 5. IlSCO; a branch of Bardes Corporation.
 6. NSi Industries LLC.
 7. O-Z/Gedney; a brand of the EGS Electrical Group.
 8. 3M; Electrical Markets Division.
 9. Tyco Electronics.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.03 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 3 EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 14 AWG and smaller; stranded for No. 12 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 14 AWG and smaller; stranded for No. 12 AWG and larger, except VFC cable, which shall be extra flexible stranded.
- C. Minimum Sizes:
1. For interior power and lighting branch circuit shall be No. 12 AWG
 2. For exterior power and lighting branch circuit shall be No. 10 AWG
 3. For control and auxiliary wiring shall be No. 14 AWG stranded
- D. Aluminum conductors shall not be used.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway
- B. Exposed Feeders and Branch Circuits: Type THHN-THWN, single conductors in raceway.
- C. Feeders and Branch Circuits Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Feeders and Branch Circuits Concealed in below grade concrete walls, below Slabs-on-Grade, and Underground: Type T THHN-2-THWN-2, single conductors in raceway.
- E. Branch Circuits Installed through luminaire ballast channels: Type THHN, THWN-2, 90°C, single conductors in raceway

3.03 INSTALLATION OF CONDUCTORS AND CABLES

- A. All conductors and cables shall be installed in a raceway system.
- B. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

- C. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- D. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- E. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- F. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
- G. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."
- H. All raceway systems installed in below-floor and above-ceiling plenum spaces shall be sealed using specified methods listed in Section 26 05 33 "Raceways and Boxes for Electrical Systems".

3.04 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.05 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.07 PENETRATIONS

- A. Penetrate fire barriers, smoke barriers, vapor barriers, roofing materials and other rated architectural elements in a manner that preserves the rating of the architectural element.
- B. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.08 FIELD QUALITY CONTROL

- A. Test and Inspection Reports: Prepare a written report to record the following:
 1. Megohm testing of conductors including procedures used.
 2. Results that comply with requirements.
 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
 4. Reports shall be included with the O&M manuals.
- B. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

**SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes: Grounding systems and equipment.
- B. Section includes grounding systems and equipment, plus the following special applications:
 - 1. Underground distribution grounding.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.04 INFORMATIONAL SUBMITTALS

- A. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1. Ground rods.
 - 2. Grounding arrangements and connections for separately derived systems.
 - 3. Grounding for sensitive electronic equipment.
- B. Qualification Data: For qualified testing agency and testing agency's field supervisor.
- C. Field quality-control reports.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - 1. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NFPA 70B.
 - a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
 - b. Include recommended testing intervals.

1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member Company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 PRODUCTS

2.01 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Sizes and types of conductors in four subparagraphs below are typical examples. 28-kcmil bonding cable in first subparagraph is slightly larger than No. 6 AWG.
4. Sizes and types of conductors in four subparagraphs below are typical examples. 28-kcmil bonding cable in first subparagraph is slightly larger than No. 6 AWG.
5. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
6. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
7. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.02 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solder less compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.03 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet in diameter.

PART 3 EXECUTION

3.01 APPLICATIONS

- A. Provide all grounding and bonding required by NFPA 70, as adopted by the local authority having jurisdiction. Detailed aspects of code requirements for grounding and bonding may not be indicated within the contract documents, however, all aspects of code compliance are the responsibility of the contractor.
- B. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- C. Underground Grounding Conductors: Install bare copper conductor, No. 2/0AWG minimum.
 1. Bury at least 24 inches below grade.
 2. Retain subparagraph below to require duct-bank grounding conductor to be installed with, but external to, duct bank.
 3. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
- D. Conductor Terminations and Connections:
 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 3. Connections to Structural Steel: Welded connectors.

3.02 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.

- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or hand-hole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.03 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode in addition to grounding conductor installed with branch-circuit conductors.

3.04 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

3.05 LABELING

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.
- B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.
 - 1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.06 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

- C. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
- E. Grounding system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.
- G. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: **10 ohms.**
 - 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: **5 ohms.**
 - 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: **3 ohms.**
 - 4. Power Distribution Units or Panelboards Serving Electronic Equipment: **3 ohm(s).**
 - 5. Pad-Mounted Equipment: **5 ohms.**
 - 6. Manhole Grounds: **10 ohms.**
- H. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.07 GROUND RODS

- A. Provide as shown and/or required. Connect the grounding conductor to each rod.

3.08 SIZE OF GROUND WIRE

- A. As required by National Electric Code. Where ground wire is exposed to physical damage protect with rigid non-ferrous conduit as permitted by applicable code.

3.09 GROUND CONNECTION OF PIPING

- A. Metal internal piping shall be grounded, as a part of this contract.

3.10 CONNECTION TO THE POWER GROUND BUS

- A. Furnish and install connections in accordance with the codes; including but not limited to:
 - 1. Raceway system
 - 2. Switchboard
 - 3. Service neutral
 - 4. "Separately derived system" (transformer or emergency power supply)
 - 5. Electrically operated equipment and devices.
- B. No device or equipment shall be connected for electrical service which has a neutral conductor connected to a grounding conductor or to the frame within the device or equipment.

3.11 METHOD OF CONNECTIONS

- A. Make all ground connections and ground cable splices by thermal welding or copper compression set type connectors U.L. listed for grounding purposes. Grounding lugs, where provided as standard manufacturer's items on equipment furnished, may be used.

3.12 EXPANSION FITTINGS

- A. In conduit runs requiring an expansion fitting, a bonding jumper shall be installed around the fitting to maintain continuous ground continuity.

3.13 TESTING

- A. Conform to Section 260126 - Acceptance Testing of Electrical Systems

3.14 GROUND CABLE CROSSING EXPANSION JOINTS

- A. Ground cables crossing expansion joints or similar separations in structures or paved areas shall be protected from damage by means of suitable approved devices or methods of installation which will provide the necessary slack in the cable across the joint to permit movement. Stranded or other approved flexible copper run or jumper shall be used across such separations.

END OF SECTION

**SECTION 260533
RACEWAYS AND BOXES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. AASHTO American Association of State Highway and Transportation Officials
- B. ARC: Aluminum rigid conduit.
- C. EMT: Electrical metallic tubing.
- D. EPDM: Ethylene-propylene-diene terpolymer rubber.
- E. FMC: Flexible metal conduit
- F. GRC: Galvanized rigid steel conduit.
- G. IMC: Intermediate metal conduit.
- H. LFMC: Liquid tight flexible metal conduit.
- I. LFNC: Liquidtight flexible nonmetallic conduit.
- J. NBR: Acrylonitrile-butadiene rubber.
- K. RNC: Rigid nonmetallic conduit.
- L. SCTE Society of Cable Telecommunications Engineers

1.3 SUBMITTALS

- A. Product Data: Wireways and fittings, floor boxes, hinged-cover enclosures, cabinets, and handholes.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Listing and Labeling: Products shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70 requirements.
- C. Minimum Raceway Size: 1/2-inch (16-mm) trade size.

2.2 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 1. AFC Cable Systems, Inc.
 2. Alflex Inc.
 3. Allied Tube & Conduit; a Tyco International Ltd. Co.
 4. Anamet Electrical, Inc.; Anaconda Metal Hose.
 5. Electri-Flex Company.
 6. Eaton
 7. Maverick Tube Corporation.
 8. O-Z/Gedney – Emerson
 9. Western Tube and Conduit Corporation.
 10. Wheatland Tube Company; a division of John Maneely Company.
- B. Conduit
 1. GRC: Comply with ANSI C80.1 and UL 6. Hot dipped zinc galvanized.
 2. ARC: Comply with ANSI C80.5 and UL 6A.
 3. IMC: Comply with ANSI C80.6 and UL 1242.
 4. FMC: Comply with UL 1; zinc-coated steel or aluminum.
 5. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
 6. Fittings: Comply with NEMA FB 1 and UL 514B.
 - a. Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 - b. Material: Match conduit material.
 - c. Type: Threaded, **compression or split**.
 7. Joint Compound: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.
- C. EMT: Comply with ANSI C80.3 and UL 797.
 1. Couplings: **Setscrew or compression**. Steel. May be constructed integral with tubing.
 2. Indentor, Tap On, and Die Cast fittings are not acceptable.

- D. Deflection/Expansion Fittings: Comply with UL 651, rated for environmental conditions where installed, and including flexible internal or external bonding jumper.

2.3 NONMETALLIC CONDUIT AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 1. AFC Cable Systems, Inc.
 2. Anamet Electrical, Inc.
 3. Arnco Corporation.
 4. Carlon
 5. CANTEX Inc.
 6. CertainTeed Corp.
 7. Condux International, Inc.
 8. ElecSYS, Inc.
 9. Electri-Flex Company.
 10. Lamson & Sessions; Carlon Electrical Products.
 11. Manhattan/CDT/Cole-Flex.
 12. RACO; a Hubbell company.
 13. Thomas & Betts Corporation.
- B. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 1. Eaton-Cooper B-Line, Inc.
 2. Hoffman; a Pentair company.
 3. Husky
 4. Schneider Electric.
- B. Construction:
 1. Sheet metal: sized and shaped as indicated,
 2. Indoors: NEMA 250, Type 1, hinged cover.
 3. Outdoors and unheated spaces: NEMA 250 Type 3R, Flanged and gasketed cover.
 4. Stainless steel Type 4X in kitchens, sterilization rooms, laundry, wash-down, and similar environments. Flanged and gasketed cover.

- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Finish: Manufacturer's standard enamel finish.

2.5 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish and **color**.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 1. Thomas & Betts Corporation.
 2. Walker Systems, Inc.; Wiremold Company (The).
 3. Wiremold Company (The); Electrical Sales Division.

2.6 BOXES, CABINETS, ENCLOSURES

- A. Suitable and listed for the environment in which they are installed per UL 50 and NEMA 250.
 1. Indoors: NEMA 250, Type 1.
 2. Outdoors: NEMA 250 Type 3R, Flanged and gasketed cover.
 3. Stainless steel Type 4X in kitchens, sterilization rooms, laundry, wash-down, and similar environments. Flanged and gasketed cover.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 1. Eaton.
 2. EGS/Appleton Electric.
 3. Erickson Electrical Equipment Company.
 4. Pentair - Hoffman.
 5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
 6. O-Z/Gedney; a unit of General Signal.
 7. RACO; a Hubbell Company.
 8. Robroy Industries, Inc.; Enclosure Division.
 9. Scott Fetzer Co; Adalet Division.
 10. Spring City Electrical Manufacturing Company.
 11. Thomas & Betts Corporation.
 12. Walker Systems, Inc.; Wiremold Company (The).
 13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
- C. Sheet Steel Gage (Any Direction)
 1. Less than 24": 14 USS gauge.
 2. Greater than 24": 12 USS gauge.
- D. Outlet and Device Boxes
 1. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

2. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, galvanized ferrous alloy for use with IMC and RMC, aluminum for use with ARC, Type FD.
 3. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- E. Pull and Junction Boxes
1. Small Sheet: NEMA OS 1.
 2. Cast-Metal: Comply with NEMA FB 1 and UL 1773, cast aluminum or galvanized cast iron with gasketed cover.
 3. Access Cover as follows, unless otherwise indicated:
 - a. Screw Cover:
 - 1) Both cover dimensions less than 30 inches
 - 2) In line pulls with one cover dimension less than 16 inches
 - b. Either cover dimension greater than 30 inches: One or more hinged cover(s) with Latch.

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. Armorcast Products Company.
 - b. Fogtite.
 - c. Oldcastle Precast, Inc.;
- B. Construction:
1. Load Rating:
 - a. Type A, Pedestrian with incidental vehicular traffic: ANSI/SCTE 77 Tier 8. Material shall be:
 - 1) Polymer-Concrete Handholes and Boxes and Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
 - 2) Fiberglass-reinforced polyester resin.
 - b. Type B, Traffic Rated: AASHTO H-20. Precast Concrete with diamond plate cover.
 - c. Size. Type 2 - 17"x21"x12" and Type 3 - 21"x28"x12"
 2. Configuration: Designed for flush burial with open bottom.
 3. Cover:
 - a. Secured by tamper-resistant locking devices. (Penta Head Bolt Down Cover)
 - b. Nonskid finish shall have a minimum coefficient of friction of 0.50.
 - c. Legend: Molded lettering, "ELECTRIC.", "COMMUNICATION" "FIRE ALARM or as otherwise appropriate to the system.
 4. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

2.8 PENETRATIONS

- A. Sleeves and seals associated with penetrations shall preserve the fire, thermal, water, or other rating of the penetrated elements.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits.
- B. Comply with NFPA 70.
- C. Determine optimal raceway routes that result in coordination with all building systems. Determine pull box quantities, sizes and locations.

3.2 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed Conduit: GRC, IMC,.
 - 2. Concealed Conduit, Aboveground: GRC, IMC, EMT.
 - 3. Underground Conduit: RNC, Type EPC-80-PVC, Type EPC-40-PVC.
 - 4. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X, 4, or 3R
 - 5. Handholes and Boxes, Underground: Provide boxes suitable for the load rating and the application.
- B. Indoors
 - 1. Exposed, Not Subject to Physical Damage: EMT, IMC, GRC.
 - 2. Exposed and Subject to Damage: GRC, IMC.
 - a. Raceway locations include the following (any height):
 - 1) Loading dock.
 - 2) Gymnasiums
 - b. Raceway locations include the following, when below 8 feet above floor:
 - 1) Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - 2) Mechanical rooms.
 - 3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 4. Damp or Wet Locations: GRC, IMC.
 - 5. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4X stainless steel in institutional and commercial kitchens, trash compactor areas, at sump pumps, and similar damp, wet or corrosive locations.

- C. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in fire pump rooms, damp locations, and wet locations.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 - 3. EMT: Use compression or setscrew fittings. Comply with NEMA FB 2.10. Cast metal fittings are not acceptable
 - 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

3.3 INSTALLATION

- A. Install raceways parallel or perpendicular to structural building lines. Conceal conduit and EMT within finished walls, ceilings, and floors except as follows:
 - 1. In rooms without a dropped ceiling.
 - 2. In non-public spaces such as mechanical, electrical, communication rooms.
 - 3. Unless otherwise indicated.
- B. Do not route:
 - 1. Parallel horizontal runs of raceways within 6 inches (150 mm) or directly above flues, steam, or hot-water piping.
 - 2. Nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C)
 - 3. Aluminum conduits or fittings in contact with concrete or earth.
- C. Complete raceway installation before starting conductor installation.
- D. Anchors and Supports:
 - 1. Positively attach raceways, boxes, and enclosures to structure, do not attach to supports for mechanical or other non-electrical systems.
 - 2. Support raceways within 12 inches (300 mm) of enclosures to which attached.
 - 3. Set boxes, enclosures, and cabinets plumb.
- E. Raceway Terminations:
 - 1. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

2. Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors.
 3. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
 4. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
 5. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
 6. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- F. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap, plug or compressive seal underground raceways designated as spare at point of below grade entry into building or at first pulling access point.
- G. Stub-ups:
1. Above Recessed Ceilings: Use a raceway bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
 2. Through slab, comply with either:
 - a. Arrange stub-ups so curved portions of bends are not visible above finished slab.
 - b. Terminate conduit at threaded GRC coupling with top of coupling 1/8" below top of slab.
- H. Outlet and Device Boxes:
1. Mount outlet boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install wall outlet boxes with height measured to center of box unless otherwise indicated.
 2. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a rain-tight connection between box and cover plate or supported equipment and box.
 3. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel. Do not compromise wall ratings for fire and sound separation.
 4. Locate boxes so that cover or plate will not span different building finishes.
 5. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

6. Box construction and size to match device requirements. Where device is furnished under this or other Divisions of this specification obtain requirements prior to roughing in.
 7. Set floor boxes level and adjust to match finished floor surface.
 8. Provide cast outlet boxes in exterior, wet, or cast in concrete locations.
- I. Surface Raceways:
1. Install surface raceways only where indicated.
 2. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
 3. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- J. Movement:
1. General
 - a. Select raceway elements to accommodate the expected movement. Set initial position of raceway movement element as appropriate to accommodate ultimate worst-case movement.
 - b. Install raceway supports to allow for expansion movement.
 - c. Provide bonding jumper for fittings without a continuous ground path.
 2. Raceway thermal performance:
 - a. Install in each run of aboveground metallic raceway that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
 - b. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
- K. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, transformers and motors.

3.4 UNDERGROUND RACEWAY SYSTEMS

- A. Direct-Buried Conduit:
1. Trade size minimum: 1 inch, except $\frac{3}{4}$ inch may be used for runs shorter than 30 feet.
 2. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
 3. After installing conduit, backfill and compact soil. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of

finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.

4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor. Cover exterior of conduit from 3 inches above grade to 12 inches below grade with a bitumastic tape or coating.
 - a. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
5. Underground Warning Tape: Comply with requirements in Division 26 Section "Identification for Electrical Systems."
6. Raceways routed under slab on grade shall be kept a minimum of six inches below the underside of the slab.

B. Handholes and Boxes

1. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
2. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
3. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade. Provide offset risers to match slope of cover to slope of finished grade.
4. Install handholes with bottom below frost line.
5. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SEALS

- A. Select seals as appropriate for the element (ie: liquids, gasses, dust, and/or vapor) the seal is isolating.
- B. Follow manufacturer's instructions when installing sealants and seal fittings.
- C. Location:
 1. Seal fitting shall be accessible.
 2. Locate seal fittings so no fittings or boxes are between the seal and the element requiring isolation.
 3. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish like that of adjacent plates or surfaces.
- D. Transition to RMC or IMC where required by code or seal fitting application.

- E. Seal the following points:
 - 1. Where raceways pass from warm to cold locations:
 - a. Boundaries of refrigerated spaces
 - b. Boundaries between heated and unheated spaces.
 - 2. Raceway connections to continually wet environments such as sumps and wells.
 - 3. To limit transmittance of hazardous liquids, gasses, dust, and/or vapors.
 - 4. Where raceways 2" and larger rise from below grade to terminate at stand or slab mounted exterior utilization equipment.

3.6 PENETRATIONS

- A. Penetrate fire barriers, smoke barriers, vapor barriers, acoustic barriers, waterproofing, roofing materials, floors, walls, foundations, and other rated architectural and structural elements and assemblies in a manner that preserves the integrity of the rating and the intended performance.
 - 1. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 07 requirements for penetration firestopping.
 - 2. Roof penetrations shall be made in accordance with the recommendations of the roofing system supplier and shall not compromise the roofing warranty.
- B. Penetration of below grade walls and slab on grade:
 - 1. Comply with either of the following:
 - a. Cast raceways into wall or slab.
 - b. Provide sleeve and compression seal between sleeve and raceway. The compression seal manufacturer shall have documentation indicating that the sleeve is compatible with the seal.
 - 2. Seal interior of raceways:
 - a. Seal Bushings: Utilize at all penetrations where other seals are not specified. Provide a pull box for sealing bushing(s) at point of entry when end use equipment is located away from wall or elevated above slab.
 - b. Foam Sealant:
 - 1) For phase conductor sizes #2 AWG and smaller.
 - 2) For feeder (not service) phase conductor sizes larger than #2AWG, where no portion of the raceway entering the building or equipment travels below grade at a height that is above the point of entry or the point of raceway termination at the equipment
 - 3) Apply foam sealant at raceway entry point into first interior and exterior pull point.
 - 4) Apply foam sealant at all raceways entering handholes and manholes.
 - c. Below slab raceways are not required to be sealed when the following conditions are met:
 - a) The raceway travels below slab from one interior building point to another, and the slab entrance and exit points are at same height.

- b) The raceway horizontal travel distance is less than 20 feet or the raceway is less than 2" in diameter and the horizontal travel distance is less than 100 feet.

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

**SECTION 260540
ELECTRICAL SITE WORK**

PART 1 GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

Comply with OSHA standards and criteria.

DESCRIPTION

Provide all excavation, trenching, backfill and surface restoration required for the electrical work.

Coordinate electrical system placement with new and existing utilities.

REFERENCES

APWA - American Public Works Association

ASTM C150 - Portland Cement

PART 2 PRODUCTS

CONCRETE MIXES

Concrete shall be APWA Class 3000, manufactured with 1/2-inch aggregate and ASTM C150 Type 1 or Type 11 cement.

ASPHALT

Asphalt shall match the standard specifications of the local municipality for public roads adjoining the site.

CRUSHED ROCK

Crushed rock shall be 1 1/4" minus unless smaller is required for bedding material.

SAND

Sand shall be clean and washed building sand.

ELECTRIC PULL BOXES AND HANDHOLES

Refer to section 260533 "Raceways and Boxes for Electrical Systems".

PART 3 EXECUTION

GENERAL

Prior to completion of work Contractor shall return site to the condition it was in before work commenced.

Where existing materials must be removed to support electrical site work replacement materials shall be of the same type and quality, unless type and quality are defined herein.

EXISTING UTILITIES

The existing utilities shown on the contract drawings have been plotted from available records. No guarantee is made to the accuracy of the locations indicated and is shown for whatever benefit the Contractor may derive therefrom.

Contact all serving utilities and have them locate their lines prior to commencing work. Forty-eight (48) hours prior to commencing work telephone "Call Before You Dig" at

1-800-424-5555. The Contractor shall also have the Owner locate all utility lines prior to commencing work.

Protect shown, visible and located utilities from damage. Promptly repair all active shown, visible and located utilities damaged by construction. This repair shall be made solely at the expense of the Contractor.

When despite all care and caution damage occurs to active utilities not visible, located or shown on the contract documents, the Contractor shall immediately obtain a decision as to repair. When so directed the repair shall be made immediately by the Contractor whose trade is involved. The contract price shall not change when the conditions outlined above and utmost possible care and caution have not been followed.

Adjust the depth of electrical utilities to avoid existing utilities with no change to contract price.

Use metal detectors to search for unknown utilities in proposed route of electrical systems.

SECURING SITE WORK

The Contractor is solely responsible for securing all electrical site work with adequate barriers, warning indicators and shoring.

TRENCHING

Trenching shall be to depths as required by code, the particular installation, or as shown on the drawings. Trench width and length as required by the installation or as shown.

Trench bottom shall be free of debris and graded smooth. Where trench bottom is rock, or rocky, or contains debris larger than 1", or material with sharp edges, Contractor shall over excavate 3" and fill with 3" of sand or backfill with native materials passed through one-inch sieve.

Provide 1'-0" minimum separation between new electrical utilities and other utilities, except gas lines shall be 1'-0" both vertical and horizontal and shall be 3'-0" (horizontal) for all water service lines.

All crossings of concrete or asphalt shall be performed only after the surface material has been saw cut to required width and removed.

EXCAVATIONS

Provide excavations as required for installation intended or as shown.

Excavation bottom shall be free of debris and graded smooth. Where bottom is rock, or rocky, or contains debris larger than 1", or material with sharp edges, over excavate 6" and fill with 6" sand or backfill with native materials passed through one-inch sieve.

Conform to utility requirements for excavation and vault installation in addition to contract document requirements where excavations are for installing utility companies' vaults.

DEWATERING

Provide, operate and maintain all pumps or other dewatering equipment required for control of water in trenches and excavations for electrical site work during the entire construction period.

SHORING

Provide as required by trenching and excavating to secure site work.

BACKFILL, BEDDING AND COMPACTION

Backfill around raceways per 260533.

Bedding and backfill around precast vaults and handholes shall be in accordance with manufacturer's recommendations.

Where manufacturer has no recommendations provide 0'-6" of 1/2" minus pea gravel or sand bedding for all vaults, and any handholes larger than 3'-0" x 3'-0". For handholes smaller than 3'-0" x 3'-0" provide 0'-3" pea gravel or sand. Backfill shall extend at least 6" from structure.

All other backfill shall be free of organic debris and inorganic materials larger than 6" in diameter.

Place all backfill material so as to obtain a minimum degree of compaction of 95 percent of the maximum density at optimum moisture content. Moisten backfill material as required to obtain proper compaction.

Broken pavement, concrete, and vegetative materials shall not be used for backfilling.

Within the one-year guarantee period, re-fill, compact and re-finish all settled areas to grade.

WASTE MATERIAL DISPOSAL

Promptly remove from the site and legally dispose of all materials from trenching and excavation which are remaining after backfilling and compaction.

SURFACE REFINISHING

Refinish every disturbed surface to its' original condition and elevation. Preserve sod and topsoil removed during excavation and reinstall after backfilling is completed. Replace sod that is damaged or unusable with sod of equal or better quality to that removed. When the surface is disturbed in a newly seeded area, re-seed the restored surface with the same quantity and form of seed as that used in the original seeding. Provide topsoil, fertilizer, liming, seeding, sodding, sprigging or mulching as required to match existing original condition.

Replace all planted materials not surviving 90 days after contract acceptance at Contractor's own expense.

Return after one year and refinish all settled areas to grade.

CARE OF PLANTS AND TREES

Unless specifically noted for demolition, remove and safely store all plants and trees in trenching or excavation areas prior to commencing site work.

Where plants and trees fail to survive storage replace with like kind, quality, and maturity.

PAVED SURFACE REPAIRS

Where trenches, pits or other excavations are made in existing roadways and other areas of pavement where surface treatment of any kind exists, restore such surface treatment or pavement to the same thickness and in the same kind as originally existed. Match and tie into the adjacent and surrounding existing surfaces.

END OF SECTION

**SECTION 260543
UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Conduit.
 - 2. Handholes and pull boxes.
 - 3. Manholes.

1.03 DEFINITION

- A. RNC: Rigid nonmetallic conduit.

1.04 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
 - 2. Accessories for handholes and pull boxes.
 - 3. Warning tape.
- B. Shop Drawings for Factory-Fabricated Handholes and Pull Boxes Other Than Precast Concrete: Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:
 - 1. Cover design.
 - 2. Grounding details.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Comply with ANSI C2.
- C. Comply with NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

1.07 PROJECT CONDITIONS

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 - 1. Notify Owner no fewer than four days in advance of proposed interruption of electrical service.
 - 2. Do not proceed with interruption of electrical service without Owner's written permission.

1.08 COORDINATION

- A. Coordinate layout and installation of handholes, and pull boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.
- B. Coordinate elevations of conduit into handholes, and pull boxes with final locations as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.

PART 2 - PRODUCTS

2.01 CONDUIT

- A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.
- B. RNC: NEMA TC 2, Type EPC-40-PVC and Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.02 NONMETALLIC DUCTS AND DUCT ACCESSORIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ARNCO Corp.
 - 2. Beck Manufacturing.
 - 3. Cantex, Inc.
 - 4. CertainTeed Corp.; Pipe & Plastics Group.
 - 5. Condux International, Inc.
 - 6. ElecSys, Inc.
 - 7. Electri-Flex Company.
 - 8. IPEX Inc.
 - 9. Lamson & Sessions; Carlon Electrical Products.
 - 10. Manhattan/CDT; a division of Cable Design Technologies.
 - 11. Spiraduct/AFC Cable Systems, Inc.
 - 12. Underground Devices, Inc.
- C. Duct Accessories:
 - 1. Warning Tape: Underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."

2.03 HANDHOLES AND PULL BOXES

- A. Description: Comply with SCTE 77.
 - 1. Color: Gray.
 - 2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
 - 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
 - 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 - 5. Cover Legend: Molded lettering, "ELECTRIC.", "COMMUNICATION." As indicated for each service.

PART 3 - EXECUTION

3.01 UNDERGROUND DUCT APPLICATION

- A. Ducts for Electrical Feeders 600 V and Less: RNC NEMA Type EPC-40-PVC, in concrete-encased duct bank, unless otherwise indicated.
- B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.
- C. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.

3.02 UNDERGROUND ENCLOSURE APPLICATION

- A. Handholes and Boxes for 600 V and Less:
 - 1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-20 structural load rating.

2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.
3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.
4. Units Subject to Light-Duty Pedestrian Traffic Only: Precast concrete, AASHTO HB 17, H-10 or Polymer concrete units, SCTE 77, Tier 8 structural load rating, structurally tested.

3.03 EARTHWORK

- A. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- B. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching
- C. Cut and patch existing pavement in the path of underground ducts and junction boxes. Backfill, compact and seal all pavement edges.

3.04 DUCT INSTALLATION

- A. Slope: Pitch ducts a minimum slope of 1:300 down toward handholes and away from buildings and equipment. Slope ducts from a high point in runs between two handholes to drain in both directions.
- B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches, both horizontally and vertically, at other locations, unless otherwise indicated.
- C. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.
 1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line.
 2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole.
 3. Grout end bells into structure walls from both sides to provide watertight entrances.
- D. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building.
- E. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.
- F. Pulling Cord: Install 100-lbf test nylon cord in ducts, including spares.

3.05 INSTALLATION OF HANDHOLES AND PULL BOXES

- A. Install handholes and pull boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use pull box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas and trafficways, set so cover surface will be flush with finished grade. Set covers of other handholes 1 inch above finished grade.

- D. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy vehicle loading. Prove traffic rated box and lids

3.06 GROUNDING

- A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.07 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
 1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
 2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
 3. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.08 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION

**SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Equipment identification nameplates.
 - 2. Identification for conductors, cables AC
 - 3. Identification for raceways.
 - 4. Underground-line warning tape.
 - 5. Warning labels and signs.
 - 6. Instruction signs.
 - 7. Miscellaneous identification products.

1.03 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI A13.1 "Scheme for Identification of Piping Systems"
- B. Occupational Safety and Health Administration (OSHA). 29 CFR - Labor Chapter XVII Part 1910-145 "Occupational and Safety Health Standards" 1992.
- C. Washington Administrative Code (WAC) 296-24 Part B-2 "Safety Color Code for Marking Physical Hazards."

1.04 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.05 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.06 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Note that equipment names and room numbers shown on the Contract Drawings may not be final names and numbers. Confirm all final naming prior to label manufacture.
- C. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

- D. Coordinate installation of identifying devices with location of access panels and doors.
- E. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 PRODUCTS

2.01 EQUIPMENT NAMEPLATES

- A. Materials:
 - 1. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed
 - 2. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Overlay shall provide a weatherproof and UV-resistant seal for label.
 - 3. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm)
- B. Dimension
 - 1. Nameplate minimum of 1 3/4" high by 5" wide.
 - 2. Lettering height for panel or equipment identifier @ 1/4".
 - 3. Lettering height for remaining lines @ 1/8" high with 1/8" spacing between lines.
 - 4. Normal System: White letters on black background.
 - 5. Emergency System: White letters on orange red background.
 - 6. Legally Required Standby Branch System: - White letters on orange background.
 - 7. Comply with ANSI 13.1.
- C. Disconnects, Starters, Combination Starters and Other Devices
 - 1. Provide phenolic nameplate for each device with the following information:
 - Line 1: Load served
 - Line 2: Panelboard and circuit number from which device is fed
 - Line 3: Fuse size or breaker size as applicable

2.02 CONDUCTOR, CABLE AND AC CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each conductor and cable size.
- B. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Snap-Around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of conductor or cable it identifies and to stay in place by gripping action.
- E. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

2.03 RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1, for minimum lettering size and for minimum length of color field for each raceway size.
- B. Color for Raceway Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate Voltage, indicate load name and circuit number,

- C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wrap-around adhesive tape for securing ends of legend label.
- D. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch wide black stripes on 10-inch centers diagonally over orange background that extends full length of raceway or duct and is 12 inches wide. Stop stripes at legends.

2.04 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
 - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical utility lines.
 - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
 - 1. Comply with ANSI Z535.1 through ANSI Z535.5.
 - 2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,
 - 3. Consult with local utility to confirm warning tape requirements for utility lines. Edit the following as required for utility standard or as required for project. Non conducting protective tape provides a visual warning to anyone digging up a buried line. Tape suitable for conductive or inductive tracing has a foil core that additionally can be detected by a metal detector without digging up the line. Select one of the following or indicate on plans where each type is used.
 - 4. Non-Conducting Protective Tapes
 - 5. Pigmented polyolefin, bright-colored, continuous-printed with the inscription noted above compounded for direct-burial service.
 - 6. Thickness: 4 mils (0.1 mm).
- C. Protective Tapes Suitable for Conductive or Inductive Tracing.
 - 1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed with the inscription indicated above, compounded for direct-burial service.
 - 2. Overall Thickness: 5 mils.
 - 3. Foil Core Thickness: 0.35 mil.

2.05 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Retain paragraph below where signs are attached to non-flat surfaces such as a fence. Coordinate with Part 3.
- D. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."
 - 3. INSTRUCTION SIGNS
- E. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
 - 1. Engraved legend with black letters on white face.
 - 2. Punched or drilled for mechanical fasteners.

- 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
- F. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.
- G. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.06 CABLE TIES

- A. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one-piece, self-locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black.

2.07 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.
- G. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.02 EQUIPMENT IDENTIFICATION:

- A. On each unit of equipment, install unique designation nameplate that is consistent with naming used in wiring diagrams, schedules, and the Operation and Maintenance Manual.
- B. In addition to equipment listed in Part 2 provide nameplates for:
 - 1. Access doors for concealed electrical devices
 - 2. Transformers
 - 3. Enclosed over-current protective devices
 - 4. Electrical cabinets, enclosures and terminal cabinets
 - 5. Contactors
 - 6. Variable speed drives
 - 7. Battery -inverters, battery racks, UPS equipment

8. Power-generating units
 9. Monitoring and control panels and equipment
 10. Delete following paragraph if not applicable.
- C. Confirm all final naming prior to label manufacture.
- D. Labeling Instructions:
1. Indoor Equipment: Adhesive film label with clear protective overlay.
 2. Outdoor Equipment: Engraved, laminated acrylic or melamine label with screw fasteners
 3. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 4. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

3.03 CIRCUIT CONDUCTOR IDENTIFICATION

- A. Power-Circuit Conductor Identification, 600 V or Less:
1. For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 2. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral: White
 - 5) Equipment Ground: Green
 - 6) Isolated Ground: Green with yellow tracer
 - c. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - 4) Neutral: Gray
 - 5) Equipment Ground: Green
 - 6) Isolated Ground: Green with yellow tracer
 - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
 3. Conductors to Be Extended in the Future: Attach self-adhesive label to conductors and list source.
- B. Power-Circuit Conductor Identification, more than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use metal tags with circuit designation. For conductors to be extended in the future, attach self-metal tag to conductors and list source. Install tags at all points of accessibility including manholes, pad-mounted switches and interior switchgear. Firmly attach all tags to each cable phase using plastic tie wraps. Position tags so that they are clearly legible to the observer.
- C. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

3.04 WORKING CLEARANCE IDENTIFICATION

- A. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated.
- B. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

3.05 UNDER GROUND LINE IDENTIFICATION

- A. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, and control wiring.
 - 1. Limit use of underground-line warning tape to direct-buried cables.
 - 2. Install underground-line warning tape for direct-buried cables, cables in raceway and duct banks.
- B. Underground-Line Warning Tape Installation: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.

3.06 POSTED DRAWINGS AND OPERATING INSTRUCTIONS

- A. Mount drawings and operating procedures on the wall immediately adjacent to the main piece of equipment for which the instructions apply. If sufficient wall space is available, mount directly to one of the sheet metal panels of the equipment.
- B. Color Coding Sign: Install instructional sign for the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- C. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

3.07 WARNING SIGNS

- A. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
 - 1. Comply with 29 CFR 1910.145.
 - 2. Identify system voltage with black letters on an orange background.
 - 3. Apply to exterior of door, cover, or other access.
 - 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.

END OF SECTION

**SECTION 262416
PANELBOARDS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260500 Common Work Results, apply to this Section.
- B. Additional requirements for elements identified in this specification are in the following Division 26 Sections:
 - 1. 262816 Circuit Breakers.

1.2 SUBMITTALS

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - a. Verify space available with equipment sizes and code required working clearances prior to submitting shop drawings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Include evidence of NRTL listing for series rating of installed devices.
 - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 7. Include wiring diagrams for power, signal, and control wiring.
 - 8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
- C. Seismic Data:
 - 1. ASCE7 Special Certificate: Submit manufacturer's Special Certification that panelboards, overcurrent protective devices, accessories, and components will comply with the required seismic performance. Detailed description of equipment supports and anchorage devices on which the certification is based and their installation requirements.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Provide additional data as required by designer of panelboard mounting structure.
- D. Field Quality-Control Reports:
 - 1. Test procedures used.

2. Test results that comply with requirements.
 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- E. Panelboard Schedules: For installation in panelboards.
- F. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.3 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.4 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Comply with:
1. NEMA PB2.
 2. UL 67.
 3. UL 50 for cabinets boxes and trims.
 4. NFPA 70.

5. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 6. Labels as required by UL and NFPA 70, as adopted and amended by local codes.
- B. Seismic Criteria:
1. Provide Special Certification for Designated Seismic systems per ASCE/SEI 7 Chapter 13, *Seismic Design Requirements for Nonstructural Components*. Testing shall be in accordance with the following:
 - a. ICC ES 156 *Seismic Certification By Shake Table Testing of Non-Structural Components*.
 - b. Test shall utilize the following criteria from ASCE/SEI 7
 - 1) Importance factor, I_p , of 1.5.
 - 2) Height Factor (z/h) = 1.0, or as individually determined for each switchboard from contract drawings.
 - 3) Ground acceleration, testing force, duration, frequency bandwidth and related site factors shall meet or exceed the requirements determined by the performance criteria defined in Section 260548 "Seismic Controls for Electrical Systems". Where information is unavailable (ie a_p) use the most imposing values identified in ASCE/SEI 7.
 - c. A current listing on the State of California's OSHPD Special Seismic Certification Preapproval list with an S_{Ds} value adequate for the site may be used to demonstrate compliance with these criteria.
 2. Panelboard shall remain in place without separation of any parts when subjected to seismic forces and the unit will be fully operational after the seismic event. Identify mounting and anchoring hardware compatible with the points of attachment to the Panelboard.

2.2 MANUFACTURER

- A. Manufacturers: Subject to compliance with requirements, provide products or comparable product by one of the following:
1. Eaton Electrical Inc
 2. General Electric Company
 3. Siemens Energy & Automation, Inc.
 4. Schneider Electric.
 5. IEM.

2.3 ENCLOSURES

- A. Flush or surface-mounted cabinets, as indicated on drawings or panel schedules.
- B. Rated for environmental conditions at installed location.
1. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 2. Outdoor Locations: NEMA 250, Type 3R.
 3. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250 Type 12.
- C. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover (door in door). Key identically.

- D. Where two cabinets are located adjacent to each other in finished areas, provide matching trim.
- E. Where remote controlled switch or contactor is mounted in panelboard, mount on same frame as panelboard interior, with dedicated access door and key lock
- F. Finishes:
 - 1. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - 2. Back Boxes: Steel, galvanized where construction sequencing exposes the back box to water, otherwise same finish as panels and trim.
- G. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover, type written. Handwritten is not acceptable.

2.4 BUSSING AND WIRING

- A. Incoming Mains Location: Top or bottom, as determined by contractor in conjunction with information presented on the drawings.
- B. Phase, Neutral, and Ground Buses:
 - 1. Material: Tin-plated aluminum or Hard-drawn copper, 98 percent conductivity.
 - 2. Panelboards shall have full ampacity bussing throughout and shall be full size in regard to number of possible pole spaces. Bussing shall be identified with phases reading left to right.
 - 3. Neutral bus shall be mounted independently of equipment ground bus.
 - 4. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box and located on back of panelboard. Shall have lug or lugs from equipment grounding conductor from switchboard or distribution board and screw type terminals for connection of equipment green ground wire in same quantity as number of poles in panel.
- C. Features as scheduled:
 - 1. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
 - 2. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads. Conductor connectors to match oversizing.
 - 3. Split Bus: Vertical buses divided into individual vertical sections.
- D. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Tin-plated aluminum or Hard-drawn copper, 98 percent conductivity.
 - 2. Method: Mechanical Screw type.
 - 3. Features as scheduled:
 - a. Feed-Through Lugs: Locate at opposite end of bus from incoming lugs or main device.
 - b. Subfeed (Double) Lugs: Locate at same end of bus as incoming lugs or main device.
 - c. Gutter-Tap Lugs: Locate at same end of bus as incoming lugs or main device.
- E. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

- F. Panelboards rated for 400 amps and above shall accept 225 amp frame circuit breakers.
- G. Panelboard Short-Circuit Current Rating: Refer to Panel Schedules and one line diagrams.
 - 1. Fully rated to interrupt symmetrical short-circuit current available at terminals.
 - 2. Minimum interrupting ratings shall be 14,000 (RMS Symmetrical) at 480/277V and 10,000 (RMS Symmetrical) at 208/120V.

2.5 OVERCURRENT PROTECTIVE DEVICES

- A. Overcurrent Protective Devices shall be the same manufacturer as panelboard.
- B. Fully rated for the available short circuit current.
- C. Series Short-Circuit Current Ratings: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by an NRTL.
- D. Molded-Case Circuit Breaker (MCCB): Comply with UL 489. Standard frame sizes, trip ratings, and number of poles. Mechanical lugs, able to terminate conductors indicated on drawings.
 - 1. Frame size 100A: Thermal-Magnetic sensing with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
 - 2. Frame sizes over 250A and up to 800A: Thermal-Magnetic sensing with inverse time-current element for low-level overloads and adjustable instantaneous magnetic trip element for short circuits. Adjustable instantaneous trip element shall have front-mounted dial or utilize electronic trip unit.
 - 3. Frame sizes 800 amps and over: Electronic trip-units with RMS sensing, field-replaceable rating plug, and the following discrete (field-adjustable) sensing:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time delay adjustments.
- E. Circuit-Breaker Features and Accessories: Provide the following construction and ratings where indicated on the drawings:
 - 1. Current-Limiting: Under short circuit conditions, circuit breaker shall interrupt current in less than ¼ cycle to reduce let through current. Frame sizes 400 A and smaller shall have let-through ratings less than NEMA FU 1, RK-5.
 - 2. Branch Circuits:
 - a. GFCI Circuit Breakers: Ground Fault Circuit Interrupter, single- and two-pole configurations with Class A ground-fault protection (6-mA trip). Push to test and ground fault indicator.
 - b. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
 - c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
 - d. Combination AFCI/GFCI: As above for individual ratings.
 - 3. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
 - 4. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.

5. Auxiliary Contact: SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
 6. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
 7. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
 8. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
 9. Handle Padlocking Device: Fixed attachment, for locking circuit breaker handle in on or off position.
- F. Applications:
1. Circuit breakers shall have listing appropriate for the application.
- G. Where spare is indicated, panelboard shall be provided with the specified branch circuit breaker, full ampacity bussing and mounting hardware. Where space is indicated, panelboard shall be provided with full ampacity bussing and mounting hardware to accommodate future installation of branch circuit breaker. Provide individual filler/cover plates for each breaker space.

2.6 NAMEPLATES

- A. Engraved nameplates per Section 260553 - Identification for Electrical Systems permanently attached to panelboard front. Include panel name with 1/4" letters, area served, voltage, phase and wire (e.g., 2N1, 208Y/120, 3 phase, 4 wire, 480Y/277, 3 phase, 4 wire) in 1/8 inch characters. When project has more than one switchboard include switchboard fed from (e.g., Fed from SWBD. 4BP).
- B. Nameplate color: Normal system - white letters on black.
Emergency system - white letters on red.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NECA 407 and NEMA PB 1.1.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install panelboards and accessories according to NECA 407 and NEMA PB 1.1.
1. Secure flush mounted panels to studs in wall via slotted channel or angle iron.

2. Provide additional reinforcement where wall construction is inadequate for size and weight of panelboard.
 3. Place and secure anchorage devices in masonry and concrete elements. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
 - C. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
 - D. Mount top of panel trim according to the following priorities (highest listed first):
 1. At the height determined by the panelboard when panelboard size and weight require floor mounting.
 2. In compliance with the operating handle height limitation of the NEC.
 3. At the height indicated on the drawings.
 4. As necessary to permit adjacent panels in finished areas to have trim heights aligned.
 5. At 90 inches for panel cabinets above 42 inches in height, and at 78 inches for panel cabinets equal to or less than 42 inches in height.
 - E. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
 - F. Panelboards installed recessed in fire rated walls shall be adequately boxed or backed with fire rated material and shall be approved by Fire Marshal. The final construction shall equal or exceed fire rating of the wall.
 - G. Locate in dedicated spaces. Coordinate project construction so piping, ducts, etc. are routed around dedicated spaces above and in front of panelboards per code.
 - H. Verify space available with equipment sizes and code required working clearances prior to roughing in of back box or cabinet.
 - I. Install overcurrent protective devices and controllers not already factory installed.
 1. Set field-adjustable, circuit-breaker trip ranges.
 - J. Install filler plates in unused spaces.
 - K. Arrange conductors in gutters into groups and bundle and wrap with wire ties, after completing load balancing.

3.3 WIRING

- A. Conform to applicable sections of these specifications and NEMA PB 1.1.
- B. Panelboards shall be wired and connected after installation at locations shown. Pre-wiring off site and splicing of branch circuit in wireway above or below panelboard is not permitted.

3.4 CIRCUIT INDEX AND LABELS

- A. Typed circuit index with odd circuits on left, even circuits on right, listing each circuit by number with complete load designation, (i.e. Receptacle room ____, lights room ____, etc.). Room names/numbers per actual room identification assigned by owner at project completion (assigned room numbers may differ from drawings). Mount inside door with transparent protective cover. Provide number labels on circuit breakers to match index.
- B. Install nameplate as per Part 2.

3.5 GROUNDING

- A. Provide per Section 260526 - Grounding and Bonding for Electrical Systems.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.7 ADJUSTING

- A. Adjust moving parts and operable component to function smoothly and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as directed and in accordance with Division 26 Section "Overcurrent Protective Device Coordination Study."]
- C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
 - 1. Measure as directed during period of normal system loading.
 - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour

services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.

3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.8 CLEANING

- A. Prior to final inspection, clean panelboard interiors, adjust trims, covers, hinges and locks and refinish marred or scratched covers to original conditions. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

3.9 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

**SECTION 262816
ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Receptacle switches.
 - 3. Molded-case circuit breakers (MCCBs).
 - 4. Molded-case switches.
 - 5. Enclosures.
- B. Provide all disconnects required by code for equipment furnished under this and other Divisions of these specifications unless disconnects are integral with equipment and acceptable to the authority having jurisdiction.

1.03 REFERENCES

- A. National Electrical Manufacturers Association (NEMA)
- B. Underwriters Laboratories (UL)

1.04 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.05 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.06 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Include evidence of NRTL listing for series rating of installed devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 - 6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.07 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.
 1. Test procedures used.
 2. Test results that comply with requirements.
 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- D. Manufacturer's field service report.

1.08 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.09 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 2. Fuse Pullers: Two for each size and type.
 3. QUALITY ASSURANCE
- B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Comply with NFPA 70.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2010 m).

1.11 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton Electrical Inc
 2. General Electric Company.
 3. Siemens Energy & Automation, Inc.
 4. Schneider Electric.

2.02 RATINGS

- A. Voltage: Meet or exceed voltage of the circuit the switch or circuit breaker is applied to.
- B. Current
 1. Continuous current rating shall be either of the following:
 - a. As indicated on the drawings.
 - b. If not indicated, match or exceed the continuous current rating of the overcurrent protective device that protects the conductor providing incoming power to the switch or circuit breaker.
 2. Short circuit withstand and interrupting ratings
 - a. Shall comply with either of the following:
 - 1) If the available short circuit current at the switch or circuit breaker is indicated on the drawings, exceed the indicated value while allowing for appropriate X/R derating.
 - 2) Meet or exceed the AIC rating of the overcurrent protective device that protects the conductor providing incoming power to the switch or circuit breaker.
 - b. Compliance: Short circuit withstand and interrupting ratings shall be complied with using any of the following methods:
 - 1) Listed short circuit ratings complying with above criteria.
 - 2) Independent testing laboratory recognized series connected ratings complying with the above criteria.
 - 3) Oversizing the indicated switch or circuit breaker rated current to obtain a listed short circuit withstand and interrupting rating complying with the above criteria, if the appropriate amount of space is available at the indicated location.
 - 4) If a non-fusible disconnect is indicated it may be changed to a fusible disconnect to obtain the required listed short circuit current withstand rating.
 3. Overcurrent Protection
 - a. Provide overcurrent protection matching the ampacity indicated on the drawings.
 - b. When included as part of the disconnecting means for utilization equipment the overcurrent protection shall comply with the listing requirements of the utilization equipment. Obtain utilization equipment shop drawings as specified in the appropriate specification division to determine requirements.
- C. Poles: Match the circuit the switch or circuit breaker is applied to.

2.03 FUSIBLE SWITCHES

- A. Type HD, Heavy Duty, Single Throw, Larger than 100 amp: UL 98 and NEMA KS 1, horse-power rated, with clips or bolt pads to accommodate fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- B. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 - 4. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
 - 5. Hookstick Handle: Allows use of a hookstick to operate the handle.
 - 6. Lugs: Mechanical type, suitable for number, size, and conductor material.
 - 7. Service-Rated Switches: Labeled for use as service equipment.
 - 8. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac

2.04 If more than one type or rating of receptacle-switch combination is required, consider showing location of each on Drawings and deleting subparagraph below; otherwise, insert required information.

2.05 MOLDED-CASE CIRCUIT BREAKERS

- A. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- B. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- C. Molded Case Switch: When serving only as a disconnecting means.
- D. Frame sizes 400 amp and larger: Electronic Trip Circuit Breakers: rms sensing, with the following field-adjustable settings:
 - 1. Instantaneous trip.
 - 2. Long- and short-time pickup levels.
 - 3. Long- and short-time time adjustments.
- E. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
 - 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
 - 4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
 - 5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
 - 6. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
 - 7. Electrical Operator: Provide remote control for on, off, and reset operations.
 - 8. Accessory Control Power Voltage: Integrally mounted, self-powered.

2.06 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1 .
2. Outdoor Locations: NEMA 250, Type 3R .
3. Kitchen, Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

2.07 NAMEPLATES

- A. Provide nameplates per Section 260553 - Identification For Electrical Systems.
- B. Include the following information: Load name, voltage and phase and fuse size and type (when applicable).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers level and plumb according to manufacturer's written instructions.
- B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- C. Securely mount adjacent to equipment on wall or acceptable mounting frame. Disconnect switches shall be mounted independent from the equipment they serve. Disconnects supported only by raceway are not acceptable.
- D. Wiring space within Disconnects, Fused Switches or Enclosed Circuit Breakers shall not be used for splices.
- E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- F. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- G. Install fuses in fusible devices.
- H. Switches shall operate to the open position with the blades down.
- I. Comply with NECA 1.
- J. For combination fire/smoke damper power circuits, provide box cover units with Edison-base fuse holder and single-pole disconnect switch.

3.03 CLEANING

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

3.04 IDENTIFICATION

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.

2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.05 FIELD QUALITY CONTROL

- A. Acceptance Testing Preparation:
 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 2. Test continuity of each circuit.
- B. Tests and Inspections:
 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
 - c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.06 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as directed.

END OF SECTION

SECTION 262826

ENCLOSED TRANSFER SWITCHES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes transfer switches in individual enclosures.

1.2 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA ICS 10 - Industrial Control and Systems: AC Transfer Switch Equipment.
- B. International Electrical Testing Association:
 - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- C. Underwriters Laboratories Inc.:
 - 1. UL 1008 - Transfer Switch Equipment.

1.3 SUBMITTALS

- A. Per Division 1: Submittal procedures.
- B. Product Data: Submit catalog sheets showing voltage, switch size, ratings and size of switching and overcurrent protective devices, operating logic, short circuit ratings, dimensions, and enclosure details.

1.4 CLOSEOUT SUBMITTALS

- A. Per Division 1: Closeout procedures.
- B. Project Record Documents: Record actual locations of enclosed transfer switches.
- C. Operation and Maintenance Data: Submit routine preventative maintenance and lubrication schedule. List special tools, maintenance materials, and replacement parts.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience, and with service facilities within 60 miles of Project.
- B. Supplier: Authorized distributor of specified manufacturer with minimum ten years documented experience.

1.6 MAINTENANCE SERVICE

- A. Furnish service and maintenance of transfer switches for five years from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 AUTOMATIC TRANSFER SWITCH

- A. Manufacturers:
 - 1. ASCO
 - 2. Generac
 - 3. Cummins
 - 4. Kohler
 - 5. CAT
 - 6. Or approved equal.

- B. Product Description: NEMA ICS 10, automatic transfer switch.

- C. Configuration: Electrically operated, mechanically held transfer switch.

- D. Rating: 277/480 volt , 3 phase, 4 wire, 60 Hz, 3-pole. Ampere rating, as indicated on the Drawings.
 - 1. One 100 amp rated, 3 pole, NEMA 3R Enclosure (higher ampacities are allowed).

- E. Service Conditions: NEMA ICS 10.
 - 1. Temperature: 120 degrees F.
 - 2. Altitude: 4000 feet above sea level.

- F. The generator backup power system will not be considered a separately derived system. The neutral conductors for the ATS shall be solidly connected. Provide ATS with 100 percent fully rated neutral conductor plate and 100 percent fully rated connectors.

- G. Product Features:
 - 1. The automatic transfer switch shall be furnished by the manufacturer of the engine-generator set so as to maintain system compatibility and local service responsibility for the complete emergency power system. It shall be listed by Underwriter's Laboratory, Standard 1008 with fuse or circuit breaker protection. Representative production samples of the transfer switch supplied shall have demonstrated through tests the ability to withstand at least 10,000 mechanical operation cycles. One operation cycle is the electrically operated transfer from normal to emergency and back to normal. Wiring must comply with NEC table 312.6. The manufacturer shall furnish schematic and wiring diagrams for the particular automatic transfer switch and a typical wiring diagram for the entire system.
 - 2. The automatic transfer switch shall be a 3 pole design as rated on drawings, 277/480 volt, continuous operation in ambient temperatures of -20 degrees Fahrenheit (-30 degrees Celsius) to +140 degrees Fahrenheit (+60 degrees Celsius). Main power switch contacts shall be rated for 600 V AC minimum. The transfer switch supplied shall have a minimum withstand and closing rating when fuse protected of 200,000 amperes. Where the line side over-current protection is provided by circuit breakers, the short circuit

withstand and closing rating amperes RMS as shown on drawing. These RMS symmetrical fault current ratings shall be the rating listed in the UL listing or component recognition procedures for the transfer switch. All withstand tests shall be performed with the over-current protective devices located external to the transfer switch.

3. The transfer switch shall be double throw construction, positively electrically and mechanically interlocked to prevent simultaneous closing and mechanically held in both normal and emergency positions. Independent break before make action shall be used to positively prevent dangerous source to source connections. When switching the neutral, this action prevents the objectionable ground currents and nuisance ground fault tripping that can result from overlapping designs. The transfer switch shall be approved for manual operation. The electrical operating means shall be by electric solenoid. Every portion of the contactor is to be positively mechanically connected. No clutch or friction drive mechanism is allowed, and parts are to be kept to a minimum. This transfer switch shall not contain integral over-current devices in the main power circuit, including molded case circuit breakers or fuses. Return to Normal Switch: Mount in cover of enclosure to initiate manual transfer from alternate source to normal source.
4. The transfer switch electrical actuator shall have an independent disconnect means to disable the electrical operation during manual switching. Maximum electrical transfer time in either direction shall be 160 milliseconds, exclusive of time delays. Main switch contacts shall be high pressure silver alloy with arc chutes to resist burning and pitting for long life operation.
5. All control equipment shall be mounted on the inside of the cabinet door in a metal lockable enclosure with transparent safety shield to protect all solid state circuit boards. This will allow for ease of service access when main cabinet lockable door is open, but to prevent access by unauthorized personnel. Control boards shall have installed cover plates to avoid shock hazard while making control adjustments. The solid state voltage sensors and time delay modules shall be plug-in circuit boards with silver or gold contacts for ease of service.

H. Automatic Sequence of Operation:

1. A solid state under-voltage sensor shall monitor all phases of the normal source and provide adjustable ranges for field adjustments for specific application needs. Pick-up and drop-out settings shall be adjustable from a minimum of 70% to a maximum of 95% of nominal voltage. A utility sensing interface shall be used, stepping down system voltage to 24VAC, helping to protect the printed circuit board from voltage spikes and increasing personnel safety when troubleshooting.
2. Signal the engine-generator set to start in the event of a power interruption. A set of contacts shall close to start the engine and open for engine shutdown. A solid state time delay start, adjustable, .1 to 10 seconds, shall delay this signal to avoid nuisance start-ups on momentary voltage dips or power outages.
3. Transfer the load to the engine-generator set after it reached proper voltage, adjustable from 70-90% of system voltage, and frequency, adjustable from 80-90% of system frequency. A solid state time delay, adjustable from 5 seconds to 3 minutes, shall delay this transfer to allow the engine-generator to warm-up before application of load. There shall be a switch to bypass this warm-up timer when immediate transfer is required.
4. Retransfer the load to the line after normal power restoration. A return to utility timer, adjustable from 1-30 minutes, shall delay this transfer to avoid short term normal power restoration.
5. The operating power for transfer and retransfer shall be obtained from the source to which the load is being transferred. Controls shall provide an automatic retransfer of the load from emergency to normal if the emergency source fails with the normal source available.

6. Signal the engine-generator to stop after the load retransfers to normal. A solid state engine cool-down timer, adjustable from 1-30 minutes, shall permit the engine to run unloaded to cool-down before shutdown. Should the utility power fail during this time, the switch will immediately transfer back to the generator.
7. Provide an engine minimum run timer, adjustable from 5-30 minutes, to ensure an adequate engine run period.
8. The transfer switch shall have a time delay neutral feature to provide a time delay, adjustable from 0-120 seconds, during the transfer in either direction, during which time the load is isolated from both power sources. This allows residual voltage components of motors or other inductive loads (such as transformers) to decay before completing the switching cycle. A switch will be provided to bypass all transition features when immediate transfer is required.
9. The transfer switch shall have an in-phase monitor which allows the switch to transfer between live sources if their voltage waveforms become synchronous within 20 electrical degrees within 10 seconds of transfer initiation signal. A switch must be provided to bypass this feature if not required.
10. If the in-phase monitor will not allow such a transfer, the control must default to time delay neutral operation. Switches with in-phase monitors which do not default to time delay neutral operation are not acceptable.
11. Front mounted controls shall include a selector switch to provide for a NORMAL TEST mode with full use of time delays, FAST TEST mode which bypasses all time delays to allow for testing the entire system in less than one minute, or AUTOMATIC mode to set the system for normal operation.
12. Provide bright lamps to indicate the transfer switch position in either UTILITY (white) or EMERGENCY (red). A third lamp is needed to indicate STANDBY OPERATING (amber). These lights must be energized from utility or the engine-generator set.
13. Provide manual operating handle to allow for manual transfer. This handle must be mounted inside the lockable enclosure so accessible only by authorized personnel.
14. Provide a maintenance disconnect switch to prevent load transfer and automatic engine start while performing maintenance. This switch will also be used for manual transfer switch operation.
15. Provide LED status lights to give a visual readout of the operating sequence. This shall include utility on, engine warm-up, standby ready, transfer to standby, in-phase monitor, time delay neutral, return to utility, engine cool-down and engine minimum run. A "signal before transfer" lamp shall be supplied to operate from optional circuitry.
16. Engine Exerciser: Provide generator exerciser with adjustable settings to start engine every 7 days; run for 20 minutes before shutting down. Bypass exerciser control when normal source fails during exercising period. System shall provide the ability to exercise either with, or without load.
17. Include signal before transfer contacts.
18. Include (2) auxiliary switch position contact.

I. Enclosure:

1. Enclosure: NEMA type 3R (or 4X).
2. Finish: Manufacturer's standard gray enamel.

2.2 SOURCE QUALITY CONTROL

- A. Furnish shop inspection and testing of each transfer switch.

2.3 WARRANTY

- A. Transfer switch shall be covered for 5 years from the initial commissioning date of the generator system. To include parts, labor and travel. Transfer switch warranty shall be

included in the warranty for the engine generator system.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install housekeeping pads, per manufacturer's recommendation.
- B. Install engraved plastic nameplates in accordance with Section 260553.

3.2 MANUFACTURER'S FIELD SERVICES

- A. Per Division 1: Manufacturers' field services.
 - 1. A factory certified technician shall commission transfer switch in conjunction with the engine generator system.
- B. Check out transfer switch connections and operations and place in service.

3.3 ADJUSTING

- A. Per Division 1: Testing, adjusting, and balancing.
- B. Adjust control and sensing devices to achieve specified sequence of operation.

3.4 DEMONSTRATION AND TRAINING

- A. Demonstrate operation of transfer switch in normal, and emergency modes.

END OF SECTION

SECTION 263213

ENGINE GENERATORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes packaged engine-generator sets for optional standby power supply with the following features:
 - 1. Natural Gas
 - 2. Unit-mounted cooling system.
 - 3. Unit-mounted control and monitoring.
 - 4. Performance requirements for sensitive loads.
 - 5. Fuel system.
 - 6. Outdoor enclosure.
- B. Related Requirements:
 - 1. Section 262826 - Transfer Switches.

1.3 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. NEMA AB 1 – Molded Case Circuit Breakers and Molded Case Switches.
 - 3. NEMA ICS 10 – Industrial Control Systems: AC Transfer Switch Equipment.
 - 4. NEMA MG 1 – Motors and Generators.
- B. International Electrical Testing Association:
 - 1. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- C. National Fire Protection Association:
 - 1. NFPA 30 – Flammable and Combustible Liquids Code.
 - 2. NFPA 110 – Standard for Emergency and Standby Power Systems.

1.4 DEFINITIONS

- A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.
- B. EPS: Emergency power supply.

- C. EPSS: Emergency power supply system.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 2. Include thermal damage curve for generator.
 - 3. Include time-current characteristic curves for generator protective device.
 - 4. Include fuel consumption in gallons per hour at 0.8 power factor at 0.5, 0.75 and 1.0 times generator capacity.
 - 5. Include generator efficiency at 0.8 power factor at 0.5, 0.75 and 1.0 times generator capacity.
 - 6. Include air flow requirements for cooling and combustion air in cfm at 0.8 power factor and rated load. Testing shall be performed per ISO3046 standards. Provide drawings showing requirements and limitations for location of air intake and exhausts.
 - 7. Include generator characteristics, including, but not limited to kw rating, efficiency, reactances, and short-circuit current capability.
- B. Shop Drawings:
 - 1. Include plans and elevations for engine-generator set and other components specified. Indicate access requirements affected by height of subbase fuel tank.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, center of gravity of full assembly, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Identify fluid drain ports and clearance requirements for proper fluid drain.
 - 4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
 - 5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
 - 6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for EPS equipment and functional relationship between all electrical components.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer, supplier and manufacturer.
 - 1. Statement of quality from manufacturer detailing acceptance as an ISO9001 manufacturer.
 - 2. Manufacturer: Company specializing in manufacturing products specified in this section with minimum 20 years documented experience.
 - 3. Supplier: Authorized distributor of specified manufacturer with minimum ten years documented experience with factory certified technicians and service facility within 250 miles of the project.
- B. Source quality-control reports, including, but not limited to the following:
 - 1. Certified summary of prototype-unit test report.

2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
 3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
 4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
 5. Report of sound generation.
 6. Report of exhaust emissions showing compliance with applicable regulations.
 7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.
- C. Field quality-control reports.
- D. Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals.
1. Include the following:
 - a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
 - b. Operating instructions laminated and mounted adjacent to generator location.
 - c. Training plan.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer accepted as an ISO9001 manufacturer.
- B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved by manufacturer.

1.9 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
1. Warranty Period: 5 years from date of system commissioning by authorized dealer. Warranty to include parts, labor and travel per the manufacturer's published documents. Warranty shall be inclusive of all components of the emergency system to include the automatic transfer switch. Maintenance items such as batteries, belts and hoses are excluded.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide gas generator set, rated 277/480 volt, 3 phase, 60 Hz, 36 kW rating or as shown on the plan drawings.
- B. Approved Manufacturers:
 1. Cummins

2. Generac
 3. Kohler
 4. CAT
 5. Or approved equal.
- C. Source Limitations: Obtain packaged generator system, transfer switch and auxiliary components through one source from a single manufacturer. Generator set shall be standard offering from manufacturer. No special ratings will be permitted.
- D. Engineering changes resulting from the substitution of another product will be the responsibility of the electrical contractor.

2.2 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance:
1. Comply with NFPA 37.
 2. Comply with NFPA 70.
 3. Comply with NFPA 110 requirements for Level 2 emergency power supply system.
- B. UL Compliance: Comply with UL 2200/CSA.
- C. Engine Exhaust Emissions: Comply with EPA Tier requirements and applicable state and local government requirements.
- D. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.
- E. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
1. Ambient Temperature: Minus 30 to plus 120 deg F.
 2. Relative Humidity: Zero to 95 percent.
 3. Altitude: 4000 feet.

2.3 ASSEMBLY DESCRIPTION

- A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
- C. EPSS Class: Engine-generator set shall be classified as a Class 2 in accordance with NFPA 110.
- D. Governor: Adjustable isochronous, with speed sensing.
- E. Emissions: Comply with EPA Tier and local requirements for standby generation.
- F. Mounting Frame: Structural steel framework to maintain alignment of mounted components

without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.
- G. Capacities and Characteristics:
1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries.
 2. Output Connections: Three-phase, four wire.
 3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of components. Nameplate shall be in accordance with NFPA70.
- H. Generator-Set Performance:
1. Oversizing alternator compared with the rated power output of the engine is permissible to meet specified performance.
 2. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.
 3. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 5 seconds.
 4. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.
 5. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
 6. Transient Frequency Performance: Less than 5-Hz variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within 5 seconds.
 7. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
 8. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.
 9. Block Load Performance: per NFPA110, the unit shall be able to fully recover from a 100% block load.
 10. Excitation System: Performance shall be unaffected by 10% total voltage distortion (THD) caused by nonlinear load.
 - a. Provide permanent magnet excitation (PMG) for power source to voltage regulator.
 11. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.4 ENGINE

- A. Fuel: Natural Gas
1. Provide all accessories, to include solenoid valve, piping, and regulator, factory provided and installed.
- B. Engine Rating: Prime mover shall have adequate horsepower to meet the specified kW at the specified site altitude and temperatures or rating indicated on drawings.

- C. Lubrication System: The following items are mounted on engine or skid:
1. Filter and Strainer: Per manufacturer recommendations.
 2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
 3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
- D. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator- set mounting frame and integral engine-driven coolant pump.
1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
 2. Cooling System Sizing: Sized to adequately cool the generator set, including aftercooler, without de-rate to an ambient temperature of 122 deg F (50 deg C). Maximum external restriction shall be no greater than 0.5 inch (12.7 mm) of water column.
 3. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
 4. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
 5. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
 6. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
 - a. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible under vacuum.
 - b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
- E. Air-Intake Filter: Engine-mounted air cleaner with replaceable dry-filter element.
- F. Starting System: 12V electric, with negative ground.
1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified.
 2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
 3. Cranking Cycle: As required by NFPA 110 for system level specified.
 4. Battery: Lead acid, certified to meet NFPA 110, with capacity within ambient temperature range, as specified, to provide specified cranking cycle at least twice without recharging.
 5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
 6. Battery Compartment: Factory fabricated of metal with acid-resistant finish. Include accessories required to support and fasten batteries in place.
 7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and continuous rating adequate for batteries provided.
 8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type designed for lead-acid batteries. Unit shall comply with UL 1236 and include the following features:

- a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
- b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg F (minus 40 deg C) to 140 deg F (60 deg C) to prevent overcharging at high temperatures and undercharging at low temperatures.
- c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
- d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
- e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
- f. Enclosure and Mounting: NEMA 250, Type 1, unit mounted in generator enclosure..
- g. Battery chargers mounted within the Automatic Transfer Switch are not acceptable.

2.5 CONTROL AND MONITORING

- A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the manual position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms.
- B. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the manual position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms.
- C. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration. Panel shall be powered from the engine-generator set battery.
 1. Engine and generator control wiring shall be multi-stranded annealed copper conductors encased by cross-linked polyethylene insulation resistant to heat, abrasion, oil, water, and antifreeze. Wiring shall be suitable for continuous use at 250 deg F with insulation not brittle at minus 60 deg F (minus 51 deg C). Cables shall be enclosed in nylon flexible conduit, which is slotted to allow easy access and moisture to escape.
 - a. Engines that are equipped with an electronic engine control module (ECM) shall monitor and control engine functionality and seamlessly integrate with the generator set controller through digital communications. ECM monitored parameters shall be integrated into the genset controllers NFPA 110 alarm and warning requirements.

- b. For engines without ECM functionality or for any additional generator set controller monitoring, sensors are to be conditioned to a 4 to 20 ma signal level to enhance noise immunity and all sensor connections shall be sealed to prevent corrosion.
 - 2. Construction: All circuitry within the control panel shall be individually environmentally sealed to prevent corrosion. Encapsulated circuit boards with surface mounted components and sealed, automotive-style connectors for sensors and circuit board connectors. Enclosed circuit boards and terminal strips that are susceptible to corrosion are not acceptable.
 - 3. Custom ladder logic functionality inside the generator controller shall be supported to provide application support flexibility. The ladder logic function shall have access to all the controller inputs and customer assignable outputs.
- D. Indicating Devices: As required by NFPA 110 for Level 2 system. All ECM fault codes shall be displayed at the generator set controller in standard language; fault code numbers are not acceptable. Utilizing a digital display, including the following:
 - 1. AC voltage: True three-phase sensing.
 - 2. AC current.
 - 3. Frequency.
 - 4. EPS supplying load indicator.
 - 5. DC voltage (alternator battery charging).
 - 6. Engine-coolant temperature.
 - 7. Engine lubricating-oil pressure.
 - 8. Running-time meter.
 - 9. Current and Potential Transformers: Instrument accuracy class.
- E. Protective Devices and Controls in Local Control Panel: Shutdown devices and common visual alarm indication as required by NFPA 110 for Level 2 system, including the following:
 - 1. Start-stop switch.
 - 2. Overcrank shutdown device.
 - 3. Overspeed shutdown device.
 - 4. Coolant high-temperature shutdown device.
 - 5. Coolant low-level shutdown device.
 - 6. Low lube oil pressure shutdown device.
 - 7. Overcrank alarm.
 - 8. Overspeed alarm.
 - 9. Coolant high-temperature alarm.
 - 10. Coolant low-temperature alarm.
 - 11. Coolant low-level alarm.
 - 12. Low lube oil pressure alarm.
 - 13. Lamp test.
 - 14. Contacts for local and remote common alarm.
 - 15. Coolant high-temperature pre-alarm.
 - 16. Generator-voltage; digitally adjustable via controller, password protected.
 - 17. Main fuel tank low-level alarm.
 - 18. Run-Off-Manual selector switch.
 - 19. Control switch not in automatic position alarm.
 - 20. Low cranking voltage alarm.
 - 21. Battery-charger malfunction alarm.
 - 22. Battery low-voltage alarm.
 - 23. Battery high-voltage alarm.
 - 24. Generator overcurrent protective device not closed alarm.

- F. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated. Sensors are to be conditioned to a 4 to 20 mA signal level to enhance noise immunity and all sensor connections shall be sealed to prevent corrosions.
- G. The control system shall provide pre-wired customer use I/O: 4 relay outputs (user definable functions), 4 contact inputs, 2 analog inputs, communications support via RS232, RS485, or an optional modem. Additional I/O must be an available option. Customer I/O shall be software configurable providing full access to all alarm, event, data logging, and shutdown functionality.
- H. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.
- I. Maintenance:
 - 1. All engine, voltage regulator, control panel, and accessory units shall be accessible through a single electronic service tool. The following maintenance functionality shall be integral to the generator set controls:
 - a. Engine running hours.
 - b. Service maintenance interval (running hours, calendar days).
 - c. Engine crank attempt counter.
 - d. Engine successful starts counter.
 - e. 20 events are stored in control panel memory.
 - f. Control panel shall time and date stamp all alarms and warnings. A snap shot of key parameters shall be saved in the control panel for use in troubleshooting alarms.
 - g. A predictive maintenance algorithm will determine the optimal time for maintenance service based on the generator loading and operation.
- J. Monitoring Software: Provide monitoring software capable of communicating to no less than 15 generator sets. Software shall be connectable via RS232 connection directly on the generator control panel. Software functionality to include:
 - 1. Display generator set operating parameters including necessary pressures and temperatures, electrical output, fuel level.
 - 2. Ability to program custom I/O alarms as well as modify standard alarm settings for applications (password protected).
 - 3. Data logging and trending of up to 15 parameters, user selectable, for testing, troubleshooting, and record keeping.
 - 4. High speed data logging and trending of up to 0.2 millisecond providing sine wave visibility for testing and identification of harmonic distortion levels.

2.6 GENERATOR OVERCURRENT AND FAULT PROTECTION

- A. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.
 - 1. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel and each located in a separate box per NEC700 separation of circuits.
- B. Generator Disconnect Breaker: Molded-case type, Thermal Mag, 100 percent rated.

- C. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:
 1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms. Contacts shall be available for load shed functions.
 2. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
 3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
 4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

2.7 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

- A. Comply with NEMA MG 1 and UL2200, sized for 130 deg C temperature rise above ambient at rated load.
- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Electrical Insulation: Class H.
- D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required. Provide six lead alternator.
- E. Winding Coils: Skewed to improve sine wave shape and eliminate ripple effects caused by air gaps.
- F. Range: Provide broad range of output voltage by adjusting the excitation level.
- G. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rated speed, and heat during operation at 110 percent of rated capacity.
- H. Enclosure: Drip proof.
- I. Instrument Transformers: Mounted within generator enclosure.
- J. Voltage Regulator: Solid-state type on a sealed circuit board, separate from exciter, providing performance as specified and as required by NFPA 110. Must be 3-phase sensing.
 1. Voltage Adjustment on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.
 2. Provide anti-hunt provision to stabilize voltage.
- K. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- L. Excitation: Permanent magnet (PMG) type providing 300 percent current output for up to 10 seconds to a downstream breaker selective coordination and improved motor

starting.

2.8 OUTDOOR GENERATOR-SET ENCLOSURE

- A. Description: OEM Factory manufactured, vandal-resistant, sound-level 2, weatherproof steel housing, wind resistant up to 100 mph (160 km/h). Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panel shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.
1. Structural Design and Anchorage: Comply with ASCE 7 for wind loads up to 100 mph (160 km/h).
 2. Fire Protection: Provide smoke detector in enclosure; mounted according to NFPA 72.
 3. Hinged Doors:
 - a. Door Panels: With integral stiffeners, and capable of being removed by one person without tools.
 - b. Slip-pin hinges and latches stainless steel with nylon spacers.
 - c. Gasketed for weather and rodent protection.
 - d. Handles to have padlocking provisions.
 4. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine-generator-set components.
 5. Muffler Location: Within enclosure. All exhaust piping shall be wrapped for personnel protection and to eliminate excessive heat buildup during generator operation.
 6. Assembly Hardware (Nuts and Bolts): Use JS500 and nylon washers to prevent paint deterioration.
- B. Sound Attenuation: Factory enclosure, designed to meet the following design criteria:
1. Weather protective enclosure limiting sound emissions to 75dBA.
- C. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.
1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.

2.9 VIBRATION ISOLATION DEVICES

- A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.
1. Material: Standard neoprene separated by steel shims.
 2. Minimum Deflection: 1 inch (25 mm).

2.10 FINISHES

- A. Outdoor Enclosures and Components: Electrostatically applied Rhino Coat finish over corrosion-resistant pretreatment and compatible primer.
- B. Powder-coated paint surfaces, meeting the following applicable standards:
1. Paint Thickness: More than 2.5 mil per ASTM D 1186.87.
 2. Material Hardness: ASTM D 3363-92a.
 3. Resistance to Cracking: ASTM D 522-B.

4. Paint Adhesion: ASTM D 3359-B.
5. Resistance to Salt Water Corrosion: ASTM B 117 or ASTM D 1654.
6. Resistance to Humidity: ASTM D 1735 or ASTM D 1654.
7. Impact Resistance: ASTM 2784.
8. UV Protection: SAE J1690.

2.11 SOURCE QUALITY CONTROL

- A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
 1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.
- B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 1. Notify Construction Manager no fewer than three working days in advance of proposed interruption of electrical service.
 2. Do not proceed with interruption of electrical service without Construction Manager's written permission.

3.3 INSTALLATION

- A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.
- B. Equipment Mounting:
 1. Install packaged engine generators on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in concrete section.
 2. Coordinate size and location of concrete bases for packaged engine generators. Concrete, reinforcement, and formwork requirements are specified with concrete.
- C. Install packaged engine-generator to provide access, without removing connections or accessories, for periodic maintenance.
- D. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but

not specified to be factory mounted.

3.4 CONNECTIONS

- A. Connect engine exhaust pipe to engine with flexible connector.
- B. Connect fuel piping to engines with a gate valve and union and flexible connector.
- C. Ground equipment according to Section 260526 - Grounding and Bonding for Electrical Systems.
- D. Connect wiring according to Section 260519 - Low-Voltage Electrical Power Conductors and Cables. Provide a minimum of one 90 degree bend in flexible conduit routed to the generator set from a stationary element.
- E. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.5 IDENTIFICATION

- A. Identify system components according to Section 260553 - Identification for Electrical Systems.
- B. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: At the owner's request, the contractor shall engage a qualified, third-party, testing agency to witness tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections.
 - a. The supplier of the electric generating plant and associated items covered herein shall provide factory trained technicians to checkout the completed installation and to perform an initial startup inspection to include:
 - b. Ensuring the engine starts (both hot and cold) within the specified time.
 - c. Verification of engine parameters within specification.
 - d. Verify no load frequency and voltage, adjusting if required. Test all automatic shutdowns of the engine-generator.
 - e. Perform a load test of the electric plant, ensuring full load frequency and voltage are within specification by using a portable load bank. System will be tested for 1 hour at 50% load, 1 hour at 75% load and 2 hours at 100% load. System data will be recorded at 15 second intervals. Test results will be submitted to owner and a permanent copy shall be placed in project file.
- D. Tests and Inspections:
 - 1. Perform tests recommended by manufacturer.

- a. Visual and Mechanical Inspection
 - 1) Compare equipment nameplate data with drawings and specifications.
 - 2) Inspect physical and mechanical condition.
 - 3) Inspect anchorage, alignment, and grounding.
 - 4) Verify the unit is clean.
 - b. Electrical and Mechanical Tests
 - 1) Verify phase rotation, phasing, and synchronized operation as required by the application.
 - 2) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
 - 3) Conduct performance test in accordance with NFPA 110.
 - 4) Verify correct functioning of the governor and regulator.
2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.
 3. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float- charging conditions.
 4. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
 5. Voltage and Frequency Transient Stability Tests: Use data capture from manufacturer control panel and software to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
- E. Coordinate tests with tests for transfer switches and run them concurrently.
 - F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.
 - G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - H. Remove and replace malfunctioning units and retest, as specified above.
 - I. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
 - J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.7 TRAINING

- A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. Training date shall be coordinated with the facility owner at the time of commissioning of system.

END OF SECTION

SECTION 264020

UNDERGROUND ELECTRICAL SERVICE

PART 1 GENERAL

1.1 CONTRACTOR RESPONSIBILITY

- A. The Contractor shall be responsible for the coordination of electrical service with the Owner for service revisions.
- B. The Contractor to maintain existing service installation to existing buildings as long as practical to minimize duration of outage.
- C. The Contractor shall verify existing components and conductors within the campus primary electrical distribution system PRIOR to ordering any equipment or shop drawings and report any discrepancies to Engineer immediately.

1.2 SUBMITTALS

- A. Underground 15 KV conductors.
- B. Load break elbows.
- C. Pad-mount transformer.
- D. Insulation test reports to be submitted within 3 days of installation.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Conduit
 - 1. Primary conduit below ground to be Schedule 40 PVC (polyvinyl chloride) conduit conforming to Federal Specification W-C 1094 and encased in concrete as indicated.
 - 2. Conduit for secondary conductor shall be same as 1.1 above except concrete encasement is not required.
 - 3. Conduit for primary and secondary conductors above grade shall be galvanized rigid steel conforming to Federal Specification WW-C-581.
 - 4. Concrete for conduit encasement and transformer pad shall be in accord with Division 3 - CONCRETE, of these specifications.
- B. The 15 kV underground conductors to be installed under this contract shall be by Kerite, or approved equal and meet the following specifications.
 - 1. The cable shall be Permashield, EPR, 15 kV distribution cable, stranded copper conductor, #1/0 URD, with Class B stranding, extruded strand shield, ethylene propylene type insulation (133% level), with full-sized, concentric neutrals.
 - 2. The cable shall meet ICEA #S-68-516, AEIC #CS6, and IEEE #383 Standards.

3. Cable shall be UL-listed as Type MV-90 and have a chlorinated polyethylene jacket.
 4. The neutral shall be full sized and concentric about each phase conductor.
 5. Field verify compatibility with existing equipment before releasing for shipment.
- C. Loadbreak Connectors: Loadbreak modules and elbows will be manufactured by Cooper Power Systems or approved equal. These devices are to be used in manholes, transformers, switches, and sectionalizer boxes.
1. 200A Elbows: Elbows for the 1/0 conductors will be 200A, 15 kV – CPS #26045998 – or approved equal. Field verify compatibility with existing equipment prior to releasing for shipment.
 2. Protective Caps: All unused, exposed bushings shall have protective caps also.
- D. Low Voltage (600V) conductors: All conductors shall be copper. Aluminum is not acceptable.
- E. Pad-Mount Transformers
1. Transformer shall be pad-mounted, size and location as noted on the drawings. Primary voltage to be 12,470 with secondary voltage of 277/480V, 3 ϕ , 4-wire Y, 5 percent impedance.
 2. Transformer shall be oil filled rated 125 KV BIL with four 2-1/2 percent taps, 2 above and 2 below rated voltage, external tap changing.
 3. Tamperproof deadfront construction. The transformers and associated terminal compartments shall be so designed and constructed as to be completely tamperproof. There shall be no exposed screws, bolts or other removable fastening devices. No openings shall be provided through which foreign objects such as sticks, rods, or wires might be inserted to contact live parts. Any possible access of birds or animals shall be positively prevented. Low-voltage door to have handle with pad-locking feature so that handle is inoperative when lock is engaged.
 4. Full height, air-filled incoming and outgoing terminal compartments with hinged doors shall be located side by side separated by a steel barrier with the incoming compartment on the left. The incoming compartment will be accessible only after the door to the outgoing compartment has been opened. To facilitate making connections and permit cable pulling, the doors and compartment hood shall be removable. Removable door sill on compartments shall be provided to permit rolling or skidding of unit into place over conduit stubs in foundation.
 5. The incoming line compartment shall enclose provisions for deadfront high voltage elbow connections and provide for incoming or outgoing cable from below. The compartment shall have hinged door with a fastening device which is accessible only through the low voltage compartment and to make possible the use of single padlock. Equipment enclosed in the incoming compartment will include:
 - a. Incoming line connections for load break elbows.
 - b. Load break switch and bayonet fuses (200 amp), fuses sized to protect

transformer.

- c. Loop feed switches (200 amp).
 - d. Outgoing line connections for loadbreak elbows.
 - e. Parking stands for loadbreak elbows.
6. The outgoing line compartment shall be arranged for cabling from below. The compartment door will be hinged and be suitable for padlocking.
7. The transformer shall have integral loop-feed selector switch, with following positions.

<u>Position</u>	<u>Description</u>
1	Source A connected to transformer winding, source B open.
2	Source B connected to transformer winding, source A open.
3	Source A connected to B, transformer winding disconnected.
4	Source A and B connected to transformer winding.

8. Maintenance Devices - the following maintenance devices shall be located in the terminal compartments.
- a. Nameplate on inside of low voltage compartment door.
 - b. Operating handle for tap changer - low voltage compartment.
 - c. Filter press connection - low-voltage compartment.
 - d. Drain and sampling valves.
 - e. Ground pads - high and low voltage compartments.
9. The following devices shall be provided as a part of the transformer casing.
- a. Provision for jacking.
 - b. Lifting lugs.
10. Pad-mount transformers shall be as manufactured by General Electric, Square D, Eaton, ABB, or as approved.
11. Concrete bases shall meet requirements of transformer manufacturer.
- F. Ground Rods: Copper-clad, 3/4" x 10' long.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Conduit terminations, conduit seals, clamps, couplings, etc., shall be in accordance with industry recommended standards.
- B. Grounding
 - 1. The neutral conductors and non-current carrying parts of equipment at the

transformer shall be grounded in accordance with the applicable code. Ground conductor shall be soft-drawn copper, having a current capacity of at least 20% of that of the largest conductor to which it is connected. Ground conductor shall be connected to a copper or copper-clad steel ground rod not less than 3/4" in diameter. The total ground resistance shall not exceed 25 ohms. Where this condition cannot be obtained with one rod, additional rods shall be installed until the required ground resistance is obtained.

2. All connections shall be made with the molded fusion-welding process.
- C. Trenching, backfilling and paving replacement shall be in accord with the requirements of DIVISION 2 - SITE WORK of these specifications, with restrictions outlined herein.
 1. Bury conduit a minimum of 3'-0".
- D. Install marking tape over all conduit, 8" below ground surface.
 1. Plastic marking tape shall be installed above all underground electrical lines. Tape to be plastic tape, 6" wide, yellow color, "Terra Tape" as manufactured by the Griffalyn Co., Inc. Tape to read "CAUTION, BURIED ELECTRICAL LINE BELOW."
- E. Paving taken up or damaged in work of this Contractor shall be replaced to match existing. All work shall be in strict accord with regulations, ordinances and practices of governing authority.
- F. Installation work shall only be performed by qualified lineman/electricians who have worked on medium voltage (15 kV) systems.
- G. There shall be no conductor splices in raceways or conduits.
- H. There shall be no splices in 15 kV cables.
- I. Perform a meggar test on all insulated conductors installed under this contract. The test shall be performed from conductor to ground. The minimum value of acceptance for each conductor shall be 100 megohms. If a conductor fails to meet this requirements, all conductors in that raceway shall be removed and replaced with new and the meggar test shall be performed again to guarantee compliance with the above. A written report of the test data shall be furnished to the Engineer within five working days after the tests are complete.
- J. The Contractor shall comply with all applicable requirements of the National Electrical code and National Electrical Safety Code (latest revisions).
- K. 15kV conductors shall be color-tape coded to identify each phase. At each, transformer, and sectionalizer.
- L. At every sectionalizer box, modules and elbows shall be used for every 15 kV cable entering and leaving the box. No sectionalizer box is intended as only a pull point for cable, they are also considered an access point for power.

END OF SECTION

**SECTION 270500
COMMON WORK RESULTS FOR COMMUNICATIONS**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. OSU Construction Standards - Division 27 Communications.

1.02 SUMMARY

- A. This section includes general requirements for all Division 27 work and is supplemental and in addition to the requirements of Division 1.
- B. It is the intention of this Division of the Specifications and the Contract Drawings to describe and provide for the furnishing, installing, testing and placing in satisfactory and fully operational condition all equipment, materials, devices and necessary appurtenances to provide a complete communication system. Provide all materials, appliances and apparatus not specifically mentioned herein or shown on the drawings, but which are necessary to make a complete, fully operational installation of all communications systems shown on the contract drawings or described herein. Connect equipment and devices furnished and installed under other Divisions of this specification (or the Owner) under this Division.
- C. Workmanship shall be of the best quality and competent and experienced technicians shall be employed and shall be under the supervision of a competent and experienced foreman.
- D. The drawings and specifications are complementary and what is called for (or shown) in either is required to be provided as if called for in both. Where conflicting information occurs within the drawings and specifications or between the drawings and specifications, the more expensive alternative shall be used as a basis for bidding and construction.

1.03 WORK IN OTHER DIVISIONS

- A. See all other specifications for other work which includes but is not limited to:
 - 1. Lighting Control Wiring

1.04 CODES, PERMITS, INSPECTION FEES

- A. The following codes and standards are referenced in the Division 27 specifications. Perform all work and provide materials and equipment in accordance with the latest referenced codes and standards of the following organizations:
 - 1. American National Standards Institute (ANSI)
 - 2. National Electrical Manufacturer's Association (NEMA)
 - 3. National Fire Protection Association (NFPA)
 - 4. Underwriter's Laboratories (UL)
 - 5. American Society for Testing and Materials (ASTM)
 - 6. Bicsi (A Telecommunications Association)
 - 7. International Building Code (IBC)
 - 8. Insulated Cable Engineers Association (ICEA)
 - 9. Institute of Electrical and Electronic Engineers (IEEE)
 - 10. Federal Communications Commission Rules and Regulations (FCC)
 - 11. National Electrical Code (NFPA Article 70 2014) (NEC)
 - 12. National Electrical Safety Code (NESC)
 - 13. Occupational Safety and Health Administration (OSHA)
 - 14. Rural Utilities Service (RUS)
 - 15. Telecommunications Industry Association/Electronics Industries Alliance (TIA/EIA)
 - 16. Uniform Building Code (UBC)
- B. Install the communications systems based on the following:

NFPA 70	National Electrical Code as adopted and amended by the Local Jurisdiction.
IBC	International Building Code as adopted and amended by the Local Jurisdiction.

- C. Communications Specific:
1. TIA/EIA-455: Fiber Optic Test Standards
 2. TIA/EIA-526: Optical Fiber Systems Test Procedures
 3. TIA/EIA-568-C: Commercial Building Telecommunications Cabling Standard
 4. TIA-569-C: Commercial Building Standard for Telecommunications Pathways and Spaces
 5. TIA/EIA-606-B: Administration Standard for Commercial Telecommunications Infrastructure
 6. J-STD-607-B: Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
 7. TIA/EIA-758-A: Customer-owned Outside Plant Telecommunications Infrastructure Standard
 8. TIA-942: Telecommunications Infrastructure Standard for Data Centers
 9. TIA/EIA: Technical Service Bulletins (TSBs) (related to the above TIA/EIA standards)
 10. IEEE 241 – IEEE Recommended Practice for Electric Power Systems in Commercial Buildings, pertaining to communications systems.
 11. IEEE 802.11 Wireless Local Area Network Standard, including the IEEE 802.11a, 802.11b, 802.11g, 802.11n, and 802.11ac standards
 12. BICSI: BICSI Customer Owned Outside Plant Design Manual
 13. BICSI: BICSI LAN and Internetworking Design Manual
 14. BICSI: BICSI Telecommunications Distribution Methods Manual
 15. BICSI: BICSI Telecommunications Cabling Installation Manual
 16. NEC: NFPA 70 (2014)
 17. FCC Part 68: Connection of Terminal Equipment to Telephone Network.
- D. The referenced codes establish a minimum level of requirements. Where provision of the various codes conflict with each other, the more stringent provision shall govern. If any conflict occurs between referenced codes and this specification, the codes are to govern. Compliance with code requirements shall not be construed as relieving the Contractor from complying with any requirements of the drawings or specifications which may be in excess of requirements of the governing codes and rules and not contrary to same.
- E. Obtain all licenses, permits and inspections required by laws, ordinances and rules governing work specified herein. Arrange for inspection of work by the inspectors and give the inspectors all necessary assistance in their work of inspection.

1.05 APPROVED CONTRACTOR

- A. The Telecommunications contractor shall be an approved Ortronics Certified Installer Plus (CIP), and a certified Corning Cabling systems NPI Installer. Solicitations from a single contractor not certified by Ortronics and Corning Fiber Systems as (CIP/NPI) will not be accepted. A contractor with a valid CIP or NPI certification may not engage a subcontractor to meet the complimentary requirement.

1.06 COORDINATION

- A. Coordinate work with that of the other Contractors and/or other trades doing work on the project. Examine all drawings and specifications of other trades for construction details and coordination. Make every reasonable effort to provide timely notice of work affecting other trades to prevent conflicts or interference as to space requirements, dimensions, openings, block-outs, sleeving or other matters which will cause delays or necessitate work-around methods.
- B. Obtain submittals and shop drawings of all equipment with electrical connections furnished under other divisions of the specification and by the Owner. Provide all wiring in accordance

with specific equipment requirements. Immediately advise the Architect of any changes which may affect the contract price.

- C. Special attention is called to the following items. Coordinate all conflicts prior to installation:
1. Location of grilles, pipes, sprinkler heads, ducts and other mechanical equipment so that all communications outlets and equipment are clear from and in proper relation to these items.
 2. Location of cabinets, counters and doors so that communications outlets, and equipment are clear from and in proper relation to these items.
 3. Recessing and concealing communications materials in CMU walls, concrete construction and precast construction.
 4. In every telecommunication room with either active or passive equipment the Contractor shall monitor the work of all trades to assure that the space and clearance requirements of code are met.
 5. Review specifications for other Divisions of the work to determine where other Divisions are requiring communication connections. Verify provisions shown on contract drawings by examining shop drawing submittals of other Divisions prior to submission to the owner. Do not proceed with ordering of supporting equipment, until characteristics are verified. Proceed with rough only after verification of shop drawings.
- D. Furnish, install and place in satisfactory condition all raceways, boxes, conductors and connections and all other materials required for the electrical systems shown or noted in the contract documents to be complete, fully operational and fully tested upon completion of the project. Raceways, boxes and ground connections are shown diagrammatically only and indicate the general character and approximate location. The layout does not necessarily show the total number of raceways or boxes for the circuits required, nor are the locations of indicated runs intended to show the actual routing of the raceways. Where routings of major raceways and telecommunication pathways are indicated on plan sheets, the routing information supplements the information on diagrams. If no routing information is shown, route the systems in a manner that will coordinate with new and existing infrastructure and the work of other trades.
- E. Consult the architectural drawings for the exact height and location of all electrical equipment not specified herein or shown on the drawings. Make any minor changes (less than 6'-6" horizontal) in the location of the raceways, outlets, boxes, devices, wiring, etc., from those shown on the drawings without extra charge, where coordination requires or if so directed by the Architect before rough-in.
- F. Provide inserts or sleeves for outlet boxes, conductors, cables and/or raceways as required. Coordinate the installation thereof with other trades.
- G. The Contractor will not be paid for relocation of work, cuttings, patching and finishing required for work requiring reinstallation due to lack of coordination prior to installation.

1.07 WARRANTY

- A. Refer to General Conditions of the Contract.
- B. Ortronics/Superior Essex Compass Limited Life Time warranty for horizontal subsystem.
- C. Corning 25-year Warranty for fiber optic riser and outside plant backbone subsystems.
- D. Warranties shall be properly registered with the manufacturer in order to be considered compliant.

1.08 CORRECTION OF WORK

- A. Within one year after the date of Substantial Completion of the work, the Contractor shall correct any work found to be not in conformance with the Contract Documents promptly after written notice from the owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. This obligation shall survive acceptance of the work

under this Contract and termination of the Contract. The Owner shall give such notice promptly after discovery of the condition.

1.09 SUBMITTALS AND SHOP DRAWINGS

- A. Schedule so as not to delay construction schedule and no later than 60 days after award of contract. Allow two weeks for review for each submittal and resubmittal.
- B. Provide submittals for each product proposed for the project. See General Conditions for format, quantity, etc.
- C. Submit common brochure(s) with index and divider tabs (Hard Copy) or electronically in .PDF format - by specification section, containing all required catalog cuts. Incomplete submittals and shop drawings which do not comply with these requirements will be returned for correction, revision and resubmittal.
- D. Work shall not proceed without Carroll College Information Services approval of submitted items.
- E. The Engineer's review is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Corrections or comments made during this review do not relieve contractor from compliance with the requirements of the drawings and specifications. Contractor is responsible for: Dimensions which shall be confirmed and correlated at the job site; fabrication process and techniques of construction; coordination of his work with that of all other trades; performing his work in a safe and satisfactory manner.
- F. Submittals and shop drawings are required per the submittals schedule at the end of this Section.

1.10 PROJECT CLOSE-OUT

- A. Request For Final Punchlist
 - 1. To request a final electrical punch list, notify Architect and Owner in writing.
 - 2. Project Punchlist Procedure: Perform the following procedures for project closeout of communications portions of work.
 - a. Perform testing, tests and documentation per Section 260126 – Acceptance
 - b. Testing of Electrical Systems.
 - c. Obtain final electrical permit inspection. Include copies in O & M manual.
 - d. Provide written warranty in O & M per the General Conditions and Division 1 of the Contract.
 - e. Furnish As-Built Drawings per this section.
 - f. Furnish O & M Manuals per this section.
 - g. Give instruction periods to owner's personnel.

1.11 COMMUNICATIONS EQUIPMENT OPERATION AND MAINTENANCE (O&M) MANUALS

- A. Provide O&M manuals. Deliver final bound copies 20 days prior to scheduled instruction periods.
- B. The information included must be the exact equipment installed. Where sheets show the equipment installed and other equipment, the installed equipment shall be neatly and clearly identified on such sheets.
- C. These O&M manuals shall contain all the information needed to operate and maintain all systems and equipment provided in the project. Present and arrange information in a logical manner for efficient use by the Owner's operating personnel. The information provided shall include but not be limited to the following:
 - 1. Equipment manufacturer, make, model number, size, nameplate data, etc.
 - 2. Manufacturers recommended operation instructions.
 - 3. Complete parts list including reordering information, recommended spares and anticipated useful life (if appropriate). Parts lists shall give full ordering information

assigned by the original parts manufacturer. Relabeled and/or renumbered parts information as reassigned by equipment supplier not acceptable.

4. Shop drawings.
 5. Wiring diagrams.
- D. Furnish complete wiring diagrams for each system for the specific system installed under the contract. "Typical" line diagrams will not be acceptable unless revised to indicate the exact field installation.
- E. Group the information contained in the manuals in an orderly arrangement by specification index. Provide a typewritten index and divider sheets between categories with identifying tabs. Bind the completed manuals with hard board covers not exceeding 3" thick. Include on the covers with the name of the job, Owner, Architect, Electrical Engineer, Contractor and year of completion. Include on the back edge with the name of the job, Owner and year of completion. Hard board covers and literature contained may be held together with screw post binding.

1.12 INSTRUCTION PERIODS

- A. After substantial completion of the work and 20 days after the O&M manuals have been delivered to the Owner and after all tests and final inspection of the work by the Authority(s) Having Jurisdiction; demonstrate the electrical systems and instruct the Owner's designated operating and maintenance personnel in the operation and maintenance of the various electrical systems. The Contractor shall arrange scheduled instruction periods with the Owner. The Contractor's representatives shall be superintendents or supervisors knowledgeable in each system and suppliers representatives when so specified.
- B. Include in each instruction session an overview of the system, presentation of information in maintenance manuals with appropriate references to drawings.
- C. Include the following scheduled instruction periods:
- | | |
|--------------------------|------------------------------------|
| 1. Communication Systems | 1 st Session
4 hours |
|--------------------------|------------------------------------|

1.13 AS-BUILT DRAWINGS

- A. Continually record the actual electrical system(s) installation on a set of prints kept readily available at the project during construction. These prints shall be used for this purpose alone.
1. Mark record prints with red erasable pencil. Mark the set to show the actual installation where the installation varies substantially from the work as originally shown.
 - a. Include communication pathway indicating exact placement and routing for all components such as maintenance holes, handholes, conduit, wireway, cable tray, pull boxes, enclosures and telecommunications outlets.
 - b. Include communication wiring and cabling and indicate exact placement, routing and connection details for all components such as twisted-pair and fiber optic cables, splices, cable cross-connect termination locations, enclosures, telecommunications outlets, cross-connect jumpers and patch cords.
 2. Accurately locate with exact dimensions all underground and underslab raceways and stub-outs.
 3. Note changes of directions and locations, by dimensions and elevations, as utilities are actually installed.
 4. Include addenda items and revisions made during construction.
 5. Erase conditions not constructed or "X-out" and annotate "not constructed" to clearly convey the actual "as constructed" condition.
 6. Organize record drawings sheets in manageable sets, bind and print suitable titles, dates and other identification on the cover of each set.
- B. Transmit the As-Built drawing set to the Architect at the completion of the work. Final payment to the contractor will not be authorized until files and prints have been submitted to and accepted by the Architect.

PART 2 PRODUCTS

2.01 GENERAL

- A. All materials and equipment installed shall have been tested and listed by Underwriters Laboratories or other approved testing organization and shall be so labeled unless otherwise permitted by the Authority Having Jurisdiction (Inspector).
- B. All materials to be new, free from defects and not less than quality herein specified. Materials shall be designated to insure satisfactory operation and operational life in the environmental conditions which will prevail where they are being installed.
- C. Each type of materials furnished shall be of the same make, be standard products of manufacturers regularly engaged in production of such materials and be the manufacturer's latest standard design.
- D. All materials, equipment and systems furnished that include provisions for storing, displaying, reporting, interfacing, inputting, or functioning using date specific information shall perform properly in all respects regardless of the century. Any interface to other new or existing materials, equipment or systems shall function properly and shall be century compliant, both in regards to information sent and received.

2.02 SUBSTITUTION OF MATERIALS

- A. Acceptance of products other than those specified will be issued by addendum to the bid documents only after the following requirements are met and the proposed listed material is determined to meet or exceed the requirements:
 - 1. Requests for listing to be original material, clearly indicating the product fully complies with contract documents and be neatly marked with yellow felt tip marker to clearly define and describe the product for which listing is requested.
 - 2. Samples shall be submitted if requested.
 - 3. Requests containing insufficient information to confirm compliance with contract documents will not be considered.

PART 3 EXECUTION

3.01 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft. Handle all equipment carefully to prevent damage, breakage, denting, and scoring of finishes. Do not install damaged equipment.
- B. Store products subject to damage by the elements above ground, undercover in a weather tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instruction.

3.02 CUTTING BUILDING CONSTRUCTION

- A. Obtain permission from the Architect and coordinate with other trades prior to coring or cutting. Locate coring or cuttings so they will not weaken structural components. Core and cut carefully and only the minimum amount necessary.
- B. All construction materials damaged or cut into during the installation of this work must be repaired or replaced with materials of like kind and quality as original materials by skilled labor experienced in that particular building trade.

3.03 FIRESTOPPING

- A. Apply firestopping to communications penetrations of fire rated floor and wall assemblies to maintain fire-resistance rating of the assembly.

3.04 PAINTING

- A. Items furnished under this Division that are scratched or marred in shipment or installation shall be refinished with touchup paint selected to match installed equipment finish.

3.05 EQUIPMENT CONNECTION

- A. For equipment furnished under this or other Divisions of the specifications, or by owner, provide complete all electrical connections necessary to serve such equipment and provide required control connections to all equipment so that the equipment is fully operational upon completion of the project. Provide disconnect switch as required by code whenever an equipment connection is shown on the drawings.
- B. Investigate existing equipment to be relocated and provide new connections as required.
- C. Obtain rough-in requirements for equipment furnished under other divisions of this specification prior to roughing-in. Review shop drawings and submittals of other Divisions to determine requirements.

3.06 CLEAN UP

- A. Contractor shall continually remove debris, cuttings, crates, cartons, etc., created by his work. Such clean up shall be done daily and at sufficient frequency to eliminate hazard to the public, others, the building or the Owner's employees. Before acceptance of the installation, Contractor shall carefully clean cabinets, panels, lighting fixtures, wiring devices, cover plates, etc., to remove dirt, cuttings, paint, plaster, mortar, concrete, etc. Blemishes to finished surfaces of apparatus shall be removed and new finish equal to the original applied.
 - 1. Wipe surfaces of electrical equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

3.07 TESTING AND DEMONSTRATION

- A. Demonstrate that all electrical equipment operates as specified and in accordance with manufacturer's instructions. Perform tests in the presence of the Architect, Owner or Engineer. Provide all instruments, manufacturer's operating instructions and personnel required to conduct the tests. Repair or replace any electrical equipment that fails to operate as specified and or in accordance with manufacturer's requirements.

END OF SECTION

**SECTION 270543
UNDERGROUND COMMUNICATIONS PATHWAYS**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. OSU Construction Standards - Division 27 Communications.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Conduit
 - 2. Handholes and pull boxes.
- B. Related Sections
 - 1. Section 270500 - Common Works For Communication Systems
 - 2. Section 271300 - Communications Backbone Cabling
 - 3. Section 270543 – Underground Communications Pathways

1.03 DEFINITIONS

- A. ANSI: American National Standards Institute
- B. ASTM: American Society for Testing and Materials
- C. EPC: Electrical Polyvinyl Chloride
- D. IEC: International Electrotechnical Commission
- E. IP: Ingress Protection
- F. ISO: International Organization for Standardization
- G. MPD: Multiple Plastic Duct
- H. NEMA: National Electrical Manufacturers Association
- I. NFPA: National Fire Protection Association
- J. PE: Polyethylene
- K. PVC: Polyvinyl Chloride
- L. RNC: Rigid nonmetallic conduit.
- M. SCTE: Society of Cable Telecommunications Engineers

1.04 SUBMITTALS AND SHOP DRAWINGS

- A. Product Data: For the following:
 - 1. Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
 - 2. Warning tape.
- B. Shop Drawings for Factory-Fabricated Handholes and Pull Boxes
 - 1. Cover design.
 - 2. Grounding details.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

- B. Comply with ANSI C2.
- C. Comply with NFPA 70 (2014).

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

1.07 APPROVED CONTRACTOR

- A. The Telecommunications contractor shall be an approved Ortronics Certified Installer Plus (CIP), and a certified Corning Cabling systems NPI Installer. Solicitations from a single contractor not certified by Ortronics and Corning Fiber Systems as (CIP/NPI) will not be accepted. A contractor with a valid CIP or NPI certification may not engage a subcontractor to meet the complimentary requirement.

1.08 COORDINATION

- A. Coordinate layout and installation of handholes, and pull boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.
- B. Coordinate elevations of handholes, and pull boxes with final locations and profiles as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions.
- C. Refer to Section 270500 - Common Works For Communication Systems.

1.09 SUBSTITUTIONS

- A. Refer to Section 270500 - Common Works For Communication Systems.

PART 2 PRODUCTS

2.01 CONDUIT/DUCT

- A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.
- B. Conform to NEMA standard TC-6 for encased buried and direct buried conduit:
 - 1. EB-20
 - 2. DB-60
- C. Conform to NEMA standard TC-2 for:
 - 1. Schedule 40 - Ridged Nonmetallic conduit
 - 2. Schedule 80 - Ridged Nonmetallic conduit
- D. Conform to NEMA standard TC-3 and UL 514B for:
 - 1. EPC 40 PVC
 - 2. EPC 80 PVC

2.02 APPROVED CONDUIT/DUCT IMPLEMENTATION

- A. Approved conduit types for direct buried or encasement in concrete are:
 - 1. Schedule 40 - Ridged Nonmetallic conduit
 - 2. Schedule 80 - Ridged Nonmetallic conduit
 - 3. Rigid Metallic Conduit
 - 4. Intermediate Metallic Conduit
- B. Approved pathway types for direct buried or installation in conduit are:
 - 1. Multiple Plastic Duct
 - 2. Fiberglass Duct
 - 3. Polyethylene Innerduct

4. Polyvinyl Chloride Innerduct
- C. Conduit Type To Be Used
 1. Install the following types of circular communications raceway in the locations listed unless otherwise indicated on the Drawings.
 - a. Interior Dry Locations, Exposed: EMT with set screw fittings.
 - b. Interior Dry Locations, Concealed (Not Embedded in Concrete): EMT with set screw fittings.
 - c. Interior Wet Locations: EMT with compression fittings.
 - d. Exterior, Exposed Including Roof: Rigid steel conduit.
 - e. PVC Schedule 40 conduit.
 - f. Rigid steel conduit when additional protection is required.

2.03 RIGID METAL CONDUIT AND FITTINGS

- A. Conduit:
 1. Type RGS: Rigid galvanized steel.
 2. Type CRS: PVC externally coated conduit; rigid steel conduit with external PVC coating and internal galvanized surface.
- B. Fittings and Conduit Bodies: In-line straight-through, threaded, galvanized steel fittings and Type C conduit bodies only; do not use bends or tees, e.g., Lbs.
- C. Bonding and Grounding Locknuts and Wedges: Malleable iron with set screws and lug screws.
- D. Insulated Bushing: Malleable iron with integral insulated throat, rated for 150 degrees C.
- E. Bonding and Grounding Bushing: Malleable iron with integral insulated throat, rated for 150 degrees C, with solder-less lugs or lug screws.
- F. Sealing Fittings: Threaded type conduit seal fittings and sealing compound suitable for hazardous location installations in accordance with NEC:
 1. Crouse-Hinds retrofit sealing fitting EYSR.
 2. Crouse-Hind CHICO A sealing compound.

2.04 ELECTRICAL METALLIC TUBING AND FITTINGS

- A. Type EMT: Electro-galvanized steel tubing.
- B. Fittings and Conduit Bodies:
 1. General: in-line straight-through steel or malleable iron fittings and Type C conduit bodies only; do not use bends or tees, e.g. LBs.
 2. Wet Areas: steel compression-type couplings and nipples.
 3. Dry Areas: set screw-type couplings and nipples.
- C. Bonding Locknuts: Malleable iron with set screws and lug screws.
- D. Insulated Bushing: Malleable iron with integral insulated throat, rated for 150 degrees C.
- E. Bonding and Grounding Bushing: Malleable iron with integral insulated throat, rated for 150 degrees C, with solderless lugs or lug screws.

2.05 RACEWAY COATING

- A. Acceptable Manufacturers:
 1. Koppers Bitumastic.
 2. Scotchwrap.
- B. Bitumastic material or plastic tape.

2.06 NONMETALLIC DUCTS AND DUCT ACCESSORIES

- A. Underground Plastic Utilities Duct: NEMA TC 6 & 8, Type EB-20-PVC, ASTM F 512, UL 651A, with matching fittings by the same manufacturer as the duct, complying with NEMA TC 9.
- B. Underground Plastic Utilities Duct: NEMA TC 6 & 8, Type DB-60-PVC and Type DB-120-PVC, ASTM F 512, with matching fittings by the same manufacturer as the duct, complying with NEMA TC 9.
- C. Duct Accessories:
 - 1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum duct spacing, indicated while supporting ducts during concreting or backfilling.
 - a. Nonmetallic base and intermediate duct spacers with locking keyways designed specifically for use with nonmetallic conduit; e.g., Carlon SNAP-LOC duct spacers for 4-inch (100 mm) diameter conduit with 1-1/2-inch (38 mm) separation.
 - 1) Base Spacer: S288NHN.
 - 2) Intermediate Spacer: S289NHN.
 - 2. Expansion/Deflection Fittings: Similar to Crouse-Hinds XD expansion/deflection coupling or Appleton DF Series deflection and expansion coupling.
 - 3. Duct Plugs:
 - a. Aboveground Conduit Openings: Tapered PVC plugs with tab for pull tape; e.g., Carlon 4-inch (100 mm) PVC plugs with pull tab, P258NT.
 - b. Underground or Under slab Conduit Openings: Removable screw tight compression type duct plugs with wing-nut and corrosion resistant hardware; e.g., Pacific Plastics No. 5900514, George-Ingraham 0605, or Vikimatic P4000WT.
 - 4. Duct Water Seal: Products suitable for closing underground and entrance duct openings, where innerduct or cable is installed, to prevent entry of gases, liquids, or rodents into the structure; e.g., SEMCO PR 851.
 - 5. Warning Tape: Underground-line warning tape specified in Division 26 Section "Identification for Electrical Systems."
 - 6. Concrete Warning Planks: Nominal 12 by 24 by 3 inches (300 by 600 by 76 mm) in size, manufactured from 6000-psi (41-MPa) concrete.
 - a. Color: Red dye added to concrete during batching.
 - b. Mark each plank with "COMMUNICATIONS" in 2-inch- (50-mm-) high, 3/8-inch- (10-mm-) deep letters.

2.07 INNERDUCT

- A. Outdoor Innerduct: 1-inch (25 mm) and 1-1/4-inch (32 mm) inside diameter corrugated, ribbed, or smooth walled, semi rigid PVC or heavy-wall polyethylene tubing.
- B. Plenum-Listed Indoor Innerduct: 1-inch (25 mm) and 1-1/4-inch (32 mm) inside diameter corrugated walled innerduct for use in plenum air handling spaces.

2.08 INNERDUCT FITTINGS

- A. Couplings: Metallic or nonmetallic quick-connect, reverse threaded, and Schedule 40 couplings for connecting sections of installed innerduct.
- B. Conduit Plugs: Compression-type conduit plugs with locking nuts for sealing and securing the outside walls of one or more innerduct ends to the inside wall of 4-inch (100 mm) inside diameter conduits, e.g.:
 - 1. Four 1-inch (25 mm) innerduct configuration.
 - 2. Three 1-1/4-inch (32 mm) innerduct configuration.
- C. Innerduct Plugs: 1-inch (25 mm) and 1-1/4-inch (32 mm) compression-type innerduct plugs for sealing innerducts, with wing nut for hand tightening and eyebolt for securing pull tape.

- D. Innerduct Caps: Removable push-in caps for plugging 1-inch (25 mm) and 1-1/4-inch (32 mm) innerduct.

PART 3 EXECUTION

3.01 PATHWAYS

- A. All pathways, conduit, and sleeves shall have no less than 50% available for future fill capacity upon completion of project.

3.02 CORROSION PROTECTION

- A. Aluminum shall not be installed in contact with earth or concrete.

3.03 EARTHWORK

- A. Excavation and Backfill: Comply with Division 31 Section "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary top soiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.
- D. Cut and patch existing pavement in the path of underground ducts and utility structures.

3.04 DUCT INSTALLATION

- A. Slope: Pitch ducts a minimum slope of 1/8" per foot down toward vaults and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two junction boxes to drain in both directions.
- B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches (1220 mm) 12.5 feet (4 m) and 25 feet (7.5 m), both horizontally and vertically, at other locations, unless otherwise indicated.
- C. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.
- D. Duct Entrances to Handholes: Use end bells, spaced approximately 10 inches (250 mm) O.C. for 5-inch (125-mm) ducts, and vary proportionately for other duct sizes.
 - 1. Begin change from regular spacing to end-bell spacing 10 feet (3 m) from the end bell without reducing duct line slope and without forming a trap in the line.
- E. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet (3 m) outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition.
- F. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.
- G. Pull tape: Measuring and pulling tape constructed of synthetic fiber with plastic jacket, printed with accurate sequential footage marks; e.g., George-Ingraham 1/2-inch (13 mm) tape 9216-JK.
 - 1. Following conduit installation, install pull tape (mule tape) with preprinted foot markers in each empty conduit containing a bend or over 10 feet (3000 mm) in length, except

- sleeves, nipples, and runs with openings in clean room areas. Tie the pull tapes securely to duct plug or wall racking at each end.
2. Immediately after pull tape installation, for conduit openings on conduits underground, install screw tight, removable, watertight, and dust-tight duct plugs in conduit ends.
 3. Verify lengths at the time of installation and provide as-built documentation.

3.05 CONDUIT BENDS AND SWEEPS

- A. Make changes in direction of communications conduit runs with sweeps of the longest possible radius.
- B. Make sweeps in parallel or banked runs of conduits, 2 inches (50 mm) and larger in diameter, from the same center or centerline so that sweeps are parallel and of neat appearance.
- C. Field-Made Bends and Sweeps:
 1. Use an acceptable hickey or conduit-bending machine.
 2. Do not heat metal raceways to facilitate bending.
 3. Before installing 4-inch (100 mm) field-made sweeps in duct banks, pull a 3-1/2-inch (89 mm) diameter by 12-inch (300 mm) long mandrel through duct sections to verify circularity and sweep radius.
- D. The angular sum of the bends between pull points and/or pull boxes to not exceed 180 degrees.
- E. Minimum Inside Bend Radius for Communications Conduit Bends, Sweeps, Boxes, and Fittings:
 1. Underground or Under slab 4-inch (100 mm) Conduit: 60 inches. (1.5 m)
 2. Other Conduit Runs:
 - a. One-inch (25 mm) conduit, 11 inches (275 mm).
 - b. Two-inch (50 mm) conduit, 21 inches (525 mm).
 - c. Three-inch (75 mm) conduit, 31 inches (775 mm).
 - d. Four-inch (100 mm) conduit, 40 inches (1000 mm).
 - e. Other sizes, 10 times the inside diameter of the conduit.
- F. Do not install boxes, bends, elbows, tees, conduit bodies, and other conduit fittings, which do not provide for the minimum inside cable bend radius specified in paragraph E above.
 1. Conduit Bodies: in-line straight-through Type C conduit fittings can be used as pull boxes for conduit up to a maximum of 2 inches (50 mm) ID. Other conduit fittings, which include direction changes such as E, L, LB, LR, LL, LRT, TA, TB, and X, are not allowed.
 2. Refer any design or installation conflicts with these requirements to the Owner.

3.06 PENETRATIONS

- A. Seal conduit entering structures at the first box or outlet to prevent the entrance of gases, liquids, or rodents into the structure.
 1. Empty Conduits: Removable screw tight duct plugs.
 2. Innerduct Installed: Suitable duct water seal between conduit and innerduct. Manufactured seals in empty innerduct.
 3. Cable Installed: Suitable duct water seal between conduit and cable, or between innerduct and cable.
- B. Concrete Sleeves: Conduits routed perpendicular through floors, walls, or other concrete structures to pass through cast-in-place conduit sleeve openings wherever possible, or appropriate size holes to be bored to accommodate the installation of conduit sleeves. The size and location of the holes to not impair the structure's integrity.
 1. Concrete Boring: Bore a hole in the concrete with a diameter of 1/2 to 1 inch (13 to 25 mm) larger than the conduit sleeve to be installed. Grout around the conduit sleeve and finish to match existing surroundings.

2. Conduits that rise vertically through a slab to be stubbed 6-inches (150 mm) above the floor and capped pending future use.
- C. Drywall Sleeves: Install insulating throat bushings on both ends of conduit sleeves placed in fire-rated walls using drywall construction.
- D. Where conduit enters a structure through a concrete roof or membrane waterproofed wall or floor:
 1. Provide a watertight seal.
 2. With Concrete Encasement: Install watertight entrance seal device on the accessible side.
 3. Securely anchor malleable iron body of watertight entrance seal device into construction with one or more integral flanges.
 4. Secure membrane waterproofing to watertight entrance seal device in a permanent, watertight manner.

3.07 ABOVE-GROUND CONDUIT INSTALLATION

- A. Support conduit installed in aboveground interior and exterior locations at a maximum of 7 feet (2.1 m) on center.
- B. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps.
- C. Securely attach aboveground conduit under the provisions of this Section.
- D. Conceal conduit in finished areas, leave exposed in unfinished areas and where not possible to conceal. In finished areas, the Owner will make the final decision on conduit concealment.
- E. Run exposed and concealed conduits parallel or perpendicular to walls, structural members, or intersections of vertical planes to maintain headroom and provide a neat appearance. Follow surface contours as much as possible.
- F. No section of conduit located within buildings to exceed 100 feet (30 m) in length between pull points and/or pull boxes. Pull points in conduits 2" and larger shall not be conduit bodies, but rather boxes or wireway.
- G. Expansion/Deflection Joints:
 1. Where indicated on the Drawings, provide specific purpose expansion/deflection fittings for conduit crossing building expansion/deflection joints in structures or concrete slabs. Expansion fittings to have copper bonding jumper.
 2. For PVC conduit, provide expansion/deflection joints for 25 degrees F maximum temperature variation. Install in accordance with manufacturer's instructions.
 3. For rigid steel conduit located in exterior areas, provide expansion/deflection joints for maximum site temperature variation, installed in accordance with manufacturer's instructions.
- H. Provide each conduit passing from a nonhazardous or noncorrosive area to a hazardous area and each conduit entering an enclosure within a hazardous area with a sealing fitting in accordance with NEC Article 500. The sealing fitting to be UL listed and to be filled with approved sealing compound of the same manufacture.
- I. Hubs, Bushings, and Insulating Sleeves:
 1. Wet and Hazardous Box and Cabinet Connections: Use watertight threaded conduit sealing hubs with insulated throat and bonding type locknuts for fastening rigid steel conduit to cast or sheet metal pull boxes.
 2. Exposed Conduit Terminations: Cap exposed steel communication conduit ends with bushings or smooth collars to protect cable sheath.

3.08 INNERDUCT TO BE USED

- A. Under-slab and Underground Conduit Installation: Outdoor or Plenum-listed innerduct.
- B. Aboveground, Exterior, and Interior Conduit Installations: Plenum-listed innerduct.
- C. Non-Plenum Areas: Plenum-listed innerduct.
- D. Plenum Areas: Plenum-listed innerduct.

3.09 INNERDUCT INSTALLATION

- A. Pull innerduct through conduit and wireways, or place innerduct in cable trays using continuous un-spliced lengths of innerduct between pull boxes, and/or section termination points as indicated on the Drawings.
- B. Cut innerduct square. Debur cut ends.
- C. Bring innerduct to the shoulder of fittings and couplings and fasten securely.
- D. Wipe innerduct and fittings clean and dry before joining. Apply full, even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum.
- E. Provide suitable innerduct slack in pull boxes, and at turns to ensure that there is no kinking or binding of the tubing.
- F. Make changes in direction of communications innerduct runs with sweeps of the longest possible radius and at least 10 times the inside diameter of the innerduct.
- G. During innerduct pulling, care to be taken to avoid excessive tension, which can cause deformation of the innerduct. Inspect innerduct following placement and replace any damaged sections.
- H. Following installation, visually inspect innerduct, remove any burrs at openings, and, if necessary, clean innerduct interior.

3.10 PULL TAPE INSTALLATION

- A. All conduit runs longer than 10ft shall have pull tape with pre-printed footage markers installed.
- B. Following conduit or innerduct installation, install pull tape (mule tape) with preprinted foot markers in all sections longer than 10ft, except runs with openings serving clean room areas. Tie the pull tape securely to wall racking at each location.
- C. Verify lengths at the time of installation and provide as-built documentation.

3.11 INSTALLATION OF HANDHOLES AND PULL BOXES

- A. Install handholes and pull boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use pull box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.7-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas and traffic ways, set so cover surface will be flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
- D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated.

Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

- E. Field-cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
- F. For enclosures installed in asphalt paving and subject to occasional, non deliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.
 - 1. Concrete: 3000 psi (20 kPa), 28-day strength, complying with Division 03 Section "Cast-in-Place Concrete," with a troweled finish.
 - 2. Dimensions: 10 inches wide by 12 inches deep (250 mm wide by 300 mm deep).

3.12 GROUNDING

- A. Ground underground ducts and utility structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."

3.13 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
 - 1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
 - 2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
 - 3. Test vault and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."
- B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.14 IDENTIFICATION

- A. Label each conduit and other raceway at each end with the purpose (e.g. destination (e.g. "Telecom Room TR-1112").
- B. Label each pull box with purpose and destination (e.g. "TR-1112 to BTR-1118").
- C. Provide labeling which is clear and permanent, such as black permanent-ink marker.

3.15 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of vaults, including sump. Remove foreign material.

END OF SECTION

**SECTION 271300
COMMUNICATIONS BACKBONE CABLING**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. OSU Construction Standards - Division 27 Communications.

1.02 SUMMARY

- A. Section Includes:
 - 1. Twisted pair copper cable
 - 2. Multi-mode optical fiber cable
 - 3. Single-mode optical fiber cable
 - 4. Cable connecting hardware, patch panels and cross-connects.
 - 5. Cabling identification products.
- B. Related Sections:
 - 1. Section 270500 - Common Works For Communication Systems
 - 2. Section 271500 - Communications Horizontal Cabling
 - 3. Section 270543 – Underground Communications Pathways

1.03 DESCRIPTION

- A. Backbone cabling system shall provide interconnections between communications equipment and equipment cabinets, rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.
- B. Backbone cabling cross-connects may be located in communications equipment rooms, cabinets or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.04 DEFINITIONS

BICSI: Building Industry Consulting Service International.

BDF: Building Distribution Frame

Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

EMI: Electromagnetic interference.

ICEA: Insulated Cable Engineers Association

IDC: Insulation displacement connector.

IDF: Intermediate Distribution Frame

LAN: Local area network.

MDF: Main Distribution Frame

NRTL: Nationally Recognized Testing Laboratory

OFNR: Optical Fiber Nonconductive Riser

RCDD: Registered Communications Distribution Designer.

UTP: Unshielded twisted pair.

1.05 PERFORMANCE REQUIREMENTS

- A. General Performance: Backbone cabling system shall comply with transmission standards in TIA/EIA-568-C, when tested according to test procedures of this standard.

1.06 SUBMITTALS AND SHOP DRAWINGS

- A. Product Data: For the following:
 - 1. Nominal OD.
 - 2. Minimum bending radius.
 - 3. Maximum pulling tension.
- B. Shop Drawings:
 - 1. Cabling administration drawings and printouts.
 - 2. Wiring diagrams to show typical wiring schematics including the following:
 - a. Cross-connects.
 - b. Patch panels.
 - c. Pathways and spaces.

1.07 APPROVED CONTRACTOR

- A. The Telecommunications contractor shall be an approved Ortronics Certified Installer Plus (CIP), and a certified Corning Cabling systems NPI Installer. Solicitations from a single contractor not certified by Ortronics and Corning Fiber Systems as (CIP/NPI) will not be accepted. A contractor with a valid CIP or NPI certification may not engage a subcontractor to meet the complimentary requirement.

1.08 COORDINATION

- A. Refer to Section 270500 - Common Works For Communication Systems.

1.09 SUBSTITUTIONS

- A. Refer to Section 270500 - Common Works For Communication Systems.

PART 2 PRODUCTS

2.01 PATHWAYS

- A. General Requirements: Comply with TIA/EIA-569-B.
- B. Cable Support: NRTL labeled for support of communications cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
- C. Support brackets with cable tie slots for fastening cable ties to brackets.
- D. Lacing bars, spools, J-hooks, and D-rings.
- E. Straps and other devices.
- F. Cable pathways are not to exceed 40% fill capacity. To allow for future growth

2.02 TWISTED PAIR CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Superior Essex Inc.
 - 2. General
- B. Description: Category 3, Pic-Filled, Black jacketed cable with overall sheath. 100-ohm, multiple pair UTP, formed into 25-pair binder groups covered with ASP sheath with 24 AWG solid copper.
- C. Model #: PE-89.

- D. Comply with ICEA S-90-661 for mechanical properties.
- E. Comply with TIA/EIA-568-C for performance specifications.
- F. Comply with TIA/EIA-568-C, CAT-3.
- G. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
 - 1. Communications, Riser Rated: Type CMR, complying with UL 1666.

2.03 TERMINATION BLOCKS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 - 1. Ortronics
- B. Description:
 - 1. Cat 3, 110-Style Blocks.
 - a. Model #: Ortronics OR-30200007
 - 2. Wiring Troughs
 - a. Vertical backbone managers wall mount 300 pair.
 - b. Ortronics OR-806003194
 - 3. 110 block labels
 - a. Clear plastic holder for 110 blocks with paper inserts, for blocks with legs
 - b. Ortronics P/N OR-70400646
 - c. Refer to Ortronics catalog for more complete 110 termination block kits.
- C. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-C, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- D. Connecting Blocks: 110-style IDC for CAT-3 at the service provider entrance. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- E. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
- F. Number of Terminals per Field: One for each conductor in assigned cables.

2.04 OPTICAL FIBER CABLE

- A. Manufacturers:
 - 1. Corning – FREEDM One Tight-Buffered
- B. Subject to compliance with requirements, provide products by one of the following:
 - 1. Corning outdoor rated Multimode fiber Corning plenum armor coated cable
 - 2. Corning outdoor rated Singlemode fiber armor coated cable
 - 3. Corning MTP-MTP method A Multimode fiber outdoor rated cable
 - 4. Corning MTP-MTP method A Singlemode fiber outdoor rated cable
- C. Description: OM4 Multimode, 50/125-micron, strand count per Plans, fiber, nonconductive, tight buffer, optical fiber cable.
- D. Comply with ICEA S-87-640 for outside plant applications.
- E. Comply with ICEA S-83-596 for mechanical properties.
- F. Comply with TIA/EIA-568-C for performance specifications.
- G. Comply with TIA/EIA-492AAAA-B for detailed specifications.
- H. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with

- UL 444, UL 1651, and NFPA 70 for the following types:
 1. Plenum Rated, Nonconductive: Type MTP-MTP method A
 2. Outdoor Rated, Nonconductive
 3. Maximum Attenuation: 3.0 dB/km at 850 nm; 1.3 dB/km at 1300 nm.
 4. Minimum Modal Bandwidth: 2,000 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
- I. Description: Singlemode fiber, strand count per Plans, nonconductive, tight buffer, optical fiber cable.
- J. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
 1. Plenum Rated, Nonconductive: Type MTP-MTP method A
 2. Outdoor Rated, Nonconductive
- K. Individual fiber strands shall be color coded per telecommunications industry practice.
- L. Fiber strands shall have the following characteristics:
 1. Fiber Type - Singlemode, glass core, glass cladding.
 2. Core Diameter 8.0 to 9.0
 3. Core/Clad Concentricity 0.8
 4. Cladding Noncircularity 1%
 5. Maximum attenuation at 1350 nanometers (nominal) 0.5 dB/km.
- M. Jacket:
 1. Jacket Color: Aqua for 50/125-micrometer cable, yellow for Singlemode cable.
 2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-C. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

2.05 OPTICAL FIBER CABLE HARDWARE

- A. Manufacturers:
 1. Corning
- B. Subject to compliance with requirements, provide products by one of the following:
 1. Corning for Multimode fiber
 2. Corning for Singlemode fiber
- C. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
 1. Corning Fiber Optic Patch Panel Assembly
 - a. CCH-01U
 - b. CCH-04U
 - c. Corning Universal Play LC Module, shuttered Duplex LC to MTP
- D. Innerduct:
 1. No innerduct required with armor cable.
 2. Plenum innerduct with MTP cable.
- E. Cable Connecting Hardware:
 1. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA-568-C.
 - a. CCH-01U
 - b. CCH-04U
 - c. Corning Universal Play LC Module, shuttered Duplex LC to MTP

2.06 OPTICAL FIBER CABLE LABELING

- A. Cable jacket shall have a permanently attached label that identifies:
 1. Cable Number

2. Strand Count
 3. Destination
- B. Cable will be labeled at every termination, splice point, entrances and exits to splice enclosures, vaults, hand hole, building, building floor and patch panel.
- C. Labeling Examples:
1. Example: SM16, 1-36 Tunnel Entrance D
 2. Example: SM04, 1-6 Plageman Hall

2.07 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.08 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test cables on reels according to TIA/EIA-568-C.
- C. Factory test UTP cables according to TIA/EIA-568-C.
- D. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-C.
- E. Cable will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

PART 3 EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 270500 - Common Works For Communication Systems.

3.02 WIRING METHODS

- A. Backbone cables shall be installed separately from horizontal distribution cables.
- B. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.
- C. Where cables are housed in conduits, the backbone and horizontal cables shall be installed in separate conduits.
- D. Where backbone cables and distribution cables are installed in a cable tray or wireway, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.
- E. Large bundles of cables and/or heavy cables shall be attached using metal clamps and/or metal banding to support the cables.
- F. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.
- G. Install plenum cable in environmental air spaces, including all ceilings.
- H. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."
- I. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.03 INSTALLATION OF PATHWAYS

- A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-B.

- B. Drawings indicate general arrangement of pathways and fittings.
- C. Comply with TIA/EIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.
- D. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- E. Pathway Installation in Communications Equipment Rooms:
 - 1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
 - 2. Install cable trays to route cables if conduits cannot be located in these positions.
 - 3. Secure conduits to backboard when entering room from overhead.
 - 4. Extend conduits 3 inches (76 mm) above finished floor.
 - 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

3.04 INSTALLATION OF CABLES

- A. Comply with NECA 1.
 - 1. General Requirements for Cabling:
 - 2. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA 568-C (C.1, C.2, C.3) document, manufacturer's recommendations and best industry practices.
 - 3. Pair untwist at the termination shall not exceed 12 mm (one-half inch).
 - 4. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.
 - 5. Cables shall be neatly bundled and dressed to their respective panels or blocks. Each panel /block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
 - 6. The cable jacket shall be maintained to within 25 mm (one inch) of the termination point.
 - 7. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.
 - 8. Comply with BICSI ITSIM, "Cable Termination Practices."
 - 9. Install 110-style IDC termination hardware unless otherwise indicated.
 - 10. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 11. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 12. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 - 13. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
 - 14. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
- B. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
- C. In the communications equipment room and at the workstation outlet, install a 10-foot (3-m) long service loop on each end of cable. At the workstation end, the service loop shall be at the last cable support before entering the conduit to the wall box.
- D. Pulling Cable: Comply with BICSI ITSIM, "Pulling Cable." Monitor cable pull tensions.

- E. UTP Cable Installation:
 - 1. Comply with TIA/EIA-568-C.
 - 2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
- F. Voice terminations MDF to service provider wall: The CAT-3 backbone cable will be terminated on 110 style blocks mounted on the wall. The voice field will be 25 pair CAT-3 cables terminated on the wall next to the backbone voice field.
- G. Optical Fiber Cable Installation:
 - 1. Comply with TIA/EIA-568-C.
 - 2. Terminate cables on rack mounted patch panels.
 - 3. Each cable shall be individually attached to the respective splice enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.
 - 4. Each fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.
 - 5. Each cable shall be clearly labeled at the entrance to the splice enclosure. Cables labeled within the bundle shall not be acceptable.
- H. Open-Cable Installation:
 - 1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 - 2. Suspend UTP cable not in a wireway or pathway, a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 48 inches (1220 mm) apart.
 - 3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
 - 4. Group connecting hardware for cables into separate logical fields.
- I. Separation from EMI Sources:
 - 1. Comply with BICSI TDMM and TIA/EIA-569-B recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment as a minimum requirement in addition to the requirements below.
 - 2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
 - 3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
 - 4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
 - 5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
 - 6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.05 FIRESTOPPING

- A. Comply with TIA/EIA-569-B Annex A, "Firestopping."
- B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.06 GROUNDING

- A. All copper circuits shall be provided with protection between each building with an entrance cable protector panel. All building-to-building circuits shall be routed through this protector. The protector shall be connected with a #6 AWG green copper bonding conductor between the protector ground lug and the TC ground point. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems." for grounding conductors and connectors.
- B. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- C. Comply with ANSI-J-STD-607-B.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.07 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-B. Comply with requirements for identification specified in Section 260553 Identification for Electrical Systems.
- B. Administration Class: 4.
- C. For painting backboards: For fire-resistant plywood, do not paint over manufacturer's label
- D. See Section 271500 "Communications Horizontal Cabling" for additional identification requirements. See Evaluations for discussion about TIA/EIA standard as it applies to this Section.
- E. Paint and label colors for equipment identification shall comply with TIA/EIA-606-B for Class 4 level of administration including optional identification requirements of this standard.
- F. Comply with requirements in Section 271500 "Communications Horizontal Cabling" for cable and asset management software.
- G. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- H. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- I. Cable and Wire Identification:
 - 1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
 - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
 - 4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

- a. Individually number each wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
- 5. Label each unit and field within distribution racks and frames.
- J. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- K. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-B, for the following:
- L. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.08 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. See Section 271500 "Communications Horizontal Cabling" for additional testing requirements.
 - 2. Visually inspect UTP and optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-C.
 - 3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components
 - 4. Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, wire map and polarity between conductors. Test cables after termination and after cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-C. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - 5. Optical Fiber Cable Tests:
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-C. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - 6. Link End-to-End Attenuation Tests:
 - a. Multimode backbone link measurements: Test at 850 nm in one direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
 - b. Singlemode backbone link measurements: Test at 1310 nm in one direction according to TIA/EIA-526-7, Method A.1, One Reference Jumper.
 - 7. Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-C.
 - 8. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to the Table in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
 - 9. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
 - 10. End-to-end cabling will be considered defective if it does not pass tests and inspections.

11. Prepare test and inspection reports.

END OF SECTION

**SECTION 271500
COMMUNICATIONS HORIZONTAL CABLING**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. OSU Construction Standards - Division 27 Communications.

1.02 SUMMARY

- A. This section includes the following items for wiring systems used as signal pathways for voice and high-speed data transmission:
 - 1. General
 - 2. Approved Manufacturers
 - 3. Unshielded twisted-pair cabling
 - 4. UTP Termination hardware
 - 5. Fiber Optic Cable
 - 6. Outlets
 - 7. Wire Management Hardware
 - 8. Patch Panels
 - 9. Cable Tray, Support, Anchorage, And Attachment Components
 - 10. Identification Labels
- B. It is the intent of this section for the Contractor to provide a complete workable cabling system ready for the Owner's use in accordance with EIA/TIA 568-C standards to support high speed data applications up to and in excess of 1000Mbs including IEEE system standards based on Twisted Pair Distributed Data Interface (TPDDI), Ethernet, Fast Ethernet, Gigabit Ethernet and Asynchronous Transmission Mode (ATM).
- C. Related Sections
 - 1. Section 270500 - Common Works For Communication Systems
 - 2. Section 271300 - Communications Backbone Cabling
 - 3. Section 270543 - Underground Communications Pathways
- D. Related Work to be Provided by Owner or their Authorized Representative
 - 1. Installation of workstation devices: computers, terminals, telephones, and similar equipment.
 - 2. The installation of patch cords or cross connect wire to connect workstation devices to network equipment and backbones.

1.03 DESCRIPTION

- A. Horizontal cabling system shall provide connectivity to field devices.

1.04 REFERENCES

- A. American National Standards Institute (ANSI)
- B. Telecommunications Industry Association (TIA)/Electronic Industries Alliance (EIA)
 - 1. ANSI/TIA/EIA 568-C Commercial Building Telecommunications Cabling Standard
- C. Building Industry Consulting Services International (BICSI)
- D. Federal Communications Commission (FCC)
- E. Institute of Electrical and Electronics Engineers (IEEE)
- F. National Fire Protection Association (NFPA)
- G. Underwriter's Laboratories, Inc. (UL)

1.05 APPLICABLE CODES AND STANDARDS

- A. Provide the system in compliance with the following:
 - 1. NFPA 70 (2014) National Electrical Code as adopted and amended by the Local Jurisdiction
 - 2. IBC International Building Code as adopted and amended by the Local Jurisdiction
 - 3. Other Codes
 - a. Local fire code, building code, mechanical code, electrical code, rules and interpretations required by the Authority Having Jurisdiction.

1.06 DEFINITIONS

- A. As Directed: as directed by the Architect, Owner or Authorized Representative.
- B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- C. EMI: Electromagnetic interference.
- D. Cable: Telecommunication conductors and sheaths.
- E. Cabling, Cabling System: Cables between and including the telecommunications outlet/connector and the cross connect including all fittings, conductors, connector strips, connections, termination and all other items necessary and/ or required in connection of such work.
- F. Telecommunications Outlet: Connectivity point for telecommunications services, including but not limited to telephony, network, wireless access point and AV Systems.
- G. Concealed: embedded in masonry or other construction, installed behind wall furring or within wall partitions, or installed within hung ceilings.
- H. Exposed: not installed underground or "Concealed" as defined above.
- I. Furnish: Deliver to the jobsite.
- J. Install: To enter permanently into the project and make fully operational including testing.
- K. Permanent Link: the end-to-end cable media transmission path including the cable and termination equipment on each end.

1.07 SUBSTITUTION OF MATERIALS

- A. Refer to Section 270500 - Common Works For Communication Systems.

1.08 SUBMITTALS AND SHOP DRAWINGS

- A. Product Data: For the following:
 - 1. Product Data for all items provided under this Section.
 - a. Indicate materials, finishes, load ratings, dimensions, listings, approvals and attachment methods.
 - b. Indicate how the components of an item or system are assembled, interconnected, function together and how they will be installed on the project.
 - c. Highlight with yellow or blue marker, or indicate with arrow stamp, adequate information to demonstrate materials being submitted fully comply with contract documents.
 - d. Indicate listing by UL or other approved testing agency.
 - e. Manufacturers' Cable Installation Instructions
- B. Shop Drawings
 - 1. Provide detailed elevation views (minimum scale 1"=1'-0") of, equipment racks, termination blocks, patch panels, cable paths and workspace requirements for access to equipment and cable connections.
 - 2. Ratings of items.

3. Coordinate with other division shop drawings and submittals. Identify interface points and indicate method of connection.
4. Provide drawings to show evidence of coordination with other trades.
5. Provide plan drawings of the building showing:
 - a. Routing for all cables installed under this Work.
 - b. Pathways of all cable supports with part number, total capacity, and installed capacity for each support or run of supports.
6. Reports and Schedules
 - a. Provide Cable Termination Schedules for all cables installed under this work, with the following information:
 - b. Workstation cable -corridor number (ceiling mount), outlet ID, cable ID, rack number, termination device number and port/cable pair position.
7. Provide sample reports showing the proposed format for cable test reports.
8. Provide a construction schedule showing the various work tasks, time periods, duration and staffing requirements.

C. Manufacturers' Cable Installation Instructions

1.09 OPERATION AND MAINTENANCE MANUALS

- A. Provide two (2) copies of O&M manuals required for all equipment furnished under this Specification. Submit a preliminary copy, complete except for the bound cover, prior to 75% completion of the project for checking and review.
- B. The information included must be the exact equipment installed. Where sheets show the equipment installed and other equipment, the installed equipment shall be neatly and clearly identified on such sheets.
- C. These O&M manuals shall contain all the information needed to operate and maintain all systems and equipment provided in the project. Present and arrange information in a logical manner for efficient use by the Owner's operating personnel. The information provided shall include but not be limited to the following:
 1. Equipment manufacturer, make, model number, size, nameplate data, etc.
 2. Dimensional and performance data for specific unit provided as appropriate.
 3. Complete parts list including reordering information, recommended spares and anticipated useful life (if appropriate). Parts lists shall give full ordering information assigned by the original parts manufacturer. Relabeled and/or renumbered parts information as reassigned by equipment supplier not acceptable.
 4. Shop drawings.
 5. Wiring diagrams.
 6. A complete list of local (nearest) manufacturer representative and distributor contacts for each type of equipment and manufacturer. Include name, company, address, phone, fax, e-mail address, and web site.
 7. Provide revised Cable Termination Schedules of all cables installed under the Work. Schedules shall be in printed form and on CD disk and in the version of Microsoft Excel extant at the time of first submission.
 8. Cable Test Reports in CD form, including review software.
 9. Group the information contained in the manuals in an orderly arrangement by Specification paragraph. Provide a typewritten index and divider sheets between categories with identifying tabs. Bind the completed manuals with hard board covers not exceeding 3" (.75mm) thick. Requirements outlined in Section 01 77 00 must be followed. Requirements outlined in Section 01 77 00 must be followed.

1.10 AS-BUILT DRAWINGS:

- A. Continually record the actual cabling system installation on a set of prints kept readily available at the project during construction. These prints shall be used for this purpose alone.
- B. Mark record prints with red erasable pencil. Mark the set to show the actual installation where the installation varies substantially from the work as originally shown.

- C. Include addenda items and revisions made during construction.
- D. Erase conditions not constructed or "X-out" and annotate "not constructed" to clearly convey the actual "as constructed" condition.
- E. Organize as-built drawings sheets in manageable sets, bind and print suitable titles, dates and other identification on the cover of each set.
- F. Transmit the as-built drawing set to the Owner at the completion of the work. Final payment to the contractor will not be authorized until these prints have been submitted to and accepted by the Owner.

1.11 FINAL ACCEPTANCE REQUIREMENTS

- A. Certificate of Compliance:
 - 1. Provide for Owner's documentation, a completion statement in form stipulated by the Owner and signed by the Contractor, stating that the Work was completed in compliance with the Contract Documents and that the installation was proper for the conditions of application and use.

1.12 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling installer shall have Commercial Experience with staff personnel certified by BICSI.
 - 1. Installation Supervision: Installation shall be under the direct supervision of a Level 2 Installer and shall be present at all times when Work of this section is performed at the Project site.
 - 2. Have a demonstrated experience installing commercial projects of similar size and scope.
- B. Source Limitations:
 - 1. Obtain all products except cables through one source from a single manufacturer.
 - 2. All Permanent Link components (including cables) of the workstation cable system shall be the products of one manufacturer.
- C. Electrical Components, Devices and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the authority having jurisdiction, and marked for intended use.

1.13 APPROVED CONTRACTOR

- A. The Telecommunications contractor shall be an approved Ortronics Certified Installer Plus (CIP), and a certified Corning Cabling systems NPI Installer. Solicitations from a single contractor not certified by Ortronics and Corning Fiber Systems as (CIP/NPI) will not be accepted. A contractor with a valid CIP or NPI certification may not engage a subcontractor to meet the complimentary requirement.

1.14 COORDINATION

- A. Refer to Section 270500 - Common Works For Communication Systems.

1.15 CERTIFICATION & WARRANTY

- A. Refer to General Conditions and Division 1 of the Contract.
- B. Documentation of cable manufacturer's warranty must be provided to the Architect, Owner or Authorized Representative at completion of the project.
 - 1. All UTP installations are warranted and are required to be pre-register with Ortronics before work begins.
 - 2. All fiber installations are warranted and required to be pre-registered with Corning (Singlemode).
- C. All work and all items of equipment and materials shall be warranted for a minimum period of one year, from the date of Substantial Completion of the work. Where a manufacturer's warranty is longer than one year, the Contractor shall offer the extended warranty. The

Contractor shall, upon notification of any defective items, repair or replace such items within 24 hours without cost to the Owner, all to the satisfaction of the Owner/Engineer.

- D. Furnish a manufacturer's "Permanent Link" performance warranty of all EIA/TIA 568-C CAT-6 cables for a minimum period of twenty-five years, from the date of acceptance of the work. Where a manufacturer's warranty is longer than twenty-five years, the Contractor shall offer the longer warranty.
1. Ortronics Clarity 25 year applications assurance warranty
 2. The Warranty shall be awarded directly to the Owner by the Manufacturer.
 3. The Permanent Link Performance Warranty shall be issued and signed by the component manufacturer and shall list the owner as the holder of the warranty.
 4. The Permanent Link Performance Warranty shall cover the testing and replacement of the labor and material for all "Permanent Link" components.
 5. The structured cable system shall be a complete certified system as offered by a single manufacturer. The system and all components shall be performance matched, approved for use with a single manufacturer and guaranteed by the manufacturer. The cable must be approved for use with the manufacturer's system.

1.16 SUBSTITUTIONS

- A. Refer to Section 270500 - Common Works For Communication Systems.

PART 2 PRODUCTS

2.01 GENERAL

- A. Subject to compliance with requirements, provide products by one of the manufacturers specified herein. Provide telecommunications cable and termination equipment with performance levels and capacities as noted herein.
- B. Part numbers provided in this Specification have been coordinated with the manufacturers' latest available product literature. Part numbers are subject to change without notice by the manufacturers. Where a specific part number is invalid, provide product meeting component description.
- C. Where specific items are called out in the specification or indicated on the drawings for a specific application, use those products or materials, or approved substitutes. Where no specific call outs are made use premium products and materials.
- D. All components used in plenum space must be plenum rated or approved for use in plenum space.
- E. Black Velcro tie wraps are to be used for all cable bundling and support. Plastic or Nylon tie wraps are not approved.
- F. All cabling is plenum rated per OSU wiring standards

2.02 APPROVED MANUFACTURERS

- A. UTP Cables (Permanent Link) - Approved Manufacturers
1. Ortronics/Superior Essex Inc.
- B. Permanent Link Components - Approved Manufacturers
1. Ortronics/Superior Essex Inc.
- C. Cable Management Devices - Approved Manufacturers
1. CPI
 2. Ortronics Mighty MO
 3. Ortronics Mighty MO 6
 4. Dell
- D. Wire Management Hardware - Approved Manufacturers
1. Cooper B-line Flex Tray
 2. Erico

3. Chatsworth (CPI)

2.03 UNSHIELDED TWISTED-PAIR CABLES

- A. CAT-6- 4-Pair Cable Unshielded Twisted Pair (Permanent Link Component)
 - 1. Voice - Superior Essex grade Cat 3, colored Grey, Plenum
 - 2. Data - Superior Essex DataGAIN Cat 6, colored Green, Plenum
 - 3. Physical specifications: 4 twisted pair 24 AWG, solid copper conductors, 100-Ohm nominal impedance +/- 15%. Comply with UL 444.
 - 4. Electrical characteristics: Superior to the individual characteristics established in EIA/TIA 568-C for CAT-6 cable performance.
 - 5. Cable construction: round cable, individually insulated conductors under a common sheath.

2.04 UTP TERMINATION HARDWARE (PERMANENT LINK COPONENT)

- A. 8-Pin modular Angled Front Patch Panel (Permanent Link Component)
 - 1. 19-inch rack mounted patch panel, suitable to terminate 24 or 48 UTP 4-pair cables. Comply with EIA/TIA-568-C CAT 6 performance. Wired with T568-B pinning. Complete with wire management bars and designation strips
 - 2. Manufacturer: Ortronics Clarity.
 - a. 48 Ports Angled: Ortronics P/N OR-PHA66U48 (For use as specified when utilizing Ortronics Mighty MO 6 equipment rack and vertical wire managers only).

2.05 FIBER OPTIC CABLE

- A. Corning OM4, colored Violet Plenum, Duplex LC.

2.06 OUTLETS (PERMANENT LINK COMPONENT)

- A. Ortronics voice - OR-6373003, 8 POS, Fog White T568B
- B. Ortronics data - OR TJ600-25, 8 POS, Green T568B
- C. Jacks: 100-ohm, balanced, twisted pair connector, four-pair, modular, RJ-45. Comply with TIA/EIA- 658-C CAT-6 performance. Outlet wired with standards compliant T568-B.
- D. 8-Pin Modular Outlets: Dual jack-connector assemblies mounted in single or multigang faceplate.
 - 1. Faceplate: type 302 stainless steel
 - 2. Mounting: Flush, unless otherwise indicated
 - 3. Faceplate Color: White
 - 4. Manufacturer: Ortronics TracJack 6 Port faceplate
 - a. Work Area Outlet: Six port TracJack faceplate, constructed from high impact thermo-plastic, with recessed label fields, mounts within a single gang wall box.
 - b. Ortronics OR-40300545, fog white.
 - c. Wall Phone: One port TracJack faceplate with mounting lugs for wall phone, constructed from stainless steel, mounts within a single gang wall box, RJ45.
 - d. Ortronics OR-403STJ1WP.
- E. Wall Mounted Telephone Outlet: 8 conductor outlet and face-plate, mounted over a standard electrical j-box.
 - 1. Stainless steel face-plate with two mounting studs to support wall mounted telephone.
 - 2. Manufacturer: Specified or equivalent approved manufacturer.

2.07 WIRE MANAGEMENT HARDWARE

- A. Shall be installed whenever a patch panel is installed
- B. Single Space-Rack Mounted
 - 1. 19-inch rack mount
 - 2. Installed above and below each 24 port patch panel
 - 3. Manufacturer: Ortronics

4. Part #: OR-808004759
- C. Double spaced-Rack Mounted
 1. 19-inch rack mount
 2. Installed above and below each 48 port patch panel
 3. Manufacturer: Ortronics
 4. Part #: OR-808004818

2.08 PATCH PANELS

- A. Category 6 modular patch panels
 1. 48 port, 8P8C modular jack panel, high density, 6 port modules, Category 6, IDC terminals, T568A/B wiring scheme.
 2. Part #: Ortronics Angled OR-PHA66U48

2.09 CABLE TRAY, SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cooper B-Line, Inc.; Flex Tray
 - b. ERICO International Corporation.
 - c. GS Metals Corp.
 - d. Thomas & Betts Corporation.
 - e. Unistrut; Tyco International, Ltd.
 - f. Wesanco, Inc.
 2. Finishes:
 - a. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-3. Fitting and accessories - hot-dip galvanized or stainless steel where hot-dip galvanized is not available.
 3. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be heavy-duty malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

2.10 IDENTIFICATION LABELS

- A. Comply with TIA/EIA-606-B and applicable requirements in this section.
- B. Machine printed self-adhesive, smudge resistant labels for cables and face-plates. Labels shall be appropriately sized for cable diameter. Labels shall be appropriately colored for face-plate color contrast. Submit sample labels for approval.

PART 3 EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 270500 - Common Works For Communication Systems.

3.02 GENERAL

- A. Follow manufacturers' instructions for installing components and adjusting all equipment and telecommunications cables. Where no instructions are included with the equipment, follow accepted industry practices and workmanlike installation standards.
- B. Keep all items protected before and after installation, with dust and water proof barrier materials as necessary. The Contractor shall be responsible to ensure the integrity of the protective measures throughout the life of the project.
- C. The Contractor shall protect all telecommunications equipment from damage, at all times during the construction. Do not install equipment in the telecommunications areas until the other trades have completed their work in the areas so that the equipment will not be moved or damaged.
- D. Ensure that safe ingress and egress, from all work areas, are maintained during movement and installation of materials.
- E. Clean up and remove all debris generated by installation activities. Keep the telecommunications areas free of debris at all times.
- F. Deliver to Owner two sets of all special tools specifically needed for proper operation, adjustment and maintenance of cable and cable termination hardware installed under this Contract.
- G. Pair untwist at each termination shall not exceed 1/2 inch (12mm).

3.03 INSTALLATION STANDARDS

- A. Comply with BICSI TCI, TIA/EIA-568-C, and TIA/EIA-569-A.

3.04 EXAMINATION

- A. Verification of Conditions: Examine the areas to receive the work and the conditions under which the Work would be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Examine pathway elements intended for cables.
 - 1. Verify proposed routes of pathways. Check raceways, cable trays, and other elements for compliance with space allocations, clearances, installation tolerances, hazards to cable installation, and other conditions affecting installation. Verify that cabling can be installed complying with EMI clearance requirements.
 - 2. Prepare wall penetrations and verify that penetrations of rated fire walls are made using products labeled for type of wall penetrated.
 - 3. Identify plan to support cables and raceways in suspended ceilings. Verify weight of individual types and sizes of cables. Verify that load capacity of cable support structures is adequate for each pathway.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.05 METHODS AND PROCEDURES

- A. General
 - 1. Install all components in accordance with this Specification, the approved Cable Termination Schedule, the manufacturer's recommendations, and the Telecommunications Distribution Drawings.
- B. Work area outlets
 - 1. The cable jacket shall be maintained to within 25mm (one inch) of the termination point.
 - 2. Data jacks, unless otherwise noted in drawings, shall be located in the right side position(s) of each faceplate.
 - 3. Voice jacks shall occupy the left position(s) on the faceplate.
- C. Cable Installation - Copper

1. Cable shall be installed in accordance with manufacturer's recommendations and best industry practices.
2. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit. Cable raceways shall not be filled greater than the TIA/EIA-569-B maximum fill for the particular raceway type or 40% (Initial Installations).
3. Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.
4. Where transition points or consolidation points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.
5. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of 48-inch (1.2 meter) intervals. At no point shall cable(s) rest on light fixtures, acoustic ceiling grids, panels, conduits, sprinkler pipe, water pipe, and/or HVAC system ducting.
6. Horizontal distribution cables shall be bundles in groups of no more than 50 cables when being supported by J-Hook or trapeze systems. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance. An exception to this rule is when cable is installed in cable tray systems.
7. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
8. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, the contractor shall install appropriate carriers to support the cabling.
9. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.
10. Cables shall be identified by a self-adhesive machine label in accordance with the System
11. Documentation Section of this specification and ANSI/TIA/EIA-606. The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.
12. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.
13. Pulling tension on 4-pair UTP cables shall not exceed 25-lbf for a four-pair UTP cable.
14. Ensure that all telecommunications cable supports (J-hooks, cable tray, conduits, etc.) are fully installed before proceeding with cable installation. At no times shall cables be installed and left unsupported. At no times shall cables be tie-wrapped to any other supporting structure in lieu of specified cable supports. Do not bundle or tie-wrap the cables even within the approved cable supports. Do not allow the cable to sag more than 12-inches.
15. Protect all cables at all times during installation, especially on floor(s), including dedicated telecommunication spaces. Provide rigid protection for cables left on floor at any time during construction. Design protection to prevent pressure on cables from walking, equipment placement, or rolled/dragged construction equipment and materials.
16. Maintain manufacturer's recommended minimum bend radius of the cables. Do not stretch, stress, tightly coil, bend or crimp the workstation cables during the installation or when leaving them out of the way of other trades during the staging of the work. The Contractor, at the Contractors expense shall replace all abused or stressed cables.
17. After dressing the cable to its final location, remove only enough jacketing to allow the conductors to be splayed and terminated in a neat and uniform fashion. Every effort will be made to maintain jacketing integrity by removing only as much jacketing as is practical, to accomplish termination. For twisted pair cables, maintain the manufacturers twisting of the wire pairs through to the point of termination.
18. Terminate all cables neatly, with enough slack to pull off, test and re-terminate each cable as needed.

19. Separation from Power Lines
 - a. Provide the following minimum separation distances between pathways for copper communications cables and power wiring of 480 volts or less:
 - 1) Open or Nonmetal Communications Pathways:
 - a) 12 inches from electric motors, fluorescent light fixtures, and unshielded power lines carrying up to 3 kVA.
 - b) 36 inches from electrical equipment and unshielded power lines carrying more than 5 kVA.
 - c) 48 inches from large electrical motors or transformers.
 - b. Grounded Metal Conduit Communications Pathways:
 - 1) 2 1/2 inches from electrical equipment and unshielded power lines carrying up to 2 kVA.
 - 2) 6 inches from electrical equipment and unshielded power lines carrying from 2 kVA to 5 kVA.
 - 3) 12 inches from electrical equipment and unshielded power lines carrying more than 5 kVA.
 - 4) 3 inches from power lines enclosed in a grounded metal conduit (or equivalent shielding) carrying from 2 kVA to 5 kVA.
 - 5) 6 inches from power lines enclosed in a grounded metal conduit (or equivalent shielding) carrying more than 5 kVA.

D. Cable Installation - Fiber

1. Place fiber optic cable so as to maintain the minimum cable bend radius limits specified by the manufacturer or ten times the cable diameter, whichever is larger.
2. Use care when handling fiber optic cable. Carefully monitor pulling tension so as not to exceed the limits specified by the manufacturer.
3. There shall be no splicing of Horizontal fiber optic cable.

3.06 CONNECTORS

- A. Provide appropriate CAT-6 8-pin modular connectors for the termination of all 4-pair cables. Provide an accompanying faceplate and/or mounting plate at the appropriate outlet location. Install faceplates level and align to adjacent outlet faceplates.

3.07 ANGLED FRONT PATCH PANELS

- A. Provide 8-pin modular patch panels as shown in the Contract Documents for the termination of all workstation and Wireless access point cables installed under this Work. Mount the patch panels into the equipment racks. Provide patch panels complete with designation strips.
- B. Provide horizontal wire management panels in each equipment rack. Installed above and below each 24 and 48 port patch panel.

3.08 IDENTIFICATION

- A. OSP copper labels shall be engraved. OSP copper labels shall be white letters on black background.
- B. OSP Singlemode fiber optic labels shall be engraved, black letters on yellow background.
- C. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device. Specific labeling information shall be project specific and the information will be given to the contractor by OSU Network Services.
- D. All horizontal cables are to be labeled using a machine printed label at each end of the cable approximately 6 inches of the termination point. Handwritten labels shall not be used.
- E. All patch panel ports and TO ports shall be labeled with the cable, network, TR room #, and port identifier.
- F. All inside building cabling, termination, hardware, protection units, patch panels, and work area outlets shall comply with ANSI/TIA/EIA 606 labeling standard color codes.

- G. Labeling scheme information and format to be provided by OSU Network Services.
1. Note all labeling information on the as-built drawings.

3.09 TESTING AND ACCEPTANCE

A. GENERAL

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-C.1, C.2. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.
2. All cables shall be tested in accordance with this document, the ANSI-TIA/EIA standards, the Ortronics, Superior Essex and Corning Certification Program Information Manuals and best Industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the Owner's authorized representative for clarification and resolution.

B. Copper channel testing:

1. All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance. Horizontal cabling shall be tested using a level IIe or level III test unit for category 5e or category 6, performance compliance, respectively.
2. Continuity - Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals. Crossed pairs and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.
3. Length - Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI-TIA/EIA-568-C Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.
4. Category 6 and 6E:
 - a. Follow the Standard requirements established in ANSI/TIA/EIA-568-C.1, C.2:
 - b. A level III test unit is required to verify category 6 performance and must be updated to include the requirements of ANSI/TIA/EIA-568-C.1.
 - c. The primary field-test parameters leading to Pass/Fail criteria used to verify installed horizontal cabling are listed below. These parameters are defined in ANSI/EIA/TIA-568-C.1.
 - 1) Wire Map
 - 2) Length
 - 3) Insertion Loss
 - 4) Near-end cross talk (NEXT) loss
 - 5) Power sum near-end cross talk (PSNEXT) loss
 - 6) Equal-Level-far-end cross talk (ELFEXT)
 - 7) Power sum equal-level-far-end cross talk (PSELFEXT)
 - 8) Return Loss
 - 9) Propagation Delay
 - 10) Delay Skew
 - d. Approved test unit manufacturer is Fluke DTX. Other test units are unacceptable. The Fluke DTX shall have the latest Linkware software version installed at time of project testing.

3.10 FIBER TESTING

- A. For horizontal and riser cabling system using multimode optical fiber, attenuation shall be measured bi-directionally at both 850 nanometer (nm) and 1300 nm operating windows using an LED light source and power meter.
- B. For horizontal and riser cabling system using single mode optical fiber, attenuation shall be measured bi-directionally at both 1310 nanometer (nm) and 1550 nm operating windows, using an LASER light source and power meter.
- C. Campus Backbone multimode fiber cabling shall be tested with OTDR at both 850 nm and 1300 nm bi-directionally.
- D. Campus Backbone single mode fiber cabling shall be tested with OTDR at both 1310 nm and 1550 nm bi-directionally.
- E. Test set-up and performance shall be conducted in accordance with ANSI/TIA/EIA-526-14A, Method B Standard.
- F. Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. ONLY BASIC LINK TEST IS REQUIRED. The contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above. The values for calculating loss shall be those defined in the ANSI/TIA/EIA Standard.
- G. Attenuation testing shall be performed with a stable launch condition using two-meter jumpers to attach the test equipment to the cable plant. The light source shall be left in place after calibration and the power meter moved to the far end to take measurements.

3.11 TEST RESULTS

- A. Submit completed test results with close out documentation on CD-ROM. Hard copy printed results are also required to be submitted via 3 ring binder(s), tabbed by EF/MC/IC/TC/ER/TR Binder shall be labeled with Oregon State University Project name and project number. This applies to all Horizontal copper and all fiber optic test results.
- B. Horizontal Cat. 3, Cat. 6, and Cat 6E cabling shall be tested with Fluke DTX 1800 Level III tester. Test results produced by other testers WILL NOT be accepted. A summary report will accompany the individual graph format test results. Test results shall have the Technicians names, correct date and time. Test results without the correct information and not in colored graph format shall not be accepted.

3.12 FINAL ACCEPTANCE & SYSTEM CERTIFICATION

- A. Completion of the installation, in-progress inspections, receipt of the test and as-built documentation, and successful performance of the cabling system will constitute completion of the system. Upon successful completion of the installation and subsequent inspection, Oregon State University shall be provided with a numbered certificate, from Ortronics or Superior Essex and/or Corning if applicable, registering the installation.

END OF SECTION

SECTION 31 22 16
FIELD SUBGRADE ESTABLISHMENT

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, material and equipment for the earthwork related to establishment of a finished subgrade for the synthetic turf field area. Work includes but is not limited to the following:
 - 1. Layout and engineering;
 - 2. Management of the construction sequencing and scheduling relative to soil moisture content and the use of onsite material as fill;
 - 3. Excavation, filling, back filling and compacting;
 - 4. Subgrade scarification, drying, and re-compaction as required;
 - 5. Compaction, compaction testing, and establishment of subgrade;
 - 6. Verification of compliance with the specified planarity tolerances.

1.02 EXISTING SITE CONDITIONS

- A. Refer to drawings for topographical and existing condition information and the geotechnical report for site soil conditions.
- B. Carefully maintain benchmarks, monuments and other reference points. If disturbed or destroyed, replace as directed. It is the responsibility of the Contractor to familiarize themselves with all records of existing utilities in area of site work.
- C. The Contractor shall contact the appropriate utility agencies for identification of underground utility location.

1.03 TEMPORARY EROSION AND SILTATION CONTROL

- A. All work shall conform to the erosion and sedimentation control requirements of the local jurisdiction including installation of siltation control such as filter fabric fences, check dams, sedimentation basins, etc.

1.04 EXISTING UTILITIES

- A. The Contractor shall coordinate all existing utilities prior to proceeding with demolition and earthwork activity. Protect any active pipes encountered.

1.05 DUST CONTROL

- A. Protect persons and property from damage and discomfort caused by dust. Water as necessary to quell dust.

1.06 ROADWAY PROTECTION

- A. Provide wheel-cleaning stations to clean wheels and undercarriage of trucks before leaving site, as necessary to prevent dirt from being carried onto public streets. If streets are fouled, they must be cleaned immediately in conformance with the requirements of the local jurisdiction as applicable. This requirement applies to all vehicle movements for the entire period of construction.

1.07 TRAFFIC REGULATION

- A. Conduct operations in such a manner to avoid unnecessary interference to existing traffic. Minimize heavy vehicle traffic to and from site during peak traffic hours. Do not park vehicles in traffic lanes. Provide flagmen as required. Conform to traffic control requirements of the local jurisdiction.
- B. Contractor shall be responsible for all traffic control and emergency call outs resulting from Contractor operations.
- C. Maintain fire lanes, roadways and alleys to existing buildings continuously, as required by the fire department having jurisdiction.
- D. Existing walkways and roadways leading past the construction shall remain clear and safe at all times. Provide barriers, flashing lights, walkways, guardrails and night lighting as required for safety and control.

1.08 RELATED WORK IN OTHER SECTIONS

Refer to Earthwork for general site grading requirements.
33 46 16 Field Subsurface Drainage
33 46 23 Field Permeable Aggregate

PART 2 - PRODUCTS

Not Applicable

PART 3 – EXECUTION

3.01 FIELD LAYOUT AND ENGINEERING

- A. The General Contractor shall be responsible for the vertical and horizontal layout of all work and control points required to construct all work in accordance with the drawings and specifications.

3.02 SEQUENCING AND SCHEDULING

- A. All new cut and fill areas shall be seal rolled at the end of each day to minimize moisture penetration.

3.03 EXCAVATED MATERIALS

- A. Suitable excavated material may be utilized as fill. Any excess material is to be disposed of offsite.

3.04 FIELD SUBGRADE AREAS

- A. All areas are to be compacted to 95% of maximum density by mechanical means. The Contractor shall be responsible for maintaining appropriate soil moisture prior to and during compaction activities, the cost of which is to be included in the contract price.
- B. Care must be exercised during grading of the subgrade so as to achieve a uniform, true surface relative to finish grade.
- C. Fill must be select material to be free of organic matter, clay, concrete and other extraneous

material, compactable to a minimum of 95% density. Fill shall be placed and compacted in lifts of 12" maximum loose depth.

- D. Finish subgrade for the synthetic turf field areas shall be compacted to a 95% maximum density. Subgrade shall be established to within the tolerance of +0.00' or - 0.10' of the design subgrade elevation for these areas.
- E. Upon completion of the subgrade establishment and Contractor confirmation for conformance with the tolerance, the Contractor shall notify the Engineer and schedule an inspection for approval. The Contractor shall have a laser plane system with slope control available to the Engineer for the inspections. The Contractor shall not be authorized to install the subsurface drainage system until the subgrade has been inspected and approved by the Engineer.

END OF SECTION

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SECTION 32 18 23
SYNTHETIC TURF SURFACING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Scope of work to include all labor, material, equipment, transportation and services to install complete new vertically draining in-filled synthetic turf surfacing system as shown and described. System to be as herein specified including, but not specifically limited to the following:

Base Bid:

1. The field shall be manufactured from a combination of long parallel slit film and monofilament fibers.
2. Markings shall include football, soccer, softball, as well as a mid-field logo.
3. Field Infill System shall consist of a combination of sand and SBR rubber.

Additive Alternate Bid:

4. Installation of field underlayment/supplemental pad system consisting of either a 23mm polypropylene panels or a 25mm paved in place elastic layer pad at the field area.

- B. Common requirements of synthetic turf regardless of site location shall include:

1. Product submittals including samples, technical data, shop drawings etc.
2. Independent testing of the synthetic turf materials prior to shipment to the project site;
3. Delivery of the synthetic turf materials (not including infill) a minimum of 1 week prior to the scheduled installation of the materials;
4. Review and acceptance or certification of the existing permeable aggregate as it applies to installation of turf system, permeability and warranty implementation;
5. Installation of complete vertical draining synthetic turf surfacing system.
6. Installation of tufted and inlaid field lines and markings as indicated on the drawings.
7. Provide extra turf materials to the Owner for future repair and protective purposes.
8. Provide all appropriate maintenance and repair manuals and warranty package to Owner.

1.02 SYNTHETIC TURF SURFACING PERFORMANCE & PAYMENT BOND

- A. The Synthetic Turf Contractor shall provide a performance and payment bond to the General Contractor for the full subcontract amount of the synthetic turf surfacing system including materials, assembly, shipping, and installation. A copy of the performance and payment bond must be provided to the Owner within 14 days of the issuance of the notice to proceed.
- B. The performance and payment bond must be provided in the name of the same corporate entity that provides the warranty for the synthetic turf surfacing system to the Owner.

1.03 SYNTHETIC TURF SURFACING PRODUCTS

- A. The following vendors and corresponding products are pre-approved for the Synthetic Turf Field surface:

- | | |
|-----------------------------------|---------------------------------|
| 1. AstroTurf –Rhino Blend | AstroTurf (760) 529-9809 |
| 2. FieldTurf/Tarkett - Vertex | FieldTurf (760) 310-2139 |
| 3. Hellas - Fusion | Hellas (760) 891-8090 |
| 4. Shaw Sports Field – Legion Pro | Shaw Sports Turf (760) 330-0816 |

- B. All vendors that are not included as a pre-approved product shall submit a substitution request in accordance with the Instructions to Bidders. The substitution request must be submitted a minimum of 6 business days prior to the bid opening. Substitution requests must include the following information for evaluation by the Owner and Engineer.
1. Vendor Background and Experience: Describe your firm's history. Include information identifying the firm's annual volume and the firm's stability in the marketplace. Also include the firm's record relating to installation schedules and performance.
 2. Provide information regarding local representation, and post-installation support.
 3. Provide proof of bondability.
 4. Product Manufacturer Background and Experience: Describe the history and experience of the product manufacturer with this specific product including years of experience and a count and listing of North American and worldwide synthetic turf field installations. The list shall include field locations, client, client contact names, address, telephone, material installed, date of installation, and general contractor (if any).
 5. Product Installer Background and Experience: Describe the history and experience of the product installer with this specific product including years of experience and a count and listing of field installations. The list shall include field locations, client, client contact names, address, telephone, material installed, date of installation, and general contractor (if any). If the installer is not the manufacturer or vendor of the product, describe the experience the installer has with this specific product.
 6. Product Samples: Provide the following samples with the substitution request.
Two 8" x 12" samples each of green turf without infill material showing backing with perforations.
Two 8" x 12" samples each of turf with the infill material.
Two samples of the proposed in-fill material.
 7. Product Specification: Provide specification for the proposed synthetic turf product. Note any required deviations from the In-filled Synthetic Turf Technical Specifications included in this section.
 8. Product Performance: The samples submitted with the proposal will be reviewed and evaluated. As a supplement to the samples, provide a written description of the following performance criteria for the proposed synthetic turf surfacing system:
 - a. Abrasive characteristics
 - b. Weekly, Monthly, and Annual Maintenance Requirements
 - c. Playability for Football and Soccer
 - d. Wet and Dry Traction
 9. References: Supply a minimum of ten references, including contact name and telephone number, for other installations of this product.

1.04 APPROVED FIBER MANUFACTURERS

- A. The following fiber manufacturers are pre-approved for the In-filled Synthetic Turf Systems:
- Astroturf, Bonar, Fieldturf, Hellas, Polytex, Shaw, Tencate
- B. The synthetic turf vendor shall provide written documentation in the form of a signed affidavit certifying the source of the fiber used for the field including both green and any other colors used for the lines and markings.
- C. Fiber shall be certified in writing to have less than 50 ppm or less of lead from both the fiber supplier and the turf vendor.

1.05 MINIMUM QUALIFICATIONS FOR SYNTHETIC TURF SYSTEM

- A. Approved Synthetic Turf System shall be manufactured, sold, and warranted by a single vendor. Manufacture of the system shall include, at a minimum, assembly of the constituent components, i.e. tufting, of the specified fiber into an approved backing.
- B. The manufacturer of the synthetic turf system must have produced a minimum of fifty (50) successful in-filled fields of full size and outdoors within the past two (2) years.
- C. Installer of the synthetic turf system must have installed either a minimum of ten (10) successful in-filled synthetic turf football or soccer fields of full size within the past two (2) years or a minimum of twenty (20) successful in-filled synthetic turf football or soccer fields of full size within the past five (5) years. The installer shall have installed a minimum of five (5) successful in-filled synthetic turf football or soccer fields of full size with the product vendor.

1.06 RELATED WORK SPECIFIED IN OTHER SECTIONS

33 46 23 Field Permeable Aggregate

1.07 STANDARD SPECIFICATIONS

American Society for Testing Materials (ASTM), (latest edition) for material and testing standards
NCAA Rules for Football
NCAA Rules for Soccer

1.08 POST AWARD SUBMITTALS

- A. Shop Drawings: submit to the Engineer complete and detailed drawings showing all component parts of the synthetic turf system. The shop drawings shall be drawing to scale (1"=20') and shall include:
 - 1. total depth of infill
 - 2. edge details
 - 3. insert details including backing material
 - 4. seam details
 - 5. seam layout
 - 6. gluing patterns
 - 7. dimensional shop drawing for all field lines, markings and boundaries
- B. Synthetic Turf Samples: submit to the Owner:
 - 1. Two 12"x 12" samples each of each color turf showing backing with perforations.
 - 2. Two 12" x 12" samples each of turf showing method of seam makeup with perforations. One sample to have example of inlaid lines.
 - 3. Two 12" x 12" samples each of the other colors proposed for use on the field for lines and markings.
 - 4. Two 1-pound samples of the proposed In-fill material(s).
- C. Manufacturer's Specifications and Warranty:
 - 1. Submit to the Engineer selected manufacturer's material specifications and installation instructions. Include detailed specifications of manufacturer's provisions for achieving permeability, stating rate in infiltration and permeability in inches per hour of system materials for the vertical draining system.

2. Submit to the Engineer warranty package herein specified for review.
- D. Testing and Quality Control: Submit to the Engineer the following test results for the system specified. An independent testing laboratory experience with testing of synthetic turf or carpeting materials shall certify these tests. The qualifications of the testing laboratory to be utilized for the submittal and the pre-shipment testing shall be submitted to the Engineer for approval. Applicable minimum material ASTM tests:
1. Dynamic Cushion Test - ASTM F355, Procedure A, (system); ASTM F355 procedure A at the 24" drop.
 2. Yarn and fabric characteristics.
 3. Pill Burn Test – ASTM D2859
- E. Maintenance and Operating Data:
1. Prior to acceptance and/or occupancy by the Owner, furnish to the Owner two (2) copies in hard cover form of maintenance and operating data with imprinted Project, Owner, Engineer, Contractor and Turf Subcontractor names, and date of turf system installation.
 2. In addition, provide descriptions of any equipment recommended for maintenance and repair, citing specific vendors for each unit.
 3. Use and Limitations - Provide a separate page stating approved activity usage for the turf and activities not recommended relative to warranty.
 4. Index - Index with tab dividers for data as follows: Materials installed with their characteristics:
 - a. General maintenance
 - b. Small repair procedures
 - c. Minor seam repair
 - d. Discussion of precautions to be practiced, general maintenance, and uses to avoid to protect turf surface and to maintain installation's warranty
 - e. Recommendations for paint application and removal of lines and markings.

1.09 PRE-SHIPMENT SUBMITTALS

- A. Prior to shipment of the synthetic turf materials to the job site, synthetic turf material from every sixth roll shall be randomly sampled and the tested by an independent testing laboratory experience with testing synthetic turf materials. The testing laboratory shall be completely independent with no ties to the turf manufacturer. The testing shall include the following:

<u>Item</u>	<u>ASTM</u>	<u>Property</u>
1.	FTIR Spectrograph	Pile Composition
2.	D418	Pile Weight
3.	D418	Total Weight
4.	D418	Pile Height
5.	D418	Backing Perforation Diameter and Spacing
6.	D1335	Tuft Bind (without infill)
7.	D1682	Grab/Tear Strength.

- B. Copies of the test results shall be transmitted to the Owner and Engineer directly from the testing laboratory. The synthetic turf materials shall not be shipped to the site without written authorization from the Engineer after the Owner and Engineer have approved the test results.
- C. Samples of the synthetic turf material tested from every sixth (6th) roll shall also be transmitted to the Engineer for approval by the independent testing laboratory prior to shipment of the

synthetic turf materials to the job site. Sample size shall be minimum 12" x 12".

- D. All fees and costs associated with the pre-shipment sampling and testing shall be paid by the Contractor.

1.10 CERTIFICATION OF THE BASE

- A. The Synthetic Turf Surfacing Contractor shall furnish to the Owner, prior to the synthetic turf system installation as applicable, a written certification of the acceptability by the turf vendor of the permeable aggregate for installation and warranty validation.

1.11 TURF SYSTEM HOLD HARMLESS

- A. The synthetic turf manufacturer and installer shall not infringe upon any current or pending patents held by other synthetic turf manufacturers or installers.
- B. The Contractor, their synthetic turf subcontractor, and the synthetic turf manufacturer shall hold the Owner, Owner's Representative, and the Engineer harmless from infringement of any current or future patent issued for the synthetic turf surfacing system, installation methods and vertical draining characteristics. A notarized statement shall be provided as part of the submittal package.

1.12 WARRANTY OF SYNTHETIC TURF

- A. Warranty shall cover, in general, the usability of the turf surface, accessories, use characteristics, and suitability of the installation. All items covered by warranty are to be replaced or repaired with new materials, including installation at the sole expense of the warranting contractor for the period of eight (8) years to the Owner, for the designated uses enumerated as follows:

- Football
- Soccer
- Lacrosse
- Softball
- Ultimate
- Physical exercises
- Pneumatic rubber-tired maintenance and service vehicles
- Pedestrian traffic and other similar uses
- Ceremonial and Entertainment Events

- B. A principal of the applicable firm, duly-authorized to make contracts, shall sign the turf vendor warranty. If the turf vendor is not the manufacturer, the manufacturing firm shall also sign the warranty. The term "Contractor" contained herein means the firm furnishing warranty. "Owner" is the Carroll College. Warranty period shall be a minimum of eight years from date of acceptance of the installed system by the Owner.
- C. Furnish a pre-paid insurance policy in support of the warranty required for the field, for the entire warranty period from an A-rated domestic insurance carrier. The warranty shall be secured to the Owner with an insurance policy of not less than \$300,000 per claim and an aggregate of \$5,000,000.

1.13 FORM OF WARRANTY OF SYNTHETIC TURF SYSTEM

- A. Contractor hereby warrants to Owner, subject to the limitations and conditions set forth below, that its synthetic turf system consisting of synthetic turf described as

_____ , and the adhesives used in the installation, is free from defects in material and workmanship and shall, for a period of eight years as applicable from the date of acceptance by the Owner, remain serviceable for multiple sports activities.

- B. Contractor warrants to the Owner that its synthetic turf materials shall not fade, fail, shrink, wrinkle, or reflect excessive wear. Contractor shall, at their sole expense and cost, replace such areas of the synthetic turf system not performing to these standards for the life of the warranty.
- C. Definitions
 - 1. The term "not fade" in the context of this warranty shall mean that the synthetic turf material shall remain a uniform shade of green, or other colors installed, with no significant loss of color.
 - 2. The term "not fail" or "excessive wear" as used in the context of this warranty shall mean that the length and weight of the face yarn or pile material in the synthetic turf surface above the infill materials shall not have been decreased by more than 10% per year according to ASTM D418, nor exceed 50% during the warranty period. In the event that the synthetic turf system does not retain its fiber height or shock absorbency and is consequently no longer serviceable during the warranty period, the Contractor shall, at their sole expense, replace such portion of the system that is no longer serviceable.
 - 3. The term "serviceable" in the context of this warranty shall mean that the synthetic turf system for the soccer field shall have a maximum "G" value according to ASTM F1936-10 and Procedure A, ASTM F355, not to exceed 120G's at any location upon installation and shall not exceed 160G's throughout life of the warranty period. This shall be determined by conducting dynamic cushioning tests at the locations designated in ASTM F1936-10 and at corners of the soccer penalty boxes at opposite sides of the field. Any increase from 120G's to allowable 160-G's maximum shall be at a relative uniform rate not to exceed 15 G's in any single yearly period.
- D. Where applicable, the fabric seams shall remain attached to the underlying surface over the warranty period and shall not separate or become unglued or unattached, as applicable.
- E. Contractor warrants to the Owner that the permeable synthetic system shall drain vertically a minimum of 20 inches precipitation per hour without visible surface ponding.
- F. Contractor shall replace with new materials, at their sole expense, any damage to the synthetic turf system that extends more than 3 feet beyond the location of foreign combustibles, which may ignite and fire-damage the synthetic turf system. The Contractor shall not be held liable for any incidental or consequential damages. These warranties and the Contractor's obligations here-under are expressly conditioned upon:
 - 1. The Owner making all minor repairs to the synthetic turf system upon the discovery of the need for such repairs;
 - 2. The Owner maintaining and properly caring for the synthetic turf system in accordance with the Contractor's maintenance manual and instructions;
 - 3. The Owner complying with the dynamic and static load specifications established by the Contractor.
- G. The warranty is not to cover any defect, failure, damage or undue wear in or to the synthetic turf system caused by or connected with abuse, neglect, deliberate acts, act of God, casualty, static or dynamic loads exceeding Contractor's recommendations, footwear having cleats, spikes, or similar projections other than conventional baseball, football, soccer, or rugby shoes having cleats of not more than 1/2" in length, and other conventional running track shoes

having spikes of not more than 1/4" in length, or use of improper cleaning methods.

- H. Contractor shall be allowed to examine the synthetic turf system regarding any claim that the Owner makes to be present at any time, to analyze the results of all tests conducted by the Owner or others, and to conduct such tests of their own. Contractor shall not be responsible for any costs or expenses incurred by the Owner or others with respect to such tests, except the Contractor shall pay for costs of all tests and analysis conducted or directed by their representative.
- I. In the event the Contractor does not respond to the Owner's written notice within 10 days of receipt of notice or does not submit, schedule and execute corrective work within 30 days for any material replacement and within 5 days for work limited to repairs of existing materials or repair that can be made with attic stock materials, the Owner has the option of having the work performed at the expense of the Contractor.
- J. Sample form of warranty herein set forth is a suggested form for use for the work under this section. Manufacturer's standard form of warranty may be used provided all conditions specified are incorporated. All claims by the Owner under this warranty must be made in writing to Contractor's address at _____ within 30 days after the Owner learns of the defect giving rise to the claim. This warranty shall constitute a contract made in the State of Montana and shall be governed by the laws thereof.

1.14 FORM OF WARRANTY FOR SUPPLEMENTAL PAD SYSTEM (ADDITIVE ALTERNATE BID)

- A. Contractor hereby warrants to Owner, subject to the limitations and conditions set forth below, that field underlayment system consisting of _____, is free from defects in material and workmanship and shall, for a period of eight years from the date of acceptance by the Owner, remain serviceable for multiple sports and snow removal activities.
- B. Contractor warrants to the Owner that its field underlayment materials shall remain permeable and shall not fail, shrink or buckle. Contractor shall, at their sole expense and cost, replace such areas of the field underlayment system not performing to these standards for the life of the warranty.
- C. Definitions
 - 1. The term "permeable" in the context of this warranty shall mean that the field underlayment material shall provide a minimum vertical drainage rate of 20 inches per hour.
 - 2. The term "not shrink" in the context of this warranty shall mean that the field underlayment panels shall remain butted together without gaps exceeding 1/4 inch in any location across the field.
 - 3. The term "buckle" in the context of this warranty shall mean that the field underlayment shall lay flat on the base without warping or creating surface irregularities in excess of 1/4 inch.
- D. Contractor shall replace with new materials, at their sole expense, any field underlayment materials that do not comply with these warranty requirements.
- E. These warranties and the Contractor's obligations here-under are expressly conditioned upon;
 - 1. The Owner maintaining and properly caring for the synthetic turf and field underlayment system in accordance with the Contractor's maintenance manual and instructions;

2. The Owner complying with the dynamic and static load specifications established by the Contractor.
- F. The warranty is not to cover any defect, failure, damage caused by or connected with abuse, neglect, deliberate acts, act of God, casualty, static or dynamic loads exceeding Contractor's recommendations.
 - G. Contractor shall be allowed to examine the field underlayment system regarding any claim that the Owner makes to be present at any time, to analyze the results of all tests conducted by the Owner or others, and to conduct such tests of their own. Contractor shall not be responsible for any costs or expenses incurred by the Owner or others with respect to such tests, except the Contractor shall pay for costs of all tests and analysis conducted or approved by the Owner's Representative.
 - H. In the event the Contractor does not respond to the Owner's written notice within 10 days of receipt of notice or does not submit, schedule and execute corrective work within 30 days, the Owner has the option of having the work performed at the expense of the Contractor.
 - I. Sample form of warranty herein set forth is a suggested form for use for the work under this section. Manufacturer's standard form of warranty may be used provided all conditions specified are incorporated. All claims by the Owner under this warranty must be made in writing to Contractor's address at _____ within 30 days after the Owner learns of the defect giving rise to the claim. This warranty shall constitute a contract made in the State of California and shall be governed by the laws thereof.

1.15 WARRANTY TESTING

- A. The turf for the football/soccer field is to be tested for dynamic cushioning ("G" Test) by an experienced independent testing laboratory acceptable to the Engineer or Owner at the completion of the installation shortly prior to acceptance inspection by the Owner/Engineer, at the anniversary date of the first year, second year, fourth year, sixth year, and 60 days prior to the anniversary date of the warranty expiration. If conditions of the Specifications and/or Warranty are not met, the Contractor has the option of corrective work or replacement. In the event corrective work does not meet the requirements of the Specifications after a second attempt to bring the system within these limits, then the Contractor is to replace non-conforming areas or sections solely at the Owner's discretion and direction.
- B. Tests shall be performed in accordance with ASTM F-1936-10 and F355.
- C. Test locations as designated in F-1936-10, Paragraph 8.1. Included in the report shall be the measured depth of the infill material at all test locations.
- D. All costs for the stated testing shall be paid by the Synthetic Turf Surfacing Contractor.
- E. If the Contractor does not have the tests performed within 10 days of specified times listed, the Owner has the option of ordering the testing work at the expense of the Synthetic Turf Surfacing Contractor.

PART 2 - MATERIALS

2.01 GENERAL

- A. Infilled Synthetic Turf: The turf system shall be a vertical-draining permeable synthetic turf system. The turf system shall consist of a synthetic grass-like surface pile, which shall be

tufted into a synthetic backing.

- B. All backing layers and coatings shall be firmly bonded together. Coating materials must be completely cured and bonded to the other backing layers. Synthetic turf panels or rolls that do not meet this requirement will be rejected.
- C. The entire system shall be resistant to weather, insects, rot, mildew, and fungus growth, and be non-allergenic and non-toxic. The entire system shall be constructed to maximize dimensional stability, to resist damage and normal wear and tear from its designated use, and to minimize ultraviolet degradation.
- D. All adhesives used in bonding the system together shall be resistant to moisture, bacterial and fungus attacks, and resistant to ultraviolet rays at any location upon installation.

2.02 DYNAMIC CUSHIONING REQUIREMENTS

- A. The dynamic cushioning of the system shall not exceed a maximum value of 130 G's per ASTM, F1936-10 snf ASTM, F355, procedure A at any location upon installation.

2.03 SUPPLEMENTAL PAD COMPOSITION

- A. The supplemental pad system shall be either an interlocking polypropylene panels or a paved in place elastic layer pad. The shock-absorbing pad shall become part of the base for the synthetic turf surfacing system where noted.
- B. Polypropylene Panels:
 - 1. The panels shall be interlocking with gaps that allow for thermal expansion and contraction but do not exceed 0.25 inches. The panels shall be designed and manufactured specifically for in-filled synthetic turf underlayment applications. The panels shall meet the following minimum requirements:
 - Size: 61 x 42 inches interlocking panels
 - Area: Net coverage per panel 16.90+/- ft²
 - Thickness: 0.90" (23mm) +/- .18"
 - Panel Weight: approximately 4.1 lbs / panel
 - 2. Company must demonstrate successful installations totaling a minimum of 5 million square feet of manufacturer's material.
 - 3. The panels shall provide the following minimum performance requirements:
 - Surface contact: 50% minimum with synthetic turf backing,
 - Friction coefficient: movement of artificial turf over 50mm distance 8.92N maximum force ISO 8295
 - Shock Absorption: 60-70% per EN 14808
 - Vertical Deformation: less than 4 mm per EN14809
 - Repeated impact compression resistance: 106psi, repeated load, 20,000 cycle's system test with infilled turf; not to exceed 3%
 - Bacteria and Fungi resistance: Pass per ASTM G22-76/G21-96
 - Water Quality: ESSM 105-d/1997 PassMaterial must be 100% recyclable, recycling for energy through combustion is not acceptable. Manufacturer must demonstrate recycling process as part of the pre-approval process.
 - 4. Manufacturer Reference: Brock International Power Base or pre-approved equal
Brock International
2840 Wilderness Place
Boulder, CO 80301

Telephone: (303) 544-5800

5. Manufacturer Warranty: The interlocking polypropylene panels shall include a 20 year manufacturer's warranty.

C. Polyurethane Elastic Layer Pad

1. The shock-absorbing pad shall be a paved-in-place (in-situ) porous elastic layer and shall become part of the base for the system.
2. The elastic layer shall be porous and shall resist the effects of adhesives, water, freeze-thaw, heavy loads associated with athletic fields, compression/deflection, rot, mold, mildew, bacteria, and air-borne pollution.
3. Single Layer Installation: The paved-in-place (in-situ) elastic layer shall be installed in one lift to a minimum thickness of 25mm. The elastic layer shall contain only the following:

<u>Components</u>	<u>% by Weight</u>
Granulated SBR rubber (1-5mm)	43-47%
Clean-washed "bird's-eye" aggregate (3-6mm)	44-48%
Single component high quality polyurethane binder	6-8%

4. The exact material mix ratio may be altered to provide strength, shock attenuation (in conformance with the 120G limit specified herein) and to provide permeability as approved by the Engineer. Successful bidder may submit an elastic layer formulation with minor modification for Engineer's consideration and approval.

2.04 PERMEABILITY REQUIREMENTS OF THE SYNTHETIC TURF SYSTEM

- A. The system including the synthetic turf, infill materials and the supplemental pad shall drain vertically a minimum of 20 inches precipitation per hour without visible surface ponding.

2.05 SYNTHETIC TURF PILE SURFACE

- A. The pile surface shall provide good traction in all types of weather with the use of conventional "sneaker-type shoes" and composition, molded-sole athletic shoes.
- B. The pile surface shall be suitable for both temporary and permanent line markings using rubber-base paint where applicable.
- C. Pile surface shall be nominally uniform in length for all portions of the field. Synthetic turf panels or rolls with irregular pile heights or with "J hooked" fibers that extend more than 1/4 inch above the surrounding fibers will be rejected.

2.06 SYNTHETIC TURF FABRIC SURFACE

- A. The fabric surface shall be constructed and installed in minimum 15-foot widths with no longitudinal or transverse seams, except for head or tee seams at field boundaries and inlaid lines within a finished roll assembly. The seams shall be 15'-0" spacing.
- B. Rolls that do not lay evenly and with full dimension width will be rejected. No fitted pieces or relief cuts will be allowed to true alignment.
- C. The color shall be uniform with no visible deviations in shade permitted. Rolls that do not meet this requirement will be rejected.

2.07 SYNTHETIC TURF SYSTEM MATERIAL COMPONENTS

- A. Pile fibers shall resemble freshly-grown natural grass in appearance, texture and colors.
- B. Fabric backing for the in-filled synthetic turf systems can be loose laid and anchored at the perimeter of the fields as shown in the details or adhered to the base.
- C. No transverse or "head" seams will be permitted within the football field grid (160' width x 360' length)
- D. All panel seams shall be secured with either sewing or adhesive with a supplemental fabric. Sewn turf seams shall utilize a high strength polyester fiber cord or nylon. Adhered seams shall include a minimum 12" width seam backing shall be utilized with adhesive to extend the width and length of the seam.

2.08 SYNTHETIC TURF PERFORATIONS

- A. Synthetic turf with tufted fibers and a coated backing must include either perforations in the backing for vertical drainage, or the turf shall include a partially coated backing providing permeability without the use of perforations. Certified independent test results indicating a minimum drainage rate of 40 inches per hour for the permeable backing must be provided.
- B. Perforations in turf backing to be a minimum of 3/16" diameter clear opening and shall be spaced a maximum of 4" uniformly on-center. The turf shall be perforated with a minimum of 95% integrity over entire surface. Holes must be full diameter, completely through the underside of the turf backing with no material residue or fragmented fibers remaining.
- C. Engineer shall approve the turf perforations prior to shipment, upon shipment onsite, or during on-site perforating operations as applicable.
- D. If the non-permeable backing material exceeds 12 inches in width it shall be perforated in accordance with paragraph 2.7 of this section. Perforations shall be drilled from the surface after the adhesive has set.

2.09 LINES AND MARKINGS

- A. A complete field lining, marking and field boundary system with team area limits, etc., shall be provided with the initial installation of the surfacing system. Layouts shall be accurately surveyed and marked prior to installation.
- B. All lines and field markings shall be tufted in or installed as synthetic turf inlays. Wherever possible, lines shall be tufted into the turf panels in lieu of inlays. All markings shall be uniform in color, providing a sharp contrast with the turf color, and shall have sharp and distinct edges. Markings shall be true and shall not vary more than 7/32" from specified width and location.
- C. Manufacturer shall guarantee the synthetic turf is adaptable to painted lines in the event painting is utilized in the future.
- D. For cemented seams, use supplemental backing material. The supplemental backing material shall bridge all inlaid lines and markings a minimum of 4 inches on each side of the seam. Supplemental backing material that is greater than 12 inches in width shall be perforated in accordance with paragraph 2.7 of this section. Perforations shall be drilled from the surface after the adhesive has set.

Football:

- 1. Playing field boundaries: 12" wide white line except between 25 yd,

- where the boundary shall be a 72" wide white panel
2. Goal line: 8" wide white lines
 3. Each 5-yard line: 4" wide white lines
 4. 50 yard line: 4" wide white framed in 4" wide yellow
 5. Each 1-yard inbound line: 4" x 2' white lines
 6. Each 5-yard inbound line: 4" x 6" white line (each side of yard line)
 7. Each 1-yard marker: 4" x 2' white line
 8. 3-yard line: 4" x 6' wide white line
 9. Team box lines: 4" wide white lines extending from the 25 yard line
 10. Number size: 6' high x 4' wide
 11. Number face: 12"
 12. Number arrows: 6" high and 18" wide white turf
 13. Number color: white
 14. Mid Field Logo: white & purple as shown on the plans

Soccer:

1. Playing field boundaries: 4" wide yellow lines
2. Mid-field line: 4" wide yellow line
3. Goal and penalty boxes: 4" wide yellow lines
4. Center circle & penalty arc: 4" wide yellow lines
5. Corner kick arc: 4" wide yellow lines
6. Corner kick hash marks: 4" wide x yellow lines
7. Center spot: 9" diameter yellow dot

2.10 MINIMUM SPECIFICATIONS FOR SYNTHETIC TURF SYSTEM MATERIALS

- A. The minimum material will be verified and enforced and will be the basis for Owner's testing. Material that fails to meet these minimum specifications will be rejected. The material specifications in this section are minimums. The manufacturer of the synthetic turf fiber and fabric may elect to exceed these specifications to ensure compliance with all requirements and the warranty as specified in this section.
- B. Color of synthetic turf to be medium green as approved by Owner. Additional turf colors shall be as called for in Section 2.8 for lines and markings. The fiber used for the lines and markings shall be of the same composition as that used for the green areas.

<u>ASTM</u>	<u>Property</u>	<u>Minimum Specifications</u>
D418	Pile Weight (slit film)	21 oz/sq yard
D418	Pile Weight (monofilament)	21 oz/sq yard
D418	Primary Backing	8 oz/sq yard total
D418	Back Coating	16 oz/sq yard
D418	Total Weight	66 oz/sq yard
D418	Pile Height	2.25" minimum
D1335	Tuft Bind (without infill)	8 lbs.
D1682	Grab/Tear Strength	200 lbs.
D2859	Pill Burn Test	Pass

2.11 MINIMUM TURF MATERIAL SPECIFICATIONS

- A. Pile fiber shall be a combination of long parallel slit film and monofilament fibers polyethylene athletic quality yarn designed specifically for outdoor use and stabilized to resist the effects of ultra-violet degradation, heat, wear, water and airborne pollution.
- B. Fiber shall be certified to have less than 50 ppm or less of lead from both the fiber supplier and the turf vendor.
- C. The monofilament fiber shall meet the following requirements:

Item	ASTM	Property	Minimum Specifications
1.	D1577	Yarn Denier / Ply	10800 / 6
2.	D1577	Base Filament Thickness	300 U Micron
3.	D1577	Monofilament Width	1.40 mm
4.	D2256	Yarn Breaking Strength	20 lbs
5.	D2256	Yarn Elongation to Break	50%
6.	D789	Yarn Melting Point	240° F.

- D. The long parallel slit film fiber shall meet the following requirements:

Item	ASTM	Property	Minimum Specifications
1.	D1577	Yarn Denier / Ply	5000 / 1
2.	D1577	Filament Thickness	100 U Micron
3.	D2256	Yarn Breaking Strength	20 lbs
4.	D2256	Yarn Elongation to Break	50%
5.	D789	Yarn Melting Point	240° F.

- E. Fiber Wear Simulation: Fiber shall exhibit no splitting or appreciable degradation after a minimum of 20,000 cycles of simulated Lisport wear testing and shall remain serviceable without appreciable face weight loss after a minimum of 40,000 cycles of simulated Lisport wear testing.
- F. Fabric Composition: Shall consist of 100% polyethylene monofilament yarn tufted into polypropylene backings coated with high-grade polyurethane. Coating and backing materials shall assure suitable tuft bind strength, dimensional stability, and long-term wearing properties.

2.12 INFILL MATERIALS

- A. The synthetic turf shall utilize a combination of sand and rubber infill materials. The maximum sand content shall not exceed 30% by volume and shall not be less than 20% by volume. Proprietary infill volumes with greater than 30% sand will be considered on a product by product basis. The exact in-fill material ratio may be altered to provide strength, shock attenuation, and to provide permeability by the vendor/installer as approved by the Engineer, however the minimum sand by volume shall not be less than 20%.
- B. Infill material shall be applied in a dried condition when the turf is dry. It shall be applied in uniform layers effectively dragged and/or brushed to distribute the material uniformly onto the backing of the turf.
- C. The sand infill material shall be graded silica sand, sub-round to round, compaction resistant, washed and dried. The sand shall meet the following criteria:

Percent Silica	80-95%
Shape	Round to Sub-round

Sphericity	0.65 – 0.85
Roundness	0.60 – 0.70
Hardness (Moh)	7

The sand gradation shall meet the following wet sieve analysis:

<u>Sieve Size</u>	<u>Percent Retained</u>
#16	0% – 5%
#20	10% – 20%
#30	50% – 70%
#40	15% – 25%
#50	0% – 10%
#100	0% – 5%
Pan	0% – 2%

D. Rubber Infill:

- The rubber shall be 100% SBR ambient or cryogenically processed free of any tire cord and steel materials or kevlar. SBR rubber shall be manufactured from North American automotive or truck tires and shall be generated from California based tires. Tires more than 10 years old from date of production are not allowed. The rubber infill material gradation shall meet the following size requirements:

2.0 – 1.5 mm	0% - 10%
1.5 – 1.0 mm	10% - 30%
1.0 – 0.5 mm	40% - 80%
0.5 – 0.0 mm	0% - 10%

- SBR rubber shall be certified in writing to have less than 50 ppm or less of lead from both the rubber supplier and the turf vendor.
- Infill material shall be applied in a dried condition when the turf is dry. It shall be applied in uniform layers effectively dragged to distribute the material uniformly to the backing of the turf.
- The application rate shall provide a total minimum weight of 3.0 lbs of rubber infill material per square foot of the turf area.
- Maximum exposed fiber height shall range from ¾" to ½" after infill placement, settling, and compaction, however in no instance shall exposed pile height conflict with any known patents.

2.13 MAINTENANCE EQUIPMENT – SWEEPER UNIT

- The Contractor shall provide one tow behind sweeper/ provide ground driven rotary brush for the cleaning and maintenance of the infilled synthetic turf. Unit shall:
 - Provide for metered re-application of infill material with simultaneous dirt removal through 2 sieve trays
 - Provide sieve trays with variable settings from 4-10MM;
 - Adjustable depth row of tines for decompact infill material
 - Working width to be nominally 6 ft.
 - Rear mounted drag brush.
 - Provide connections for tow behind standard tractor or utility vehicle.

- B. Manufacturer's Reference: The sweeper unit shall be SMG TurfCare TCA 2000 or approved equal. Contact SMG Equipment LLC, (253) 350-8803 / www.smgequipment.com.

2.14 MAINTENANCE EQUIPMENT – DRAG BRUSH UNIT

- A. One tow-behind drag unit shall be furnished to the Owner with the surfacing system.
- B. The drag brush unit shall include 3-point hitch, rear-mount with tow coupling.
- C. Include four specially-arranged brush rows to level surface of turf with infilling granulate
- D. Working width to be nominally 5 ft.
- E. Manufacturer's Reference: The unit shall be SMG Turftuner TT1600 or approved equal. Contact SMG Equipment LLC, (253) 350-8803 / www.smgequipment.com.

2.15 ALTERNATE FIELD EQUIPMENT

- A. The synthetic turf vendor may request to substitute equipment for those specific units specified, provided an equivalent function is provided to the specified equipment.

PART 3 - INSTALLATION

3.01 CERTIFICATION OF FIELD BASE INSTALLATION

- A. The Contractor or the Contractor's subcontractor shall perform an inspection of the permeable aggregate and submit written certification of acceptance of the base for the installation of the synthetic turf system.
- B. Summary of certification shall include, but not be limited to:
 - 1. Acceptance of the base construction "finish surfaces" as totally suitable for the application of work specified under this section.
 - 2. Verification and certification of the infiltration and permeability rates of the permeable aggregate as applying to the warranty.
- C. All discrepancies between the required materials, application and tolerance requirements noted by the turf installer shall be brought immediately to the attention of the Contractor and the Engineer. Failure of the turf installer to immediately inform the Contractor and Engineer of any prior work that does not meet the required specifications will result in the turf installer being required to perform any work needed to bring the base to acceptable condition.

3.02 SUPPLEMENTAL PAD INSTALLATION

- A. Polypropylene Panel Installation:
 - 1. Acceptance of the base construction "finish surfaces" as totally suitable for the application of work specified under this section.
 - 2. Use only new materials manufactured and shipped for the specific installation. No used, recycled or refurbished materials are to be installed. Manufacturer must provide documentation of material content and MSDS sheet for submittal package.
 - 3. Product to be shipped as flat panels on prepackaged pallets. Pallets to be wrapped with heavy-duty barrier for protection from moisture and UV exposure.

4. Seams should be mechanically locked into place by hand without use of additional materials, glue, fasteners or secondary processes or equipment.
5. Material must be installed using manufacturers guidelines.
6. Manufacturer must provide written procedures to selected turf supplier for the installation of turf on top of underlayment.
7. Surplus materials to be determined by the Owner prior to order and delivery of product to the installation site. Surplus quantities to be identified in writing by the General Contractor at the time of order placement.
8. Upon completion of installation, a walk-through will be conducted to inspect the quality of work and ensure all details meet specifications.
9. Perform all work in strict accordance to the drawings, shop drawings and manufacturer's installations and instructions.

B. Elastic Layer Pad Installation

1. The Superintendent shall thoroughly inspect all materials delivered to site both for quality and quantity to assure that the entire installation shall have sufficient material to maintain proper mixing ratios.
2. Installation of the elastic layer shall not take place if the ambient temperature is below 50 degrees F, if the material is wet, or if rain is falling or pending.
3. The material to be placed shall be mechanically mixed to obtain a homogeneous mixture. Extreme care shall be taken under the immediate supervision of the Superintendent in the weighing and mixing of the components to maintain a uniform mixture with predicable and consistent performance characteristics across the entire field area. The polyurethane shall be of sufficient volume to obtain satisfactory long-term bonding of the components but shall not be of such volume as to render the elastic layer hard and uncomfortable for athletic use.
4. The elastic layer shall be installed with a paving machine that utilizes an electrically heated finish surface screed bar. The paving machine must be operated by a minimum of two skilled technicians at all times.
5. All seams shall be hand rolled and cold pad joints shall be primed with a polyurethane primer supplied by the binder manufacturer.
6. The Superintendent must consistently monitor thickness of the elastic layer and supervise all mixing ratios by means of component weight checks.
7. The elastic layer pad must cure free of foot and equipment traffic for 48 hours after placement.
8. The finished elastic layer must be properly compacted, uniform in texture, density, thickness, and tolerance to grade and suitable as a shock attenuation pad providing dynamic cushioning for the turf system.
9. The elastic layer shall have minimum thickness of 25 mm. The finished surface shall not vary more than 1/4" in 10' (6.25mm in 3.0 meters) measured in any direction as gauged from a string line or straight edge.
10. The Contractor shall test the permeability of the in-situ pad prior to synthetic turf installation. The pad shall be tested in a minimum of six (6) representative locations. The test results shall be submitted to the Engineer prior to synthetic turf installation.

3.03 SYNTHETIC TURF INSTALLATION

- A. Perform all work in strict accordance to the drawings, specifications, shop drawings and manufacturer's specifications and instructions.
- B. Verification: The Contractor is responsible for inspecting, verifying, and accepting all installed work of this section.

- C. Environmental Conditions: Do not apply adhesive materials or infill material when:
 - 1. Ambient air temperature is below 50 degrees F.
 - 2. Material temperatures are below 50 degrees F.
 - 3. Rain is falling or pending
 - 4. Conditions exist, or are pending, that will be unsuitable to the installation of the system.

- D. Preparation:
 - 1. Accept base onto which the synthetic turf surfacing system and the anchoring system are to be applied, as specified above.
 - 2. Immediately prior to application of the synthetic turf, the base shall be thoroughly cleaned of all foreign material, soil, or any other substances that may be detrimental to permeability and the installation of the turf system.

3.04 INSPECTION OF MATERIALS

- A. Prior to installation, and immediately upon delivery of synthetic turf system materials to the project site, the Synthetic Turf Surfacing Contractor shall inspect material as follows:
 - 1. For damaged or defective items;
 - 2. Measure turf pile height and thickness of each roll;
 - 3. Measure backing perforation diameter and spacing;
 - 4. Reject damaged materials and all materials out of tolerance with this specification.
- B. After installation, inspect project area for acceptable seaming, adhesive bonding, uniformity of color of turf, bubble- and wrinkle-free surface smoothness as laid, field lines and markings, insert installations, edge details. Remove and/or repair deficient workmanship in a manner consistent with these specifications prior to requesting the Engineer's inspection pursuant to completion and acceptance of the work.

3.05 OWNER'S TEST

- A. Owner may have samples of the turf submitted and tested for verification of conformance to specifications. Turf system acceptance is subject to the results of these tests.
- B. Any material so tested and found not conforming to specification will be rejected and replaced with material conforming to the specification at Synthetic Turf Surfacing Contractor's expense. Re-submittal shall be required.

3.06 SYNTHETIC TURF INSTALLATION

- A. Perform all work in strict accordance to the drawings, shop drawings and manufacturer's specifications and instructions.
- B. Verification: The Contractor is responsible for inspecting, verifying, and accepting all installed work of this section.
- C. Environmental Conditions: Do not apply adhesive materials or infill material when:
 - 1. Ambient air temperature is below 40 degrees F.
 - 2. Material temperatures are below 40 degrees F.
 - 3. Rain is falling or pending
 - 4. Conditions exist, or are pending, that will be unsuitable to the installation of the system.

- D. Preparation:
1. Accept base onto which the synthetic turf surfacing system and the anchoring system are to be applied, as specified above.
 2. Immediately prior to application of the synthetic turf, the base shall be thoroughly cleaned of all foreign material, soil, or any other substances that may be detrimental to permeability and the installation of the turf system.
- E. Equipment and Access:
1. Passenger vehicles shall not be allowed to park or staged upon the completed aggregate surface either prior to or during installation of the synthetic turf.
 2. Equipment utilized during construction including compressors, generators, etc. shall be in complete working order, with exhaust systems oriented vertically and away from the synthetic turf surface. At any location where equipment is parked and/or staged on the turf surface during installation, adequate protection of the finish turf surface will be required including, but not limited to heat resistant panels to ensure 100% viability of the finish turf surface and fibers. Should a portion of the turf be damaged as a result of installation techniques, the entire turf panel may be subject to rejection and replacement at the direction of the Owner's Representative.
- F. The fabric surface shall be constructed and installed in 15 -foot minimum widths with no longitudinal or transverse seams, except for head or tee seams at field boundaries and inlaid lines within a finished roll assembly.
- G. Rolls that do not lay evenly and with full dimension width will be rejected. No fitted pieces will be allowed to true alignment.
- H. Bonding of Material Surfaces: The bonding or fastening of all system material components shall provide a permanent, tight, secure and hazard-free, athletic playing surface. System material components include:
1. Bonding all seams and inlaid line and markings
 2. Bonding and seaming must maintain their integrity for total length of warranty period.
- I. Seams:
1. All turf seams shall be either sewn with high strength polyester fiber cord or nylon or adhered to a supplemental backing material.
 2. Backing layers must lie flat on the field base to provide a uniform pile surface.
 3. The width between fiber rows at the seam locations shall not exceed that of the tufting gauge of the turf materials.
 4. All sewn seams shall be brushed to provide full coverage of fiber over the thread.
- J. Turf Edges: Turf edges to be as shown on the edge fastening detail and nailed at the perimeter.

3.07 LINING / MARKING INSTALLATION

- A. Complete field markings shall be provided with the initial installation of the surfacing system. Provide lines and markings in conformance with these specifications. Layouts shall be accurately surveyed and marked prior to installation.

- B. If overlapping backing materials are utilized for the inlaid lines and markings resulting in a non-permeable surface in excess of 12 inches wide, the backing materials shall be perforated in conformance with section 2.08 after gluing and prior to installation of the infill material.
- C. Painted lines and markings shall be crisp and distinct, with no weeping or overspray. Application of paint shall be exactly aligned with required dimensions and a guide wire/string line shall be used to produce straight lines.
- D. Contractor shall reapply paint if markings exhibit any appreciable fading or degradation within three months of initial application.

3.08 SYNTHETIC TURF EDGE ANCHOR INSTALLATION

- A. Anchor synthetic turf along the sides and ends with the existing edge nailer board as shown in the details. Complete any adjustments/additions to the turf nailer board to ensure the top of the infill meets and matches the top of the concrete or rubberized surface edge directly adjacent to the synthetic turf.

3.09 IN-FILL INSTALLATION

- A. The in-fill material shall be applied in a dry condition and when the synthetic turf is dry.
- B. The synthetic turf installer shall not infringe upon any current or pending patents held by other synthetic turf manufacturers or installers with the installation of the in-fill materials.
- C. The infill materials will be installed with a minimum of 12 applications. The infill installation shall not result in fiber material trapped below the surface of the infill material. If fiber is trapped below the surface, a portion or all of the infill material must be removed and reinstalled.
- D. The infill material shall be installed at a uniform depth across the entire field area. Infill depths shall not vary by more than +/- 5 mm from the design infill level indicated in the approved submittals across the entire synthetic turf surfacing area.
- E. The in-fill materials shall be water settled to provide accelerated consolidation of the in-fill material prior to use by the Owner. Water is available from quick coupling valves located around the field, as well as the washwater/spray system. The Synthetic Turf Contractor shall utilize existing equipment to evenly apply a minimum of 1 inch of water over the entire field area for water settlement. Upon completion of the initial water settlement, the surface will be inspected the Owner and Engineer for footing stability and in-fill consolidation. The Synthetic Turf Contractor shall provide any additional water settling as required by the Owner and Engineer to achieve the desired level of in-fill stability and consolidation.

3.10 CLEANING

- A. Remove all excess materials of all types, equipment, debris, etc., from the site immediately after completion of the work. Remove all stains and other blemishes from all finished surfaces. Leave work in clean, new appearing condition, ready for use by Owner.
- B. The Contractor shall inspect the entire field area with a hand held metal detector to identify any construction materials or tools left on the field. All such materials shall be removed prior to Owner occupancy of the field.

3.11 PROTECTION

- A. Adequate protection of materials and work from damage will be the responsibility of the installer during installation and until acceptance of their work. Synthetic Turf Surfacing Contractor will be responsible for protection after the acceptance of the work until final acceptance of all contract work by the Owner. All material damaged prior to acceptance by the Owner shall be replaced at no cost to the Owner.

3.12 EXTRA MATERIALS

- A. Deliver to Owner all extra materials herein specified. Receive Owner's written receipt for all materials. Deliver receipt to Engineer.
- B. Infill Materials: Provide four (4) 33-gallon rubber trash containers with lids of each infill material used.
- C. Turf for Future Repairs: Material may be roll ends or cutoffs; however, each piece of fabric shall be at least 5' x 10'. At least one green piece shall be at least 10' x 15'. The following are minimum areas for the extra synthetic turf materials to be provided by the Synthetic Turf Surfacing Contractor to the Owner:

1. Green Turf:	1000 sf
2. White Turf:	100 LF 4" lines
3. Yellow Turf:	100 LF 4" lines
4. White Turf	500 SF
5. Purple Turf	100 SF

3.13 MAINTENANCE EQUIPMENT

- A. Contractor shall uncrate, assemble and demonstrate operation of equipment to Owner and Owner's Representatives.
- B. Following assembly of equipment, Contractor shall complete a minimum four (4) hour training session utilizing the equipment with a variety of maintenance personnel from the Sweetwater Union High School District and Olympian High School staff.

3.14 MAINTENANCE

- A. Vendor shall complete maintenance of the synthetic turf field at both 6 months and 1 year after the date of Substantial Completion. Minimum maintenance activities shall include:
 - 1. Inspect and repair as required each inlay and seam.
 - 2. Brush and remove surface debris, loose fibers and any other deleterious material. Use of a rotating, mechanical brush is recommended.
 - 3. Decompact and re-level infill materials. Import and place /top dress new infill material matching original infill materials as needed to establish original infill depth, with original installation height of exposed fiber.
- B. All maintenance activities shall be as approved and directed by the original manufacturer. All maintenance activities shall be coordinated with scheduled use of the facility and completed at the convenience of the owner and applicable user groups.

END OF SECTION

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SECTION 32 84 23
FIELD IRRIGATION SYSTEMS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Connect to existing point of connection for site irrigation systems. Protect and modify existing irrigation systems to remain, so that existing systems remain operational at all times during the construction period. One (1) 24 hour shut down period will be allowed at three (3) time intervals to effectively isolate, and reconnect new irrigation systems to existing irrigation systems. Work shall be as shown on the plans including service line extension; isolation gate / ball valves; quick coupler valves; automatic control valves and rotor/spray head assemblies.
- B. Isolate and abandon water supply and irrigation control systems within work area. Piping and appurtenances within work area to be removed.
- C. Coordinate all work with existing site landscape irrigation systems and potable water services.

1.02 STANDARD SPECIFICATIONS

- A. All sections of the standard specifications applicable to any and all parts of this project shall govern, except as specifically modified in these contract documents.
 - 1. The Standard Specifications for Municipal Public Works Construction, Washington State Chapter (latest edition).
 - 2. American Water Works Association
 - 3. American Society for Testing and Materials
 - 4. State of Washington and Standards

1.03 FIELD DIMENSION AND LAYOUT

- A. The Contractor will be responsible for furnishing, setting, and marking of all line, grade, and location stakes, including offsets and general construction staking. The Engineer will provide reference points.
- B. There shall be onsite at all times when work-requiring control is being performed, all necessary equipment, supplies and instruments related thereto. A qualified layout specialist must be assigned to the Contractor's crew for this work. This equipment and specialist must be available at no additional cost to the Engineer for the purpose of approving layout and certifying work progress onsite.
- C. The Engineer prior to commencing construction and on a continuing basis must approve all layout work, materials and methods for each phase requiring accuracy control.

1.04 SUBMITTALS

- A. Product Information: The Contractor shall submit copies of catalog information of all equipment for approval.
- B. As-Built Drawings: Contractor shall furnish accurate as-built drawings of the complete irrigation and washwater systems. The drawing shall be a blueprint to scale. Drawings shall

show installed manufacturer's name and catalog number. The as-built drawing shall be turned over to the Engineer for review at or before the professional review (punch list) of the project.

PART 2 – PRODUCTS

2.01 PVC WASHWATER & IRRIGATION PIPING

- A. Main line and lateral pipe shall be Schedule 40 PVC. Plastic pipe shall be extruded from 100% virgin Polyvinyl chloride (PVC) Pipe to conform to ASTM D2241, F477, D1784 Cell Class 124-54-A, B.
- B. Sleeving pipe shall be Schedule 40 PVC.
- C. Pipe shall be guaranteed to be free from manufacturing defects in material and workmanship in accordance with the section of specifications covering warranties. The pipe is to be guaranteed to operate within the limits of pressure and temperatures recommended by the manufacturer and as required in these specifications.
- D. Pipe Sizing: Schedule 40 PVC

Size	O.D.(In)	Min. Wall (In)
3"	3.500	0.216
2 ½"	2.875	0.203
2"	2.375	0.154
1 ½"	1.900	0.145
1 ¼"	1.660	0.140

2.02 PLASTIC PIPE FITTINGS AND CONNECTIONS

- A. Fittings to be PVC except as noted on riser, valve assemblies, details, etc.
- B. Connections shall be solvent weld, except at valves, risers, etc. that require threaded connections.
- C. Threaded connections shall be of male adapter type.
- D. Couplings and fittings to be taper-molded, Schedule 40, except where indicated in details to be Schedule 80.
- E. Threaded nipples must be Schedule 80.
- F. Fittings shall conform to ASTM D2466-76a and D1484-75.

2.03 JOINING MATERIALS

- A. All joining materials used will be manufactured by I.P.S. or equal, and will be used in accordance to the manufacturer's written specifications and safety recommendations.
- B. All threaded connections (PVC) shall be sealed by using Teflon tape or Teflon paste.
- C. All galvanized threads shall be sealed with an approved Teflon base pipe compound.
- D. PVC solvent compounds shall be IPS "Weld-On" P-70 purple primer and "Weld-On" P-705, P-711 heavy-bodied gray cement, IPS "Weld-On" 721 or approved equal.

2.04 BACKFLOW PREVENTION DEVICES

- A. Irrigation Backflow Prevention Device for washwater irrigation system shall be a Febco No. LF 850 Reduced Pressure Assembly, 2" with test cock plugs or approved equal.
- B. Backflow prevention device shall be installed in Utility Vault Model No. 38-TA (2") or 25 TA (1").
- C. Backflow prevention devices shall be as approved by the City of Helena Water and Sewer Department.

2.05 MANUAL ISOLATION GATE VALVES

- A. All Valves to conform to the latest revision of AWWA Standard C-509.
- B. Gate Valves
 - 1. Valves to conform to the latest revision of AWWA Standard C-509.
 - 2. All parts shall be accessible for repair or maintenance without removing the body from the line.
 - 3. The body, bonnet, and seal plate shall have a factory applied thermoplastic epoxy coating on all interior and exterior surfaces. The wedge shall be cast iron completely encapsulated with a resilient elastomer material permanently bonded to the wedge and shall have a rubber tearing bond that meets ASTM D429.
 - 4. The gate valve shall be rated for 200 psi WWP.
 - 5. Gate valves shall be M+H 4067-07 with hand operated wheel handle or approved equal.
 - 6. Two valve operating keys are to be furnished.

2.06 MANUAL ISOLATION BALL VALVES

- A. Valves to conform to the latest revision of AWWA Standard C-509.
- B. All parts shall be accessible for repair or maintenance without removing the body from the line.
- C. The body shall be brass, 400# WOG, thread ended ball valve with PVC coated round handle. Locking handle is not acceptable.
- D. 1"- 3", Matco-Norca, 758 full port, FIPT x FIPT, forged brass, Chromed Plated Ball, Teflon Seat, Two Piece Body, Ball Valve, 600 PSI non-shock WOG, 150 PSI SWP. Threaded Ends Comply with ANSI B2.1. Valves shall be installed with the handle on the side, parallel with the ground when in the open position. The handle shall be perpendicular to the ground, pointing upward when in the closed position.

2.07 QUICK COUPLING VALVES

- A. Quick-coupling valves shall be bronze two-piece construction or iron body, bronze mounted, globe pattern. Pressure rating to be 150 psi. Connections shall be iron pipe, threaded. The cover shall designate non-potable water. Valves to be Rainbird 44-LRC, 1", two-piece.
- B. Contractor is to furnish to the Owner two couplers with either 1 " x 1" or 1" x 3/4" (per Owner's option). Hose swivels shall be attached with two coupler keys.
- C. Valves to be housed as shown in the details, for installation in or adjacent to the concrete turf anchor.

- D. Work to include layout, trenching, pipe installations, backfill, quick coupling valves, valve boxes, riser assemblies, and related items.

2.08 QUICK COUPLER VALVE BOX – SYNTHETIC TURF

- A. Quick Coupler Valves at synthetic turf field to be housed in TurfCool Quick Connect Valve Box, TC-3700-QCV as manufactured by Sportsfield Specialties Inc. (1-888-975-3343), or approved equal. Box shall be equipped and/or modified to have synthetic turf or rubberized surfacing cover as detailed.
- B. All caps shall be Purple (NP).
- C. Quick Coupler Valves shall be installed with as Lasco Swing Joint #G332-212.

2.09 DETECTABLE MARKING TAPE

- A. Detectable marking tape: Christy's 3" detectable marking tape consists of a minimum 5 mil overall thickness; five ply composition; ultra-high molecular weight; 100% virgin polyethylene; acid, alkaline and corrosion resistant. The tape shall have a 20 gauge solid aluminum foil core, encapsulated within 2.55 mil polyethylene backing. Tape tensile strength shall be in accordance with ASTM D882-80A and be not less than 7,800 psi. Tape legend—Caution Irrigation Line Below. TA-DT-3-GI.

2.10 VALVE BOXES

- A. All ball valves, gate valves, quick coupling valves or remote control valves outside of synthetic turf field limits shall be installed in an Oldcastle/Carson #1419-12 valve box with a 1419 plastic lid. The cover shall be secured with stainless steel bolts

2.11 UNDERGROUND ELECTRICAL WIRE

- A. All wiring is to be UL labeled type "UF" for direct bury.
- B. All wire shall be No. 14 AWG, single strand copper. Red or Black jackets for hot wires. White jacket for common wire.
- C. Wiring is to be supplied in minimum 1,000' continuous lengths.
- D. Underground splices shall be made in a new splice box with vinyl insulated connectors and sealed in Epoxy Resin (3M DBY/DBR or approved equal).
- E. Separate spare wires shall be installed to the splice box as designated in the plans. Spare wires shall be marked "spare" and be of a different color, not black or white.

2.12 TRACE WIRE

- A. Trace wire shall be 12 GA. solid bare copper wire. Wire to be UF rated and UL listed.

2.13 ELECTRICAL EQUIPMENT

- A. All components of control equipment, solenoid valves, etc., shall be UL labeled, certified and conform to current National Electrical Code, and be acceptable to local governing codes.

2.14 AUTOMATIC (REMOTE CONTROL) VALVES

- A. Valves shall include heavy-duty plastic construction. Pressure rating to be 200 PSI. Connections shall be threaded per detail.
- B. Valves to be electrically generated, actuated by a solenoid utilizing AC current, 24 volts, and rated at not more than 9.9 VA. The solenoid is to be sealed so it is completely waterproof.
- C. Operation to be normally closed.
- D. The valves shall include a 10 year warranty.
- E. Solenoid to mounted directly on the valve body or bonnet. All parts and tubing downstream of the entrance opening must be of larger size to permit passage of foreign particles.
- F. Construction is to be so that all operating parts are accessible and removable from the top by removing the bonnet without having to disconnect the valve body from the pipeline.
- G. Valves to be Weathermatic 8200 series or approved equal.

2.15 VALVE BOXES

- A. Valve boxes for individual auto-control valves shall be CARSON-BROOKS No. 1730-18 (jumbo box) or approved equal, green with 1730-4B bolt down green cover. Use CARSON-BROOKS 1730-18 or approved equal, turned upside down at each ACV per detail. Valve boxes shall be installed with retaining clip and furnished with stainless steel bolts.

2.16 SPRINKLERS

- A. Sprinkler performance must meet or exceed the listed criteria in the legend of the drawing, except gallons per minute flow may not be exceeded by more than 5%. Nozzles shall have matching precipitation rates.
- B. Rotary pop-up sprinklers shall be furnished with gear drive mechanism.
- C. Sprinklers shall have a minimum extension in the operating position of 2 1/4" for lawn areas and 12" for shrub and planting bed areas. The sprinklers shall be spring-loaded for return to the recessed position.
- D. Rotating unit shall be stainless steel nozzle turret with a rubber cover.
- E. Adjustable heads are not acceptable for use as full-circle (360 degree) heads.
- F. Rotors: Hunter I-20, I-25, and I-40 series 4" Pop-Up Rotors with stainless steel riser assembly, nozzles as necessary to accommodate the head spacing and layout as shown. Rotating unit shall be stainless steel nozzle turret with a rubber cover.
- G. The Contractor shall furnish to the Owner two spare full circle and two spare part circle sprinkler heads.
- H. Swing joint assemblies: Pre-fabricated Schedule 40 PVC swing joint - Approved manufacturer's Lasco, Rainbird, Spears. Size swing joint assembly as indicated on detail sheet.

2.17 JOINING MATERIALS

- A. All joining materials used for solvent welded joints shall be manufactured by I.P.S. or equal, and will be used in accordance to the manufacturer's written specifications and safety recommendations.
- B. All threaded connections (PVC) shall be sealed by using Teflon tape or Teflon paste.
- C. PVC solvent compounds shall be IPS "Weld-On" P-70 purple primer and "Weld-On" P-711 heavy-bodied gray cement or approved equal.

2.18 MARKING TAGS

- A. All appurtenances shall be installed with polyurethane identification tags manufactured by T. Christy Enterprises or approved equal. Tags shall read "CAUTION: NON-POTABLE WATER – DO NOT DRINK" in English on one side, and valve number designation on the opposing side. Tags shall be white, with black ink.

PART 3 – EXECUTION

3.01 TRENCH EXCAVATION

- A. Trenches shall be excavated to the line and grade indicated in the plans and specifications. Except for unusual circumstances where approved by the Engineer, the trench site shall be excavated to only such width as is necessary for adequate working space. The top width of the trench will generally not exceed 18" for sizes 2-1/2" and smaller. The trench shall be kept free from water until all connections are completed. No water is to be permitted in the trenches until jointing material has set in the case of solvent and weld joints. Surface water shall be diverted so as not to enter the trench. Boulders, rocks, roots and other obstructions shall be entirely removed or cut out to the width of the trench and to a depth 6" below the bottom of the pipe.
- B. Trenches, where applicable, shall be excavated to a depth to provide 24" cover minimum below finish grade over piping in synthetic turf field areas.

3.02 INSTALLATION OF PLASTIC PIPING

- A. Pipe couplings and fittings shall be handled and installed in accordance with the recommendations of the pipe manufacturer. The chemical used in solvent welding are intended to penetrate the surface of both pipe and fitting, which after curing, result in a complete fusion at the joint. Use solvent and cement only as recommended by the pipe manufacturer.
- B. Solvent welds:
 - 1. Follow all recommendations of the approved cement manufacturer.
 - 2. Remove all dust, dirt and moisture from the surfaces to be welded.
 - 3. Make up solvent welds only when environmental conditions are appropriate.
 - 4. Check all fittings for correct position before solvent weld sets.
 - 5. Allow at least 15 minutes set up (curing) time for each welded joint before moving or handling.
 - 6. Do not introduce flow or pressure until the manufacturers recommended set-up and cure time has elapsed.

- C. Plastic to Metal Connections: On plastic to metal connections, work the metal connection first. Use Perma-Tex No. 2, Teflon tape, or similar non-hardening material on 3-threaded connections. Liquid Teflon is not acceptable. Light wrench pressure is all that should be used. Connections between metal and plastic are to be threaded adapters, except where indicated in the details.
- D. Curing: Prior to introducing water into the piping, a minimum of two hours curing time for the plastic joint connections shall transpire.

3.03 QUICK COUPLING VALVE (QCV) INSTALLATION

- A. All piping shall be thoroughly flushed through extended risers before quick coupling valves (QCV) are attached.
- B. Quick coupling valves shall be installed as indicated in the details, perpendicular to the surface. Valve top to be 1" to 1-1/2" below inside surface of box lid.
- C. When installing QCV the top nipple of the riser assembly is to be threaded to QCV above ground, carefully checking so as not to cross-thread. Then thread nipple with QCV to intermediate coupling.

3.04 QUICK COUPLING VALVE BOX INSTALLATION

- A. Valves to be housed in a plastic or aluminum valve box as shown in the details.

3.05 SPRINKLER INSTALLATION

- A. All piping shall be thoroughly flushed through extended risers before sprinklers are attached. Liquid Teflon may be used on sprinkler threads.
- B. Sprinklers shall be installed as indicated in the details, perpendicular to the surface.
- C. When installing sprinklers, the top nipple of the riser assembly is to be threaded to sprinkler above ground, carefully checking so as not to cross-thread. Then thread nipple with sprinkler to intermediate coupling.
- D. Sprinkler heads located in the natural turf areas shall be installed flush with finish grade.

3.06 AUTOMATIC (REMOTE CONTROL) VALVE INSTALLATION

- A. Install valves in valve manifold vaults or plastic valve boxes as designated on the plans.
- B. Refer to the details for specific installation requirements associated with zone conditions.

3.07 BACKFILLING

- A. Sand backfill material shall be placed and compacted around and under the piping and risers by hand tools to a depth of 6" above and 6" below the top of all piping, including lateral and main line piping. Backfill is to be compacted to 95% minimum density by mechanical tamping. Trench must be free of water during backfilling operation.
- B. All backfill around quick coupling valves and sprinkler risers shall be mechanically compacted to 95% minimum density with moisture added.
- C. Detectable marking tape: 6" cover over mainline and lateral lines.

3.08 TESTING

- A. Before testing, all piping is to be thoroughly flushed.
- B. Request Architect and Owner attendance at each test. Provide a minimum of 24 hour prior notice.
- C. Prior to acceptance of work, all pressure piping and fittings shall be subjected to a hydrostatic pressure test of 150 psi. This test shall include all mainline and lateral piping for a minimum of one hour. Leaks and/or imperfections developing under said pressure shall be remedied by the Contractor before final acceptance of the work. Pressure shall be maintained while the entire installation is inspected. The Contractor shall provide all work connected with the tests. Include temporary above ground piping to connect a riser from each lateral so that the entire system can be tested simultaneously.
- D. Blocking shall be in place at the time of testing. Insofar as practical, tests shall be made with valves and risers exposed for inspection.
- E. Allowable leakage in gallons per 1,000 lineal feet of pipe is as follows:

3"	3.0 gallons per hour
2"	2.0 gallons per hour
1-1/2" and 1"	1.5 gallons per hour
- F. Performance Testing: After system is 100% installed, perform a coverage test to determine whether water coverage and operation of the system is adequate for planting, without areas of excessive flooding, dry spots, areas of insufficient overlap, or excessive overspray. Test to be performed under automatic operation of the controller via the remote radio system. If the irrigation system is determined by Owner to be inadequate due to Contractor's poor workmanship or materials, it shall be replaced or repaired at Contractor's expense and both pressure and coverage tests repeated until accepted.
- G. Adjusting: Contractor shall substitute or modify up to 10% of the total nozzles as directed by the Owner. Adjustments to the system will be made without additional cost to the Owner.

3.09 INSTRUCTIONS AND LITERATURE

- A. Contractor is to conduct training sessions to demonstrate and instruct school personnel on operation and maintenance of all equipment installed.
- B. Where applicable, Contractor shall have equipment manufacturers' representatives participate in this session.
- C. Contractor is to supply four (4) sets of descriptive literature and parts lists for all equipment furnished.

END OF SECTION

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SECTION 33 46 16
FIELD SUBSURFACE DRAINAGE

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Furnish and install field drainage system for the synthetic turf field area as shown on the plans including perimeter infiltration trench with pea gravel bedding and backfill and perforated piping. Provide overflow connection to the existing onsite storm drainage system as shown on the plans.
- B. Two options are provided for the Contractor's selection within the plans for field drainage as follows:

Option 1: Furnish and install 12-inch depth of additional aggregate base for water storage and infiltration into the subgrade soils.

Option 2: Furnish and install subsurface drainage laterals across the field area on 15' centers with 12" x 1" flat drains as shown on the plans.

- C. Upon completion of this work, restore subgrade to specified condition and tolerances, compacted to 95% density with no loose material on surface.

1.02 STANDARD SPECIFICATIONS

- A. American Public Works Association, Washington State Chapter, Standard Specifications for Municipal Public Works Construction (APWA) (latest edition).
- B. Standard Specifications for Road, Bridge, and Municipal Construction, Washington State Department of Transportation (WSDOT), American Public Works Association (APWA)
- C. United States Department of Agriculture, Soil Conservation Service, Engineering Standard 606.

1.03 SUBMITTALS

- A. Submit to the Engineer for approval:
 - 1. Pea gravel sieve analysis
 - 2. Product data for perforated and non-perforated tubing
 - 3. Product data for all fittings and connections

1.04 RELATED WORK IN OTHER SECTIONS

Section 31 00 00 Earthwork
Section 31 22 16 Field Subgrade Establishment
Section 33 46 23 Field Permeable Aggregate

PART 2 – PRODUCTS

2.01 PERFORATED AND NON-PERFORATED PIPING (OPTION 1 & 2)

- A. The piping shall be dual wall corrugated polyethylene with smooth interior wall.
- B. Material shall conform to requirements of Type III, Grade 4, Class "C" polyethylene as

specified in ASTM D1248.

C. Dimensions:

1. Inside diameter variance shall not exceed -0.0% or +5%.
2. Lengths shall be in coiled configuration with a -0.0% tolerance.

D. Water inlet areas shall be slotted with a width of 1/16" " 0.020" to a maximum of 3/32" "0.030" uniformly spaced circumferential slots located on the inner depression of the corrugation, totaling a minimum of 1.25 square inches per lineal foot. The perforations shall provide a clear opening. Tubing with perforations that are punched with a flap type opening or that are not uniform will be rejected.

E. Fittings and Connections:

1. Fittings shall be as furnished by the manufacturer of the pipe.
2. Connections of tubing lengths shall be with split coupling or snap-in-type couplings utilizing polyethylene or construction tape.
3. Tubing is to be inserted into sockets for the full socket length. "Slip-fit" connections will not be permitted.
4. All split coupling connections are to be fully taped. All connections at fittings and connections are to be taped at interface of exposed joint.

2.02 PERFORATED FLAT DRAINS (OPTION 2 ONLY)

- A. Flat Drains: For perforated laterals, use "AdvanEdge" flat pipe, 1" x 12" without geotextile fabric wrapping. Water inlet areas shall be slotted with a width of 1/16" (0.020) to a maximum of 3/32" (0.030) uniformly spaced circumferential slots located on the inner depression of the corrugation, totaling a minimum of 1.25 square inches per lineal foot.
- B. The perforations shall provide a clear opening. Tubing with perforations that are punched with a flap type opening or that are not uniform will be rejected. Use manufacturers end caps, couplers, and fittings to connect to the collector pipe where indicated.

2.03 PEA GRAVEL

- A. Pea-gravel bedding for perforated pipe shall be clean, washed, uniformly graded 3/8" to 1/8". The pea gravel material graduation must meet the following sieve analysis:

<u>Sieve Size</u>	<u>Percent Passing</u>
1/ 2"	100
3/ 8"	90 - 100
# 4	5 - 15
# 8	0 - 10
# 100	0 - 0.6
# 200 (wet sieve)	0 - 0.4
# 270 (wet sieve)	0 - 0.2

2.04 TESTING

- A. The Owner will be performing testing of materials delivered to the job site for the purpose of verifying compliance with the contract documents. The Owner's testing is for this purpose only and not for construction quality control by the Contractor.
- B. The Contractor shall coordinate directly with the Owner's testing firm relative to the delivery schedules of the imported materials. Sampling will be scheduled each day deliveries occur.
- C. The Contractor shall provide testing and surveillance as required to assure materials and

work fully comply with contract requirements.

PART 3 – EXECUTION

3.01 TRENCHING

- A. Excavation shall be made to the alignment, elevation, grade and slope as indicated on the drawings.
- B. Trenching shall be accomplished utilizing equipment with slope and depth control, such as "Laser Plane Control System", so as to ensure accuracy in the bottom of the trench.
- C. No high points above designated invert or calculated trench bottom elevation will be permitted. No sloughing of site material or loose excavated soil will be permitted to remain in the trenches.
- D. Surplus excavated soil shall be removed from the field area. Excavated material may not remain on subgrade. Excess soil material shall be disposed of off of the playfield area.
- D. Provide a smooth, even subgrade after removal of the trench material. Subgrade to be compacted to 95% density. Leave no loose material on the subgrade. Remove all loose material from lateral trench bottom.
- E. Trench to line and grade as shown on the drawings utilizing laser-controlled equipment. Dispose of excavated trench material.
- F. Install corrugated polyethylene (CPEP) perforated piping with pea gravel bedding and backfill as shown on the plans.
- G. For flat drainage piping, install perforated lateral piping directly on structural fabric.

3.02 PLACEMENT

- A. Excavation below invert grade must be established to a depth so as to provide for specified placement of pea gravel bedding at bottom of pipe elevation prior to laying the tubing.
- B. Pea-gravel bedding for perforated pipe shall be clean, washed, and uniformly graded 3/8" to 1/8".
- C. No foreign material will be permitted inside, alongside, under, or on top of, installed perforated piping.

3.03 BACKFILL

- A. The backfill for all perforated pipe shall be clean washed pea gravel, uniformly graded 3/8" to 1/8".
- B. All trenches to have backfill material "crowned" a minimum of 2" above subgrade to protect from foreign material and provide for ease of location identification. Crowns with foreign material contamination shall be removed prior to placement of base aggregate.
- C. Specified bedding shall not be placed until Engineer approves the trench.
- D. Trench backfill shall not be placed before Engineer approves perforated pipe placement.
- E. During placement of specified trench backfill, pipe must be held in place with a hand device

to prevent displacement and provide for achieving specified invert elevation. Do not damage pipe or allow pipe to be displaced by placement of backfill material.

3.04 CONNECTIONS

- A. All connections are to be made with approved fittings as recommended by the tubing manufacturer and approved by the Engineer.
- B. Tubing is to be inserted into sockets for the entire length. Tape all connections utilizing polyethylene or construction tape.
- C. No foreign material will be permitted inside the installed tubing.
- D. Cap the ends of all lateral runs as shown on the drainage plan. All open ends during construction are to be temporarily capped or plugged.
- E. Connection of laterals to collector drains shall be made with a combination reducing tee and reducing saddle tee or end tee utilizing snap connections.

3.05 EQUIPMENT MOVEMENT

- A. No trucks or equipment will be allowed to drive over the top of the trenches or flat pipe except track-equipped machinery utilized in spreading imported granular materials.

END OF SECTION

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SECTION 33 46 23
FIELD PERMEABLE AGGREGATE

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Include all labor, material, transportation and services to complete installation of the permeable aggregate base and the permeable aggregate top course as shown on the drawings for the synthetic turf field surfacing areas including:
 - 1. Confirmation of Final subgrade establishment
 - 2. Structural soil-bearing fabric
 - 3. Base course permeable aggregate
 - 4. Top course permeable aggregate
 - 5. Recycled Plastic Edge Anchor

1.02 STANDARD SPECIFICATIONS

- A. Design Procedure and General Specifications, Asphalt Paving, Asphalt Association of Washington, Inc., (APAAW);
- B. American Public Works Associations, Washington State Chapter, Standard Specifications for Municipal Public Works Construction, (APWA), latest edition.
- C. American Standard Testing Materials, (ASTM);
- D. American Association of State Highway and Transportation Officials, (AASHTO).

1.03 RELATED WORK IN OTHER SECTIONS

Section	11 68 24	Outdoor Athletic Equipment and Furnishings
Section	31 22 16	Field Establishment
Section	32 18 23	Synthetic Turf Surfacing
Section	33 46 16	Field Subsurface Drainage

1.04 SUBMITTALS

- A. Submit to the Engineer for approval:
 - 1. Qualifications of contractor installing and fine grading the permeable aggregate.
 - 2. Permeable structural fabric product data.
 - 3. Concrete Anchors.
 - 4. Base Course Permeable Aggregate sieve analysis.
 - 5. Base Course Permeable Aggregate infiltration rate (for material compacted to a minimum density of not less than 98% of maximum dry density as determined by ASTM D698).
 - 6. Top Course Permeable Aggregate sieve analysis.
 - 7. Top Course Permeable Aggregate infiltration rate (for material compacted to a minimum density of not less than 98% of maximum dry density as determined by ASTM D698).
 - 8. Equipment and procedures to be utilized for the permeable aggregate installation.
 - 9. Recycled Plastic; Manufacturers Published Product Data.

1.05 QUALIFICATIONS

- A. The subcontractor responsible for field permeable aggregate placement and compaction shall

be submitted to the Engineer for approval. Specific qualification requirements are included as follows:

1. The subcontractor shall be and has been actively and directly engaged in constructing synthetic field projects and shall provide proof of five (5) or more full size (75,000SF) sports field base installations completed in the past three (3) years. The Contractor's experience shall include completion of high school, collegiate, or professional level competition fields. Upon request, provide a listing of all construction contracts (whether completed or in progress) entered into or performed by the subcontractor and completed with the subcontractor's staff within the past three years for projects similar in scope, time and complexity of the work called for under this Contract; include the names of the contracts, and the names and contact information of the owners, and the subcontractors staff who have completed the work. Qualification experience requirement cannot be satisfied with personnel who will not be actively involved with this project.

PART 2 - MATERIALS

2.01 STRUCTURAL SOIL-BEARING FABRIC

A. Fabric

1. Material: Fabric to be 100% Polypropylene, non-woven, needle-punched engineering fabric with a minimum weight of 4.0 oz/sy.
2. Physical Properties:

Tensile Strength, lbs., (ASTM D-4632):	100	
Elongation (%), (ASTM D4632):	50	
Puncture Strength, (lbs), (ASTM D4833):		65
Mullen Burst Strength (PSI), (ASTM D3786):	225	
Trapezoidal Tear, (lbs), (ASTM D4533):	45	
Abrasion Res. % Str. Ret., (ASTM D4886):	80	
Coefficient. of Perm., cm/sec., (ASTM D4491):	0.22	
Flow Rate Gal./Min./Sq.Ft.) (ASTM D4491):	140	
3. Material to be Northwest Linings (253) 872 0244, or approved equal.

2.02 BASE COURSE PERMEABLE AGGREGATE

- A. The base course permeable aggregate shall be installed below the top course permeable aggregate in areas to receive synthetic turf.
- B. Aggregate to be open-graded, fractured, durable, friction course.
 1. To ensure free drainage, material to be clean with minimal fines.
 2. The compacted base course permeable aggregate shall have a minimum infiltration rate of 40 inches per hour when the material is compacted to a density of not less than 98% of the maximum dry density as determined by ASTM D698 (98% Proctor).
 3. Material Strength and Durability
 - a. The material shall demonstrate a compressive strength sufficient to support the anticipated construction loading, including the necessary traffic and compactive effort, without significant breakage of individual particles, or significant alteration of the particle gradation as approved.
 - b. Where the compressive strength is suspect, the Engineer will remove a sample of the material that has been placed by the Contractor at the specified density and perform a particle gradation, the results of which will be compared to previous production test results (approved baseline values). If the results of this test indicate higher passing values for any given screen exceeding 10% of the baseline, the material may be considered noncompliant.

- B. Base course material to be a minimum of 75% fractured with at least one fractured face by mechanical means on each individual particle larger than 1/4". A sand and gravel source is acceptable for this material.
- C. Gradation:

The following values are provided as guidance in generating the performance criteria established above. Minor variations in locally or regionally available aggregate products may require deviation from the table below. Upon proof of compliance with fracture, durability, and infiltration at density, a production particle gradation may be approved as the baseline for future testing.

Typical Base Course Permeable Aggregate particle size range:

Sieve Size	Percent Passing by Weight
1-1/4"	100
1"	90 - 100
3/4"	80 - 100
1/2"	50 - 80
3/8"	40 - 60
No. 4	15 - 40
No. 8	10 - 20
No. 30	5 - 15
No. 100	0 - 3.0
No. 200 (wet sieve)	0 - 2.0

2.03 TOP COURSE PERMEABLE AGGREGATE

- A. The top course permeable aggregate shall be installed over the base course permeable aggregate in the synthetic turf areas.
- B. Aggregate to be open-graded, 100% fractured, durable, friction course. To ensure free drainage, material to be clean with minimal fines. The compacted top course permeable aggregate shall have a minimum infiltration rate of 20 inches per hour when the material is compacted to a minimum density of not less than 98% of maximum dry density as determined by ASTM D698.
- C. Material Strength and Durability
 - 1. The material shall demonstrate a compressive strength sufficient to support the anticipated construction loading without significant breakage of individual particles, resulting in a significant alteration of the particle gradation as approved.
 - 2. Where the compressive strength is suspect, the Engineer will remove a sample of the material that has been placed by the Contractor at the specified density and perform a particle gradation, the results of which will be compared to previous production test results (approved baseline values). If the results of this test indicate higher passing values for any given screen exceeding 10% of the baseline, the material may be considered noncompliant.
- D. Gradation

The following values are provided as guidance in generating the performance criteria established above. Minor variations in locally or regionally available aggregate products may require deviation from the table below. Upon proof of compliance with fracture, durability, and infiltration at density, a production particle gradation may be approved as the baseline for future testing.

Typical Base Course Permeable Aggregate particle size range:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
3/4"	100
1/2"	90 - 100
3/8"	70 - 90
No. 4	30 - 60
No. 8	20 - 40
No. 30	5 - 15
No. 100	2 - 5
No. 200 (Wet Sieve)	0 - 3.0
No. 270 (Wet Sieve)	0 - 1.5

2.04 TESTING

- A. The Owner will be performing testing of materials delivered to the job site for the purpose of verifying compliance with the contract documents. The Owner's testing is for this purpose only and not for construction quality control by the Contractor.
- B. The Contractor shall coordinate directly with the Owner's testing firm relative to the delivery schedules of the imported materials. Sampling will be scheduled each day deliveries occur.
- C. The Contractor shall provide testing and surveillance as required to assure materials and work fully comply with contract requirements.
- D. The Contractor at a price equal to the Owner's contract testing agreement shall pay for owner's tests that do not meet specifications. The Contractor shall pay directly to the testing organization upon invoice to the owner, which has been approved by the Engineer.

2.05 RECYCLED PLASTIC EDGE ANCHOR

- A. Includes all materials required to provide a secure recycled plastic edge for establishment of Permeable Aggregate grade and anchoring of synthetic turf.
- B. A recycled plastic lumber nailer board shall be installed per the details to secure the turf. Product shall be manufactured from 100% recycled materials, consisting of HDPE Plastic Lumber. Material should be dimensional lumber in lengths no shorter than 6'.
 - 1. Where attachment is scheduled to concrete curbing, provide minimum 2"x4" nominal dimensional lumber.
- C. Manufacturer's reference: Product is available from RESCO Plastics, Inc., Coos Bay, Oregon. (800) 266-5097.
- D. Concrete Anchoring: Concrete wedge anchor, zinc plated, 3/8" x5" length, partially threaded, with zinc plated washer and nut.
- E. Steel power-load driven or ram-set Concrete Anchor Nail, minimum shank diameter 5/32", minimum head/washer diameter 3/8", sufficient length to insure a minimum 2" embedment. Individual anchors shall develop a minimum 450 lb shear, 350 lb tension in 4,000 psi concrete at 2" embedment.

PART 3 – EXECUTION

3.01 SUBGRADE ESTABLISHMENT

- A. No work shall be performed in this section until subgrade is 100% completed and accepted by the Engineer.
- B. Finish subgrade shall be compacted to a minimum 95% maximum dry density.
- C. Subgrade shall be established to within the tolerance of +0.00' or -0.10' of the design subgrade elevation.

3.02 STRUCTURAL SOIL-BEARING FABRIC INSTALLATION

- A. No loose material is allowed on subgrade prior to placement of structural fabric. Loose material is to be removed prior to placement.
- B. Fabric to be laid on smooth, compacted, subgrade surface between drainage trenches.
- C. Subgrade shall be approved by the Engineer prior to placement of structural-bearing fabric.
- D. Structural fabric must be flat on stabilized subgrade for full width.
- E. Dimensions to be a minimum width of 12.5' and minimum continuous length of 150 lf.
- F. When the length of the fabric is not continuous, the lateral seam shall have a minimum overlap of 24".
- G. Fabric shall not be folded or turned up along the edges.
- H. The fabric shall be field cut as necessary to meet specified tolerances of distance from drainage trenches.
- I. Fabric shall be placed between trenches. In no instance shall fabric cover trench, lie against aggregate or pea gravel backfill, or extend vertically above subgrade.
- J. Stabilization: Immediately upon laying, the fabric is to be covered with base aggregate. No loaded trucks are to be permitted to move over fabric-covered surfaces until a minimum of 8" of aggregate has been placed, except if specifically approved by the Engineer, who will require strict, direct - 100% - control of all vehicle movement on site.

3.03 EQUIPMENT MOVEMENT

- A. No trucks or equipment will be allowed to drive over the top of the field subsurface drainage piping, whether lateral piping or collector piping. Following placement of a minimum of 8" depth of reservoir aggregate.
- B. In the event non-track traffic is observed or evidenced to cross trenches, the Contractor shall, at their own expense, expose the drainpipe in the area directed for observation by the Engineer and repair any damage promptly.

3.04 AGGREGATE PLACEMENT

- A. Moisture Content: Aggregate to contain 3.5% to 4.0% moisture content to ensure that fines do not migrate and to facilitate proper compaction. Contractor must ensure that aggregate

leaving the source plant meets this requirement and is required to apply water to aggregate on site to attain and maintain this minimum moisture content in stockpile and during all placement operations.

- B. Prior to aggregate placement, remove any excess or contaminated backfill from the subsurface drainage trenches.
- C. Surface must be free of standing water and subgrade stabilized with structural fabric in place prior to placement.
- D. Materials to be placed in layers not exceeding 6" bulk and 4-1/2" compacted in depth. Each layer must be spread uniformly with equipment that will not cause perceptible separation in gradation (segregation), preferably a self-propelled paving machine.
- E. Should there occur during any stage of the spreading or stockpiling a separation of the material particles, the Contractor must immediately remove and dispose of segregated material and correct or change handling procedures to prevent any further separation.

3.05 AGGREGATE COMPACTION

- A. Each layer shall be compacted to a minimum density of not less than 95% of maximum dry density as determined by ASTM D698 and measured using a nuclear method.
- B. Use Static Tandem Drum-type roller of not less than five tons weight.

3.06 AGGREGATE TOLERANCES

- A. The Contractor shall utilize a laser plane system for grade control.
- B. The surface of the base course permeable aggregate in areas to be covered with top course aggregate as applicable shall not deviate from designated compacted grade within the range of -0.50" and +0.00".
- C. The surface of the top course permeable aggregate shall not deviate from designated compacted grade with the range of -0.00" and +0.25".
- D. Upon completion of the fine grading, compaction, and Contractor confirmation of conformance with the tolerances, the Contractor shall notify the Engineer and schedule an inspection for approval. The Contractor shall have a laser plane system available to the Engineer for the inspections. The Contractor shall not be authorized to place synthetic turf over the permeable aggregate until it has been inspected and approved by the Engineer.
- E. Upon completion of elevation verification, the entire permeable aggregate surface shall be inspected for planarity. Planarity inspection shall be completed in conjunction, coordination with the synthetic turf vendor. The installation foreman for the synthetic turf shall be present at the time of the inspection. Inspection shall consist of stretching a stringline taut over the finished permeable aggregate surface at such interval as may be required to confirm surface planarity and acceptance for installation of synthetic turf surface. Any deviation greater than 1/4" shall require remediation efforts as may be required to meet subgrade tolerance.

3.07 RECYCLED PLASTIC EDGE ANCHOR

- A. Prior to proceeding with Edge Anchor installation, confirm with the Engineer the final elevation for installation relative to adjacent surfaces.
- B. The Edge Anchor may be temporarily set with temporary hardware to establish the proper line and grade. This temporary hardware may remain after final installation.

1. Wedge Anchor
 - a. The Plastic Edge Anchor may be temporarily set with power-loads to establish the proper line and grade. This temporary hardware may remain after final installation.
 - b. Once the initial line and grade has been established, pre-drill the edge anchor and establish a void in the adjacent concrete surface that meets the approved anchor supplier's requirements for proper securing of the anchor.
 - c. Minimum requirements for anchor installation:
 - 1). Depth of Embedment: 3" or as recommended by the anchor supplier, whichever is greater.
 - 2). Horizontal Spacing: no greater than 36" on center and 12" from end of any length of lumber.
 - 3). Nut Torque: Per approved manufacturer's recommendation.
 - 4). Do not trim bolt ends. Bolts with trimmed or damaged ends will be rejected and must be removed.

2. Concrete Anchor Nail
 - a. The Plastic Edge Anchor may be temporarily set with power-loads placed at the Contractors option to assist in establishing the proper line and grade. This temporary hardware may remain after final installation.
 - b. Once the initial line and grade has been established, install the specified ram-set or power-load driven Concrete Anchoring Nails in manner consistent with the approved manufacturers printed instruction and the specified spacing.
 - c. Minimum requirements for Concrete Anchor Nail installation:
 - 1). Depth of Embedment: 2" or as recommended by the anchor supplier, whichever is greater.
 - 2). Horizontal Spacing: no greater than 21" on center and 6" from end of any length of lumber.
 - 3). Stagger the spacing of each Anchor up and down within the middle one-half the face of the Recycled Edge Anchor.

END OF SECTION

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