

**City of Oakley**  
**ADDENDUM NO. 3 to contract documents for**  
**OAKLEY RECREATION CENTER PROJECT**  
**CIP # 194**

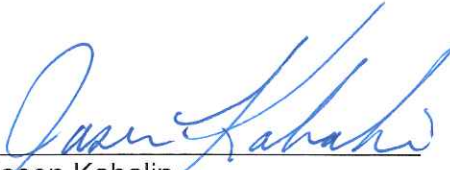
**BID OPENING DATE: February 1, 2018 at 2:00pm**

Notice is hereby given that the following clarifications and revisions are made to the above referenced contract documents:

**Table of Contents:**

- Bid Walk Questions
- RFI Answers from Bidders
- Approved Equal Manufacturer/Product Requests
- Unit Price Schedule & Schedule of Values- **To be used for Bid Submittal on Feb. 1, 2018**
- Updates to Specifications, Fire Manual & Plans

All bidders shall acknowledge receipt and acceptance of Addendum No. 3 by signing in the space provided at the end of this Addendum and submitting the signed addendum with their proposal.

  
\_\_\_\_\_  
Jason Kabalin  
Associate Engineer  
January 23, 2018

\_\_\_\_\_  
Contractor Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Company Name

## **Bid Walk Questions:**

Q – Are there any Pre Qualifications required for this project?

A: No pre qualifications are required for the project.

Q – Are there any specific labor requirements for this project

A: No specific labor type is required for the project (i.e. union, non-union)

Q – What are the hours of work? Are Saturdays allowed?

A: Work Hours: M-F 7:30 AM to 5:30 PM. Saturday allowed with notifications, 8AM to 5PM

Q: Is the proposed sod netted?

A: no, the proposed sod is non-netted. (note that this has been addressed in Addendum No.2).

Q - What are School hours?

A:The school hours and days schedule is attached

Q - Are bid units field measure or actual quantities?

A – Bid units are actual quantities. Note that addendum will revise to one lump sum with schedule of values.

Q - Entrance shared?

A - Yes with school. Entrance is congested 8 to 8:30 & 3:00 with some minimum days. Some site work will require shutting down this entrance, but that work shall be performed during school breaks for summer, etc.

Q - Main waterline is non-potable. Will this require purple piping / boxes?

A -Purple pipe is not required for the non-potable well irrigation water. Boxes will be black.

Q - Will the Contractor be required to pull building permits?

A - The building permit has been obtained by the City but deferred submittal items will be required to be pulled by the Contractor. The city will be responsible for any fees associated with permitting.

Q - is an encroachment permit required?

A - No.

Q - Will temporary power be available?

A :Yes

Q - What is the desired construction duration?

A - One year to be completed in Spring or Summer 2019.

Q - Is construction water available?

A - Ironhouse Sanitary provide free non-potable water available for pickup. If onsite water is required, arrangements will need to be made with Diablo Water District.

Q - Has a designated lay-down (staging) area been determined?

A - No. Location to be determined by the Contractor.

Q - Will existing buildings be in use during construction?

A - Yes, but only for storage.

Q - How will site be delivered to Contractor?

A - Site will be delivered as it currently exists. North portable building will be removed prior to construction start. Intersection project work will be ongoing during construction.

Q - What is the depth of the water connection?

A - Depth is unknown. Need pothole to determine the depth.

**RFI's Answers from Bidders: (Combining RFI1 issued by Brightview, RFI 2 issued by Brightview, and RFI 3 issued by GoodLand, RFI 6,7,8,9, 10 by SW Allen Con., RFI 2, 3 from Diede Construction)**

1. **Question** Sheet L6.6 Irrigation Legend and Notes: Legend specifies mainline to be sch. 40 Purple pipe. Lateral line is not specifying Purple pipe. The turf rotors, pop-ups, remote control valves, etc. on the legend are not specifying non-potable components. The specifications (see 32 84 00 2.2 A. & B.) is not specifying Purple pipe. Is this project to be installed as a non-potable system?

**Answer: The project does not require installing purple pipe. See updated legend in sheet L6.6.**

2. **Question** Sheet L1.3 Planting Notes: Plant List specifies sod lawn with biodegradable mesh netting. Referencing the specifications (see 32 90 00 - 10 2.6) here it notes sod is to be non-netted. Please provide further clarification of sod requirements.

**Answer: Sod specie has been updated per the specs in Addendum 2 drawing and it will be the non-netted type.**

3. **Question** Sheet L1.3 Planting Notes: As mentioned in these planting notes (see Acces-sories Note 4) a 3" depth of washed pea gravel is specified to be installed within stormwater planter areas. However, upon cross-referencing the Civil Details (see Detail 2 Sheet C9.9) no pea gravel covering is shown over the bio-retention soil mix. Is pea gravel required to be installed?

**Answer: Yes, pea gravel is required to be installed in the storm water treatment zones.**

4. **Question** Sheet L5.1 Construction Details - Planting: The City of Oakley tree and shrub planting details note that the plant pits are to be excavated at two times the rootball diameter. Upon referencing the specifications (see 32 90 00 - 15 3.7 B.) here is specifying wider and deeper excavated plant pits. Which takes precedence the city details or the specifications  
**Answer: City standard detail shown in detail 1/L5.1 takes precedence**
5. **Question** "I'm putting together a bid for the masonry on the Oakley Recreation Center project, and I've found a conflict on the drawings. Detail 6/L5.2 shows Wall (E) and it is labeled as a "concrete retaining wall", but there is a also label that calls for 8x8x16 CMU block. Sheet L1.2 indicates that Wall (E) is concrete. Is this wall concrete or CMU?"  
**Answer: Wall-E detail have been updated in Addendum 2 drawing sets as the CMU block walls**
6. **Question** David F. O'Keefe Company no longer represents the Backstop and Bleacher products specified in the landscape plans.  
**Answer: Please contact the new rep for any PW Ballfield furnishing.**  
**Jeff Whitman**  
**Email: [Jeffwhitman@sbcglobal.net](mailto:Jeffwhitman@sbcglobal.net)**  
**Office #: 925 -984 2075**  
**<http://www.norcaloutdoorsupplyco.com/contact-us.html>**
7. **Question** Sheet C-3.0 indicates to "Remove Existing Asphalt". Please specify a depth of the asphalt for bidding purposes.  
**Answer: The depth of asphalt to be removed is specified in the legend.**
8. **Question** Sheet C-3.0, Note 16 "Remove Storm Drain Line". What shall be the assumed size, pipe material, and depth of the SD to be removed.  
**Answer: The size, pipe material and depth of the SD to be removed is specified under note 16.**
9. **Question** Under which line item are the structural equipment pads at the North and South ends of the building to be included in the unit pricing?  
**Answer: The top two bidders shall provide a schedule of values for the equipment pads as part of the Building Schedule of Values**
10. **Question** Please confirm the responsibilities of the SWPPP fee's and filiting with regard to filing with SMARTS, the NOI, the NOT, the WDID, and the annual SWPPP Fee's.  
**Answer: The responsibilities of the SWPPP are included in specification section 01 57 23 Temporary Storm Water Pollution Control.**

**11. Question Wall type B2 on A9.1 calls for High Impact. Is that going to be on both sides or just a single side?**

**Answer: The High Impact Gyp will be on both sides for Wall Type B2.**

**12. Question Wall type B4 calls for Acoustically Enhanced Board and High Impact board. Will we install an Acoustic Board and High Impact on both sides of the wall? Or will one side receive Acoustic Board and the other side receive High Impact board?**

**Answer: One side will receive High Impact Gyp, the other side will receive Acoustically Enhanced Gyp. Board.**

**13. Question 6/A8.5 shows a 2 hour rated shaft into the roof. No 2 hour walls are called out on the Partition Schedule. Where does this take place?**

**Answer: 2 hr shaft has been changed to a 1 hr shaft per Addendum 3. See accompanied revision. Shaft construction is glass mat gyp. over 2-1/2" CH Metal Stud over 1" gyp. shaft liner panel. The Kitchen hood exhaust shaft is the only location for this construction.**

**14. Question Details 1,2/A8.8 shows metal framed at wood framing. Is this correct? If so where does it take place?**

**Answer: The only locations for metal stud framing is for the kitchen hood exhaust shaft and the framing for the mechanical soffit along each side of Great Room 102 between gridlines 4 and 10. There is additional metal framing supporting the ceilings.**

**15. Question For the fire protection system, will there be a VESDA detection network?**

**Answer: No, there will be no VESDA system on this project.**

**16. Question There are some discrepancies between the plans and the specs for TPO Roof Section 075423. The plans show Vapor Barrier (No type specified. Peel & Stick or Polyethylene?), Layer of 2" Rigid Insulation, 1/4" Roof Board, & 60 mil TPO Membrane. The specs show Section 2.4 Vapor Retarder 6 mil Visqueen but section 3.5 calls for a self-adhering sheet vapor retarded, both of these are different products and are priced very differently. It also mentions for the TPO membrane a 60 mil TPO, but then section 2.2 mentions a fabric backed TPO which is typically a fleecback membrane which would be 115mil. Can you please clarify which is the type wanted, fleecback or normal TPO? Also, section 3.4 mentions a substrate board but it is not called out what type/thickness it is? However, the plans don't show a substrate board. Please clarify which system we are to follow. The plans or the specs**

**Answer: Spec has been revised to reflect a mechanically fastened, smooth backed 60mil TPO over 1/4" Roof protection board over 2" rigid polyiso insulation over fully adhered vapor retarder over structure.**

17. Question On the lighting schedule fixture LL1 Is listed as “ED(1%)” which would be integral dimming and “0-10V 1% Dimming.” According to LSI (the manufacturer), this is contradictory. Can you please verify which option is required for this project?

Answer: Please request that the manufacturer provide 0-10V dimming with 100% to <1% dimming range using eldoLED SOLOdrive integral canopy mounted power supply.

18. Question On the fixture schedule, fixture type LR1 has up lights and down lights. Can you provide total wattage for each driver (Uplight and downlight)?

Answer: Type LR1 is specified with a total wattage of 227 watts with a 60% downlight and 40% uplight distribution. Separate power supply wattages are not listed on the product data. However, wattage is typically linearly related to distribution. Therefore, downlight wattage should be approximately 136 watts and uplight wattage should be approximately 91 watts. The lighting control system manufacturer should verify this with the luminaire manufacture

**Approved Equal Manufacturer/Product Requests: (Substitutions must match all characteristics layed out in specifications)**

1. 09 54 26: Suspended Wood Ceiling and Mounted Wall Panels  
2.1C: ACGI Linear Open Series 1 solid wood plank is accepted as an approved equal
2. 09 67 23 Resinous Flooring  
2.3A-1 APF Epoxy CastorCrete SL-B is accepted as an approved equal
3. 07 41 13: Standing Seam Metal Roof Panels  
2.2B-1a: Morin Metal Roofs SLR-16 is accepted as an approved equal
4. 28 31 00: Fire Alarm System  
2.1C: Mircom FX-2003-6DS fire alarm control panel is accepted as an approved equal
5. 08 42 29: Sliding Automatic Entrances  
2.3 Tucker Entra-Slide SL10 accepted as an approved equal

## **Updates to the Plans and Specifications pages:**

### **Fire Manual:**

1. Correction Made to remote area 1

### **Specs:**

#### **Part I:**

1. See attached revised Specification Part I - Bid Proposal - Section A - Unit Price Schedule.
2. See attached revised Specification Part I – Site Schedule of Values
3. The terms set forth herein supersede any and all contrary terms in Exhibit A Insurance Requirements attached hereto. The insurance requirements for all General Contractors shall have a \$5M and for all Sub-Contractors a \$1M limit.

#### **Part II:**

1. Section 4, Scope of Work updated

#### **Part III:**

<b>Section</b>	<b>Title</b>	<b>Changes</b>
01 10 00	Summary	Updated address of Siegel & Strain (1.2)
01 33 00	Submittals	Required documentation of compliance with VOC limits required by CALGreen (1.6)
06 10 53	Miscellaneous Rough Carpentry	Added platform subfloor/underlayment here, and provided more detailed treatment of platform framing.
06 16 13	Insulating Sheathing	Added requirement that insulated sheathing products be free of halogenated flame retardants and specified GAF Energy Guard NH or approved equal
06 20 23	Interior Finish Carpentry	Deleted all references to platform here because it is finished and framed in other Sections.
07 14 16	Cold-Fluid-Applied Waterproofing	Deleted above-grade waterproofing and molded drainage panels specification. Deleted requirements for flood testing. Added requirement to allow adequate time for curing.

07 25 00	Weather Barriers	Changed building wrap with integral drainage matrix from Benjamin Obdyke Slicker HP to Slicker Max Rainscreen (2.1.B) and changed specs to match new product.
07 41 13	Standing-Seam Metal Roof Panels	Modified minimum slope requirements to allow for design slope of 1/4 inch per 1 foot under designated conditions. (2.2.7.a) Named GAF EnergyGuard NH for preformed roof insulation boards. (2.4.a) Divided gutters section into exterior eave gutter and architectural gutter (2.6.D) Included installation of underlayment at integral gutter (3.3.a.1.g)
07 54 23	Thermoplastic Polyolefin (TPO) Roofing	Made changes required to change from an adhered to a mechanical installation of TPO roof membrane. Implemented noted specifications: GAF; EverGuard 60, smooth not fabric backed, mechanically fastened not fully adhered. Fully adhered vapor retarder not visqueen. ¼" roof protection board. 2" rigid GAF EnergyGuard NH polyiso insulation
08 71 00	Door Hardware	Door Bottom on Hardware group 14 revised to ZER 3551
09 22 16	Non-Structural Metal Framing	Deleted references to specific Drawing sheets (2.2.C)
09 24 00	Cement Plastering	Deleted paper-backed lath (2.1.B)
09 54 26	Suspended Wood Ceilings	Made changes required to change product from a Armstrong; Woodworks Linear Veneered Plank to Solid Wood Plank. Needed a different suspension system than the one named, so changed that also.
09 64 00	Wood Flooring	Made changes required for product change, Action Floor Systems, LLC: Action AnchorFlex LP instead of AnchorFlex (not LP). Biggest difference is thickness and continuous resilient underlayment instead of channels. Added cross-references to 06 10 53 to clarify where to find platform subfloor/underlayment for engineered wood flooring (1.1.B, 2.5.A).
09 67 23	Resinous Flooring	Distinguished where quartz broadcast should be included in system: Tek-Crete SL CQ at restrooms, and where it shouldn't: Tek-Crete SL CP system at kitchen (2.3 A and E)
10 14 23	Panel Signage	Corrected Section references in Sustainable Design Submittals requirement (1.4.B).



10 28 00	Toilet, Bath, and Laundry Accessories	Deleted drinking fountain railing (2.3) and diaper changing table (2.2 A.9)
10 71 00	Sunshades and Screens	Added window surrounds to Summary (1.1.A.1). Changed specification of perforated metal sheet (2.1.B). Delineated that steel panels are used at sunshades and screens, and that aluminum panels are used at window surrounds (2.1.B, 2.a and 3.a).
211313	Wet Pipe Sprinkler System	Added fire protection specs section
31 10 00	Site Preparation	Modified and reissued
32 16 00	Curbs, Gutters, Sidewalks and Driveways	Section Removed from Project
32 13 16	Decorative Concrete	Modified and reissued

**Drawing Set:**

**Civil:**

C2.0

1. The location of the relocated building and the existing AC pad is identified with spot elevations.
2. The existing conduit and electrical/signal boxes for the offsite intersection design is shown on all sheets.
3. Existing catch basin outfall invert elevation raised from 34.80 to 35.19.

C3.0

1. Site demolition notes 20 through 30 have been added.
2. Demo concrete hatch is added to the existing driveway that will be reconstructed for the service yard entrance. Demo concrete hatch also added to the existing walkway at the North West corner of the site near the main entrance.
3. Depth of asphalt to be removed is specified in the legend.
4. The size, pipe material and depth of the existing storm drain pipe to be removed is specified under note 16.
5. Note added: "to remove the existing metal pole and foundation" in front of the existing portable building to remain.

C4.0

1. Grease interceptor added in accordance with the Iron House Sanitary District approved material list.
2. Sanitary Sewer Cleanouts or manholes are spaced out no more than 100 feet apart.
3. SDR 26 added to all sanitary sewer lines
4. Site utility notes added.
5. The tie-in invert elevation of the 18" storm drain line changed to match the existing catch basin outfall.

6. The outfall invert elevation for the new drain inlet located at the North West corner of the site was raised from 35.07 to 35.46.
7. A storm drain inlet is added in the middle of the service yard.
8. Area drains added to landscape areas
9. Rim elevations added to bubble up structures.
10. Site lighting and electrical conduit shown for coordination purposes.

C4.1

1. The rim elevations of the drain inlets changed.

C5.0

1. Rim elevations added to manholes and drain inlets.
2. Grading of the service yard changed
3. Top of wall and curb elevations changed around the trash enclosure and electrical equipment.
4. Grading notes added.

C5.1

1. Rim elevations added to drain inlets.
2. Grading of the field changed.

C5.2

1. Scale added to all viewports

C5.3

1. Sheet C5.3 is a new sheet that includes sections and an enlarged view for the grading of the ADA parking stalls and of the landscaped self-retaining area on the west side of the building.

C6.0

1. Limits of new paving changed.
2. Box-out concrete and install enviroplex with ada grate around the existing building vents

C6.1

1. Crosswalk striping added at the entrance to the adjacent school.

C7.0

1. Storm drain inlet protection added.

C8.0

1. Line and Curve tables for the horizontal control plan have been updated.
2. Survey Notes added

C9.2

1. Note 1 on detail 7 changed

C9.4

1. Detail 4 and 5 changed

C9.11

1. Grease interceptor details 5 and 6 have been added.

C9.12

1. Sheet C9.12 is a new sheet.

### **Landscape:**

L2.1

1. A note for GSM flashing has been updated.
2. Lighting fixture locations has been updated per the electrical plan

L2.3

3. Lighting fixture locations has been updated per the electrical plan

L5.2

4. Detail 4 is renamed as 'Stairs and Handrail' instead of Wall- (C)

L6.1

5. Irrigation changes due to the changes of east side concrete mow band along the ballfield and the well location.

L6.6

6. In the irrigation legend, it has been changed to standard pipes for the mainline.
7. Note #14 is revised.

### **Architecture:**

A2.1

1. Center Wall in Kitchen 107 goes to bottom of ceiling.

6/A8.5:

1. Previous 2hr shaft wall revised to 1hr shaft wall with metal CH studs.

### **Mechanical:**

M2.0

1. Added grease shaft and references to architectural details on drawings per city comments.

M3.0

1. Updated architectural section base to reflect the changes in grease duct enclosure.

## **Plumbing:**

- P0.1
  - 1. Sheet Index and code list updated
- P0.2
  - 1. Floor Cleanout Detail 5 revised
- P0.4
  - 1. Sheet added
- P2.0
  - 1. Re-routed grease waste line to connect to Civil stub outside building.
  - 2. Removed Grease Interceptor from plumbing scope.
  - 3. Added (2) floor drains p-traps/vent piping and trap primer piping.
  - 4. Relocated (2) 3" SD piping near grid line 1/B.5 and 11/D.
  - 5. Added 3/4" HW&CW lines to connect to Civil stubs.
  - 6. Relocated Fire Water to near grid line 1/B.5.
- P2.1
  - 1. Relocated 3" SD piping near grid line 1/B.5.
  - 2. Added 3/4" HW&CW lines.
  - 3. Relocated connection to trap primer to standpipe near grid line 1/B.5.
  - 4. Re-routed 2" V from DF-1 to vent directly outside.
  - 5. Added GCO to backwater valves.
- P2.2
  - 1. Relocated cold water and gas piping to Make-up air Unit location.
  - 2. Relocated grease and waste vent penetrations and added note for vent penetration.
- P3.1
  - 1. Added (2) floor drains.
  - 2. Relocated gas, waste and cold water piping for Make-up air Unit relocation.
  - 3. Added 3/4" HW&CW lines.
  - 4. Added (N) grease vent lines for (N) floor drains.
  - 5. Relocated and added floor cleanouts. Relocated grease and waste vent thru roof.

## **Fire-Protection:**

- FP2.2
  - 1. Added 6 fire sprinkler heads to space next to Mech. Rm 201
  - 2. Upsized branch line size to 1-1/2" to accommodate extra heads
- FP4.1
  - 1. Updated fire protection section

# OAKLEY RECREATION CENTER PROJECT, CIP No. 194

**Part I**

**Bid Proposal**

**A. UNIT PRICE SCHEDULE**

The undersigned, Pursuant to and in compliance with your Notice to Contractors and the Contract Documents relating to the **OAKLEY RECREATION CENTER PROJECT**, including Addenda No. 1, 2, and 3 as Bidder, declares that the only persons or parties interested in this proposal as principals are those named herein; that this proposal is made without collusion with any other person, firm, or corporation; that he has carefully examined the location of the proposed work, the annexed proposed form of contract, and the plans therein referred to; and he proposes and agrees if this proposal is accepted that he will contract with the City of Oakley in the form of the scope of the contract annexed hereto, to provide all necessary machinery, tools, apparatus, and other means of construction, and to do all the work and furnish all the materials specified in the contract, in the manner and time therein prescribed, and according to the requirements of the Engineer as therein set forth, and that he will take in full payment therefore the following item prices, to wit:

**BID ITEMS**

ITEM NO.	SPEC SECTION	DESCRIPTION OF ITEM	EST. QTY	UNIT OF MEASURE	UNIT PRICE	TOTAL
1	Division 02-33	Construct Oakley Recreation Center Project Complete	1	LS		

The top two bidders, as selected by the City, shall provide a Total Sum breakdown by 2:00 pm on Feb 5, 2018 as follows:

- Provide a breakdown for the site work per the Site Schedule of Values list attached.
- Provide a Building Schedule of Values for divisions 03 to 28 as specified in Section 01 29 00 "Payment Procedures".

Both the Site Schedule of Values and Building Schedule of Values shall equal the Total Bid Lump Sum Bid.

**Total Bid \$ \_\_\_\_\_**  
**(Numbers)**

**Dollars**

**(Written)**

Pursuant to the Public Contract Code § 20103.8c the lowest bid shall be “the lowest total of the bid prices on the base contract and those additive or deductive items that when taken in order from a specifically identified list of those items in the solicitation, and added to, or subtracted from, the base contract, are less than, or equal to, a funding amount publicly disclosed by the local agency before the first bid is opened.” In this case, the funding amount publically disclosed is the Engineer’s Estimate, which totals \$6,500,000.

# OAKLEY RECREATION CENTER PROJECT, CIP No. 194

## SITE SCHEDULE OF VALUES

***Note, per Revised Part I, Bid Proposal, A. UNIT PRICE SCHEDULE, the Site Schedule of Values list is to only be completed by the top two bidders as selected by the City.***

ITEM NO.	SPEC SECTION	DESCRIPTION OF ITEM	EST. QTY	UNIT OF MEASURE	UNIT PRICE	TOTAL
1	01 55 26	Mobilization	1	LS		
2	01 25 26	Traffic Control, Construction Signage, Pedestrian Safety	1	LS		
3	02 40 00	Demo Asphalt Concrete Pavement and Aggregate Base to Subgrade	18,570	SF		
4	02 40 00	Demo Portland Cement Concrete, Aggregate Base to Subgrade	935	SF		
5	02 40 00	Demo Building Concrete Pad	1	EA		
6	02 40 00	Demo Wood Trellis Concrete Footings	10	EA		
7	31 10 00	Clear and Grub	111,000	SF		
8	31 10 00	Rough Grading	145,000	SF		
9	31 10 00	Tree Removal	1	LS		
10	32 11 00	Class II Aggregate Base For Temporary Path	1,350	SF		
11	32 12 00	Asphalt Concrete (Type A)	47,920	SF		
12	32 13 16	Concrete Sidewalk	24,090	SF		
13	32 13 16	Concrete Vehicular Pavement	1,385	SF		
14	32 13 16	City Standard Vertical Concrete Curb Adjacent to Hardscaped Areas	255	LF		
15	32 13 16	Deepened Vertical Concrete Curbs Adjacent to Landscaped Areas	1,520	LF		
16	32 13 16	Deepened Vertical Concrete Curb and Gutter	510	LF		
17	32 13 16	Curb Ramp With Truncated Domes	4	EA		
18	32 13 16	Jensen Precast Concrete Wheel Stop Model S-48	4	EA		

ITEM NO.	SPEC SECTION	DESCRIPTION OF ITEM	EST. QTY	UNIT OF MEASURE	UNIT PRICE	TOTAL
19	32 13 16	Truncated Domes	1	LS		
20	32 17 23	Signing and Striping	1	LS		
21	33 40 00	4" PVC Storm Drain Pipe	310	LF		
22	33 40 00	6" PVC Storm Drain Pipe	375	LF		
23	33 40 00	8" PVC Storm Drain Pipe	321	LF		
24	33 40 00	12" PVC Storm Drain Pipe	370	LF		
25	33 40 00	15" PVC Storm Drain Pipe	135	LF		
26	33 40 00	18" PVC Storm Drain Pipe	195	LF		
27	33 40 00	4" PVC Perforated Pipe	530	LF		
28	33 40 00	6" PVC Perforated Pipe	420	LF		
29	33 40 00	Storm Drain Cleanouts	20	EA		
30	33 40 00	12" x 12" Catch Basins	9	EA		
31	33 40 00	18" x 18" Catch Basins	4	EA		
32	33 40 00	24" x 24" Catch Basins	4	EA		
33	33 40 00	Area Drains	13	EA		
34	33 40 00	Bioretention Areas	Allow	LS		
35	33 40 00	Stormwater Pollution Prevention Plan	1	LS		
36	33 30 00	4" Sanitary Sewer PVC Pipe	136	LF		
37	33 30 00	6" Sanitary Sewer PVC Pipe	220	LF		
38	33 30 00	8" Sanitary Sewer PVC Pipe	185	LF		
39	33 30 00	Sanitary Sewer Manholes	2	EA		
40	33 30 00	Sanitary Sewer Cleanouts	3	EA		
41	33 10 00	5/8" Domestic Water Copper Pipe	32	LF		
42	33 10 00	2" Domestic Water Copper Pipe	20	LF		
43	33 10 00	2.5" Domestic Water Copper Pipe	160	LF		
44	33 10 00	1" Domestic Water Polyethylene Pipe	295	LF		
45	33 10 00	4 " Domestic Water PVC Pipe	290	LF		
46	33 10 00	4" Fire Water PVC Pipe	212	LF		
47	33 10 00	6" Fire Water PVC Pipe	30	LF		
48	33 10 00	8" Fire Water PVC Pipe	315	LF		
49	33 10 00	Water Valves	9	EA		

ITEM NO.	SPEC SECTION	DESCRIPTION OF ITEM	EST. QTY	UNIT OF MEASURE	UNIT PRICE	TOTAL
50	33 10 00	1-1/2" Sensus Omni C2 Water Meter	1	EA		
51	33 10 00	4" Domestic Water Backflow Preventer	1	EA		
52	33 10 00	8" Fire Water Backflow Preventer	1	EA		
53	33 10 00	Fire Hydrants	1	EA		
54	33 10 00	Fire Department Connections	1	EA		
55	33 10 00	Post Indicator Valve	1	EA		
56	26 56 01	Site Lighting	1	LS		
57	26 27 00	Site Electrical - Trench/conduit for (6) EV Charging Stations	1	LS		
58	32 13 16	Wall- (A)	52	LF		
59	32 13 16	Wall- (B)	32	LF		
60	03 30 32	Stairs and Handrail	1	LS		
61	32 13 16	Wall- (D)	177	LF		
62	32 13 16	Wall- (E)	95	LF		
63	05 52 14	Fence- (A) (42" Cable Fence)	103	LF		
64	32 31 16	Fence- (B) (78" Fence)	113	LF		
65	32 31 13	Fence- (C) (8' H Chain link Fence)	89	LF		
66	32 31 13	Fence- (D) (4'H Chain link Fence)	229	LF		
67	32 31 13	Fence- (E) (9'H Chain link Fence)	80	LF		
68	05 70 00	Gate- (A) (Metal Panel Double Gates)	3	EA		
69	32 31 16	Gate- (B) (Double Swing Gate)	1	EA		
70	32 13 16	12" Concrete Mow Band	896	LF		
71	32 90 00	Redwood Header	107	LF		
72	12 93 00	Concrete Seat pads	14	EA		
73	12 93 00	Concrete Bench	8	EA		
74	12 93 00	Trash & Recycling Receptacle	3	EA		
75	12 93 00	Bollards	13	EA		
76	12 93 00	Backstop	1	LS		
77	12 93 00	Dugout	2	EA		
78	12 93 00	Bleacher	2	EA		
79	12 93 00	Players Bench	4	EA		



ITEM NO.	SPEC SECTION	DESCRIPTION OF ITEM	EST. QTY	UNIT OF MEASURE	UNIT PRICE	TOTAL
80	12 93 00	Drinking Fountain	1	EA		
81	12 93 00	Bike Rack	3	EA		
82	12 93 00	Entry Sign	1	EA		
83	12 93 00	Parking sign	1	EA		
84	32 32 19	Trash Enclosure	1	LS		
85	32 90 00	24" Box Trees	69	EA		
86	32 90 00	15 Gal Trees	73	EA		
87	32 90 00	Shrub and groundcover planting	29,779	SF		
88	32 92 13	Hydroseed	20,451	SF		
89	32 90 00	Sodded Turf	75,265	SF		
90	32 90 00	Bark Mulch along perimeter of the ballfield	27,500	SF		
91	32 84 00	Irrigation	1	LS		
92	31 10 00	Earthwork Off-haul	200	CY		

**Total Site Schedule of Values (Items 1-92) \$ \_\_\_\_\_**

## **Section 4**

# **SCOPE OF WORK**

### **4-1.01 LOCATION OF WORK**

The City reserves the right to add or delete from quantities of work during the project and to add or delete locations as defined in Section 9-1.01 of these Specifications. Locations of work for this project are set out in *Plans & Specifications*, Part II and incorporated herein.

### **4-1.02 CHANGES TO THE WORK**

The bidder's attention is directed to the provisions of Section 4 of the Standard Specifications and the following modifications, all of which are applicable to this Contract:

- A. Owner, without invalidating the Contract, may order additions to or deductions from the Work, the Contract Sum being adjusted accordingly. Any claim for extension of time cause thereby shall be adjusted at the time of ordering such change. See Section 9-1.01A of these Specifications regarding measurement and payment for increased or decreased quantities.
- B. Any alteration or alterations made in the *Plans & Specifications* which are a part of this Contract, or any provision of this Contract shall not operate to release any surety or sureties from liability on any bond or bonds attached hereto and made a part hereof, and consent to make such alterations is hereby given, and the sureties to said bonds hereby waive the provisions of Civil Code §2819.
- C. In giving instructions, the Engineer shall have authority to issue written change orders. Except in an emergency endangering life and property, no extra work or change shall be made unless in pursuance of such written order and no claim for an addition to the Contract Sum shall be valid unless the additional work was so ordered.
- D. Prior to any Work being done, any change order that is in excess of the original Contract amount, additional time, and contingency, will not become effective until approved by the City.
- E. Any change order exceeding the amount of the approved budget is invalid unless and until a budget adjustment has been approved by the City Manager or the City Council.
- F. Unit prices in any change order shall be the same as those unit prices in the original Contract.
- G. Change Orders paid by force account or on a time and materials basis shall be limited to the following maximum mark-ups: 10% Labor, 5% Equipment, 10% Materials, 10% Subcontractors. Labor Surcharge Percentages shall be set at the current rate at the time the change order is issued. City does not pay overtime for any change orders whether Force Account, Time and Materials, or Lump Sum.

# Bell Schedules

## Regular Day

0	7:30 - 8:17
Advisory	8:20 - 8:38
1st	8:41 - 9:28
2nd	9:31 - 10:18
3rd	10:21 - 11:08

1st Lunch		2nd Lunch		3rd Lunch	
Lunch	11:08 - 11:43	4B	11:11 - 11:58	4B	11:11 - 11:58
4A	11:46 - 12:33	Lunch	11:58 - 12:33	5B	12:01 - 12:48
5A	12:36 - 1:23	5A	12:36 - 1:23	Lunch	12:48 - 1:23

6th	1:26 - 2:13
7th	2:16 - 3:03

Our School

[Principal's Message](#)

[Important Dates](#)

[Bell Schedules](#)

[Staff](#)

[School Map](#)

School Library

[OPS Library](#)

[Library Schedule](#)

[Reading Lists](#)

[Room 1 Schedule](#)

[Mrs. Madriz, Counselor](#)

[Teacher of the Year](#)

[OPS School Store](#)

## Minimum Day No Advisory

0	7:30 - 8:17
1st	8:20 - 8:51
2nd	8:54 - 9:25
3rd	9:28 - 9:59

1st Lunch		2nd Lunch		3rd Lunch	
Lunch	9:59 - 10:19	4B	10:02 - 10:33	4B	10:02 - 10:33
4A	10:22 - 10:53	Lunch	10:33 - 10:53	5B	10:36 - 11:07
5A	10:56 - 11:27	5A	10:56 - 11:27	Lunch	11:07 - 11:27

6th	11:30 - 12:01
7th	12:04 - 12:35

**OAKLEY UNION ELEMENTARY SCHOOL DISTRICT  
MODIFIED TRADITIONAL INSTRUCTIONAL CALENDAR**

**2017-2018**

JULY					AUGUST					SEPTEMBER					OCTOBER				
M	T	W	TH	F	M	T	W	TH	F	M	T	W	TH	F	M	T	W	TH	F
3	H	5	6	7		1	2	3	4					/S/	Fall Break 2	Fall Break 3	Fall Break 4	Fall Break 5	Fall Break 6
10	11	12	13	14	7	8	9	10	11	H	5	6	7	8	Fall Break 9	Fall Break 10	Fall Break 11	Fall Break 12	Fall Break 13
17	18	19	20	21*	14	15	16	17	18	11	12	13	14	15	16	17	18	19	20
24*	25**	26**	(27)	28	21	22	23	24	25	18	19	20	21	22	23	24	25	26	27
31					28	29	30	31		25	26	27	28	29	30	31			
NOVEMBER					DECEMBER					JANUARY					FEBRUARY				
M	T	W	TH	F	M	T	W	TH	F	M	T	W	TH	F	M	T	W	TH	F
		/S/	2	3					1	Winter Break 1	Winter Break 2	Winter Break 3	Winter Break 4	Winter Break 5				1	2
6	7	8	9	H	4	5	6	7	8	8	9	10	11	12	5	6	7	8	9
13	14	15	16	17	11	12	13	14	15	H	/S/	17	18	19	12	13	14	15	H
20^	21^	22^	H	H	18	19	20	21	Winter Break 22	22	23	24	25	26	H	20	21	22	23
27	28	29	30		Winter Break 25	Winter Break 26	Winter Break 27	Winter Break 28	Winter Break 29	29	30	31			26	27	28		
MARCH					APRIL					MAY					JUNE				
M	T	W	TH	F	M	T	W	TH	F	M	T	W	TH	F	M	T	W	TH	F
			1	2	H	3	4	5	6		1	2	3	4					1
5	6	7	8	9	9	10	11	12	13	7	8	9	10	11	4	5	6	[7]	8
12	13	14	15	16	16	17	18	19	20	14	15	16	17	18	11	12	13	14	15
Spring Break 19	Spring Break 20	Spring Break 21	Spring Break 22	Spring Break 23	23	24	25	26	27	21	22	23	24	25	18	19	20	21	22
Spring Break 26	Spring Break 27	Spring Break 28	Spring Break 29	Spring Break 30	30					H	29	30	31		25	26	27	28	29

**KEY:**

- \* New Teacher Workday
- \*\* New & Returning Teacher Workday
- ( ) First Day of School
- H Holiday
- /S/ Staff Development Day
- ^ No Classes/Non-School Day
- [ ] Last Day of School
- Early Release Days
- Districtwide Minimum Days

**NON-SCHOOL DAYS**

- September 4 Labor Day
- Oct.2-Oct. 13 Fall Break
- November 10 Veterans' Day
- November :20-22 Non-School Days
- November :23-24 Thanksgiving Holidays
- December 22-Jan. 5 Winter Break
- January 15 Martin Luther King Jr. Day
- February 16 Lincoln's Birthday
- February 19 President's Day
- March 19-March 30 Spring Break
- April 2 Non-School Day
- May 28 Memorial Day

## SECTION 01 10 00

### SUMMARY

#### PART 1 - GENERAL

##### 1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work under separate contracts.
4. Future work.
5. Owner-furnished products.
6. Access to site.
7. Coordination with occupants.
8. Work restrictions.
9. Specification and Drawing conventions.

B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

##### 1.2 PROJECT INFORMATION

A. Project Identification: Oakley Recreation Center, CIP-194.

1. Project Location: 1250 O'Hara Avenue, Oakley, CA 94561.

B. Owner: City of Oakley.

1. Address: 3231 Main Street, Oakley, CA 94561
2. Owner's Representative: Lindsey Bruno.

C. Architect: Siegel & Strain Architects.

1. Address: 6201 Doyle Street, Suite B, Emeryville, CA 94608
2. Contact: Susi Marzuola.

##### 1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. New single-story recreation center building, site improvements, and other Work indicated in the Contract Documents.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

##### 1.4 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

- B. Preceding Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations are scheduled to be substantially complete before Work under this Contract begins.
  - 1. Relocation of existing building on Owner's property.
- C. Concurrent Work: Owner reserves the right to award separate contract(s) for the following construction operations at Project site. Those operations may be conducted simultaneously with work under this Contract.
  - 1. Audio-visual systems: Provide conduit and junction boxes to receive communications wiring and devices.
  - 2. Computer and communications systems: Provide conduit and junction boxes to receive communications wiring and devices.
  - 3. Owner reserves right to award other contracts.
- D. Subsequent Work: Owner may award separate contract(s) for the following additional work to be performed at site following Substantial Completion. Completion of that work will depend on successful completion of preparatory Work under this Contract.
  - 1. Additional lighting at platform: Provide conduit and junction boxes to receive future lighting.
  - 2. [Owner reserves the right to award other contracts.]

## **1.5 FUTURE WORK**

- A. The Contract Documents include requirements that will allow Owner to carry out future work following completion of this Project; provide for the following future work:
  - 1. Future building indicated in Drawings as Phase 2.

## **1.6 ACCESS TO SITE**

- A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  - 1. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

## 1.7 COORDINATION WITH OCCUPANTS

- A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
  - 1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
  - 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
  - 3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
  - 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

## 1.8 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
  - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:30 a.m. to 5:30 p.m., Monday through Friday, unless otherwise indicated.
  - 1. Weekend Hours: With Owner's permission, if requested by 3:00 p.m. the preceding Wednesday.
  - 2. Early Morning Hours: With Owner's permission.
  - 3. Hours for Activities Exceeding Noise Restrictions: With Owner's permission, if requested two weeks in advance of activity.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
  - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
  - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Restricted Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

## 1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
  - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  - 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
  - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 01 10 00**



## SECTION 01 33 00

### SUBMITTAL PROCEDURES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

B. Related Requirements:

1. Section 01 29 00 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 01 31 00 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
3. Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
4. Section 01 32 33 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and final completion construction photographs.
5. Section 01 40 00 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
6. Section 01 77 00 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
7. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
8. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
9. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

##### 1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

##### 1.3 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
  - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
  - a. Scheduled date for first submittal.
  - b. Specification Section number and title.
  - c. Submittal Category: Action; informational.
  - d. Name of subcontractor.
  - e. Description of the Work covered.
  - f. Scheduled date for Architect's final release or approval.
  - g. Scheduled dates for purchasing.
  - h. Scheduled date of fabrication.
  - i. Scheduled dates for installation.
  - j. Activity or event number.

#### **1.4 SUBMITTAL FORMATS**

- A. Submittal Information: Include the following information in each submittal:
  1. Project name.
  2. Date.
  3. Name of Architect.
  4. Name of Construction Manager.
  5. Name of Contractor.
  6. Name of firm or entity that prepared submittal.
  7. Names of subcontractor, manufacturer, and supplier.
  8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
  9. Category and type of submittal.
  10. Submittal purpose and description.
  11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
  12. Drawing number and detail references, as appropriate.
  13. Indication of full or partial submittal.
  14. Location(s) where product is to be installed, as appropriate.
  15. Other necessary identification.
  16. Remarks.
  17. Signature of transmitter.
- B. Options: Identify options requiring selection by Architect.

- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
  - 1. Provide paper submittals only as required by authorities having jurisdiction for notarized or wet-signed certificates and affidavits.

## 1.5 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
  - 1. Email: Prepare submittals as PDF package, and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
    - a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
  - 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
  - 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  - 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
  - 4. Concurrent Consultant Review: Where the accepted Submittal Schedule indicates that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

- a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
  1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

## 1.6 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Documentation of compliance with VOC limits set forth in Section 01 81 13.33 "Sustainable Design Requirements - CALGreen."
    - e.f. Testing by recognized testing agency.
    - f.g. Application of testing agency labels and seals.
    - g.h. Notation of coordination requirements.
    - h.i. Availability and delivery time information.
  4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams that show factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.
  1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.

- b. Schedules.
  - c. Compliance with specified standards.
  - d. Notation of coordination requirements.
  - e. Notation of dimensions established by field measurement.
  - f. Relationship and attachment to adjoining construction clearly indicated.
  - g. Seal and signature of professional engineer if specified.
- C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
    - a. Project name and submittal number.
    - b. Generic description of Sample.
    - c. Product name and name of manufacturer.
    - d. Sample source.
    - e. Number and title of applicable Specification Section.
    - f. Specification paragraph number and generic name of each item.
  3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.
  4. Paper Transmittal: Include paper transmittal including complete submittal information indicated.
  5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
  7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

- a. Number of Samples: Submit three sets of Samples. Architect and Construction Manager will retain one Sample set; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
  - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
  - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  2. Manufacturer and product name, and model number if applicable.
  3. Number and name of room or space.
  4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
  1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
  2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
  3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
  4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
  5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
  6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - a. Name of evaluation organization.
  - b. Date of evaluation.
  - c. Time period when report is in effect.
  - d. Product and manufacturers' names.
  - e. Description of product.
  - f. Test procedures and results.
  - g. Limitations of use.

## **1.7 DELEGATED-DESIGN SERVICES**

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

## **1.8 CONTRACTOR'S REVIEW**

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

## **1.9 ARCHITECT'S REVIEW**

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.
1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action, as follows:
    - a. No Exception Taken.
    - b. Make Corrections Noted.
    - c. Submit Specified Item.
    - d. Revise and Resubmit.
    - e. Rejected.
    - f. Not Reviewed.
  - B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
  - C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
  - D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
  - E. Architect will return without review submittals received from sources other than Contractor.
  - F. Submittals not required by the Contract Documents will be returned by Architect without action.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 01 33 00**



## SECTION 06 10 53

### MISCELLANEOUS ROUGH CARPENTRY

#### PART 1 - GENERAL

##### 1.1 SUMMARY

A. Section Includes:

1. Wood blocking and nailers.
2. Wood furring.
3. Plywood backing panels.
4. Platform framing, including framing of attached stairs and ramps.
5. Platform subfloor and underlayment.

B. Related Requirements:

1. Section 01 81 13.33 "Sustainable Design Requirements - CALGreen."
2. Section 05 52 13 "Pipe and Tube Railings" for railing at plywood ramp to platform.
3. Section 09 64 00 "Wood Flooring" for engineered hardwood flooring installed at platform.
4. ~~Section 06 20 23 "Interior Finish Carpentry" for plywood subfloor / underlayment at platform. Framing of platform and adjacent stairs and ramps is the Work of this Section.~~

##### 1.2 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
1. NHLA: National Hardwood Lumber Association.
  2. NLGA: National Lumber Grades Authority.
  3. WCLIB: West Coast Lumber Inspection Bureau.
  4. WWPA: Western Wood Products Association.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. For adhesives, written documentation of VOC content.
  2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
  3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
  4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Sustainable Design Submittals:
1. FSC Certified Wood: Product data and chain-of-custody certificates for products containing certified wood.

2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials and no added urea formaldehyde.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Evaluation Reports: For fire-retardant-treated wood, from ICC-ES.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

### **PART 2 - PRODUCTS**

#### **2.1 WOOD PRODUCTS, GENERAL**

- A. Certified Wood: Lumber and plywood shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  1. Factory mark each piece of lumber with grade stamp of grading agency.
  2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
  3. Provide dressed lumber, S4S, unless otherwise indicated.
- C. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

#### **2.2 FIRE-RETARDANT-TREATED MATERIALS**

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
  1. Use treatment that does not promote corrosion of metal fasteners.
  2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
  3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent, except at platform subfloor/underlayment, where maximum moisture content shall be 10 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
- E. Application: Treat items indicated on Drawings, and the following:
  - 1. Framing for raised platforms.
  - 2. Concealed blocking.

### **2.3 DIMENSION LUMBER FRAMING**

- A. Platform Framing: No. 2 grade and the following species:
  - 1. Douglas fir-larch; WCLIB or WWPA.

### **2.4 MISCELLANEOUS LUMBER**

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  - 1. Blocking.
  - 2. Nailers.
- B. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
  - 1. Hem-fir or hem-fir (north), Standard or No. 3 Common grade; NLGA, WCLIB, or WWPA.
  - 2. Western woods, Standard or No. 3 Common grade; WCLIB or WWPA.
- C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

### **2.5 PLYWOOD BACKING PANELS**

- A. Equipment Backing Panels: DOC PS 1, Exterior, C-C Plugged, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

### **2.6 PLATFORM SUBFLOOR/ UNDERLAYMENT**

- A. Plywood Combination Subfloor-Underlayment: DOC PS 1, Exterior, C-C Plugged single-floor panels. Thickness and span as indicated on Drawings.
  - 1. Provide fire-retardant-treated plywood at platform subfloor/underlayment, with a moisture content not exceeding 10 percent.
  - 2. Flatness: Flat within 3/16-inch over any 10-foot radius; 1/8-inch over any 6-foot radius.
  - 3. Edge Detail: Square.

### **2.6.7 FASTENERS**

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION, GENERAL**

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Where wood-preserved-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- C. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.
- E. Do not splice structural members between supports unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
  1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.
- G. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- H. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
- I. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

#### **3.2 WOOD BLOCKING AND NAILER INSTALLATION**

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

### 3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal-size (19-by-63-mm actual-size) furring horizontally at 24 inches (610 mm) o.c.
- C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal-size (19-by-38-mm actual-size) furring vertically at 16 inches (406 mm) o.c.

### 3.4 FRAMING AT PLYWOOD PLATFORM

- A. Frame plywood platform with members and components indicated on Drawings and in configuration indicated on Drawing.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- ~~D-C.~~ Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate supports to comply with requirements for attaching other construction.
- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
- F. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

### 3.5 FLOOR JOIST FRAMING INSTALLATION

- A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches (38 mm) of bearing on wood or metal, or 3 inches (76 mm) on masonry. Attach floor joists as follows:
  - 1. Where supported on wood members, by toe nailing or by using metal framing anchors.
  - 2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.
- B. Provide solid blocking of 2-inch nominal (38-mm actual) thickness by depth of joist at ends of joists unless nailed to header or band.
- C. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches (102 mm) or securely tie opposing members together. Provide solid blocking of 2-inch nominal (38-mm actual) thickness by depth of joist over supports.
- D. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.

### 3.6 PLYWOOD SUBFLOOR / UNDERLAYMENT INSTALLATION

- A. Combination Subfloor - Underlayment:

1. Screw plywood panels to framing, with one screw every 6 inches.
2. Space plywood panels 1/8 inch (3 mm) apart at edges and ends.

**END OF SECTION 06 10 53**

## SECTION 06 16 13

### INSULATING SHEATHING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

A. Section Includes:

1. Insulating wall sheathing.
2. Fire-retardant-treated plywood sheathing.
3. Preservative-treated plywood sheathing.

B. Related Requirements:

1. Section 01 81 13.33 "Sustainable Design Requirements - CALGreen" for requirements pertaining to materials used in the Work of this Section.
2. Section 06 10 00 "Rough Carpentry" for plywood panel products.
3. Section 06 16 00 "Sheathing" for plywood wall, floor, and roof sheathing.
4. Section 06 10 53 "Miscellaneous Rough Carpentry" for plywood backing panels.

##### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Sustainable Design Submittals:

1. FSC Certified Wood: Product data and chain-of-custody certificates for products containing certified wood.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

##### 1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated plywood, including borate-treated plywood.
2. Fire-retardant-treated plywood.

## **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

### **2.2 WOOD PANEL PRODUCTS**

- A. Emissions: Products shall comply with the requirements set forth in Section 01 81 13.33 "Sustainable Design Requirement - CALGreen."
- B. Certified Wood: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":
  - 1. Plywood.
    - a. Factory mark panels to indicate compliance with applicable standard.

### **2.3 PRESERVATIVE-TREATED PLYWOOD**

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
    - a. At plywood, where indicated, use borate preservative treatment.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat the following:
  - 1. Items indicated on Drawings
  - 2. Plywood in contact with masonry or concrete.
  - 3. Plywood used with roofing, flashing, vapor barriers, and waterproofing.
- D. Moisture Limit: After treatment, ensure plywood is dry to maximum 16% moisture content.

### **2.4 FIRE-RETARDANT-TREATED PLYWOOD**

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.



- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
  - 1. Use treatment that does not promote corrosion of metal fasteners.

## 2.5 WALL SHEATHING

- A. Plywood Sheathing: See Structural Drawings, Plywood Sheathing Notes, for specifications.
- B. Foil-Faced, Polyisocyanurate-Foam Sheathing: ASTM C 1289, Type I or Type II, Class 2, rigid, cellular, polyisocyanurate thermal insulation.
  - 1. Foam-plastic core and facings shall have a flame-spread index of 25 or less when tested individually.
  - 2. Products shall be free of halogenated flame retardants.
  - 3. Basis-of-Design Product: Subject to compliance with requirements, provide the following, or approved equal:
    - a. GAF Energy Guard NH
  - 4. Thickness: 1 inch.
- ~~2. Foil Faced, Polyisocyanurate Foam Sheathing: ASTM C 1289, Type I or Type II, Class 2, rigid, cellular, polyisocyanurate thermal insulation. Foam plastic core and facings shall have a flame spread index of 25 or less when tested individually.~~
  - 1. ~~Manufacturers: Subject to compliance with requirements, provide products by one of the following:~~
    - a. ~~Dow Chemical Company (The).~~
    - ~~GAF; EnergyGuard.~~
    - ~~Johns Manville~~
    - ~~Rmax, Inc.~~
  - 2. ~~Thickness: 1 inch.~~
- ~~B. Products shall be free of halogenated flame retardants. GAF Energy Guard NH or approved equal.~~

## 2.6 ROOF SHEATHING

- A. Plywood Sheathing: See Structural Drawings, Plywood Sheathing Notes, for specifications.

## 2.7 FLOOR SHEATHING

- A. Floor Sheathing: See Structural Drawings, Plywood Sheathing Notes, for specifications..

## 2.8 FASTENERS AND ACCESSORIES

- A. General: Provide fasteners of size and type indicated that comply with requirements for material and manufacture specified in Structural Drawings, Notes. The following pertains to fasteners not specified in Structural Drawings, Notes.
- B. Brads and Staples: ASTM F 1667.

- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Joint Tape: Acrylic adhesive flashing tape.
  - 1. Product: 3M All Weather Flashing Tape 8067.

## **2.9 MISCELLANEOUS MATERIALS**

- A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
  - 1. Adhesives shall comply with VOC limits set forth in Section 01 81 13.33 "Sustainable Design Requirements - CALGreen."

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION, GENERAL**

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  - 1. Structural Drawings, Table 2301.10.1 "Fastening Schedule"
  - 2. Where fastenings are not indicated on Structural Drawings, comply with Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
  - 3. When using a fastener with performance certified by an ICC-ES report, comply with ICC-ES evaluation report stipulations for fastener.
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

### **3.2 WOOD STRUCTURAL PANEL INSTALLATION**

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated on Drawings, including specifications in Structural Drawings, Carpentry Notes, Plywood Sheathing Notes, and Nailing Notes. Provide space between panels at edges and ends, as indicated on Drawings.

### **3.3 FOAM-PLASTIC SHEATHING INSTALLATION**

- A. Comply with manufacturer's written instructions.
- B. Foam-Plastic Wall Sheathing: Install vapor-relief strips or equivalent for permitting escape of moisture vapor that otherwise would be trapped in stud cavity behind sheathing.
- C. Apply sheathing tape to joints between foam-plastic sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

**END OF SECTION 06 16 13**

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## SECTION 06 20 23

### INTERIOR FINISH CARPENTRY

#### PART 1 - GENERAL

##### 1.1 SUMMARY

A. Section Includes:

1. Wood base, except custom vented wood base at wood flooring.
- ~~2. Built in performing space with plywood platform as substrate for wood flooring, and plywood walls and ceiling.~~

B. Related Work:

1. Section 01 81 33.33 "Sustainable Design Requirements - CALGreen" for requirements pertaining to materials used for the Work of this Section.
- ~~2. Section 05 52 13 "Pipe and Tube Railings" for railing at plywood ramp to platform.~~
2. Section 06 10 53 "Miscellaneous Rough Carpentry" for framing and subfloor at platform performing space ~~with plywood floor, walls, and ceilings.~~
3. Section 06 40 23 "Interior Architectural Woodwork" for cabinetry and other custom woodwork.
- ~~4. Section 09 64 00 "Wood Flooring" for engineered wood flooring installed at platform, ramp, and stairs of performing area.~~

##### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.

B. Sustainable Design Submittals:

1. FSC Certified Wood: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials and no added urea formaldehyde.

C. Shop Drawings: Show plans, elevations, sections, and details of plywood floor, and plywood paneling at walls and ceiling of built-in platform and performing area. Indicate support framing and attachments to framing, including fastening patterns. Indicate any cutouts or required penetrations. Show large-scale details of joints from floor to wall, and from wall to ceiling. Provide reflected ceiling plan, showing lighting fixtures, speakers, grilles, sprinklers, and any required penetrations. Indicate perimeter moldings, if any.

### 1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For fire-retardant-treated wood, from ICC-ES.

### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
- B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

### 1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
  - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or blotchy surface contamination and discoloration.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. Certified Wood:
  - 1. The following wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001 and FSC STD-40-004:
    - a. Interior trim.
  - 2. Certified Wood: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":
    - a. Plywood.
- B. Wood Panel Products
  - 1. Emissions: Products shall comply with the requirements set forth in Section 01 81 13.33 "Sustainable Design Requirement - CALGreen."
  - 2. Plywood shall contain no added urea formaldehyde.
- C. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's Board of Review. Grade lumber by an agency certified by the American Lumber Standard Committee's Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.

## 2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: For applications indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and comply with testing requirements; testing will be conducted by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
  1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
- C. For exposed items indicated to receive a stained or natural finish, use organic resin chemical formulations that do not contain colorants, and provide materials that do not have marks from spacer sticks on exposed face.
- D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
- E. Application: At platform and where indicated.

## 2.3 INTERIOR TRIM

### A. Molding and Trim for Transparent Finish

1. Species: Maple.
2. Maximum Moisture Content: 12
3. Finger Jointing: Not allowed.
4. Face Surface: Smooth.
5. Finish: As selected by Architect.

### A-B. Lumber Trim for Opaque Finish (Painted Finish):

1. Species and Grade: Idaho white, lodgepole, ponderosa, radiata, or sugar pine, D Select (Quality); NLGA or WWPA.
2. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
3. Finger Jointing: Allowed.
4. Face Surface: Surfaced (smooth).
5. Optional Material: Primed MDF of same actual dimensions as lumber indicated may be used in lieu of lumber.

### B-C. Moldings for Opaque Finish (Painted Finish): Made to patterns included in MMPA's "WM/Series Wood Moulding Patterns."

1. Softwood Moldings: MMPA WM 4, P grade.
  - a. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine.
  - b. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.

~~2.2 PLYWOOD PLATFORM, WALLS, AND CEILING AT PERFORMANCE AREA~~

~~C. Plywood for Opaque Finish: DOC PS 1, tongue and groove Douglas fir, Exterior, A-C. Thickness and span as indicated on Drawings.~~

~~1. Provide fire retardant treated plywood at platform cladding.~~

~~2. Platform Framing: See Section 06 10 53 "Miscellaneous Rough Carpentry."~~

**2.4 MISCELLANEOUS MATERIALS**

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- B. Low-Emitting Materials: Adhesives shall comply with the testing and product requirements indicated in Section 01 81 13.33 "Sustainable Design Requirements - CALGreen."
- C. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
  - 1. Adhesives shall have a VOC content of 30 g/L or less.
- D. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.
  - 1. Adhesives shall have a VOC content of 70 g/L or less.
- E. Interior Blocking, Shims, and Nailers: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

**2.5 FABRICATION**

- A. Standing and Running Trim:
  - 1. Back out or kerf backs of interior standing and running trim.
  - 2. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

**2.6 SHOP PRIMING**

- A. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior finish carpentry, as applicable to each unit of work.
  - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of wood trim. Apply two coats to surfaces installed in contact with concrete or masonry and to end-grain surfaces.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.



### 3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

### 3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
  - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
  - 2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
  - 3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining interior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
  - 4. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

### 3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install trim after gypsum-board joint finishing operations are completed.
- B. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.
- C. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 36 inches (900 mm) long, except where necessary. Stagger joints in adjacent and related standing and running trim.
- D. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
- E. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
- F. Fill gaps, if any, between top of base and wall with plastic wood filler; sand smooth; and finish same as wood base if finished.
- G. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches (3 mm in 2400 mm).

### ~~3.5 PLYWOOD PANEL FLOORING, WALL CLADDING, AND CEILING INSTALLATION~~

#### ~~H.—General:~~

- ~~1. Install panels level, plumb, true, and straight, with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm). Install with no more than 1/16 inch in 96 inch (1.6 mm in 2400 mm) vertical cup or bow and 1/8 inch in 96 inch (3 mm in 2400 mm) horizontal variation from a true plane.~~
- ~~2. Center joints or plywood accurately over supports and fasten securely to solid wood members, as indicated on Drawings; if not indicated, as specified in this Section.~~
- ~~2. Where edges of plywood panels are left exposed, fill, sand, and ease edges.~~
- ~~2. Support panel edges by fastening to framing members or blocking.~~
- ~~2. Provide a 1/8 inch space between all adjacent panels.~~
- ~~2. At Floors: Lay fire retardant treated floor panels with face grain perpendicular to platform joists. Install with smooth side up. Minimum panel size not less than 24 by 48 inches with each panel continuous over two or more spans.~~
- ~~2. Apply a continuous bead of glue to floor joists. Set panel on floor framing, ensuring full contact, and nail plywood panel in place. Apply a continuous bead of glue to tongue and groove edges, and install subsequent panels likewise. Do not apply glue to wall studs.~~
- ~~2. At Walls: Select and arrange panels on each wall to minimize noticeable variations in grain character between adjacent panels. Leave 1/4 inch (6 mm) gap to be covered with trim at top, bottom, and openings. Install with uniform tight joints between panels.~~
- ~~3. Attach panels to supports as indicated with panel adhesive and fasteners. Space fasteners and adhesive as indicated on Drawings.~~
- ~~2. Conceal fasteners to greatest practical extent.~~
- ~~2. Arrange panels with grooves and joints over supports. Fasten to supports with nails of type and at spacing indicated.~~
- ~~2. At Ceilings: Install panels with face grain perpendicular to ceiling joists. Fasten as indicated on accepted shop drawings. Space fasteners as indicated on Drawings. Install molding at joints and perimeter, as indicated.~~

### 3.5 ADJUSTING

- A. Replace interior finish carpentry that is damaged or does not comply with functional or visual requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

### 3.6 CLEANING

- A. Clean interior finish carpentry on exposed and semiexposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes if any.

### 3.7 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
  1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

**END OF SECTION 06 20 23**

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## SECTION 07 14 16 - COLD FLUID-APPLIED WATERPROOFING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section includes waterproofing between structural slab and topping slab at building perimeter.

~~?. Between slab and above grade waterproofing.~~

~~?. Between structural slab and topping slab.~~

~~?. Molded drainage panels or mats:~~

~~?. Installed with waterproofing adjacent to or over occupied space.~~

#### B. Related Work:

1. Section 03 30 00 "Cast-in-Place Concrete" for concrete slab receiving cold fluid-applied waterproofing, and for topping slab as overburden at cold fluid-applied waterproofing.

#### 1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

#### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.  
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

1. Include nailing pattern for hanging molded drainage panels on lagging.

C. Samples: For each exposed product and for each color and texture specified, including the following products:

1. 8-by-8-inch (200-by-200-mm) square of waterproofing membrane, including all layers.  
2. 4-by-4-inch (100-by-100-mm) square of drainage panel.

#### 1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Sample Warranties: For special warranties.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.
  - 1. Build for each typical waterproofing installation including pavers and accessories to demonstrate surface preparation, crack and joint treatment, corner treatment, and protection.
    - a. Size: 100 sq. ft. (9.3 sq. m) in area.
    - b. Description: Each type of wall and plaza installation.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
  - 1. Do not apply waterproofing in snow, rain, fog, or mist.
  - 2. Spray-applied membrane requires minimum ambient temperature of 40 degrees F (7 degrees C). Contact waterproofing manufacturer for equipment and handling requirements for conditions between 19 degrees F (-7 degrees C) and 40 degrees F (7 degrees C).
- B. Plumbing, electrical, mechanical, and structural items under or penetrating waterproof membrane shall be positively secured in their proper positions and protected prior to membrane installation.
- C. Clearance: Minimum clearance of 24 inches is required for application of spray applied polymer modified asphalt. For areas with less than 24-inch clearance, the product may be applied by hand using roller-applied polymer-modified asphalt.
- D. Overspray: Protect all adjacent areas not receiving waterproofing. Masking is necessary to prevent unwanted overspray from adhering to, or staining, areas not receiving the membrane. Once polymer-modified asphalt adheres to a surface it is extremely difficult to remove.
- E. Maintain adequate ventilation during preparation and application of waterproofing materials.

## 1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.
  - 1. Warranty Period for ~~Between-Slab and Above-Grade~~ Waterproofing: 15 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. Source Limitations for Waterproofing Systems: Obtain waterproofing materials, and protection courses, ~~and molded sheet drainage panels~~ from single source from single manufacturer.
- B. Source Limitations for Auxiliary Materials: Provide accessory products by waterproofing manufacturer. If waterproofing manufacturer does not manufacture a product required for the installation, provide product recommended by manufacturer.

### 2.2 BETWEEN-SLAB ~~AND ABOVE-GRADE~~ WATERPROOFING

- A. Between-Slab ~~and Above-Grade~~ Waterproofing Assembly: Spray-applied polymer-modified asphalt emulsion reinforced with polyester fabric, covered by a polyolefin geomembrane, for an overall thickness of 135 mils.
  - 1. System: Subject to compliance with requirements, provide the following:
    - a. EPRO Services, Inc; **e.Protect Deck**, consisting of the following:
      - 1) e.spray 60, a water-based anionic polymer-modified asphalt emulsion, applied at 60 mils thickness.
      - 2) e.poly, polyester reinforcing fabric.
      - 3) e.spray 60, a second layer of polymer-modified asphalt emulsion applied at 60 mils thickness.
      - 4) e.shield 115, a polyolefin sheet; 15 mils thickness.

~~? System shall be installed with molded sheet drainage panels.~~

### 2.3 AUXILIARY MATERIALS

- A. Detailing Material: Roller-applied, high-viscosity polymer-modified asphalt coating:
  - 1. Product: EPRO Services, Inc; **e.roll**
- B. Joint Detailing Sealant Mastic: Trowel-applied, high-viscosity polymer-modified asphalt:
  - 1. Product: EPRO Services, Inc; **e.trowel**
- C. Reinforcement Fabric: System manufacturer's polyester fabric.
  - 1. Product: EPRO Services, Inc; **e.poly**
- D. Backer Rod: Closed cell polyethylene foam.

~~? Vertical Membrane Fastener: Mechanical fastener with 3/4 inch washer.~~

~~? Product: EPRO Services, Inc; e.hanger~~

- E. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick, predrilled at 9-inch (229-mm) centers.
  - 1. Product: EPRO Services, Inc; **e.term hd**
- F. Shot Pins: Minimum 1-inch galvanized steel pins with 3/4-inch aluminum washers.
- G. Sheet Flashing: Reinforced modified-asphalt sheet, 60 mils thick, with double-sided adhesive.

### ~~3.2 MOLDED SHEET DRAINAGE PANELS~~

~~3.2 Nonwoven Geotextile Faced, Molded Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded plastic sheet drainage core; with a nonwoven, needle-punched geotextile facing.~~

~~3.2 Products: Subject to compliance with requirements, provide the following:~~

~~3.2 EPRO Services, Inc; e.drain 6000 at surfaces for no traffic or pedestrian traffic.~~

~~3.2 Installations: With waterproofing as indicated.~~

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the waterproofing.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 SURFACE PREPARATION ~~AT DECKS AND SLABS~~

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

~~3.2 At decks, close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.~~

- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids with rapid-set grout or hydraulic cement.

~~3.2 At decks, ensure substrate is properly sloped away from structure and toward deck drains.~~

- E. Prepare, treat, and seal ~~vertical and~~ horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

### 3.3 INSTALLATION, GENERAL

- A. Install assemblies, including auxiliary components such as waterstops, ~~molded drainage panels~~, reinforcements, transition course, and other items, as indicated on Drawings and in this Section. Comply with manufacturer's written instructions. If there are conflicts, consult with Architect before proceeding with installation.

### 3.4 REINFORCEMENT DETAILS

- A. At Cracks and Joints: Apply a 30 mil coat of roller-consistency polymer-modified asphalt to desired area, extending 3 inches beyond each side of the joint or area of repair. Embed a joint reinforcing strip into the asphalt. Apply a second 30 mil coat of roller-applied polymer-modified asphalt over reinforcement fabric, being sure to fully saturate fabric.
- B. At Standard Pipe Penetrations in ~~Above Grade or~~ Between-Slab Applications:



1. Prepare membrane penetrations so they are free of any material that prohibit the material to bond directly to the penetration surface
2. Apply roller-consistency polymer-modified asphalt 3 inches horizontally and 3 inches vertically around the base of the penetration.
3. Embed polyester reinforcing fabric in polymer-modified asphalt, fully covering coating.
4. Apply a second layer of roller-consistency polymer-modified asphalt until reinforcing fabric is fully saturated, then secure the reinforcement fabric to the penetration with a cable tie.
5. Cut a target piece of reinforcement fabric to accommodate the outside diameter of the penetration, and place around the penetration.
6. Embed target piece of reinforcement into existing saturated fabric, and saturate the target layer with roller-consistency polymer-modified asphalt.

C. At Drains:

1. Apply roller-consistency polymer-modified asphalt 3 inches around drain, and into the vertical surface of the drain.
2. Embed polyester reinforcement fabric around the drain and onto the drain housing.
3. Apply a second layer of roller-consistency polymer-modified asphalt to the reinforcement fabric, fully saturating fabric.

### 3.5 TREATMENT OF CRACKS AND JOINTS

- A. Treat, rout, and fill cracks larger than 1/8 inch with hydraulic cement, rapid-set grout, or acrylic caulking.
- B. The following areas shall receive a reinforcement detail of roller-applied polymer-modified asphalt and reinforcement fabric:
  1. All cracks less than 1/8 inch.
  2. All previously repaired cracks.
  3. All cold joints.
  4. For joints larger than 1/4 inch, rout out the joint and fill with back rod and acrylic caulking. Repaired joint shall be flush with the surrounding substrate.

### ~~3.5.2 MOLDED DRAINAGE PANEL INSTALLATION~~

~~3.5.2.1 At Between Slab and Above Grade Applications:~~

- ~~3.5.2.1.1 Starting from one corner, install drainage panel over the protection course.~~
- ~~3.5.2.1.2 Secure drainage panels to the deck without penetrating the deck waterproofing system.~~
- ~~3.5.2.1.3 Abut the joints of drainage panel together, so they are flush with one another.~~
- ~~3.5.2.1.4 Drainage panel shall be detailed around deck drains per the project drawings.~~
- ~~3.5.2.1.5 Subsequent trades must contact the general contractor if damage to the deck system occurs; failure to do so may be void the warranty.~~

### 3.6 INSTALLATION OF BETWEEN-SLAB AND ABOVE-GRADE WATERPROOFING

A. Polymer-Modified Asphalt Membrane - First Layer

1. Mask off adjoining surfaces where unwanted polymer modified asphalt membrane may impact other construction trades.
2. Commence application of spray-applied polymer-modified asphalt when ambient air temperatures are within manufacturer recommendations.
3. Surfaces that will receive the membrane must be clean and free from standing moisture.

4. Start installing spray-applied polymer-modified asphalt in presence of approved 3rd party inspector.
5. Apply a 10 mil primer coat of un-catalyzed spray-applied polymer-modified asphalt and allow to set. The primer coat is designed to reduce that amount of potential blistering that may occur as the concrete continues to release moisture.
6. Moving from the low point to the high point of the ~~decks~~slab, apply one coat of un-catalyzed spray-applied polymer-modified asphalt waterproofing according to manufacturer's instructions to obtain a seamless membrane with an uncured thickness of thickness of 80 mils (2 mm).
7. Apply waterproofing in and around penetrations and cavities to ensure the formation of monolithic seal around all penetrations.
8. Apply waterproofing to prepared wall terminations and vertical surfaces to heights indicated according to manufacturer's recommendations and details, if applicable.
9. Verify film thickness of waterproofing every 100 sq ft. (9.3 sq. m.)

B. Polymer-Modified Asphalt Reinforcement

1. Reinforcement mesh shall be installed immediately following the first application of spray-applied polymer-modified asphalt.
2. Roll manufacturer's polyester reinforcing fabric over freshly applied polymer-modified asphalt.
3. Press firmly on the reinforcement fabric until it becomes saturated with the underlying polymer-modified asphalt.

C. Polymer-Modified Asphalt Membrane - Second Layer

1. Begin application of spray-applied polymer-modified asphalt over the previously installed spray-applied polymer-modified asphalt and polyester reinforcement material.
2. Moving from the low point to the high point of the deck, apply one coat of spray-applied polymer-modified asphalt waterproofing according to manufacturer's instructions to obtain a seamless membrane with a minimum dry film thickness of 60 mils (1.5 mm).
3. Apply waterproofing in and around penetrations and cavities to ensure the formation of monolithic seal around all penetrations.
4. Apply waterproofing to prepared wall terminations and vertical surfaces to heights indicated according to manufacturer's recommendations and details. (if applicable).
5. Allow membrane 24-48 hours to fully bond with substrate.
6. Verify film thickness of waterproofing every 100 sq ft. (9.3 sq. m.)

D. Polyolefin Sheet Protection Course:

1. Install polyolefin protection course over previously applied 120 mils of reinforced spray-applied polymer-modified asphalt.
2. Overlap protection course seams a minimum 6 inches.
3. Secure protection course to polymer-modified asphalt with Sta'-Put Quick Grip LVOC spray adhesive, or manufacturer-approved alternate.
4. Secure polyolefin protection course seams with manufacturer's adhesive tape.

~~??- FIELD QUALITY CONTROL~~

~~?- Between Slab and Above Grade Applications:~~

- ~~?- Independent inspectors and waterproofing manufacturer installers shall document the amount of spray-applied polymer-modified asphalt used and document quantities in the inspection report.~~

- ~~?. Conduct a visual inspection after the reinforced spray applied polymer modified asphalt layer has been installed. Note any visual deficiencies and mark for repair.~~
- ~~?. Decks utilizing spray applied polymer modified asphalt must wait a minimum of 48 hours prior to conducting a flood test. For decks where roller applied polymer modified asphalt is used instead of spray applied polymer modified asphalt, membrane will require a minimum of 72 hours prior to conducting a flood test.~~
- ~~?. Conduct flood test for a 24 hour period by flooding deck area with a minimum of 2 inches of water. Any leaks detected should be identified, repaired, and retested. Conduct flood test prior to the application of any protection course.~~

### 3.7 CURING, PROTECTION, AND CLEANING

- A. Allow for waterproofing to fully bond with substrate, generally 24 to 48 hours after application, depending on ambient weather conditions.
- ~~A.B.~~ Protect waterproofing from contamination and damage while curing, and from wear during remainder of construction period.
- ~~B.C.~~ Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

**END OF SECTION 07 14 16**

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## SECTION 07 25 00 - WEATHER BARRIERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Water-resistive air barrier (building wrap).
2. Water-resistive air barrier with integral drainage matrix for installation behind cement plaster (stucco) cladding.
3. Flexible flashing.

B. Related Sections:

1. See Section 06 16 00 "Sheathing" for taped plywood sheathing serving as air barrier.
2. Section 07 42 46 "Fiber-Cement Wall Panels" for cladding installed over water-resistive air barrier.
3. Section 09 24 00 "Cement Plastering" for stucco installed over water-resistive air barrier with integral drainage matrix.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show details of weather barriers at terminations, openings, and penetrations. Show details of penetration flashing sleeves and flexible flashing applications.

#### 1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For water-resistive air barriers and flexible flashing, from ICC-ES.

### PART 2 - PRODUCTS

#### 2.1 WATER-RESISTIVE BARRIER

A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.

1. Product: Subject to compliance with requirements, provide the following:

- a. Berry Plastics Corporation; TYPAR Weather Protection Membrane.

B. Building Wrap with Integral Drainage Matrix: ~~ASTM E 1677, Type I air barrier with integral drainage matrix; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction. Water resistive air barrier shall be detachable from drainage matrix.~~

1. Product: Subject to compliance with requirements, provide the following:

- a. Benjamin Obdyke Slicker Max Rainscreen 6 mm.  
~~? Benjamin Obdyke Incorporated; Slicker HP.~~

#### 2.2 FLEXIBLE FLASHING

A. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density spunbonded polyolefin to produce an overall thickness of not less than 0.05 inch (1.27 mm).

1. Product: Subject to compliance with requirements and building wrap manufacturer's recommendations, provide the following:
    - a. Berry Plastics Corporation; TYPAR Flexible Flashing.
  2. Primer for Flexible Flashing: Product recommended in writing by flexible flashing manufacturer for substrate.
- B. Block Copolymer Flashing: Composite, self-adhesive flashing product consisting of a block copolymer compound bonded to a high-density spunbonded polyolefin to produce an overall thickness of not less than 0.011 inch (.28 mm).
1. Product: Subject to compliance with requirements and building wrap with integral drainage matrix manufacturer's recommendations, provide the following:
    - a. Benjamin Obdyke Incorporated; HydroFlash flexible flashing.
  2. Primer: None needed.

### 2.3 ACCESSORIES

- A. Seam Tape: Air barrier manufacturer's recommended or system-standard seam tape.
- B. Plastic-Capped Nails or Staples: As recommended by air barrier manufacturer for application; for sealing out moisture at air barrier at air barrier fastener penetrations.
- C. Weather Barrier Joint Sealant: Weather barrier manufacturer's recommended or system-standard elastomeric polymer joint sealant for use between flashing pieces; compliant with ASTM C920.
- D. Nails and Staples: Product recommended in writing by flexible flashing manufacturer and complying with ASTM F 1667.
- E. Insect Screen: For installation with air barrier at top and bottom edge of exterior cladding.

### 2.4 PREFABRICATED PENETRATION FLASHING BOOTS

- A. Penetration Flashing Boots: Flat polyethylene panels with shaped penetration boots for junction boxes, pipe penetrations, and other building service penetrations in above-grade walls.
  1. Product: Provide Quickflash Weatherproofing Products, Inc.; QuickFlash Flashing Panels, or comparable product by another manufacturer. Provide models recommended by manufacturer for penetrating items and cladding indicated.

## PART 3 - EXECUTION

### 3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed and taped or sealed.

~~?.—Cover sheathing with water resistive air barrier as follows:~~

~~?.—Cut back barrier 1/2 inch (13 mm) on each side of the break in supporting members at expansion or control joint locations.~~

~~?.—Apply barrier to cover vertical flashing with a minimum 4-inch (100 mm) overlap at horizontal seams, 6-inch (150 mm) overlap at vertical seams, and 12-inch (300 mm) overlap at corners, unless otherwise indicated.~~

- B. Water-Resistive Barrier Installation: Comply with manufacturer's written instructions and warranty requirements for each type of water-resistive barrier installation.

1. Cut back barrier 1/2 inch (13 mm) on each side of the break in supporting members at expansion- or control-joint locations.

1.2. Apply barrier to cover vertical flashing with a minimum 4-inch (100-mm) overlap at horizontal seams, 6-inch (150-mm) overlap at vertical seams, and 12-inch (300-mm) overlap at corners, unless otherwise indicated.

2.3. Seal seams, edges, fasteners, and penetrations with tape as recommended by weather barrier manufacturer.

- a. Exception: If weather barrier manufacturer does not recommend taping seams, confer with architect before foregoing the step of taping seams.

3.4. Extend weather barrier into jambs of openings and seal corners with tape.

B.C. Insect Barrier: Install according to manufacturer's written instructions at locations indicated on Drawings.

### 3.2 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.

1. Prime substrates, if required, as recommended by flashing manufacturer.
2. Lap seams and junctures with other materials at least 4 inches (100 mm) except that at flashing flanges of other construction, laps need not exceed flange width.
3. Lap flashing over water-resistive barrier at bottom and sides of openings.
4. Lap water-resistive barrier over flashing at heads of openings.
5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

### 3.3 PENETRATION FLASHING BOOT INSTALLATION

A. Install penetration flashing boots according to manufacturer's instructions.

1. Wall Installation: Slit building paper to receive top flange of boot.
2. Install boot over penetrating item. Fasten boot through substrate to studs or blocking.
3. Connect and secure penetrating items as required.
4. Seal annular space between boot and penetrating item with urethane sealant as specified in Section 07 92 00 "Joint Sealants."
5. Wall Installation: Apply flexible flashing overlapping sides of flange. Apply flexible flashing to top of flange, covering joint between weather barrier and flange.

**END OF SECTION 07 25 00**

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## **SECTION 07 41 13.16 - STANDING-SEAM METAL ROOF PANELS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes standing-seam metal roof panels.
- B. Related Work:
  - 1. Section 06 16 00 "Sheathing" for plywood roof sheathing.
  - 2. Section 07 54 23 "Thermoplastic Polyolefin (TPO) Roofing."

#### **1.2 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
  - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
  - 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
  - 5. Review structural loading limitations of deck during and after roofing.
  - 6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
  - 7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
  - 8. Review temporary protection requirements for metal panel systems during and after installation.
  - 9. Review procedures for repair of metal panels damaged after installation.
  - 10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
  - 2. Include documentation indicating that roofing materials comply with energy performance requirement.
- B. Sustainable Design Submittals: See Section 01 81 13.33 "Sustainable Design Requirements - CALGreen." Provide applicable submittals in addition to submittals specified herein.
- C. Shop Drawings:
  - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).
- D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
  1. Include similar Samples of trim and accessories involving color selection.
- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
  1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For special warranties.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For metal panels to include in maintenance manuals.

#### **1.6 QUALITY ASSURANCE**

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  1. Build mockups for typical roof area, including accessories, as directed by Architect.
  2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

- D. Retain strippable protective covering on metal panels during installation.

## 1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

## 1.9 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

## 1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including rupturing, cracking, or puncturing.
    - b. Deterioration of metals and other materials beyond normal weathering.
  - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.
- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
  - 1. Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
  - 1. Wind Loads: As indicated on Drawings.
  - 2. Other Design Loads: As indicated on Drawings.
  - 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 1680 or ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:
  1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- D. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
  1. Uplift Rating: UL 90.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## 2.2 STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
  1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
- B. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together.
  1. Product: Subject to compliance with requirements, provide the following:
    - a. Metal Sales Manufacturing Corporation; Curved Magna-Loc 180 standing seam
  2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
    - a. Nominal Thickness: 0.03 inch (0.75 mm).
      - 1) 24 gauge
    - b. Exterior Finish: Three-coat fluoropolymer.
    - c. Color: As selected by Architect from manufacturer's full range of colors complying with cool roof energy performance requirements.
  3. Clips: One-piece fixed or Two-piece floating to accommodate thermal movement.
    - a. Material: Not less than 0.05 inch nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet; ASTM A 653 G90 (Z275) or ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation.

4. Panel Coverage: 16 inches (406 mm).
5. Panel Height: 2 inches (51 mm).
6. Minimum Radius: 20 feet, 0 inches (6.1 m).
7. Minimum Slope: Rated for 2 inches per foot. [Roofing panels approved by roofing panel manufacturer for use at design slope of 1/4 inch per foot under the following condition:](#)
  - a. Panels shall be installed over fully-adhered high-temperature underlayment approved by roofing manufacturer.

### 2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
  1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
  2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
  3. Products: Subject to compliance with requirements, provide ~~one of~~ the following:
    - a. GCP Applied Technologies, Inc.; Grace Ultra

### 2.4 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured by TPO roof membrane manufacturer.
  1. GAF; EnergyGuard NH Polyiso Insulation. (Non-Halogenated polyiso insulation boards.)
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 2, Grade 2, felt or glass-fiber mat facer on both major surfaces.
- C. Thickness: 2 inches.

### 2.5 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- C. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum board.
  1. Product: Subject to compliance with requirements, provide the following:
    - a. Georgia-Pacific Gypsum, LLC; DensDeck Roof Board, 1/4-inch thick.

### 2.6 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Gutters:

1. Exterior Eave Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (914 mm) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels roof fascia and rake trim.
2. Integral Gutter: See Architectural details.

~~D.E.~~ Panel Fasteners: Self-tapping screws designed to withstand design loads.

E.F. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

## 2.7 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
  - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

## 2.8 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
  1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
  1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
  2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

- a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

### 3.3 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days.

1. At Gutters: Fully line integral gutter and extend for a distance of 12 inches on each side of gutter. Lap under uphill side of gutter, and over downhill side of gutter.

2. At Roofing: Apply underlayment over **entire expanse of roof areas where slope is less than 2 inches per foot**, and as follows:

- a. Roof perimeter for a distance up from eaves of 36 inches (914 mm) beyond interior wall line.
- b. Valleys, from lowest point to highest point, for a distance on each side of 18 inches (460 mm). Overlap ends of sheets not less than 6 inches (152 mm).
- c. Rake edges for a distance of 18 inches (460 mm).
- d. Hips and ridges for a distance on each side of 12 inches (305 mm).
- e. Roof-to-wall intersections for a distance from wall of 18 inches (460 mm).
- f. Around dormers, chimneys, skylights, and other penetrating elements for a distance from element of 18 inches (460 mm).

~~?. — Apply over the roof area indicated below:—~~

- ~~?. — Roof perimeter for a distance up from eaves of 36 inches (914 mm) beyond interior wall line.~~
- ~~?. — Valleys, from lowest point to highest point, for a distance on each side of 18 inches (460 mm). Overlap ends of sheets not less than 6 inches (152 mm).~~
- ~~?. — Rake edges for a distance of 18 inches (460 mm).~~
- ~~?. — Hips and ridges for a distance on each side of 12 inches (305 mm).~~
- ~~?. — Roof to wall intersections for a distance from wall of 18 inches (460 mm).~~
- ~~?. — Around dormers, chimneys, skylights, and other penetrating elements for a distance from element of 18 inches (460 mm).~~

- B. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 07 62 00 "Sheet Metal Flashing and Trim."



### 3.4 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.
- B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.
- C. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (68 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.
- D. Installation Over Wood Panel Decking:
  - 1. Install base layer of insulation with joints staggered not less than 24 inches (610 mm) in adjacent rows.
    - a. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    - b. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
    - c. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
    - d. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
    - e. Loosely lay base layer of insulation units over substrate.
  - 2. Mechanically attach base layer of insulation and substrate board using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to wood panel decks.
    - a. Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
  - 3. Install upper layers of insulation with joints of each layer offset not less than 12 inches (305 mm) from previous layer of insulation.
    - a. Staggered end joints within each layer not less than 24 inches (610 mm) in adjacent rows.
    - b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    - c. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
    - d. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
    - e. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
    - f. Adhere each layer of insulation to substrate using adhesive as follows:
      - 1) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

### 3.5 COVER BOARD INSTALLATION

- A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction.
  - 1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.

2. Cut and fit cover board tight to nailers, projections, and penetrations.
3. Loosely butt cover boards together and fasten to roof deck.
4. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

### 3.6 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  1. Shim or otherwise plumb substrates receiving metal panels.
  2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
  3. Install screw fasteners in predrilled holes.
  4. Locate and space fastenings in uniform vertical and horizontal alignment.
  5. Install flashing and trim as metal panel work proceeds.
  6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
  7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
  8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
  1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
- C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
  1. Install clips to supports with self-tapping fasteners.
  2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
  3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
- F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
  1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

- G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
  2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).
- H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- I. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

### **3.7 ERECTION TOLERANCES**

- A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

### **3.8 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

### **3.9 CLEANING AND PROTECTION**

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION 07 41 13.16**

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## SECTION 07 54 23 - THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

- ~~1. Adhered thermoplastic polyolefin (TPO) roofing system.~~
- ~~?. Self-adhering, thermoplastic polyolefin (TPO) roofing system.~~
- ~~2.1. Mechanically fastened, thermoplastic polyolefin (TPO) roofing system.~~
- ~~?. Loosely laid and ballasted, thermoplastic polyolefin (TPO) roofing system.~~
- ~~?. Substrate board.~~
- ~~3.2. Vapor retarder.~~
- ~~4.3. Roof insulation.~~
- ~~5.4. Cover board.~~
- ~~6.5. Walkways.~~

B. Related Requirements:

1. Section 06 16 00 "Sheathing" for wood-based, structural-use roof deck panels.
2. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.

#### 1.2 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

#### 1.3 PREINSTALLATION MEETINGS

- ~~A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at [Project site] <Insert location>.~~

- ~~1. Meet with Owner, Architect, [Construction Manager,] Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.~~
- ~~?. Review methods and procedures related to roofing installation, including manufacturer's written instructions.~~
- ~~?. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.~~
- ~~?. Review deck substrate requirements for conditions and finishes, including flatness and fastening.~~
- ~~?. Review structural loading limitations of roof deck during and after roofing.~~
- ~~?. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.~~
- ~~?. Review governing regulations and requirements for insurance and certificates if applicable.~~
- ~~?. Review temporary protection requirements for roofing system during and after installation.~~
- ~~?. Review roof observation and repair procedures after roofing installation.~~

- ~~B.A. Preinstallation Roofing Conference: Conduct conference at Project site.~~

1. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

2. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
4. Review structural loading limitations of roof deck during and after roofing.
5. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
6. Review governing regulations and requirements for insurance and certificates if applicable.
7. Review temporary protection requirements for roofing system during and after installation.
8. Review roof observation and repair procedures after roofing installation.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals: Provide documentation of compliance with applicable requirements set forth in Section 01 81 13.33 "Sustainable Design Requirements - CALGreen."
- C. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
  1. Layout and thickness of insulation.
  2. Base flashings and membrane termination details.
  3. Flashing details at penetrations.
  4. Tapered insulation layout, thickness, and slopes.
  5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
  6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
  7. Tie-in with adjoining air barrier.
- D. Samples for Verification: For the following products:
  1. Roof membrane and flashings, of color required.  
~~?. Aggregate ballast in gradation[ and color] required.~~  
~~?. Roof paver[, full sized,] in each color and texture required.~~
  2. Walkway pads, of color required.
- E. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.  
~~?. Manufacturer Certificates:~~
  1. ~~Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.~~
    - a. ~~Submit evidence of compliance with performance requirements.~~
  2. ~~Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.~~
- B. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.

C. Evaluation Reports: For components of roofing system, from ICC-ES.

D. Field Test Reports:

1. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

~~D. Field quality control reports.~~

~~?. Sample Warranties: For manufacturer's special warranties.~~

## 1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

~~?. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.~~

## 1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

## 1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

## 1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

## 1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, vapor retarders, walkway products, and other components of roofing system by membrane manufacturer.

2. Warranty Period: 20 years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, vapor retarders, walkway products, for the following warranty period:
  1. Warranty Period: Three years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.
  1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
  2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D 3746, ASTM D 4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. Wind Uplift Resistance: Design roofing system to resist roof area field, perimeter, and corner wind uplift pressures indicated on Drawings when tested according to FM Approvals 4474, UL 580, or UL 1897.
- D. Solar Reflectance Index (SRI): Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.
- E. ENERGY STAR Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low -slope roof products.
- F. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.
- G. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

### **2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING**

- A. TPO Sheet: ASTM D 6878/D 6878M, internally fabric- or scrim-reinforced, ~~fabric-backed~~ TPO sheet.
  1. Product: Subject to compliance with requirements, provide the following:
    - a. GAF; EverGuard 60, with manufacturer's recommended ~~adhesive and other~~ installation accessories.
  2. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.
  3. Thickness: 60 mils (1.5 mm), nominal.



4. Exposed Face Color: White.

### 2.3 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
1. Adhesives and Sealants: Comply with requirements set forth in Section 01 81 13.33 "Sustainable Design Requirements - CALGreen."
- B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as TPO sheet.
- C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- ~~?. Roof Vents: As recommended by roof membrane manufacturer.~~
- ~~1. Size: Not less than 4 inch (100 mm) diameter.~~
- D. Bonding Adhesive: Manufacturer's standard[, water based].
- ~~?. Slip Sheet: ASTM D 2178/D 2178M, Type IV; glass fiber; asphalt impregnated felt.~~
- E. Slip Sheet: Manufacturer's standard, of thickness required for application.
- ~~?. Vented Base Sheet: ASTM D 4897/D 4897M, Type II; nonperforated, asphalt impregnated fiberglass reinforced, with mineral granular patterned surfacing on bottom surface.~~
- F. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.
- ~~?. Metal Battens: Manufacturer's standard, aluminum-zinc alloy coated or zinc coated steel sheet, approximately 1 inch wide by 0.05 inch thick (25 mm wide by 1.3 mm thick), prepunched.~~
- ~~?. Ballast Retaining Bar: Perimeter securement system consisting of a slotted extruded aluminum retention bar with an integrated compression fastening strip.~~
- ~~1. Fasteners: 1 1/2 inch (38 mm) stainless steel fasteners with neoprene washers.~~
- G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.
- H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

### ~~?.? SUBSTRATE BOARDS~~

- ~~I. Substrate Board: ASTM C 1396/C 1396M, Type X gypsum board.~~
- ~~1. Thickness: 5/8 inch (16 mm).~~
- ~~J. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.~~

## 2.4 VAPOR RETARDER

~~A. Polyethylene Film: ASTM D 4397, [6 mils (0.015 mm)] [10 mils (0.25 mm)] thick, minimum, with maximum permeance rating of [0.13 perm (0.084 metric perm)] [0.076 perm (0.050 metric perm)].~~

~~1. Tape: Pressure sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.~~

~~2. Adhesive: Manufacturer's standard lap adhesive, listed by FM Approvals for vapor retarder application.~~

~~B.A. Self-Adhering-Sheet Vapor Retarder: Polyethylene film laminated to layer of butyl rubber adhesive, minimum 30-mil (0.76-mm) total thickness; maximum permeance rating of 0.1 perm (6 ng/Pa x s x sq. m); cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor retarder manufacturer.~~

## 2.5 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured ~~[or approved]~~ by TPO roof membrane manufacturer ~~[, approved for use in FM Approvals' RoofNav listed roof assemblies].~~

B. Polyisocyanurate Board Insulation: ASTM C 1289, ~~[Type II, Class 1, Grade 2]~~ ~~[Type II, Class 2, Grade 2]~~, felt or glass-fiber mat facer on both major surfaces, tapered as required to create slope indicated.

~~1. Product: GAF; EnergyGuard NH Polyiso Insulation. (Non-Halogenated polyiso insulation boards.)~~

~~— Product: Subject to compliance with requirements, provide polyisocyanurate board insulation by TPO membrane manufacturer.~~

~~1-2. Thickness: As shown on Drawings; if not shown, not less than 2 inches.~~

## 2.6 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation ~~[and cover boards]~~ to substrate, and acceptable to roofing system manufacturer.

~~2. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:~~

~~1. Full spread, spray applied, low rise, two component urethane adhesive.~~

~~— Adhesives and Sealants: Comply with requirements set forth in Section 01 81 13.33 "Sustainable Design Requirements - CALGreen."~~

~~2. Adhesives and sealants shall comply with the following limits for VOC content:~~

~~a. Plastic Foam Adhesives: 50 g/L.~~

~~2. Gypsum Board and Panel Adhesives: 50 g/L.~~

~~2. Multipurpose Construction Adhesives: 70 g/L.~~

~~2. Fiberglass Adhesives: 80 g/L.~~

~~2. Contact Adhesives: 80 g/L.~~

~~2. PVC Welding Compounds: 510 g/L.~~

~~2. Other Adhesives: 250 g/L.~~

- ~~?. Single Ply Roof Membrane Sealants: 450 g/L.~~
- ~~?. Nonmembrane Roof Sealants: 300 g/L.~~
- ~~?. Sealant Primers for Nonporous Substrates: 250 g/L.~~
- ~~?. Sealant Primers for Porous Substrates: 775 g/L.~~

~~2. Adhesives and sealants shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."~~

C. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum board ~~or ASTM C 1278/C 1278M fiber reinforced gypsum board.~~

1. Product: Subject to compliance with requirements, provide the following:

a. Georgia-Pacific Gypsum, LLC; DensDeck Prime Roof Board, 1/4-inch thick.

~~D. Roofing Asphalt: [ASTM D 312/D 312M, Type III or Type IV] [ASTM D 6152/D 6152M, SEBS modified].~~

~~?. Asphalt Primer: ASTM D 41/D 41M.~~

## 2.7 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway ~~[pads] [or] [rolls]~~, approximately 3/16 inch (5 mm) thick and acceptable to roofing system manufacturer.

1. Size: Approximately 36 by 60 inches (914 by 1524 mm).
2. Color: Contrasting with roof membrane.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

~~?. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 00 "Steel Decking."~~

~~?. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.~~

~~?. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than [75] <Insert number> percent, or as recommended by roofing system manufacturer, when tested according to ASTM F 2170.~~

~~a. Test Frequency: One test probe per each [1000 sq. ft. (93 sq. m)] <Insert area>, or portion thereof, of roof deck, with not less than three tests probes.~~

~~?. Submit test reports within 24 hours after performing tests.~~

~~?. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.~~

~~?. Verify that joints in precast concrete roof decks have been grouted flush with top of concrete.~~

- ~~?.—Verify that minimum curing period recommended by roofing system manufacturer for lightweight insulating concrete roof decks has passed.~~
- ~~?.—Verify any damaged sections of cementitious wood fiber decks have been repaired or replaced.~~
- ~~?.—Verify adjacent cementitious wood fiber panels are vertically aligned to within 1/8 inch (3.2 mm) at top surface.~~

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Perform fastener-pullout tests according to roof system manufacturer's written instructions.
  - 1. Submit test result within 24 hours after performing tests.
    - a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

~~D.—Install sound absorbing insulation strips according to acoustical roof deck manufacturer's written instructions.~~

### 3.3 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions, ~~FM Approvals' RoofNav assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.~~
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.
- C. Install roof membrane and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition ~~[and to not void warranty for existing roofing system].~~
- D. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified under Section 07 25 00 "Weather Barriers." ~~[Section 07 27 13 "Modified Bituminous Sheet Air Barriers."][Section 07 27 15 "Nonbituminous Self-Adhering Sheet Air Barriers."][Section 07 27 26 "Fluid Applied Membrane Air Barriers."]~~

### 3.4 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches (610 mm) in adjacent rows.
  - ~~1.—At steel roof decks, install substrate board at right angle to flutes of deck.~~
    - ~~a.—Locate end joints over crests of steel roof deck.~~
  - ~~2.1.~~ Tightly butt substrate boards together.

- ~~3.2.~~ Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
- ~~?.~~ ~~Fasten substrate board to top flanges of steel deck according to recommendations in FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.~~
- 4.3. Fasten substrate board to ~~top flanges of steel~~roof deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.
- ~~?.~~ ~~Loosely lay substrate board over roof deck.~~

### 3.5 VAPOR RETARDER INSTALLATION

- ~~A.~~ ~~Polyethylene Film: Loosely lay polyethylene film vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 and 6 inches (50 and 150 mm), respectively.~~
- ~~1.~~ ~~Continuously seal side and end laps with [tape] [adhesive].~~
- ~~B.~~A. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 and 6 inches (90 and 150 mm), respectively.
1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.
  2. Seal laps by rolling.
- ~~C.~~ ~~Built Up Vapor Retarder: Install two glass fiber felt plies lapping each felt 19 inches (483 mm) over preceding felt.~~
- ~~1.~~ ~~Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.~~
  - ~~?.~~ ~~Embed each felt in a solid mopping of hot roofing asphalt.~~
  - ~~?.~~ ~~Glaze coat completed surface with hot roofing asphalt.~~
  - ~~?.~~ ~~Apply hot roofing asphalt within plus or minus 25 deg F (14 deg C) of equiviscous temperature.~~
- ~~D.~~B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

### 3.6 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.
- B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.
- ~~?.~~ ~~Installation Over Metal Decking:~~
- ~~1.~~ ~~Install base layer of insulation with [joints staggered not less than 24 inches (610 mm) in adjacent rows] [end joints staggered not less than 12 inches (305 mm) in adjacent rows] [and with long joints continuous at right angle to flutes of decking].~~
    - ~~a.~~ ~~Locate end joints over crests of decking.~~
    - ~~?.~~ ~~Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.~~

- ~~?. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.~~
- ~~?. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.~~
- ~~?. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).~~
  - ~~1) Trim insulation so that water flow is unrestricted.~~
- ~~b. Fill gaps exceeding 1/4 inch (6 mm) with insulation.~~
- ~~?. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.~~
- ~~?. Loosely lay base layer of insulation units over substrate.~~
- ~~?. Mechanically attach base layer of insulation[ and substrate board] using mechanical fasteners specifically designed and sized for fastening specified board type roof insulation to metal decks.~~
  - ~~1) Fasten insulation according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.~~
  - ~~?) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.~~
- ~~2. Install upper layers of insulation[ and tapered insulation] with joints of each layer offset not less than 12 inches (305 mm) from previous layer of insulation.~~
  - ~~a. Staggered end joints within each layer not less than 24 inches (610 mm) in adjacent rows.~~
  - ~~?. Install with long joints continuous and with end joints staggered not less than 12 inches (305 mm) in adjacent rows.~~
  - ~~?. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.~~
  - ~~?. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.~~
  - ~~?. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).~~
    - ~~1) Trim insulation so that water flow is unrestricted.~~
  - ~~b. Fill gaps exceeding 1/4 inch (6 mm) with insulation.~~
  - ~~?. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.~~
  - ~~?. Loosely lay each layer of insulation units over substrate.~~
  - ~~?. Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:~~
    - ~~1) Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.~~
    - ~~?) Set each layer of insulation in ribbons of bead applied insulation adhesive, firmly pressing and maintaining insulation in place.~~
    - ~~?) Set each layer of insulation in a uniform coverage of full spread insulation adhesive, firmly pressing and maintaining insulation in place.~~

C. Installation Over ~~{Wood}~~{Wood Panel} Decking:

1. Mechanically fasten slip sheet to roof deck using mechanical fasteners specifically designed and sized for fastening slip sheet to ~~{wood}~~{wood panel} decks.

- ~~a. Fasten slip sheet according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.~~
- ~~b.a.~~ Fasten slip sheet to resist specified uplift pressure at corners, perimeter, and field of roof.
2. Install base layer of insulation with {joints staggered not less than 24 inches (610 mm) in adjacent rows} ~~{end joints staggered not less than 12 inches (305 mm) in adjacent rows}.~~
- ~~a. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.~~
- ~~b.a.~~ Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
- ~~e.b.~~ Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
- ~~d.c.~~ At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).
- 1) Trim insulation so that water flow is unrestricted.
- ~~e.d.~~ Fill gaps exceeding 1/4 inch (6 mm) with insulation.
- ~~f.e.~~ Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- ~~g.f.~~ Loosely lay base layer of insulation units over substrate.
3. Mechanically attach base layer of insulation{ and substrate board} using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to {wood}{wood panel} decks.
- ~~a. Fasten insulation according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.~~
- ~~b.a.~~ Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
4. Install upper layers of insulation{ and tapered insulation} with joints of each layer offset not less than 12 inches (305 mm) from previous layer of insulation.
- a. Staggered end joints within each layer not less than 24 inches (610 mm) in adjacent rows.
- ~~?. Install with long joints continuous and with end joints staggered not less than 12 inches (305 mm) in adjacent rows.~~
- b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
- c. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
- d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).
- 1) Trim insulation so that water flow is unrestricted.
- e. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
- f. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- g. Loosely lay each layer of insulation units over substrate.

- h. Adhere each layer of insulation to substrate using adhesive ~~according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification,~~ as follows:
- ~~1) Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.~~
  - ~~2) Set each layer of insulation in ribbons of bead applied insulation adhesive, firmly pressing and maintaining insulation in place.~~
  - ~~2)1) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.~~

~~D. Installation Over Concrete Decks:~~

- ~~1. Install base layer of insulation with [joints staggered not less than 24 inches (610 mm) in adjacent rows] [end joints staggered not less than 12 inches (305 mm) in adjacent rows].~~
  - ~~a. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.~~
  - ~~2. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.~~
  - ~~2. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.~~
  - ~~2. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).~~
    - ~~1) Trim insulation so that water flow is unrestricted.~~
  - ~~b. Fill gaps exceeding 1/4 inch (6 mm) with insulation.~~
  - ~~2. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.~~
  - ~~2. Loosely lay base layer of insulation units over substrate.~~
  - ~~2. Adhere base layer of insulation to [concrete roof deck] [vapor retarder] according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:~~
    - ~~1) Prime surface of concrete deck with asphalt primer at rate of 3/4 gal./100 sq. ft. (0.3 L/sq. m), and allow primer to dry.~~
    - ~~2) Set insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.~~
    - ~~2) Set insulation in ribbons of bead applied insulation adhesive, firmly pressing and maintaining insulation in place.~~
    - ~~2) Set insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.~~
- ~~2. Install upper layers of insulation [and tapered insulation] with joints of each layer offset not less than 12 inches (305 mm) from previous layer of insulation.~~
  - ~~a. Staggered end joints within each layer not less than 24 inches (305 mm) in adjacent rows.~~
  - ~~2. Install with long joints continuous and with end joints staggered not less than 12 inches (305 mm) in adjacent rows.~~
  - ~~2. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.~~



- ~~?.— Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.~~
- ~~?.— At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).~~
  - ~~1) — Trim insulation so that water flow is unrestricted.~~
- ~~b. — Fill gaps exceeding 1/4 inch (6 mm) with insulation.~~
- ~~?.— Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.~~
- ~~?.— Loosely lay each layer of insulation units over substrate.~~
- ~~?.— Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:~~
  - ~~1) — Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.~~
  - ~~?.— Set each layer of insulation in ribbons of bead applied insulation adhesive, firmly pressing and maintaining insulation in place.~~
  - ~~?.— Set each layer of insulation in a uniform coverage of full spread insulation adhesive, firmly pressing and maintaining insulation in place.~~

~~E. — Installation Over Cementitious Wood Fiber Decks:~~

- ~~1. — Mechanically fasten slip sheet to roof deck using mechanical fasteners specifically designed and sized for fastening slip sheet to cementitious wood fiber decks.~~
  - ~~a. — Fasten slip sheet according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.~~
  - ~~?.— Fasten slip sheet to resist specified uplift pressure at corners, perimeter, and field of roof.~~
- ~~2. — Install base layer of insulation with [joints staggered not less than 24 inches (610 mm) in adjacent rows] [end joints staggered not less than 12 inches (305 mm) in adjacent rows].~~
  - ~~a. — Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.~~
  - ~~?.— Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.~~
  - ~~?.— Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.~~
  - ~~?.— At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).~~
    - ~~1) — Trim insulation so that water flow is unrestricted.~~
  - ~~b. — Fill gaps exceeding 1/4 inch (6 mm) with insulation.~~
  - ~~?.— Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.~~
  - ~~?.— Loosely lay base layer of insulation units over substrate.~~
  - ~~?.— Adhere base layer of insulation to slip sheet according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:~~
    - ~~1) — Set insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.~~

- ~~?)—Set insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.~~
  - ~~?)—Set insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.~~
  - 3. Install upper layers of insulation [and tapered insulation] with joints of each layer offset not less than 12 inches (305 mm) from previous layer of insulation.
    - a. Staggered end joints within each layer not less than 24 inches (610 mm) in adjacent rows:
      - ~~?)—Install with long joints continuous and with end joints staggered not less than 12 inches (305 mm) in adjacent rows.~~
      - ~~?)—Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.~~
      - ~~?)—Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.~~
      - ~~?)—At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).
        - 1) Trim insulation so that water flow is unrestricted.~~
    - b. Fill gaps exceeding 1/4 inch (6 mm) with insulation:
      - ~~?)—Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.~~
      - ~~?)—Loosely lay each layer of insulation units over substrate.~~
      - ~~?)—Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:
        - 1) Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.
        - ~~?)—Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.~~
        - ~~?)—Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.~~~~
- F. Installation Over Lightweight Insulating Concrete Decks:
- 1. Mechanically fasten vented base sheet to lightweight insulating concrete, with vented side down, using mechanical fasteners specifically designed and sized for fastening to lightweight insulating concrete decks.
    - a. Fasten vented base sheet according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.
    - ~~?)—Fasten vented base sheet to resist specified uplift pressure at corners, perimeter, and field of roof.~~
  - 2. Install base layer of insulation with [joints staggered not less than 24 inches (610 mm) in adjacent rows] [end joints staggered not less than 12 inches (305 mm) in adjacent rows].
    - a. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
    - ~~?)—Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.~~

- ~~2. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.~~
- ~~2. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).~~
  - ~~1) Trim insulation so that water flow is unrestricted.~~
- ~~b. Fill gaps exceeding 1/4 inch (6 mm) with insulation.~~
- ~~2. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.~~
- ~~2. Loosely lay base layer of insulation units over substrate.~~
- ~~2. Adhere base layer of insulation to vented base sheet according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:~~
  - ~~1) Set insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.~~
  - ~~2) Set insulation in ribbons of bead applied insulation adhesive, firmly pressing and maintaining insulation in place.~~
  - ~~2) Set insulation in a uniform coverage of full spread insulation adhesive, firmly pressing and maintaining insulation in place.~~
- ~~3. Install upper layers of insulation [ and tapered insulation ] with joints of each layer offset not less than 12 inches (305 mm) from previous layer of insulation.~~
  - ~~a. Staggered end joints within each layer not less than 24 inches (610 mm) in adjacent rows:~~
    - ~~2. Install with long joints continuous and with end joints staggered not less than 12 inches (305 mm) in adjacent rows.~~
    - ~~2. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.~~
    - ~~2. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.~~
    - ~~2. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).~~
      - ~~1) Trim insulation so that water flow is unrestricted.~~
  - ~~b. Fill gaps exceeding 1/4 inch (6 mm) with insulation.~~
  - ~~2. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.~~
  - ~~2. Loosely lay each layer of insulation units over substrate.~~
  - ~~2. Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:~~
    - ~~1) Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.~~
    - ~~2) Set each layer of insulation in ribbons of bead applied insulation adhesive, firmly pressing and maintaining insulation in place.~~
    - ~~2) Set each layer of insulation in a uniform coverage of full spread insulation adhesive, firmly pressing and maintaining insulation in place.~~

### 3.7 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction.
1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
  2. At internal roof drains, conform to slope of drain sump.
    - a. Trim cover board so that water flow is unrestricted.
  3. Cut and fit cover board tight to nailers, projections, and penetrations.
  4. Loosely lay cover board over substrate.
  5. Adhere cover board to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:
    - a. Set cover board in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.
    - b. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
    - c. Set cover board in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
- B. Install slip sheet over cover board and beneath roof membrane.

### ~~3.8 ADHERED ROOFING INSTALLATION~~

- ~~C. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.~~
- ~~1. Unroll roof membrane and allow to relax before installing.~~
- ~~2. Start installation of roofing in presence of roofing system manufacturer's technical personnel and Owner's testing and inspection agency.~~
- ~~3. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.~~
- ~~4. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.~~
- ~~5. Hot Roofing Asphalt: Apply a solid mopping of hot roofing asphalt to substrate at temperature and rate required by manufacturer, and install fabric backed roof membrane. Do not apply to splice area of roof membrane.~~
- ~~6. Fabric Backed Roof Membrane Adhesive: Apply to substrate at rate required by manufacturer, and install fabric backed roof membrane.~~
- ~~7. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.~~
- ~~8. Apply roof membrane with side laps shingled with slope of roof deck where possible.~~
- ~~9. Seams: Clean seam areas, overlap roof membrane, and hot air weld side and end laps of roof membrane and sheet flashings, to ensure a watertight seam installation.~~

- ~~1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.~~
- ~~2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.~~
- ~~3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.~~

~~D. Spread sealant bed over deck drain flange at roof drains, and securely seal roof membrane in place with clamping ring.~~

### **3.8 MECHANICALLY FASTENED ROOFING INSTALLATION**

~~A. Mechanically fasten roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.~~

~~B. Unroll roof membrane and allow to relax before installing.~~

~~C. For in-splice attachment, install roof membrane with long dimension perpendicular to steel roof deck flutes.~~

~~E.D. Start installation of roofing in presence of roofing system manufacturer's technical personnel and Owners testing and inspection agency.~~

~~F.E. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.~~

~~G.F. Mechanically fasten or adhere roof membrane securely at terminations, penetrations, and perimeter of roofing.~~

~~H.G. Apply roof membrane with side laps shingled with slope of roof deck where possible.~~

~~H. In-Seam Attachment: Secure one edge of TPO sheet using fastening plates or metal battens centered within seam, and mechanically fasten TPO sheet to roof deck.~~

~~I. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings to ensure a watertight seam installation.~~

- ~~1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and flashing sheet.~~
- ~~2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.~~
- ~~3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.~~

~~J. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.~~

### **3.8.3.9 BASE FLASHING INSTALLATION**

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

**3.93.10 WALKWAY INSTALLATION**

- A. Flexible Walkways:
  - 1. Provide 6-inch (76-mm) clearance between adjoining pads.
  - 2. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

**END OF SECTION 07 54 23**

## SECTION 08 71 00

### DOOR HARDWARE

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions of Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.
- B. This Section includes the following, but is not necessarily limited to:
  - 1. Door Hardware, including electric hardware.
  - 2. Storefront and Entrance door hardware.
  - 3. Thresholds, gasketing and weather-stripping.
- C. Related Sections: The following sections are noted as containing requirements that relate to this Section, but may not be limited to this listing.
  - 1. Division 8: Section – Hollow Metal Doors and Frames.
  - 2. Division 8: Section – Solid Core and Stile and Rail Wood Doors
  - 3. Division 8: Section - Aluminum Storefront
  - 4. Division 28: Section - Fire/Life-Safety Systems & Security Access Systems.

##### 1.3 REFERENCES (Use date of standard in effect as of Bid date.)

- A. 2013 California Building Code, CCR, Title 24.
- B. BHMA – Builders' Hardware Manufacturers Association
- C. CCR – California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.
- D. DHI – Door and Hardware Institute
- E. NFPA - National Fire Protection Association.
  - 1. NFPA 80 - Fire Doors and Other Opening Protectives
  - 2. NFPA 105 - Smoke and Draft Control Door Assemblies
- F. UL - Underwriters Laboratories.
  - 1. UL 10C - Fire Tests of Door Assemblies
  - 2. UL 305 - Panic Hardware
- G. WHI - Warnock Hersey Incorporated
- H. SDI - Steel Door Institute

1.4 SUBMITTALS & SUBSTITUTIONS

- A. General: Submit in accordance with Conditions of the Contract and Division 1 Specification sections.
- B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- C. Submit electronic copy of schedule organized vertically into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:
  - 1. Include a Cover Sheet with;
    - a. Job Name, location, telephone number.
    - b. Architects name, location and telephone number.
    - c. Contractors name, location, telephone number and job number.
    - d. Suppliers name, location, telephone number and job number.
    - e. Hardware consultant's name, location and telephone number.
  - 2. Job Index information included;
    - a. Numerical door number index including; door number, hardware heading number and page number.
    - b. Complete keying information (referred to DHI hand-book "Keying Systems and Nomenclature"). Provision should be made in the schedule to provide keying information when available; if it is not available at the time the preliminary schedule is submitted.
    - c. Manufacturers' names and abbreviations for all materials.
    - d. Explanation of abbreviations, symbols, and codes used in the schedule.
    - e. Mounting locations for hardware.
    - f. Clarification statements or questions.
    - g. Catalog cuts and manufacturer's technical data and instructions.
  - 3. Vertical schedule format sample:

Heading Number 1 (Hardware group or set number – HW -1)					
			(a) 1 Single Door #1 - Exterior from Corridor 101	(b) 90°	(c) RH
			(d) 3' 0"x7' 0" x 1-3/4" x (e) 20 Minute (f) WD x HM		
(g) 1	(h)	(i) ea	(j) Hinges - (k) 5BB1HW 4.5 x 4.5 NRP (l) 1/2 TMS	(m) 626	(n) IVE
2	6AA	1 ea	Lockset - ND50PD x RHO x RH x 10-025 x JTMS	626	SCH

(a) - Single or pair with opening number and location. (b) - Degree of opening (c) - Hand of door(s) (d) - Door and frame dimensions and door thickness. (e) - Label requirements if any. (f) - Door by frame material. (g) - (Optional) Hardware item line #. (h) - Keyset Symbol. (i) - Quantity. (j) - Product description. (k) - Product Number. (l) - Fastenings and other pertinent information. (m) - Hardware finish codes per ANSI A156.18. (n) - Manufacture abbreviation.



- D. Make substitution requests in accordance with Division 1. Substitution requests must be made prior to bid date. Include product data and indicate benefit to the project. Furnish samples of any proposed substitution.
- E. Wiring Diagrams: Provide product data and wiring and riser diagrams for all electrical products listed in the Hardware Schedule portion of this section.
- F. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.
- G. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- H. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, wiring/riser diagrams, manufacturers' installation and adjustment and maintenance information.
- I. Fire Door Assembly Testing: Submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

#### 1.5 QUALITY ASSURANCE

- A. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.
- B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
  - 1. Responsible for detailing, scheduling and ordering of finish hardware.
  - 2. Meet with Owner to finalize keying requirements and to obtain final instructions in writing.
  - 3. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.
- C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.
- D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.
  - 1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".
- E. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.
- B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.
- C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.
- D. Contractor to inventory door hardware jointly with representatives of hardware supplier and hardware installer until each all are satisfied that count is correct.

1.7 WARRANTY

- A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:
  - 1. Locksets: "ND" Ten (10) years.
  - 2. Electronic: One (1) year.
  - 3. Closers: Thirty (30) years --except electronic closers shall be two (2) years.
  - 4. Exit devices: Three (3) years.
  - 5. All other hardware: Two (2) years.

1.8 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.9 PRE-INSTALLATION CONFERENCE

- A. Convene a pre-installation conference at least one week prior to beginning work of this section.
- B. Attendance: Architect, Construction Manager, Contractor, Security Contractor, Hardware Supplier, Installer, Key District Personnel, and Project Inspector.
- C. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work. Review District's keying standards.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

<u>Item</u>	<u>Manufacturer</u>	<u>Acceptable Substitutes</u>
Hinges	Ives	Hager, Stanley, McKinney
Locks, Latches & Cylinders	Schlage	Or Approved Equal

Exit Devices	Von Duprin	Or Approved Equal
Closers	LCN	Or Approved Equal
Push, Pulls & Protection Plates	Ives	Trimco, BBW, DCI
Flush Bolts	Ives	Trimco, BBW, DCI
Dust Proof Strikes	Ives	Trimco, BBW, DCI
Coordinators	Ives	Trimco, BBW, DCI
Stops	Ives	Trimco, BBW, DCI
Overhead Stops	Glynn-Johnson	Or Approved Equal
Thresholds	Zero	Pemko, National Guard
Seals & Bottoms	Zero	Pemko, National Guard

## 2.2 MATERIALS

- A. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.
1. Hinges shall be sized in accordance with the following:
    - a. Height:
      - 1) Doors up to 42" wide: 4-1/2" inches.
      - 2) Doors 43" to 48" wide: 5 inches.
    - b. Width: Sufficient to clear frame and trim when door swings 180 degrees.
    - c. Number of Hinges: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.
  2. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.
- B. Floor Closers: Shall be equipped with compression springs, cam and roller operating mechanism and a one piece spindle-cam for maximum operating performance and longevity.
- C. Continuous Hinges: As manufactured by Ives, an Allegion Company. UL rated as required.
- D. Heavy Duty Cylindrical Locks and Latches: Schlage "ND" Series as scheduled with "Sparta" design, fastened with through-bolts and threaded chassis hubs.
1. Provide cylindrical locksets exceeding the ANSI/BHMA A156.2 Grade 1 performance standards for strength, security, and durability in the categories below:
    - a. Abusive Locked Lever Torque Test – minimum 3,100 inch-pounds without gaining access
    - b. Offset lever pull – minimum 1,600 foot pounds without gaining access
    - c. Vertical lever impact – minimum 100 impacts without gaining access
  2. Cycle life - tested to minimum 16 million cycles per ANSI/BHMA A156.2 Cycle Test with no visible lever sag or use of performance aids such as set screws or spacers
  3. UL 10C for 4'-0" x 10'-0" 3-hour fire door.

4. Cylinders: Refer to "KEYING" article, herein.
  5. Provide solid steel anti-rotation through bolts and posts to control excessive rotation of lever.
  6. Provide lockset that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.
  7. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw capable of UL listing of 3 hours on a 4' x 10' opening. Provide proper latch throw for UL listing at pairs.
  8. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
  9. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
  10. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
  11. Provide wired electrified options as scheduled in the hardware sets.
    - a. 12 through 24 volt DC operating capability, auto-detecting
    - b. Selectable EL (fail safe)/EU (fail secure) operating mode via switch on chassis
    - c. 0.230A (230mA) maximum current draw
    - d. 0.010A (10mA) holding current
    - e. Modular / "plug in" request to exit switch
  12. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.
- E. Deadlocks: Rotating cylinder trim rings of attack-resistant design. Mounting plates and actuator shields of plated cold-rolled steel. Mounting screws of 1/4" diameter steel and protected by drill-resistant ball bearings. Steel alloy deadbolt with hardened steel roller. Strike alloy deadbolt with reinforcer and two 3" long screws. ANSI A156.5, 2001 Grade 1 certified.
- F. Exit devices: Von Duprin as scheduled.
1. Comply with ANSI/BHMA A156.3 - 2001 standards.
  2. All internal parts shall be of cold-rolled steel with zinc dichromate coating.
  3. Mechanism case shall have an average thickness of .140".
  4. Compression spring engineering.
  5. All latchbolts shall be deadlocking with 3/4" throw and have a self-lubricating coating to reduce friction and wear.
  6. Device shall bear UL label for fire and or panic as may be required.
  7. All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
  8. All Exit Devices to be sex-bolted to the doors.
  9. Panic Hardware shall comply with CBC Section 11B.404.2.7 and shall be mounted between 34" and 44" above the finished floor surface. The unlatching force shall not exceed 15 lbs. applied in the direction of travel.
- G. Closers: LCN as scheduled. Place closers inside building, stairs, room, etc.
1. Door closer cylinders shall be of high strength cast iron construction with double heat treated pinion shaft to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.
  2. All door closers shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 11/16 inch and piston diameter of 1 inch to ensure longevity and durability under all closer applications.
  3. All parallel arm closers shall incorporate one piece solid forged steel arms with bronze bushings. 1-9/16" steel stud shoulder bolts, shall be incorporated in regular arms, hold-open arms, arms with hold open and stop built in. All other closers to have forged steel

- main arms for strength, durability, and aesthetics for versatility of trim accommodation, high strength and long life.
4. All parallel arm closers so detailed shall provide advanced backcheck for doors subject to severe abuse or extreme wind conditions. This advanced backcheck shall be located to begin cushioning the opening swing of the door at approximately 45 degrees. The intensity of the backcheck shall be fully adjustable by tamper resistant non-critical screw valve.
  5. Closers shall be installed to permit doors to swing 180 degrees.
  6. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees F. to -30 degrees F. without requiring seasonal adjustment of closer speed to properly close the door.
  7. Provide the manufactures drop plates, brackets and spacers as required at narrow head rails and special frame conditions. NO wood plates or spacers will be allowed.
  8. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Per 11B-404.2.8.1, door shall take at least 5 seconds to move from an open position of 90 degrees to a position of 12 degrees from the latch jamb.
- H. Flush Bolts & Dust Proof Strikes: Automatic Flush Bolts shall be of the low operating force design. Utilize the top bolt only model for interior doors where applicable and as permitted by testing procedures.
1. Manual flush bolts only permitted on storage or mechanical openings as scheduled.
  2. Provide dust proof strikes at openings using bottom bolts.
- I. Door Stops:
1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
  2. Do not install floor stops more than four (4) inches from the face of the wall or partition (CBC Section 11B-307).
  3. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.
- J. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10" high and 2" LDW. Sizes of armor and mop plates shall be listed in the Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.
- K. Thresholds: As Scheduled and per details.
1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope.
  2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 "Thermal and Moisture Protection".
  3. Use 1/4" fasteners, red-head flat-head sleeve anchors (SS/FHSL).
  4. Thresholds shall comply with CBC Section 11B-404.2.5.
- L. Seals: Provide silicone gasket at all rated and exterior doors.

1. Fire-rated Doors, Resilient Seals: UL10C Classified complies with NFPA 80 & NFPA 252. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.
  2. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C Classified complies with NFPA 80 & NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.
  3. Smoke & Draft Control Doors, Provide UL10C Classified complies with NFPA 80 & NFPA 252 for use on "S" labeled Positive Pressure door assemblies.
- M. Door Shoes & Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.
- N. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

### 2.3 KEYING

- A. Furnish a Proprietary Schlage masterkey system as directed by the owner or architect. Key system to be designated and combined by the Schlage Master Key Department even if pinned by the Authorized Key Center, Authorized Security Center or a local authorized commercial dealer.
- B. A detailed keying schedule is to be prepared by the owner and/or architect in consultation with a representative of Allegion or an Authorized Key Center or Authorized Security Center. Each keyed cylinder on every keyed lock is to be listed separately showing the door #, key group (in BHMA terminology), cylinder type, finish and location on the door.
- C. Extend the original Schlage masterkey system established for the project.
- D. Furnish all cylinders in the Schlage conventional style except the exit device and removable mullion cylinders which will be supplied in Schlage Full Size Interchangeable Core (FSIC). Pack change keys independently (PKI).
- E. Furnish construction keying for doors requiring locking during construction.
- F. Furnish all keys with visual key control.
1. Stamp key "Do Not Duplicate".
  2. Stamp (BHMA) key symbol on key.
- G. Furnish all cylinders with visual key control.
1. Stamp (BHMA) key symbol on face of cylinder plug (VKC).
- H. Furnish mechanical keys as follows:
1. Furnish 2 cut change keys for each different change key code.
  2. Furnish 1 uncut key blank for each change key code.
  3. Furnish 6 cut masterkeys for each different masterkey set.
  4. Furnish 3 uncut key blanks for each masterkey set.
  5. Furnish 2 cut control keys cut to the top masterkey for permanent I/C cylinders.
  6. Furnish 1 cut control key cut to each SKD combination.

- I. Furnish Schlage Padlocks and the cylinders to tie them into the masterkey system for gates, storage boxes, utility valve security, roof hatches and roll-up doors keyed as directed in the keying schedule.
  - 1. Furnish KS43D2200 padlock for use with non-I/C Schlage cylinders. Furnish 47-413 (conventional) or 47-743-XP (PrimusXP) with above.
  - 2. Furnish KS43G3200 padlock for use with FSIC Schlage cylinders. Furnish 23-030 (Classic / Everest) or 20-740 (PrimusXP) with above.
  - 3. Furnish KS41D1200 padlock for use with SFIC Schlage cylinders. Furnish 80-037 (Everest-B) with above.
- J. Furnish one Schlage cabinet lock for each cabinet door or drawer so designated on the drawings or keying schedule to match the masterkey system.
  - 1. Furnish CL100PB for use with non-I/C Schlage cylinders.
  - 2. Furnish CL77R for use with FSIC Schlage cylinders.
  - 3. Furnish CL721G for use with SFIC Schlage cylinders.

## 2.4 FINISHES

- A. Generally to be brushed chrome US26D (626 on bronze and 652 on steel) unless otherwise noted.
- B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US30D (630) unless otherwise noted.
- C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.
- D. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

## 2.5 FASTENERS

- A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.
- B. Screws for butt hinges shall be flathead, countersunk, full-thread type.
- C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.
- D. Provide expansion anchors for attaching hardware items to concrete or masonry.
- E. All exposed fasteners shall have a phillips head.
- F. Finish of exposed screws to match surface finish of hardware or other adjacent work.
- G. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

### **PART 3 - EXECUTION**

#### **3.1 INSPECTION**

- A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.
- B. Beginning of installation means acceptance of existing conditions.
- C. Fire-Rated Door Assembly Inspection: Upon completion of the installation, all fire door assemblies shall be inspected to confirm proper operation of the closing device and latching device and that only the manufacturer's furnished fasteners are used for installation and that it meets all criteria of a fire door assembly per NFPA 80 (Standard for Fire Doors and Other Opening Protectives) 2013 Edition. A written record shall be maintained and transmitted to the Owner to be made available to the Authority Having Jurisdiction (AHJ). The inspection of the swinging fire doors shall be performed by a certified FDAI (Fire Door Assembly Inspector) with knowledge and understanding of the operating components of the type of door being subjected to the inspection. The record shall list each fire door assembly throughout the project and include each door number, an itemized list of hardware set components at each door opening, and each door location in the facility.

#### **3.2 INSTALLATION**

- A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.
- B. Use the templates provided by hardware item manufacturer.
- C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 34" and 44" AFF.
- D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- F. Set thresholds for exterior doors in full bed of butyl-rubber sealant.
- G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.
- H. Hardware Installer shall coordinate with security contractor to route cable to connect electrified locks, panic hardware and fire exit hardware to power transfers or electric hinges at the time these items are installed so as to avoid disassembly and reinstallation of hardware.
- I. Hardware Installer shall also be present with the security contractor when the power is turned on for the testing of the electronic hardware applications. Installer shall make adjustments to solenoids, latches, vertical rods and closers to insure proper and secure operation.
- J. All wiring for electro-mechanical hardware mounted on the door shall be connected through the power transfer and terminated in the interface junction box specified for in the Electrical Section.



- K. Conductors shall be minimum 18 gage stranded, multicolored. A minimum 12 in. loop of conductors shall be coiled in the interface junction box. Each conductor shall be permanently marked with its function.
- L. If a power supply is specified in the hardware sets, all conductors shall be terminated in the power supply. Make all connections required for proper operation between the power supply and the electro-mechanical hardware. Provide the proper size conductors as specified in the manufacturer's technical documentation.

### 3.3 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Clean adjacent surface soiled by hardware installation.
- C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.
- E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

### 3.4 HARDWARE LOCATIONS

- A. Conform to CCR, Title 24, Part 2; and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

### 3.5 Field quality control

- A. Contractor is responsible for providing the services of an Architectural Hardware Consultant (AHC) or a proprietary product technician to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturers' instructions and as specified herein.

### 3.6 SCHEDULE

- A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.

- B. While the hardware schedule is intended to cover all doors, and other movable parts of the building, and establish type and standard of quality, the contractor is responsible for examining the Plans and Specifications and furnishing proper hardware for all openings whether listed or not. If there are any omissions in hardware groups in regard to regular doors they shall be called to the attention of the Architect prior to bid opening for instruction; otherwise, list will be considered Complete. No extras will be allowed for omissions.
- C. The Door Schedule on the Drawings indicates which hardware set is used with each door.

**Manufacturers Abbreviations (Mfr.)**

ADA	=	Adams Rite Mfg.	Aluminum Door Hardware
GLY	=	Glynn-Johnson Corporation	Overhead Door Stops
IVE	=	Ives	Hinges, Pivots, Bolts, Coordinators, Dust Proof Strikes, Push Pull & Kick Plates, Door Stops & Silencers
LCN	=	LCN	Door Closers
SCH	=	Schlage Lock Company	Locks, Latches & Cylinders
VON	=	Von Duprin	Exit Devices
ZER	=	Zero International	Thresholds, Gasketing & Weather-stripping

SPEXTRA: 350594  
GROUP NO. 01

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	630	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	FLOOR STOP	FS18L	BLK	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 02

2	EA	CONT. HINGE	224HD	628	IVE
1	EA	PANIC HARDWARE	5547-DT	626	VON
1	EA	PANIC HARDWARE	5547-NL-555CA	626	VON
1	EA	MORTISE CYLINDER	26-091	626	SCH
2	EA	OH STOP	90S	630	GLY
2	EA	CONCEALED CLOSER	2030 SERIES ST-2211	689	LCN
1	EA	THRESHOLD	PER DETAIL		
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

GROUP NO. 03

2	EA	CONT. HINGE	224HD	628	IVE
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2	EA	PANIC HARDWARE	5547-DT	626	VON
2	EA	OH STOP	90S	630	GLY
2	EA	CONCEALED CLOSER	2030 SERIES ST-2211	689	LCN
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL		
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

GROUP NO. 04

5	EA	HINGE	5BB1 4.5 X 4.5	630	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	630	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	SURFACE CLOSER	4011	689	LCN
2	EA	FLOOR STOP	FS439	682	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	ASTRAGAL	44SP OR BY HM DOOR MFR	SP	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL		
			CARD READER - WORK OF DIVISION 28		
			POWER SUPPLY - WORK OF DIVISION 28		

GROUP NO. 05

6	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	SET	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
2	EA	OH STOP	450S	630	GLY
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	ASTRAGAL	44SP OR BY HM DOOR MFR	SP	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 06

6	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	DBL CYL VESTIBULE	ND60PD SPA XN12-035	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	4111 EDA	689	LCN
2	EA	FLOOR STOP	FS18L	BLK	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	ASTRAGAL	44SP OR BY HM DOOR MFR	SP	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 07

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	SET	LONG DOOR PULL	PR 9264 36" N	630-316	IVE
1	EA	CONCEALED CLOSER	2031 WMS	689	LCN
1	EA	FLOOR STOP	FS439	682	IVE

GROUP NO. 08

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50PD RHO	626	SCH
1	EA	FLOOR STOP	FS439	682	IVE
1	EA	GASKETING	870AA	AA	ZER
1	EA	DOOR BOTTOM	360AA	AA	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 09

2	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	652	IVE
1	EA	EU STOREROOM LOCK	ND80PDEU SPA	626	SCH
1	EA	FLOOR STOP	FS439	682	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	THRESHOLD	PER DETAIL		
			CARD READER - WORK OF DIVISION 28		
			POWER SUPPLY - WORK OF DIVISION 28		

GROUP NO. 10

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	FLOOR STOP	FS439	682	IVE
1	EA	GASKETING	870AA	AA	ZER
1	EA	DOOR BOTTOM	360AA	AA	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 11

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	OH STOP	450S	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

GROUP NO. 12

3	EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PUSH PLATE	8200 6" X 16"	630	IVE
1	EA	PULL PLATE	8302 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4011	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

GROUP NO. 13

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S RHO	626	SCH
1	EA	FLOOR STOP	FS439	682	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	GASKETING	870AA	AA	ZER
1	EA	DOOR BOTTOM	360AA	AA	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 14

8	EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PANIC HARDWARE	5547-DT-LBR	626	VON
1	EA	PANIC HARDWARE	5547-NL-LBR	626	VON
1	EA	MORTISE CYLINDER	26-091	626	SCH
2	EA	OH STOP & HOLDER	90H	630	GLY
2	EA	CONCEALED CLOSER	2030 SERIES ST-2211	689	LCN
2	EA	MEETING STILE	328AA	AA	ZER
2	EA	DOOR BOTTOM	<del>355A</del> 3551	A	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 15

6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	DBL CYL VESTIBULE	ND60PD SPA XN12-035	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	SURFACE CLOSER	4011	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	FLOOR STOP	FS439	682	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER

GROUP NO. 16

5	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	652	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	EU STOREROOM LOCK	ND80PDEU SPA	626	SCH
2	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4011	689	LCN
2	EA	FLOOR STOP	FS439	682	IVE
1	EA	THRESHOLD	PER DETAIL		
2	EA	SILENCER	SR64	GRY	IVE
			CARD READER - WORK OF DIVISION 28		
			POWER SUPPLY - WORK OF DIVISION 28		

GROUP NO. 17

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	OH STOP & HOLDER	90H	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

GROUP NO. 18

1	EA	CYLINDER	AS REQUIRED BY DOOR MFR BALANCE OF HARDWARE BY DOOR MANUFACTURER CARD READER - WORK OF DIVISION 28		SCH
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GROUP NO. 19

4	EA	HW HINGE	5BB1HW 5 X 4.5	630	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	CRASH STOP	CS115	626	IVE

GROUP NO. 20

2	EA	CONT. HINGE	600	600	IVE
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SIEGEL & STRAIN Architects  
17-005

January 23, 2018  
Addendum 3

Oakley Recreation Center  
Oakley, CA

1 EA ROLLER LATCH  
1 EA FLUSH PULL

RL30  
960

US26D IVE  
626 IVE

**END OF SECTION**



## SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Non-load-bearing steel framing systems for interior partitions.
  - 2. Non-structural framing system for gypsum board soffits.
  - 3. Suspension system for plaster-finished gypsum board ceilings.
- B. Related Work:
  - 1. Section 09 29 00 "Gypsum Board" for installation of gypsum board over resilient channels, at soffits, and at ceilings.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals: Submit documentation evidencing compliance with applicable requirements set forth in Section 01 81 13.33 "Sustainable Design Requirements - CALGreen." Provide applicable submittals in addition to submittals specified herein.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

#### 2.2 FRAMING SYSTEMS FOR INTERIOR PARTITIONS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
  - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
- B. Studs and Runners: ASTM C 645.
  - 1. Steel Studs and Runners: See Legend & Notes on Exterior Wall Types sheets and Interior Wall Types sheets on Drawings (A-900 series).
    - a. Minimum Base-Metal Thickness: As indicated.
    - b. Depth: As indicated.
  - 2. Slip-Type Head Joints: Where indicated, provide the following:
    - a. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated. ~~See Details on Architectural Drawings, A-700 and A-900 series, and Interior Design Drawings, 7/ID7.02.~~
  - 1. Minimum Base-Metal Thickness: As indicated.
- D. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, galvanized steel sheet members designed to reduce sound transmission.
  - 1. Product: Subject to compliance with requirements, provide one of the following:

- a. Clark Dietrich Building Systems; RC Deluxe Resilient Channel.
- b. CEMCO; RC1-X High-End Sound Abatement Resilient Channel.
2. Configuration: Asymmetrical.
3. Fasteners: 1-inch Type S bugle-head screws.

### **2.3 FRAMING SYSTEMS FOR GYPSUM BOARD SOFFITS**

- A. Pre-engineered system of tees and crosstees with premeasured knockouts, alignment holes, angle formation, and locking angle molding that utilizes locking tabs to prevent lateral and upward movement.
  1. Maximum load per component shall be calculated per ASTM C645. Comply with manufacturer's recommendations and published documentation when providing system components required for Project.
- B. Product: Subject to compliance with requirements, provide the following:
  1. Armstrong World Industries, Inc.; Quikstix Soffits.

### **2.4 SUSPENSION SYSTEM FOR FLAT GYPSUM BOARD CEILINGS**

- A. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
- B. Product: Subject to compliance with requirements, provide the following:
  1. Armstrong World Industries, Inc.; Drywall Grid.

### **2.5 AUXILIARY MATERIALS**

- A. Isolation Strip: Where indicated.
  1. Resilient Gasket: Adhesive-backed, resilient strips that allow fastener penetration without displacement, 1/8 inch (3.2 mm) thick unless otherwise indicated, in width to suit steel stud size.
  2. Product: Unless otherwise indicated, provide the following:
    - a. CDM; CDM-ISO-STRIP Wall Base.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION, GENERAL**

- A. Installation Standard: ASTM C 754.
  1. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
  2. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### **3.3 INSTALLING FRAMED ASSEMBLIES**

- A. Install framing system components according to spacings indicated in Drawings, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Single-Layer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
  - 2. Multilayer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
- B. Install studs so flanges within framing system point in same direction.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
  - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  - 2. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- D. Resilient Channel Installation:
  - 1. Attach resilient channels directly to framing system.
  - 2. Attach channels parallel and with mounting flanges facing in one direction within continuous plane of gypsum board.
    - a. If change of framing would normally lead to change of direction of channels, provide additional blocking to allow channels to continue in one direction.
  - 3. Hold back ends of channels 1/2 inch from intersecting surfaces.
  - 4. Splice channels at framing, overlapping butt ends no more than 1 1/2 inches. Screw attach through both channels' flanges.
  - 5. Locate channels maximum 3 inches from framing at base and head of wall.
  - 6. Spacing: Unless otherwise indicated, space channels 24 inches on center where studs are 16 inches on center; space channels 16 inches on center where studs are 24 inches on center.
- E. Direct Furring:
  - 1. Screw to wood framing.
  - 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

### **3.4 INSTALLING GYPSUM BOARD SOFFIT FRAMING SYSTEMS**

- A. Install gypsum board soffit framing system according to manufacturer's published instructions.

### **3.5 INSTALLING CEILING SUSPENSION SYSTEMS**

- A. Install gypsum ceiling suspension system according to manufacturer's written instructions.
- B. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Hangers: 48 inches (1219 mm) o.c.

2. Carrying Channels (Main Runners): [48 inches (1219 mm) o.c.
  3. Furring Channels (Furring Members): 24 inches (610 mm)o.c.
- C. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- D. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
    - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
  3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  5. Do not attach hangers to steel roof deck.
  6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
  7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
  8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

**END OF SECTION 09 22 16**

## SECTION 09 24 00

### CEMENT PLASTERING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

A. Section Includes:

1. Exterior portland cement plasterwork (stucco) on metal lath with acrylic finish coat.
  - a. Three-coat plasterwork over sheathing and air barrier.
  - b. Two-coat plastering over concrete masonry units.

B. Related Sections:

1. Section 06 16 00 "Sheathing" for plywood sheathing and polyisocyanurate insulating sheathing.
2. Section 07 25 00 "Weather Barriers" for water-resistive air barrier installed behind cement plastering.
3. Section 07 62 00 "Sheet Metal Flashing and Trim" for reglets installed in stucco and for self-adhering sheet underlayment materials.

##### 1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

##### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For sealants, documentation including printed statement of VOC content.

- B. Shop Drawings: Show locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other work.

- C. Samples: For each type of factory-prepared finish coat and for each texture specified, provide 3 samples applied on cement plaster scratch and brown coat substrate.

##### 1.4 QUALITY ASSURANCE

- A. Installation Standard: ASTM E2266, current version.

- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups for each substrate and finish texture indicated for cement plastering, including accessories.
  - a. Size: 100 sq. ft. (9 sq. m) in surface area.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover, and keep them dry and protected against damage from weather, moisture, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

## 1.6 FIELD CONDITIONS

- A. Comply with ASTM C 926 requirements.
- B. Exterior Plasterwork:
  - 1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
  - 2. Apply plaster when ambient temperature is greater than 40 deg F (4.4 deg C).
  - 3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.
- C. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

## PART 2 - PRODUCTS

### 2.1 METAL LATH

- A. Expanded-Metal Lath: ASTM C 847, cold-rolled carbon-steel sheet with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized-zinc coating.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
    - b. CEMCO; California Expanded Metal Products Co.
    - c. ClarkDietrich Building Systems.
    - d. MarinoWARE.
    - e. Phillips Manufacturing Co.

~~?. Paper Backing: FS UU B 790a, Type I, Grade D, Style 2 vapor permeable paper.~~

~~?. Provide paper backed lath unless otherwise indicated.~~

### 2.2 ACCESSORIES

- A. General: Comply with ASTM C 1063, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
- B. Metal Accessories:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
    - b. CEMCO; California Expanded Metal Products Co.
    - c. ClarkDietrich Building Systems.
    - d. MarinoWARE.
    - e. Phillips Manufacturing Co.

2. Foundation Weep Screed: Fabricated from hot-dip galvanized-steel sheet, ASTM A 653/A 653M, G60 (Z180) zinc coating.
3. Cornerbeads: Fabricated from zinc-coated (galvanized) steel.
  - a. Smallnose cornerbead with expanded flanges; use unless otherwise indicated.
  - b. Smallnose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing unit masonry corners.
  - c. Bullnose cornerbead, radius 3/4 inch (19 mm) minimum, with expanded flanges; use at locations indicated on Drawings.
4. Control Joints: Fabricated from zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
5. Two-Piece Expansion Joints: Fabricated from zinc-coated (galvanized) steel; formed to produce slip-joint and square-edged reveal that is adjustable from 1/4 to 5/8 inch (6 to 16 mm) wide; with perforated flanges.

### 2.3 MISCELLANEOUS MATERIALS

- A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch (13 mm) long, free of contaminants, manufactured for use in cement plaster.
- C. Bonding Compound: ASTM C 932.
- D. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of no fewer than three exposed threads.
- E. Fasteners for Attaching Metal Lath to Substrates: ASTM C 1063.
- F. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch (1.21-mm) diameter unless otherwise indicated.
- G. Sealant: As specified in Section 07 92 00 "Joint Sealants."

### 2.4 PLASTER MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I.
- B. Masonry Cement: ASTM C 91, Type N.
- C. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
- D. Sand Aggregate: ASTM C 897.
- E. Perlite Aggregate: ASTM C 35.
- F. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems formulated with fine aggregates; for use over cement plaster base coats. Include manufacturer's recommended primers for acrylic based finishes.
  1. Manufacturer: Subject to compliance with requirements, provide products by the following:
    - a. Parex USA, Inc; Image Smooth

2. Texture: Smooth.

## **2.5 PLASTER MIXES**

- A. General: Comply with ASTM C 926 for applications indicated.
- B. Scratch and Brown Coats Mix: Factory-blended mix of portland cement, lime, fibers, and proprietary ingredients to be mixed with specified ASTM C 897-compliant sand at the job site. For use over metal lath in three-coat plasterwork, and over bonding compound at two-coat plasterwork.
  1. Product: Subject to compliance with requirements, provide the following:
    - a. Parex USA, Inc.; Fiber 47 Armourwall Scratch & Brown Concentrate.
- C. Leveling Coat: Factory-blended surface leveler consisting of copolymer binder base, compatible with portland cement, mixed with water at job site. Used for embedding mesh in assembly to help prevent cracks.
  1. Product: Subject to compliance with requirements, provide the following:
    - a. Parex USA, Inc.; Stucco Level Coat.
- D. Factory-Prepared Finish-Coat Mixes: For acrylic-based finish coatings, comply with manufacturer's written instructions.

## **2.6 INSTALLATION ACCESSORIES**

- A. Reinforcing Mesh: Fiberglass mesh, 4.5 oz., for embedding in leveling coat to help prevent cracking.
  1. Product: Product: Subject to compliance with requirements, provide the following:
    - a. Parex USA, Inc.; 355 Standard Mesh.
- B. Primer: Manufacturer's standard primer for finish indicated.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
- B. Prepare smooth, solid substrates for plaster according to ASTM C 926.

### **3.3 INSTALLING METAL LATH**

- A. Metal Lath: Install according to ASTM C 1063.
  1. Partition Framing and Vertical Furring: Install flat-diamond-mesh lath.

### **3.4 INSTALLING ACCESSORIES**

- A. Install according to ASTM C 1063 and at locations indicated on Drawings.



- B. Reinforcement for External (Outside) Corners:
  - 1. Install cornerbead at exterior locations.
- C. Control Joints: Locate as approved by Architect for visual effect and as follows:
  - 1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
    - a. Vertical Surfaces: 144 sq. ft. (13.4 sq. m).
  - 2. At distances between control joints of not greater than 18 feet (5.5 m) o.c.
  - 3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
  - 4. Where control joints occur in surface of construction directly behind plaster.
  - 5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

### 3.5 PLASTER APPLICATION

- A. General: Comply with ASTM C 926 and written instructions of plaster products manufacturer.
  - 1. Do not deviate more than plus or minus 1/4 inch in 10 feet (6 mm in 3 m) from a true plane in finished plaster surfaces when measured by a 10-foot (3-m) straightedge placed on surface.
  - 2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
  - 3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
- B. Walls; Base-Coat Mixes for Use over Metal Lath: For scratch and brown coats, for three-coat plasterwork with 3/4-inch (19-mm) total thickness, as follows:
  - 1. Apply by hand trowel or plaster gun to a minimum thickness of 3/8-inch (9.5 mm) per coat.
  - 2. Rod surface to true plane and float to densify.
  - 3. Trowel to smooth surface and make it uniform.
- C. Walls; Bonding Compound and Base Coat Mix for Two-Coat Plasterwork over CMU:
  - 1. Bonding Compound: Apply on concrete masonry unit substrates prior to direct application of plaster in two-coat plasterwork.
  - 2. Walls; Base-Coat Mix: Scratch coat for two-coat plasterwork; having 3/8-inch (10-mm) thickness on masonry, unless otherwise indicated on Drawings.
- D. Leveling Coat and Reinforcing Mesh:
  - 1. After moist curing, allow stucco base coat to air dry a minimum of 24 hours before applying the leveling and reinforcing coat.
  - 2. Use a stainless steel trowel to apply the stucco leveling coat over the stucco base coat at a thickness of 1/16 to 3/32 inches (1.6 to 2.4 mm).
  - 3. Fully embed reinforcing mesh into wet leveling coat, including diagonal strips at corners of openings, and trowel smooth. Overlap seams 2-1/2 inches (63 mm).
- E. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.

### **3.6 PLASTER REPAIRS**

- A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

### **3.7 CLEANING AND PROTECTION**

- A. Remove temporary protection and enclosure of other work after plastering is complete. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

**END OF SECTION 09 24 00**

## SECTION 09 54 26

### SUSPENDED WOOD CEILINGS AND MOUNTED WALL PANELS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

A. Section Includes:

1. Solid wood planks installed on metal suspension system at ceiling.
  - a. With curved transition to wall assembly, where indicated, providing a continuous appearance from ceiling to wall.
2. Solid wood planks screw-attached to furring at wall.
3. Acoustic insulation.
- ~~?. Wood veneered Solid wood planks for installation on metal suspension system at ceiling and screw attached at walls.~~

B. Related Requirements:

1. Section 01 81 13.33 "Sustainable Design Requirements - CALGreen."

##### 1.2 SUBMITTALS

A. Product Data: For each type of product specified.

B. Sustainable Design Submittals:

1. FSC Certified Wood: Product data and chain-of-custody certificates for products containing certified wood.
- ~~?. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low emitting materials.~~
- ~~?. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low emitting materials and no added urea formaldehyde.~~

C. Shop Drawings: Provide Shop Drawings for ceilings and walls, including placement of acoustical backing and product details. At ceilings, coordinate layout and installation of wood plank panels, acoustical backing, and suspension system components with other construction elements, including light fixtures, HVAC equipment, fire-suppression system components, partition assemblies and perimeter conditions.

D. Samples: For verification of each type of exposed finish required, prepared on samples of size indicated below. Where finishes involve normal color and texture variations, include sample sets showing the range of variations expected.

1. 12 by 18 inch assembled samples of each system indicated.

E. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.

F. Evaluation Reports: For wood plank panel ceiling suspension system, from ICC-ES.

### 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer, approved by wood ceiling manufacturer, who has completed panel ceilings similar in species, design, and extent to that indicated for this Project (including seismic performance requirements) and with a record of successful in-service performance.
- B. Woodworking Standards: Manufacturer must comply with specified provisions of Architectural Woodworking Institute quality standards.
- C. Coordination of Work: Coordinate ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.
- D. Pre-Installation Conference: Conduct conference at Project site.
- E. Mock-Up: Not less than two adjacent panels each of wall and ceiling panels.
  - 1. Mock-up may be retained in finished Work if undisturbed at time of Substantial Completion.

### 1.4 PROJECT CONDITIONS

- A. Space Enclosure and Environmental Limitations: Do not install wood panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete, and ambient temperature and humidity conditions are being maintained at the levels required by panelized wood plank system manufacturer.
  - 1. Relative humidity shall be between 25 and 55 percent.
  - 2. Temperatures shall be between 50 and 86 degrees Fahrenheit.
- B. Wood ceiling materials shall be permitted to reach room temperature and have a stabilized moisture content for a minimum of 72 hours before installation.

### 1.5 HANDLING

- A. Handling: Handle wood plank ceiling panels carefully to avoid chipping edges or damaging units.

## PART 2 - PRODUCTS

### 2.1 ~~WOOD-VENEERED~~SOLID WOOD PLANK SYSTEMS

- A. Certified Wood: ~~Particleboard~~Solid wood planks and backers shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- B. Panelized solid wood planks with backers, screw-attached to standard heavy-duty metal suspension system at ceilings; screw-attached to furring at walls.
- C. Product: Subject to compliance with requirements, provide the following:
  - 1. Armstrong World Industries, Inc.; Woodworks Linear Solid Wood Panels.
    - a. Species: Poplar, yellow or hybrid.
    - b. Panel Dimensions: 12 inches wide by 96 inches long.
    - c. Individual Plank Dimensions and Configuration: Selected by Architect from the following:

- 1) Three 3-inch wide planks, 3/4-inch thick, assembled with 1 inch reveals
- 2) Two 5-inch wide planks, 3/4-inch thick, assembled with with 1 inch reveals.

d. Backer: 1/2 inch thick, same hardwood as planks.

e. Finish: Factory-applied transparent finish.

- 1) Color: Grille Light Cherry.

~~?. Wood Veneered Plank Systems: Transparent finished wood veneered planks for screw or clip attachment; at ceilings, clip or screw attached to standard heavy duty metal suspension system; at walls, screw attached to substrate.~~

~~?. Product: Subject to compliance with requirements, provide the following:-~~

~~?. Armstrong World Industries, Inc.; Woodworks Linear, Veneered Planks.~~

~~B.D.~~ Seismic Performance: Wall panels and suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Clip- or screw-attach panels and planks and utilize system-standard seismic products according to manufacturer's written recommendations for seismic performance required.

~~C.E.~~ Fire Performance Characteristics: Fire Performance Characteristics: Identify wall and ceiling components with appropriate markings of applicable testing and inspecting organization.

1. Surface Burning Characteristics: Tested per ASTM E 84 and complying with ASTM E 1264 for Class C products.

a. Flame Spread: 200 or less.

b. Smoke Developed: 450 or less.

~~?. Surface Burning Characteristics: Tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.~~

~~?. Flame Spread: 25 or less.~~

~~?. Smoke Developed: 50 or less.~~

~~?. Planks: FSC certified fire retardant particle board with face cut veneers solid planks.~~

~~?. Plank length: 96 inches~~

~~?. Plank widths: 4 1/23 or 65 inches, as selected by Architect.~~

~~?. Plank thickness: 3/4 inches.~~

~~?. Finished Veneer: As selected by Architect from manufacturer's full range. Exposed edges banded with same finish as face.~~

~~D.F.~~ Acoustic Infill:

1. Product: One of the following:
  - a. Acoustical Surfaces; Echo Eliminator, bonded cotton panel
    - 1) Minimum 2 inches thick
    - 2) 3 lbs/cu. ft.
  - b. Acoustical Surfaces; Black Acoustical Theater Board.
    - 1) 2 inches thick
    - 2) 3 lbs/cu. ft

## 2.2 METAL SUSPENSION SYSTEM, GENERAL

- A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.
- B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
  - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
    - a. Type: Cast-in-place post-installed expansion or post-installed bonded anchors.
    - b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
  - 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.
- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
  - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
  - 2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
- D. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.
- E. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- F. Accessory Trim: As indicated on Drawings.

## 2.3 METAL SUSPENSION SYSTEM

- A. Hot Dip Galvanized Steel Suspension System for standard size acoustic panels.
  - 1. Product: Armstrong World Industries; grid as indicated in Drawings.
  - 2. Structural Classification: Heavy-duty system.
  - 3. Face Design: 1/8" reveal edge.
  - 4. Face Finish: Painted white.
- B. Hot Dip Galvanized Steel Suspension System for Large Format Acoustic Panels
  - 1. Product: Armstrong World Industries; Prelude XL, 15/16"
  - 2. Structural Classification: Heavy-duty system.

## ~~2.4 METAL SUSPENSION SYSTEM~~

- ~~2. Product: Subject to compliance with requirements, provide the following:~~

~~?.—Armstrong World Industries, Inc.; HD Linear Carrier.~~

~~?.—Components: All linear carriers shall be commercial quality hot dipped galvanized steel as per ASTM A 653. Linear carriers are double web steel construction with 15/16 inch type conecealed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Linear carriers shall have rotary stitching.~~

~~?.—Structural Classification: ASTM C 635, Heavy Duty.~~

~~?.—Color: Tech Black.~~

~~?.—Clips: Integral, factory applied, spring steel clips on linear carriers in sufficient number to receive 8 foot linear wood nominal 6 inch planks.~~

~~?.—Use of clips is subject to the ability of clips to meet seismic requirements.~~

~~?.—Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.~~

~~?.—Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least three design load, but not less than 12 gauge.~~

~~?.—Accessories/Edge Moldings and Trim:~~

~~?.—Linear Splices, #5372, for splicing planks together end to end~~

~~?.—RC2 Clip: Radius clip for creating faceted grid applications~~

~~?.—Wall Molding:~~

~~?.—Angle Molding, #7805BL—1 1/2 inch x 1 1/2 inch, Tech Black~~

~~?.—Shadow Molding, #7823BL—2 inch x 1 1/4 inch x 3/4 inch, Tech Black~~

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. General: Examine suspension system to which wood plank ceilings and wall panels attach or abut, with installer present, for compliance with requirements specified in this and other sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Install acoustical infill panels at locations indicated, according to manufacturer's written instructions. Coordinate installation with requirements for subsequent installation of wood plank panels.

### **3.3 INSTALLATION**

- A. Install metal suspension system components specific to panelized wood plank ceiling installations according to manufacturer's written instructions.
- B. Ceiling Installation: Install system to comply with manufacturer's instructions and CISCA "Ceiling Systems Handbook." Provide individually removable panels and full access to above-ceiling spaces.
- C. Wall Installation: Install system according to manufacturer's written instructions to comply with seismic requirements.

### **3.4 ADJUSTING AND CLEANING**

- A. Adjust panels to be level, aligned, and evenly spaced.

- B. Clean exposed wood surfaces. Comply with manufacturer's instructions for cleaning and touchup of minor finish damage. Remove and replace wood panel components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

**END OF SECTION 09 54 26**



## SECTION 09 64 00

### WOOD FLOORING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section Includes:
  - 1. Solid wood flooring and accessories at Lobby and Community Room.
  - 2. Engineered wood flooring at raised platform, stairs, and ramp.
- B. Related Requirements:
  - 1. Section 01 81 13.33 "Sustainable Design Requirements - CALGreen" for requirements pertaining to materials used in the Work of this Section.
  - 2. Section 03 30 00 "Cast-in-Place Concrete" for concrete slab with depressions to accommodate wood flooring system.
  - 2-3. Section 06 10 53 "Miscellaneous Rough Carpentry" for framed platform to receive engineered wood flooring that is the Work of this Section.

##### 1.2 COORDINATION

- A. Coordinate layout and installation of slab depressions to accommodate layout and height of wood flooring assembly.
- B. Coordinate layout and installation of flooring with floor inserts, if any.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wood flooring.
- B. Sustainable Design Submittals: Provide documentation evidencing compliance with pertinent requirements in Section 01 81 13.33 "Sustainable Design Requirements - CALGreen," including the following:
  - 1. FSC Certified Wood: Product data and chain-of-custody certificates for products containing certified wood.
  - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
  - 3. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials and providing evidence that composite products contain no added urea formaldehyde.
- C. Shop Drawings: For each type of floor assembly, include the following:
  - 1. Plans, sections, and attachment details.
  - 2. Details of concrete-slab depressions.
  - 3. Expansion and impact absorption provisions, and trim details.
    - a. Include details of custom vented wood base, including profile and spacing of vent grooves at back.

4. Locations of floor inserts for equipment installed through flooring assembly.
- D. Samples for Verification: For each type of wood flooring and accessory required; approximately 12 inches (300 mm) long and of same thickness and material indicated for the Work.
  1. Include Sample sets showing the full range of normal color and texture variations expected in wood flooring.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Product Test Reports: For each wood athletic flooring system, for tests performed by a qualified testing agency.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For wood athletic flooring and finish systems to include in maintenance manuals.

#### **1.6 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain-of-custody certification by an FSC-accredited certification body.
- B. Installer Qualifications: A firm or individual that has been approved by system manufacturer and by MFMA as an accredited Installer according to the MFMA Accreditation Program.
  1. Installer responsibilities include installation and field finishing of wood flooring components and accessories, and application of game lines and markers.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for installation.
  1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver floor assembly materials in unopened cartons or bundles.
- B. Protect wood from exposure to moisture. Do not deliver wood components until after concrete and other wet-work is complete and dry.
- C. Store wood components in a dry, warm, well-ventilated, weathertight location and in a horizontal position.

#### **1.8 FIELD CONDITIONS**

- A. Conditioning period begins not less than seven days before wood flooring installation, is continuous through installation, and continues not less than seven days after installation.
  1. Environmental Conditioning: Do not begin conditioning period until HVAC system is operating and temperature and relative humidity are maintained at occupancy levels in spaces to receive wood flooring. These conditions must be maintained throughout the conditioning period.

2. Wood Conditioning: Move wood components into spaces where they will be installed, no later than beginning of the conditioning period. Open sealed packages to allow wood components to acclimatize immediately upon moving wood components into spaces in which they will be installed.
- B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.
- C. Install wood flooring after other finishing operations, including painting, have been completed.

## **PART 2 - PRODUCTS**

### **2.1 WOOD FLOORING SYSTEMS**

- A. Solid Wood Flooring:
  1. System Type: Anchored resilient.
  2. Overall System Height: 1-7/8 inches (48 mm).
  3. Location: Lobby, Community Room (except raised platform and ramp and stairs at platform).
- B. Engineered Wood Flooring:
  1. System Type: Fixed adhered
  2. Overall Thickness: 5/8 inch.
  3. Location: Raised platform in Community Room and stairs and ramp at platform.

### **2.2 PERFORMANCE REQUIREMENTS**

- A. Certified Wood: Wood athletic flooring shall be produced from wood obtained from forests certified by an FSC accredited certification body to comply with FSC 1.2, "FSC Principles and Criteria for Forest Stewardship."
  1. Source 100% Forest Stewardship Council (FSC) wood, per Section 01 81 13.33 "Sustainable Design Requirements - CALGreen."
- B. Composite wood products shall contain no added urea formaldehyde.
- C. Solid wood flooring independently tested and proven to be compliant with ASTM F2772.

### **2.3 SOLID WOOD FLOORING MATERIALS**

A. Anchored Solid Wood Flooring System: Solid wood planks with underlayment composed of plywood panel, closed cell foam, and anchoring thrust pins.

A-B. Solid Wood Flooring:

1. Product: Subject to compliance with requirements, provide the following:
  - a. Action Floor Systems, LLC; Action AnchorFlex LP wood flooring

B-C. Maple Flooring: Comply with MFMA grading rules for species, grade, and cut.

1. Certification: Provide flooring that carries MFMA mark on each bundle or piece.

C-D. Random-Length Strip Flooring: Northern hard maple (*Acer saccharum*), kiln dried, random length, tongue and groove, and end matched.

1. Grade: MFMA-RL First.
2. Thickness: 25/32 inch (20 mm).

3. Face Width: 2-1/4 inches (57 mm).

## 2.4 ENGINEERED WOOD FLOORING MATERIALS

- A. Engineered Wood Flooring: HPVA EF, Complying with requirements for composite wood products.
  1. Product: Subject to compliance with requirements, provide the following:
    - a. Tesoro Woods; Great Northern Woods
  2. Species: Maple
  3. Grade: Select
  4. Thickness: 9/16 inch (14 mm)
  5. Face Width: 3 inches (75 mm)
  6. Length: Manufacturer's standard.
  7. Profile: Tongue and groove with square edges and ends.
  8. Wear Layer: 3 mm

## 2.5 SUBFLOOR MATERIALS

A. Combination Subfloor/Underlayment at Framed Platform: See Section 06 20 23 "Interior Finish Carpentry."

A-B. Plywood Underlayment at Anchored Solid Wood Flooring System: Manufacturer's standard factory-fabricated APA rated Subfloor, Exposure 1, minimum span rating of 48/24 , 23/32 inch (12 mm) thick.

1. Bonding adhesive contains no added formaldehyde (NAF).

B-C. Wood Sleepers at Ramp: Standard grade; 48 inches (1200 mm) long; kiln-dried Eastern hemlock, fir, pine, or spruce.

1. Sleeper Anchors: Manufacturer's standard drive pins recommended by anchor manufacturer to achieve minimum 900-lbf (4000-N) pullout strength in 3000-psi (20.7-MPa) concrete.
2. Sleeper Shims: In size and type recommended in writing by flooring manufacturer for application indicated.

C-D. Channel Subfloor Anchors at Solid Wood Flooring: Manufacturer's standard drive pins and "subfloor retention cups" as indicated by product designation above.

1. Steel drive pins recommended by anchor manufacturer to achieve minimum 900-lbf (4000-N) pullout strength, with steel cup or collar, allowing for movement of subfloor.

D-E. Resilient Pads Sheet at Solid Wood Flooring: Flexible, multicellular, closed-cell, expanded polyethylene-foam padssheet installed beneath plywood subfloor.

1. Type: Manufacturer's standard.
2. Material: Rubber.
3. Thickness: 1/4 inch (4 mm) 5/8 inch (12 mm).

## 2.6 FINISHES

- A. Solid Wood Floor-Finish System: System of compatible components recommended in writing by flooring manufacturer, and MFMA approved.
  1. Floor-Sealer Formulation: Pliable, penetrating type. MFMA Group 1, Sealers.

2. Finish-Coat Formulation: Formulated for matte finish indicated and multicoat application.
  - a. Type: Manufacturer's standard.

B. Engineered Wood Flooring: Factory-finished.

## 2.7 ACCESSORIES

- A. Vapor Retarder at Solid Wood Flooring: ASTM D 4397, polyethylene sheet not less than 6 mils (0.15 mm) thick.
- B. Custom Vented Wood Wall Base at Solid Wood Flooring: Custom wood cove base with vertical groove vents at back, extending entire height of base; 4 by 3 by 48 inches (100 by 75 by 1200 mm); with mitered outside corners.
  1. Profile: As shown on Drawings.
  2. Finish: As selected by Architect.
- C. Thresholds: As specified in Section 08 71 00 "Door Hardware."
- D. Fasteners at Solid Wood Flooring: Type and size recommended by manufacturer, but not less than those recommended by MFMA for application indicated.
- E. Aluminum Expansion Plate at Solid Wood Floors: Manufacturer's system-standard expansion plate, 6 inches wide, 1/4 inch thick.
- F. Adhesives at Engineered Wood Flooring: Manufacturer's standard for application indicated.
  1. VOC Content: Complying with limits set forth in Section 01 81 13.33 "Sustainable Design Requirements - CALGreen."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Concrete Slabs as Substrate for Solid Wood Flooring: Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
  1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
    - b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
    - c. Perform additional moisture tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

- D. Plywood Sheathing as Substrate for Engineered Wood Flooring: Verify that plywood substrates are clean, flat, dry, and structurally sound, per manufacturer requirements, prior to adhered installations.
1. Flatness: 3/16-inch over any 10 foot radius.
  2. Dryness: Check plywood subfloors with a calibrated moisture meter, using correct setting for species. Moisture shall not exceed 10 percent and variance between plywood subfloor and engineered wood flooring shall not be more than 2 percent.

### 3.2 PREPARATION OF CONCRETE SUBSTRATE FOR SOLID WOOD FLOORS

- A. Concrete Slabs:
1. Grind high spots and fill low spots on concrete substrates to produce a maximum 1/8-inch (3-mm) deviation in any direction when checked with a 10-foot (3-m) straight edge.
  2. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
  3. Remove coatings including curing compounds and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone; use mechanical methods recommended by manufacturer. Do not use solvents.
- B. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.3 INSTALLATION OF SOLID WOOD FLOORING

- A. Comply with wood athletic flooring manufacturer's written instructions, but not less than written recommendations of MFMA applicable to flooring type indicated.
- B. Pattern: Lay flooring parallel with long dimension of space to be floored unless otherwise indicated.
- C. Expansion Spaces: Provide as indicated, but not less than that required by manufacturer's written instructions and MFMA's written recommendations at walls and other obstructions, and at interruptions and terminations of flooring.
1. Cover expansion spaces with base molding, trim, and saddles, as indicated on Drawings.
- D. Vapor Retarder: Cover entire slab area beneath wood flooring. Install with joints lapped a minimum of 6 inches (150 mm) and sealed.
- E. Resilient Underlayment: Install perpendicular to direction of flooring, staggering end joints in adjacent rows.
- F. ChannelsSubfloor Drive Pins and Retention Cups: Anchor channelsubfloor to substrate according to manufacturer's written instructions.
- G. Strip Flooring: Mechanically fasten perpendicular to supports.
- H. Installation Tolerances: 1/8 inch in 10 feet (3 mm in 3 m) of variance from level.

### 3.4 INSTALLATION OF ENGINEERED WOOD FLOORING

- A. Install engineered wood flooring at raised platform, ramp, and stairs according to manufacturer's written instructions for glue down installation.
1. Flooring shall be installed perpendicular to joists or trusses beneath subfloor.

2. Expansion Provisions: Provide 5/8-inch expansion space between flooring and all vertical obstructions, including door trim, jambs, studs, plumbing, etc., to be covered by base molding.

### **3.5 SANDING AND FINISHING SOLID WOOD FLOORING**

- A. Allow installed flooring to acclimate to ambient conditions before sanding.
- B. Follow applicable recommendations in MFMA's "Industry Recommendations for Sanding, Sealing, Court Lining, Finishing, and Resurfacing of Maple Gym Floors."
- C. Machine sand with coarse, medium, and fine grades of sandpaper to achieve a level, smooth, uniform surface without ridges or cups. Remove sanding dust by tack or vacuum.
- D. Finish: Apply seal and finish coats of finish system according to finish manufacturer's written instructions. Provide no fewer than four coats total and no fewer than two finish coats.
  1. Water-Based Finishes: Use finishing methods recommended by finish manufacturer to reduce grain raise and sidebonding effect.

### **3.6 PROTECTION**

- A. Solid Wood Flooring: Protect wood athletic flooring during remainder of construction period to allow finish to cure and to ensure that flooring and finish are without damage or deterioration at time of Substantial Completion.
  1. Do not cover flooring after finishing until finish reaches full cure and not before seven days after applying last finish coat.
  2. Do not move heavy and sharp objects directly over flooring. Protect fully cured floor finishes and surfaces with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.
- B. Engineered Wood Flooring: Do not allow foot traffic on flooring until 24 hours after installation. Protect installed wood flooring during remainder of construction period with covering of heavy kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.
  1. Do not move heavy and sharp objects directly over kraft-paper-covered wood flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

**END OF SECTION 09 64 66**

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## **SECTION 09 67 23**

### **RESINOUS FLOORING**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section includes resinous flooring systems.
- B. Related Sections:
  - 1. Section 01 81 13.33 "Sustainable Design Requirements - CALGreen."

##### **1.2 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.

##### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
  - 1. For liquid-applied flooring components, documentation including printed statement of VOC content.
- B. Sustainable Design Submittals: Submit documentation evidencing compliance with applicable requirements set forth in Section 01 81 13.33 "Sustainable Design Requirements - CALGreen."
- C. Samples for Initial Selection: For each type of exposed finish required.
- D. Samples for Verification: For each resinous flooring system required, 6 inches (150 mm) square, applied to a rigid backing by Installer for this Project.

##### **1.4 INFORMATIONAL SUBMITTALS**

- A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- B. Material Certificates: For each resinous flooring component, from manufacturer.
- C. Material Test Reports: For each resinous flooring system, by a qualified testing agency.

##### **1.5 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For resinous flooring to include in maintenance manuals.

##### **1.6 QUALITY ASSURANCE**

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Apply full-thickness mockups on 96-inch- (2400-mm-) square floor area selected by Architect.

2. Simulate finished lighting conditions for Architect's review of mockups.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

## 1.8 FIELD CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for 24 hours after application unless manufacturer recommends a longer period.

## 1.9 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace resinous flooring that fails in materials or workmanship within specified warranty period.
- B. Warranty Period: 5 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. VOC Content of Liquid-Applied Flooring Components: Comply with requirements in Section 01 81 13.33 "Sustainable Design Requirements - CALGreen."
- B. Flammability: Self-extinguishing according to ASTM D 635.

### 2.2 MANUFACTURERS

- A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.

### 2.3 RESINOUS FLOORING

- A. Resinous Flooring System: Two-component urethane cement composition flooring with ~~decorative colored quartz broadcast set in~~ resinous grout and topcoat, providing a monolithic, slip-resistant, seamless floor with integral cove base.
  1. Products: Subject to compliance with requirements, provide the following products by Crossfield Products Corp.:
    - a. Dex-O-Tex Tek-Crete SL CP, at kitchen

1) Do not include colored quartz broadcast with Tek-Crete SL CP system.

a.b. Crossfield Products Corp.; Dex-O-Tex Tek-Crete SL CQ, at restrooms.

1) Include decorative quartz broadcast with Tek-Crete SL CQ system.

B. System Characteristics:

1. Color and Pattern: As selected by Architect from manufacturer's full range.
2. Wearing Surface: Smooth.
3. Overall System Thickness: Between 3/16 inch (4.7 mm) and 1/4 inch (6.3 mm), as recommended by manufacturer for application.

C. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated, capable of depths required for sloping to drain as indicated in Drawings.

1. Basis of Design Product: Dex-O-Tex A-81 Underlayment.

D. Body Coats:

1. Product: Dex-O-Tex SL.
2. Resin: Two-component urethane blended on site with curing agent.
3. Aggregate: Manufacturer's system -standard pre-engineered aggregate.
4. Application Method: Troweled or screeded.

E. Broadcast Aggregate, where indicated:

1. Product: Dex-O-Tex Decor-Flor Broadcast.
2. Application Method: Broadcast into wet body coat.
3. Aggregates: Quartz granules.

F. Topcoats: Sealing or finish coats.

1. Product at Toilet Room Floors:
  - a. Dex-O-Tex Quik-Glaze.
    - 1) Resin: Urethane.
    - 2) Formulation Description: High solids.
    - 3) Type: Clear.
    - 4) Number of Coats: One.
    - 5) Finish: Gloss.
2. Product at Kitchen Floors:
  - a. Dex-O-Tex; Tek-Crete Sealer CP
    - 1) Resin: Aliphatic Polyurethane.
    - 2) Formulation: Resin mixed with cementitious powder.
    - 3) Type: High-build system.
    - 4) Number of Coats: As recommended by manufacturer for application; 7-10 mils per coat.
    - 5) Finish: Skid-resistant finish, as selected by Architect from manufacturer's full range.

G. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 8,100 psi minimum according to ASTM C 579.
  2. Tensile Strength: 1,000 psi minimum according to ASTM C 307.
  3. Impact Resistance: No chipping, cracking, or delamination and not more than
  4. Hardness: 85 to 90, Shore D according to ASTM D 2240.
- H. System Chemical Resistance: Test specimens of cured resinous flooring system are unaffected when tested according to ASTM D 1308 for spot test uncovered for 24 hours in the following reagents for no fewer than seven days:
1. Betadine: Slight stain.
  2. Hydrogen Peroxide 50%: No effect.
  3. Isopropyl Alcohol: No effect.
  4. Salt Water: No effect.
  5. Motor Oil: No effect.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
1. Roughen concrete substrates as follows:
    - a. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.
  2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
  3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels for primer application according to manufacturer's written instructions.
  4. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.
- D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

### **3.2 APPLICATION**

- A. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.

2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
  3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
- B. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
1. Integral Cove Base: Height indicated in Drawings, not less than 6 inches.
- C. Troweled or Screeded Body Coats: Apply troweled or screeded body coats in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When body coats are cured, remove trowel marks and roughness using method recommended by manufacturer.
- D. Topcoats: Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer and to produce wearing surface indicated.

### **3.3 FIELD QUALITY CONTROL**

- A. Material Sampling: Owner may, at any time and any number of times during resinous flooring application, require material samples for testing for compliance with requirements.
1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
  2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
  3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.
- B. Flood test room mock-up for leaks, according to recommendations in ASTM D 5957, after completing waterproofing but before overlaying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
1. Flood to an average depth of 2-1/2 inches (64 mm) with a minimum depth of 1 inch (25 mm) and not exceeding a depth of 4 inches (100 mm). Maintain 2 inches (50 mm) of clearance from top of sheet flashings.
  2. Flood each area for 24 hours.
  3. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight. Retest until passing.
  4. If room mockup does not pass initial flood test, Owner reserves the right to require flood testing of additional resinous floor areas at Contractor's expense.
- C. Ponding Testing: Test each floor for positive drainage. Correct slopes of floors that exhibit standing water. Retest until passing.

### **3.4 PROTECTION**

- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

**END OF SECTION 09 67 23**



## SECTION 10 14 23 - PANEL SIGNAGE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Panel signs.
  - 2. Field-applied, vinyl-character signs.
- B. Related Requirements:
  - 1. Section 10 14 26 "Post and Panel/Pylon Signage" for freestanding signs.

#### 1.2 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

#### 1.3 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.
- B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Product Data for Low-Emitting Materials: For adhesives, documentation including printed statement of VOC content.
- B. ~~Sustainable Design Submittals: See Section 01 35 10 "Green Building Certification Management". Provide applicable submittals in addition to submittals specified herein.~~ ~~Sustainable Design Submittals: See Section 01 35 10 "Green Building Certification Management." Provide applicable submittals in addition to submittals specified herein.~~ Sustainable Design Submittals: Submit documentation evidencing compliance with requirements set forth in Section 01 81 13.33 "Sustainable Design Requirements - CALGreen." Provide applicable submittals in addition to submittals specified herein.
- C. Shop Drawings: For panel signs.
  - 1. Include fabrication and installation details and attachments to other work.
  - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
  - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- D. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
  - 1. Include representative Samples of available typestyles and graphic symbols.
- E. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
  - 1. Panel Signs: Not less than 12 inches (300 mm) square, including corner.

2. Room-Identification Signs: Full-size Sample.
3. Field-Applied, Vinyl-Character Signs: Full-size Sample of characters on glass.
4. Variable Component Materials: 8-inch (200-mm) Sample of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
5. Exposed Accessories: Full-size Sample of each accessory type.

F. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

## **1.5 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

## **1.6 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For signs to include in maintenance manuals.

## **1.7 QUALITY ASSURANCE**

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

## **1.8 FIELD CONDITIONS**

- A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

## **1.9 WARRANTY**

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Deterioration of finishes beyond normal weathering.
    - b. Deterioration of embedded graphic image.
    - c. Separation or delamination of sheet materials and components.
  2. Warranty Period: Five years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.
  1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- B. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and CBC for signs.



## 2.2 SIGNS

- A. Panel Signs: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
  - 1. Solid-Sheet Sign: Stainless-steel or Acrylic sheet with finish specified in "Surface Finish and Applied Graphics" Subparagraph below and as follows:
    - a. Thickness: Manufacturer's standard for size of sign.
    - b. Surface-Applied Graphics: Applied baked enamel or powder coat paint.
    - c. Etched and Filled Graphics: Sign face etched or routed to receive enamel-paint infill.
    - d. Inset, Cutout Characters: Sign face routed to receive push-through acrylic graphics slightly projecting from the sign panel.
  - 2. Mounting: Manufacturer's standard method for substrates indicated with concealed anchors adhesive two-face tape.
  - 3. Surface Finish and Applied Graphics:
    - a. Integral Stainless-Steel Finish: No. 4.
    - b. Integral Acrylic Sheet Color: As selected by Architect.
    - c. Baked-Enamel or Powder-Coat Finish and Graphics: Manufacturer's standard, in color as selected by Architect from manufacturer's full range.
    - d. Painted Finish and Graphics: Manufacturer's standard, factory-applied acrylic polyurethane, in color as selected by Architect from manufacturer's full range.
  - 4. Text and Typeface: Accessible raised characters and Braille typeface as selected by Architect from manufacturer's full range meeting requirements.
  - 5. Flatness Tolerance: Sign panel shall remain flat or uniformly curved under installed conditions as indicated and within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner.

## 2.3 PANEL-SIGN MATERIALS

- A. Steel Materials:
  - 1. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- C. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- D. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.
- E. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

## 2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
  2. For exterior exposure, furnish hot-dip galvanized devices unless otherwise indicated.
  3. Exposed Metal-Fastener Components, General:
    - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
    - b. Fastener Heads: For nonstructural connections, use screws and bolts with tamper-resistant Allen-head spanner-head or one-way-head slots unless otherwise indicated.
  4. Sign Mounting Fasteners:
    - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.
    - b. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.
  5. Inserts: Furnish inserts to be set by other trades into concrete or masonry work.
- B. Adhesives: As recommended by sign manufacturer and with a VOC content of 70 g/L or less for adhesives used inside the weatherproofing system and applied on-site when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch (1.14 mm) thick, with adhesive on both sides.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

## 2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
  2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
  3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
  4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
  5. Internally brace signs for stability and for securing fasteners.
  6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

## 2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

## **2.7 STAINLESS-STEEL FINISHES**

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
  - 1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
  - 2. Directional Satin Finish: No. 4.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that anchor inserts are correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
  - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
  - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
  - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
  - 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
  - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
    - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
    - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
  - 2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

- a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
  - b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
3. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
  4. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
  5. Shim-Plate Mounting: Provide 1/8-inch- (3-mm-) thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other direct mounting methods are impractical. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach signs to plate using method specified above.
- C. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

### **3.3 ADJUSTING AND CLEANING**

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

**END OF SECTION 10 14 23**

## SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.  
~~— Drinking fountain railing.~~
2. Underlavatory guards.
3. Custodial accessories.

B. Related Sections:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for blocking at partitions receiving grab bars ~~and drinking fountain railing.~~
- ~~1-2.~~ Section 08 83 00 "Mirrors."

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Sustainable Design Submittals: Submit documentation evidencing compliance with requirements set forth in Section 01 81 13.33 "Sustainable Design Requirements - CALGreen." Provide applicable submittals in addition to submittals specified herein.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

#### 1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

#### 1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

#### 1.5 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

#### 1.6 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Stainless Steel:
  - 1. Tubing: ASTM A 554, Grade MT 304.
  - 2. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.
- B. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
- C. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- D. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

### **2.2 PUBLIC-USE WASHROOM ACCESSORIES**

- A. Manufacturer: Subject to compliance with requirements, provide public-use bathroom accessories by Bobrick Washroom Equipment, Inc., as follows:
  - 1. Recessed Paper Towel Dispenser and Waste Receptacle: TrimLineSeries, B-3803.
    - a. Locations: Both restrooms.
  - 2. Recessed Seat-Cover Dispenser and Toilet Tissue Dispenser: ClassicSeries, B-3474.
    - a. Location: Men's ADA
  - 3. Partition-Mounted Seat-Cover Dispenser and Toilet Tissue Dispenser: ClassicSeries, B-347
    - a. Location: Men's WC
  - 4. Recessed Seat Cover Dispenser, Sanitary Napkin Disposal and Toilet Tissue Dispenser: ClassicSeries, B-3574
    - a. Location: Women's ADA
  - 5. Partition-Mounted Seat-Cover Dispenser, Sanitary Napkin Disposal and Toilet Tissue Dispenser: ClassicSeries, B-357
    - a. Locations: Women's WC 1 and 2.
  - 6. Surface-Mounted, Seat-Cover Dispenser, Sanitary Napkin Disposal and Toilet Tissue Dispenser: ClassicSeries B-3579
    - a. Location: Women's WC 3.
  - 7. Grab Bars:
    - a. 24-inch: B-5806 x 24
    - b. 36-inch: B-5806 x 36
    - c. Locations: Both restrooms.
  - 8. Counter-Mounted Manual Soap Dispenser, Foam: B-823

- a. Locations: Both restrooms.

~~9. Horizontal, Recessed Mounted Baby Changing Station: Koala Kare Products, a Division of Bobrick; KB100-05ST~~

- ~~a. Unit shall conform to ICC A117.1-2009 Accessible and Usable Buildings and Facilities and ASTM F 2285 Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use.~~

- ~~?. Locations: Both restrooms.~~

~~10.9. Coat Hook with Bumper: B-212~~

- ~~a. Locations: Both restrooms.~~

B. Mirrors:

1. See Section 08 83 00 "Mirrors."
2. Locations: As indicated on Drawings.

~~**DRINKING FOUNTAIN RAILING**~~

~~Drinking Fountain Grab Bar/Railing:~~

~~Subject to compliance with requirements, provide the following, or comparable product by another manufacturer:~~

~~Brey Krause Manufacturing; Drinking Fountain Bar, D-7867 SS.~~

~~Mounting: Flanges with concealed fasteners.~~

~~Material: Stainless steel, 0.05 inch (1.3 mm or 18 gauge) thick.~~

~~Finish: Smooth, No. 4 finish (satin).~~

~~Outside Diameter: 1 1/2 inches (38 mm). Configuration and Length: As indicated on Drawings.~~

**2.3 UNDERLAVATORY GUARDS**

A. Underlavatory Guard:

1. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.

B. Material: Molded polyurethane sleeving.

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.

**2.4 CUSTODIAL ACCESSORIES**

A. Utility Shelf with Mop and Broom Holders and Hooks: B-239 x 4.

1. 4 hooks, 3 mop holders, 34 inches long, 13 inches high, 8 inches deep.
2. Location: Janitor's closet.

## **2.5 FABRICATION**

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

### **3.2 ADJUSTING AND CLEANING**

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

**END OF SECTION 10 28 00**



## SECTION 10 71 00

### - SUNSHADES AND SCREENS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

A. Section includes:

1. Decorative metal sunshades and window surrounds.
2. Decorative metal wall panels at mechanical enclosure.

B. Related Sections:

1. Section 05 12 00 "Structural Steel Framing" for concealed and exposed steel framing other than panel framing specified herein.
2. Section 06 18 00 "Glued-Laminated Construction" for glued-laminated timber members at sunshades.

##### 1.2 COORDINATION

- A. Coordinate installation of anchorages for decorative metal items. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

##### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

##### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, including finishing materials.
- B. Shop Drawings: Show fabrication and installation details for decorative metal.
1. Include plans, elevations, component details, and attachment details.
  2. Indicate materials and profiles of each decorative metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.

##### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Welding certificates.

##### 1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing decorative metal similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Installer Qualifications: Fabricator of products.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
  2. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store decorative metal in a well-ventilated area, away from uncured concrete and masonry, and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.
- B. Deliver and store cast-metal products in wooden crates surrounded by enough packing material to ensure that products are not cracked or otherwise damaged.

## 1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with decorative metal by field measurements before fabrication and indicate measurements on Shop Drawings.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Metal Surfaces, General: Use materials with smooth, flat surfaces unless otherwise indicated. Use materials without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes. ~~Steel panels used at sunshades and screens. Aluminum panels used at window surrounds.~~
- B. Perforated Metal Sheet: ~~Flat panels with metal, pattern and finish selected by Architect. Pre-formed metal sheets, pattern, and finish to be selected by Architect.~~
  - 1. Basis-of-Design Manufacturer: BOK Modern.
  - 2. Steel: ASTM A1008/A1008M, commercial steel Type B.
    - a. At sunshades and screens.
  - 3. Aluminum: AA5052-H32.
    - a. At window surrounds.
  - 4. Pattern: Laser-cut pattern selected by Architect.
  - 5. Finish: Powder coating system; AAMA 2604.
- C. EPDM Gaskets: As needed to ensure separation of dissimilar metals.
- D. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- E. Steel Tubing: ~~ASTM A 500/A 500M (cold formed) or ASTM A 513, Type 5 (mandrel drawn).~~

### 2.2 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
  - 1. Uncoated-Steel Items: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating where concealed, Type 304 stainless-steel fasteners where exposed.
  - 2. Fasteners for Anchoring Aluminum Panels to Other Construction: Type 304 stainless steel fasteners suitable for anchoring indicated items to other types of construction indicated.
  - 3. Dissimilar Metals: Type 304 stainless-steel fasteners.
- B. Fasteners for Anchoring to Other Construction: Unless otherwise indicated, select fasteners of type, grade, and class required to produce connections suitable for anchoring indicated items to other types of construction indicated.

## 2.3 FABRICATION, GENERAL

- A. Fabricate metal panel assemblies to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish and anchorage.
- B. Fabricate systems in accordance with approved shop drawings and the supplier's instructions.
- C. Assemble items in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- D. Form decorative metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.
- E. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- F. Mill joints to a tight, hairline fit. Cope or miter corner joints. Fabricate connections that will be exposed to weather in a manner to exclude water.
- G. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.
- H. Provide necessary rebates, lugs, and brackets to assemble units and to attach to other work. Cut, reinforce, drill, and tap as needed to receive finish hardware, screws, and similar items unless otherwise indicated.
- I. Use grommets, bushings, gaskets, and washers or methods as recommended by the supplier for separation of dissimilar metals.
- J. Comply with AWS for recommended practices in shop welding. Weld behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded joints of flux, and dress exposed and contact surfaces.

## 2.4 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## 2.5 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Powder-Coating: Manufacturer's standard two-coat system meeting AAMA 2604, not less than 2.5 mils dry film thickness.
  - 1. Basis of Design Finish: Tiger Drylac 38 system with primer.
  - 2. Color and Gloss: Selected from manufacturer's full range of choices.

## **2.6 STEEL AND IRON FINISHES**

- A. Powder-Coating: Manufacturer's standard two-coat system meeting AAMA 2604, not less than 2.5 mils dry film thickness.
  - 1. Basis of Design Finish: Tiger Drylac 38 system with primer.
  - 2. Color and Gloss: Selected from manufacturer's full range of choices.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative metal.
- B. Verify field measurements are acceptable to suit assembly tolerances.
- C. Verify supports and anchors are correctly positioned and set.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Provide items required to be cast in concrete with setting templates.
- B. Take field measurements after permanent end terminations are in place and prior to preparation of shop drawings and fabrication, to ensure fitting of work.
- C. Restore protective coverings that have been damaged during shipment or installation. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at same location.
  - 1. Retain protective coverings intact; remove coverings simultaneously from similarly finished items to preclude nonuniform oxidation and discoloration.

### **3.3 INSTALLATION, GENERAL**

- A. Install metal panels in accordance with supplier's instructions.
- B. Provide anchorage devices and fasteners where needed to secure decorative metal to in-place construction.
- C. Perform cutting, drilling, and fitting required to install decorative metal. Set products accurately in location, alignment, and elevation, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry, or similar construction.
- D. Install metal panels plumb, level, square, true to line, and rigid. Fit exposed connections accurately together to form tight, hairline joints or, where indicated, uniform reveals and spaces for sealants and joint fillers.
- E. Adjust metal panels before anchoring to ensure alignment at abutting joints.
- F. Where cutting, welding, and grinding are required for proper shop fitting and jointing of decorative metal, restore finishes to eliminate evidence of such corrective work. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.
- G. Attach metal panels securely in place using anchorage devices and fasteners indicated.

- H. Corrosion Control: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
  - 1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, or dissimilar metals with a heavy coat of bituminous paint.
  - 2. Use EPDM gaskets to separate dissimilar metals where indicated.
- I. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.
- J. Install concealed gaskets, joint fillers, insulation, and flashings as work progresses.
- K. Restore protective coverings that have been damaged during shipment or installation. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at same location.
  - 1. Retain protective coverings intact; remove coverings simultaneously from similarly finished items to preclude nonuniform oxidation and discoloration.

### **3.4 CLEANING AND PROTECTION**

- A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.
  - 1. Do not use harsh cleaning materials, abrasive cleaners, or methods that will damage finish.
- B. Protect finishes of decorative metal from damage during construction period with temporary protective coverings approved by decorative metal fabricator. Remove protective covering at time of Substantial Completion.
- C. Replace defective or damaged components.
- D. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.
- E. Touchup Painting: Per manufacturer's instructions.

**END OF SECTION 10 71 00**

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## SECTION 21 13 13

### WET-PIPE SPRINKLER SYSTEMS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings, Construction Services Agreement, including General and Special Conditions, Division 1 apply to this section.

##### 1.2 DESCRIPTION OF WORK

- A. The Contractor shall furnish all labor, tools, equipment, services, and transportation necessary for, or reasonably incidental to, the construction and completion order of the fire protection work, including, but not limited to, the following:
  - 1. The installation of an automatic fire sprinkler system complete and ready for operation, for the entire building including but not limited to the mechanical equipment connection to the water main for a fully functional system.
  - 2. Prepare shop drawings, product submittals based on design documents and obtain all necessary approvals. Any major changes Contractor to verify existing site conditions and coordinate with other trade before construction work.
  - 3. Sprinkler system shall be monitored by a central alarm monitoring company. This monitoring shall include water flow indicators and tamper switches on all control valves.
  - 4. Provide complete as-built drawings of the fire sprinkler and standpipe system in AutoCAD 2013 version (or higher) using architectural backgrounds. Drawings shall include exact locations of all piping, sprinkler heads, sprinkler control valve assemblies, pipe supports, bracing, etc.
  - 5. Pay for all necessary fees.
  - 6. Painting of exposed piping and supports.
  - 7. Testing and adjusting of completed work, inspections and instructions. All inspections, testing and maintenance work required by NFPA 25, California 2013 Edition, and recommended by the equipment manufacturer shall be provided. Work shall include operation of sprinkler system alarm and supervisory devices.
  - 8. Repair of all damage done to premises as a result of this installation and removal of all debris left by those engaged in this installation.
  - 9. Excavation, trenching and backfill required in this section of work.

##### 1.3 RELATED WORK

- A. Section 07 84 13, Penetration Fire Stopping.
- B. Section 07 92 00, Joint Sealants.
- C. Section 08 31 13, Access Doors and Frames.
- D. Section 09 92 00, Painting.

- E. Section 22 00 00, Plumbing.
- F. Section 28 31 00, Fire Alarm System.
- G. Division 26, Electrical.
- H. Division 33, Utilities.

#### 1.4 REFERENCES AND STANDARDS

- A. Regulatory compliance: All work performed under this Division shall comply with the latest currently adopted editions of all codes and regulations. The following references and standards are hereby made a part of this Section and work shall conform to applicable requirements herein except as otherwise specified herein or shown on the Drawings.
- B. Codes and Standards: Conform to all applicable codes and standards as stated herein and as described in Division 1, including the following:
  - 1. California Building Code, 2016 Edition.
  - 2. California Fire Code, 2016 Edition.
  - 3. State of California Administrative Code (CAC) Titles 8, 17, 21, 22 and 24.
  - 4. California Electrical Code (CEC), 2016 Edition.
  - 5. Comply with all ADA and California Title 24 requirements for disabled access.
  - 6. Local Fire Prevention Bureau requirements.
  - 7. Comply with the latest edition of all applicable standards, including ANSI, ASTM, and OSHA.
  - 8. NFPA - National Fire Association Compliance: Install fire protection systems in conformity with the requirements of the currently adopted editions of the following:
    - a. NFPA 13, 2016 Edition - Standard for the Installation of Sprinkler Systems
    - b. NFPA 24, 2016 Edition - Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
    - c. NFPA 25, California 2013 Edition - Standard for the Inspection, Testing and Maintenance of Water Based Fire Protection Systems.
    - d. NFPA 70, 2014 Edition - National Electrical Code.
    - e. NFPA 72, 2016 Edition - National Electrical Code.
- C. Minimum requirements: The requirements of these Specifications are the minimum that will be allowed, unless such requirements are exceeded by applicable codes or regulations, in which the local regulatory code or regulation requirement shall govern.
- D. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted Authorities Having Jurisdiction and from the Owner's Representative.

#### 1.5 WORK RESPONSIBILITIES

- A. Site Conditions:
  - 1. Examine the drawings and the specifications, survey the existing site conditions, and include necessary allowances in bid proposal.



2. Resolve conflicts with code requirements, site conditions, the work of other trades, or other mechanical contractors.
  3. Verify the location of all existing utilities prior to construction and protect from damage.
  4. Pay all costs incurred due to damage of existing utilities or other facilities.
- B. Responsibility:
1. Provide complete functioning systems and include all labor, material, associated tools, and transportation required for the system to operate safely and satisfactorily.
  2. Provide all work necessary for a complete wet fire protection system regardless if specifically mentioned in the specifications.
  3. Coordinate the installation of fire protection items with the schedules for work of other trades and other contractors to prevent delays in total work. Assume responsibility for any cooperative work which must be altered due to lack of proper coordination or failure to make proper provisions in time.
  4. Be specifically responsible for ensuring that coordination between the fire sprinkler system work and the fire detection and alarm system work takes place to ensure full awareness of the location of all fire sprinkler system components (including, but not limited to, control valves, flow switches, supervisory switches and alarm bells) requiring connection to the fire detection and alarm system.

#### 1.6 PERMITS, LICENSES, AND INSPECTIONS

- A. Obtain and pay for all permits, fees and inspections required by work under this Section.
- B. Inspections: A pre-test for the EOR and IOR shall be carried out prior to the inspection by the Authority Having Jurisdiction from the start to the finish without any repairs or the test restarts from the beginning. All work shall be regularly inspected by the Authority Having Jurisdiction. Certificates of approval shall be delivered to the Owner's Representative. Be responsible for notifying the authority having jurisdiction when work is ready for inspection.

#### 1.7 DRAWINGS

- A. Drawings indicate general arrangement of piping and equipment. Should it be necessary to deviate from arrangement or location indicated to meet architectural conditions or site conditions, or due to interference with work in other divisions, such deviations as offsets, rises, or drops in piping that may be necessary, whether shown or not, shall be made at contractor's expense.

#### 1.8 COOPERATION WITH OTHER TRADES

- A. Schedule work and cooperate with other divisions to avoid delays, interferences and unnecessary work, conforming to construction schedule, making installation when and where required. A special effort shall be made to coordinate with the mechanical contractor so as not to block installation of the mechanical systems. The clearances above ceilings on this project are limited and the ductwork is to have the highest priority. All fire sprinkler work is to be coordinated with the mechanical contractor such that the ductwork can be installed in the locations shown on the mechanical drawings. If installed work is later found to interfere with work of other divisions, make all necessary changes at contractor's expense.

## 1.9 QUALIFICATIONS OF INSTALLERS

### A. Qualifications:

1. Effective July 1, 2018, a certification card issued by the California State Fire Marshal is required for all fire sprinkler system pipe fitters responsible for installing, altering or repairing water based fire protection system. There must be at least one certified fitter per job site.
2. For the actual installation, and testing of work under this section, use only thoroughly trained and experienced work personnel completely familiar with the items required and the manufacturer's current recommended methods of installation.
3. In acceptance or rejection of the finished installation, no allowance will be made for lack of skill.
4. The execution of the work shall be in strict accordance with the best practice of the trades, the intent of this specification, and all codes and ordinances.

B. Contractor's Qualifications: A firm with at least five (5) years of successful installation experience on projects with fire protection systems work similar and of comparable size and scope to that required for this project. The installer shall have performed at least five (5) similar projects in the San Francisco Bay Area. Contractor shall be prepared to submit written evidence of the installer's experience. Installation of all sprinkler piping, and appurtenances shall be done only by a licensed, fire-protection engineering contractor with at least five (5) years' experience in designing and installing sprinkler and standpipe systems. The Contractor shall possess a valid and current State of California C-16 contractor's license, and shall have held this license under the currently-licensed business name, for a period of not less than five (5) years as of the date of bidding the project and regardless of whether any other license classification is also held. Contractor shall be capable of providing on-site emergency service within four hours of notification. The contractor shall be capable of providing drawings in AutoCAD 2000 version (or higher) format.

C. Manufacturer's Qualifications: Firms regularly engaged in manufacture of fire protection products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

D. Products and Product Listing: All materials and equipment installed as part of this work shall be new and free of defects. All piping components, equipment, valves and other devices shall be UL listed and/or FM approved for fire sprinkler use.

E. Welded Joints: Weld in accordance with procedures established and qualified per ANSI B31.2. Each welder and welding operator shall be qualified per the ANSI procedures as evidenced by a copy of a certified ANSI B31.2 qualification test report. Contractor shall conduct the ANSI qualification test. Permits for on-site welding/brazing/soldering shall be obtained from the Authorities Having Jurisdiction.

## 1.10 QUALITY ASSURANCE

A. Bring to the Owner Representative's attention prior to installation, any conflicts with other trades which will result in unavoidable contact to the equipment, piping, described herein, due-to inadequate space, etc.

- B. Bring to the Owner Representative's attention any discrepancies between the specifications and field conditions, changes required due to specific equipment selection, etc., prior to installation.
- C. Provide written notification to Owner's Representative a minimum of fourteen (14) days prior to a utility shut down.
- D. Obtain inspection and approval from the Owner's Representative of any installation to be covered or enclosed prior to such closure.
- E. Restoration of Damage: Repair or replace, as directed by Owner's Representative, materials and parts of premises which become damaged as result of installation of work of this Division. Remove replaced parts from premises.

#### 1.11 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this section before, during and after installation and to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner's Representative.
- C. Protection of Materials:
  - 1. Protect materials, equipment and apparatus provided under this Division from damage, water, dust, or similar impairment, both in storage and installation until Notice of Completion has been filed. Materials, equipment or apparatus damaged because of improper storage or protection will be rejected and must be removed from site.
  - 2. Cap openings in pipes with manufactured caps or fittings. Do not use taped caps.
  - 3. Protect premises and work of other Divisions from damage arising out of installation of work of this Division.

#### 1.12 REVIEW OF CONSTRUCTION

- A. The Owner's Representative may review work at any time.
- B. Advise Owner's Representative fourteen (14) calendar days in advance that work is ready for review at following times:
  - 1. Prior to buried work.
  - 2. Prior to concealment of contract items those have been completed.
  - 3. When requirements of Contract have been completed.
  - 4. Prior to installation of suspended dry wall and ceiling.
- C. Do not backfill or conceal work without Owner Representative's consent.
- D. Maintain on job a set of specifications and drawings for use by the Owner's Representative.
- E. Noncompliance: Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required and, after it has been completely inspected and approved, make all repairs and replacements with such materials as are

necessary to the approval of the Owner's Representative and at no additional cost to the Owner.

#### 1.13 SYSTEM ACCEPTANCE

- A. Acceptance shall be contingent on:
1. Completion of the installation of all systems required for a complete and functional wet sprinkler system.
  2. Submission and acceptance of operating and maintenance data.
  3. Completion of pipe and valve identification.
  4. Completion of cleaning.
  5. Satisfactory operation of all systems for a period of one (1) week.
  6. Satisfactory completion of the acceptance tests which shall demonstrate compliance with all performance and technical requirements of the Contract Documents.
  7. Submission of as-built drawings.
  8. Final inspection and acceptance by Local Fire Prevention Bureau, and Authorities Having Jurisdiction.

#### 1.14 DAMAGE BY LEAKS

- A. Be responsible for damage to any part of the premises caused by leaks in the pipe or equipment installed under applicable section for a period of twelve (12) months from the date of acceptance of the work by the Owner.

#### 1.15 SUBMITTALS

- A. Submit product data in accordance with Division 1 and as follows:
- B. Submittal Requirements:
1. Submit manufacturer's product brochures for all products. Written descriptions of products are not acceptable. Furnish, all at one time, prior to any installation, valid submittal data on material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on equipment schedules. Product submittals shall be bound in a three (3) ring binder, with table of contents and tab set for each system. "Product Submittals" shall match "Operations and Maintenance Manuals".
  2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
  3. Submittals will be checked for general conformance with the design concept of the project, but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly design and install work.
  4. To be valid, all product submittals must:
    - a. Identify project name and location, Contractor's, Subcontractor's, suppliers or manufacturer's name, address, and telephone number.
    - b. Identify manufacturer's name and model numbers.
    - c. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

- d. Include all pertinent construction, installation, performance and technical data.
  - e. Have all product data sheets clearly labeled to indicate the individual item being submitted. In addition, all required options and accessories shall be clearly marked.
    - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding equipment tag number.
    - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, and item numbers.
- C. Shop Drawings:
- 1. General: Prepare and submit plans, sections, details and diagrams to required scales for specified areas. Drawings shall be prepared using AutoCAD 2000 (or higher), format. Drawings shall be coordinated, dimensioned and indicate equipment, pipe, duct, plumbing, and electrical in relation to architectural and structural features. Include minor piping, drains, etc. Indicate exact locations and elevations of valves, piping specialties, access doors, etc.
  - 2. Complete and detailed shop drawings of a scale no smaller than that of the design documents shall be maintained throughout the coordination and construction phase indicating the work of all trades clearly. All equipment including piping, etc. shall clearly identify both top and bottom elevations as well as distances from equipment to established building lines. Coordinate with other trades and field conditions and show dimensions and details including building construction and access for servicing.
  - 3. Use of contract documents for shop drawings is not acceptable. Any changes to the contract documents will be coordinated with the Architect and submitted to the AHJ for approval.
  - 4. Required Drawings: Prepare and submit drawings for all areas and all fire protection work. Scale shall be minimum 1/4" = 1'0" in mechanical rooms, and a minimum 1/8" = 1'0" elsewhere.
  - 5. Drawings shall be detailed in accordance with NFPA 13, 14 and 20. Shop drawings shall indicate accurate locations of all piping (with all exposed piping clearly designated), sprinkler heads, seismic braces, pipe anchors and hangers, drain locations, inspector test connections, and other apparatus associated with these systems in respect to architectural conditions, structural conditions, lighting layouts, diffuser layouts, plumbing, mechanical, and electrical layouts. Plans shall include necessary engineering features, including hydraulic reference nodes, pipe lengths and pipe diameters as required by the above-named code and standards. Complete, accurate legends for all symbols and abbreviations shall be provided on plans. Drawings shall have the same scale and same sheet size used by the other trades to facilitate coordination. Sprinkler shop drawings shall be coordinated with architectural drawings for head locations. Any wall and ceiling changes occurring prior to the submittal of contractor's shop drawings shall be incorporated into the contractor's detailed design at no additional contract cost.
  - 6. Center of tile installation is mandatory.
  - 7. Hydraulic calculations shall be executed on standard 8-1/2 x 11-inch sheets, conforming to the requirements of NFPA 13, and shall indicate pipe numbers, beginning and end node points, all referenced Shop Drawings, and system demand curves. Calculations shall be accomplished using an approved computer program

and shall be bound and indexed in a three-ring binder matching "Product Submittals" and "Operating and Maintenance Manuals".

- D. Product Data:
1. General: Manufacturer's specifications, data sheets, certified drawings, and installation instructions. Include physical and performance data such as weights, sizes, capacities, required clearances, performance curves, acoustical characteristics, finishes, color selection, and accessories. Include certified drawings on major equipment such as fire pumps.
- E. Submit product data and brochures for, but not limited to the following:
1. Pipe Material and Fittings.
  2. Pipe supports including seismic pipe supports.
  3. Fire stopping, including listing system numbers and details.
  4. Sprinkler heads, each type and model.
  5. Spare sprinkler head cabinets.
  6. Valves (all types).
  7. Water measuring devices.
  8. Valve cabinets.
  9. Inspector's test alarm modules.
  10. Pressure gauges.
  11. Water flow switches.
  12. Valve supervisory switches.
  13. Alarm Bells.
  14. Fire department connections.
  15. Test header.
  16. Pipe, valve and Identification signs, etc.

#### 1.16 RECORD DRAWINGS

- A. Record of Job Progress: Keep an accurate dimensional record of the "As-built" locations of all work as required. This record shall be kept up-to-date on prints as the job progresses and shall be available for inspection at all times. In addition, record drawings are to be used by the Owner's Representative for job review and field inspections.
- B. "As-Built" documentation shall be transmitted to the Owner within ten days after Owner Representative's acceptance of the completed installation. As-built documentation shall include the following (Unless noted elsewhere, furnish number of copies indicated):
1. Two (2) copies shall be provided for each drawing. One (1) copy of final AutoCAD drawing files shall also be provided on CD disk, for each drawing.
  2. Four (4) sets of manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
  3. Four (4) sets of hydraulic calculations and seismic bracing calculations for each sprinkler system updated to include any changes to the installations which affect the calculations.
  4. Four (4) sets of hydrostatic report and NFPA 13 material test certificate for each sprinkler system.
  5. Four (4) sets of operation and maintenance data updated to include submittal review comments and any equipment substitutions.
  6. Manufacturer's literature, reports and operation and maintenance data shall be in a labeled three (3) ring binder.

1.17 OPERATION AND MAINTENANCE DATA

- A. The installing contractor shall provide:
1. All literature and instructions provided by the manufacturer describing proper operation and maintenance of any equipment and devices installed.
  2. Publication titled NFPA 25, **California 2013 Edition**, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- B. Include, but not limited to the following: List of all equipment with Manufacturer's name, model number, and local representative, service facilities and normal channel of supply for each item. O&M manuals shall be bound in a three (3) ring binder, with table of contents and tab set for each system. "Operation and Maintenance Manuals" to match "Product Submittals",
1. System Description: Description of start-up and operating procedures.
  2. Controls: Diagrams and description of operating sequence of each system.
  3. Equipment: Manufacturer's brochures, ratings, certified shop drawings, lubrication charts and data, parts list with parts numbers. Mark each sheet with equipment identification number and actual installed condition.
  4. Materials and Accessories: Manufacturer's brochures parts list with part numbers and lubrication data where applicable. Mark each sheet with equipment identification number or system and location of installation; and to specifically identify which options are provided (in case where data sheet shows multiple options).
  5. Certificate of factory tests and code compliance as specified.
  6. Recommend preventive maintenance schedule and procedures.

1.18 GUARANTEES

- A. At completion, provide the Owner's Representative a written guarantee, in triplicate, that work has been performed in accordance with Specifications and that Contractor shall replace or repair, to the satisfaction of the Owner's Representative any portion of the work that fails within the guarantee period after final acceptance provided such failure is due to defects in materials Also agree to replace or repair, with like workmanship and any part of the building or equipment installed by other trades but damaged by them in installing their work.
- B. During the guarantee period, make four (4) inspections of the work at three (3) month intervals after final acceptance to check the performance of systems and correct any guaranteed items. Inspections to be made in the presence of the Owner's Representative.
- C. Guarantee in writing all fire protection work for a period of twelve (12) months following date of certificate of final acceptance.
- D. All apparatus shall be built and installed so as to deliver its full rated capacity at the efficiency for which it was designed.
- E. All fire protection and electrical apparatus shall operate at full capacity without objectionable noise or vibration.
- F. The fire protection systems shall provide the performance required at standard operating conditions.

- G. Where a manufacturer's guarantee/warranty exceeds one (1) year, the longer shall govern.

## **PART 2 - PRODUCTS**

### **2.1 PIPE AND FITTINGS**

- A. General: All pipe and fitting shall be new, acceptable to all Authorities Having Jurisdiction, conform to all applicable standards and codes, and be free from damage and distortion.

### **2.2 VALVES**

- A. Gate valves (Valves 2" and Smaller): MSS SP-80; UL listed and approved, 175 psi Non-shock cold water, bronze body, screw-over bonnet, threaded ends, outside screw and yoke, solid wedge, bronze trim, replaceable seat rings. Provide each valve with supervisory switch.
- B. Gate valves (Valves 2-1/2" and Larger): MSS SP-70; UL listed, and FM approved, 175 psi non-shock cold water, iron body, bolted bonnet, flanged ends, outside screw and yoke, solid wedge, pre-grooved stem for supervisory switch mounting, bronze trim, replaceable seat rings. Provide each valve with supervisory switch.
- C. Butterfly valves (Valves 2" and Larger): MSS SP-67; UL listed and approved, California State Fire Marshal Listed, indicating type, gear operated, ductile iron lug type body, stainless steel stem, nickel plated ductile iron disc, Buena-N seat, 250 psi shock cold water. Provide each valve with a supervisory switch.
- D. Ball valves (Inspector's test and drain only-up to 2" max.): MSS SP-110; UL listed and FM Approved, full or standard port, two-piece bronze body construction, chrome plated solid bronze ball, blowout proof stem, and vinyl covered steel handle, 300 psi Non-shock cold water. Provide locking type handle.
- E. Check Valves (Valves 2" and Smaller): MSS SP-80; swing type check valve, screwed bonnet, horizontal swing, renewable disc, bronze body, threaded ends, 200 psi non-shock cold water.
- F. Check Valves (Valves 2-1/2" and Larger): MSS SP-71; UL listed and FM Approved, swing type check valve, bolted bonnet, horizontal swing, renewable seat and disc, iron body, flanged ends, 175 psi non-shock cold water.
- G. Check Valves: MSS SP-71; UL listed and FM Approved, swing type or wafer style silent check valve with double center guided conical spring type, 175 lb. WOG.
- H. Drain Valves and Inspector's Test Valves: UL listed, globe, straightway or angle type, ball or butterfly, bronze body, renewable disc, threaded, 150 lb. WOG, equipped with reducer and hose connection with cap or connected to a drain line.
- I. Valves install higher than 7'-0" shall be equipped with chain operators, or equivalent.



### 2.3 SPRINKLER HEADS

- A. The acceptable fire sprinkler head manufacturers are Tyco, Victaulic, Viking and Reliable.
- B. Exposed Structure Ceiling: UL listed, quick response pendent or upright type with brass finish, 1/2" orifice, quick response sprinkler, or equal. Chrome finish in Public Areas.
- C. In Finished Ceilings and Soffits: UL listed, quick response type, 1/2" orifice, with concealed type cover plate assembly, white finish, quick response concealed sprinkler, or equal.
- D. Temperature ratings shall be 165°F. Exception, sprinklers at skylights and electrical room shall be 212°F.
- E. Sprinkler heads as shown in some spaces, may be located closer together than required by code, but are required to maintain an orderly pattern.
- F. Provide spare heads of each temperature rating and type used in a suitable metal cabinet with red enamel finish, cabinet to be located at the direction of Owner's Representative. Number of spare heads in accordance with NFPA 13.
- G. Provide sprinkler head guards, UL listed, and FM approved for sprinkler heads subject to mechanical damage or for any sprinkler head lower than seven feet (7') above the floor, for all heads in all mechanical, electrical and elevator machine rooms. Head guards shall be factory painted red enamel.
- H. For sprinkler heads in exposed areas: Provide sprinkler heads with Teflon coating for corrosion resistance. All sprinkler heads exposed to the outside of the building shall be dry pendent type.
- I. Provide standard coverage heads, extended coverage sprinkler heads are not acceptable.
- J. Escutcheons shall be factory treated to receive paint.

### 2.4 HANGERS AND SUPPORTS

- A. Hangers and seismic sway bracing shall be designed and installed as required by NFPA 13 and NFPA 14 (including all appendices), and by the California Building Code. Provide steel bracing as to resist earthquake loads, as required for Seismic Zone IV. Specifically, these codes shall be interpreted such that all system components and supports shall be capable of resisting five times the weight of the water filled pipe plus 250 lb. downward; and 0.75 times the weight of the water filled pipe in all other directions. Flexibility, internal pressure, and differential movement between the piping and building shall be allowed for, so that no allowable stress is exceeded in any member.
- B. Hangers and components shall be U.L. listed and/or FM approved. All hanger and support components including seismic sway bracing components shall be of the same manufacturer.
- C. Hanger Rods: Hanger rod size shall be no less than the standard rod sizes listed on the MSS SP-69. Rods shall be steel rods, threaded at ends only with a minimum safety factor

of 5 over the imposed load. All thread rods are not acceptable. Where rod stiffeners are required.

- D. Where beam clamps are used, provide beam clamp retaining strap.
- E. Powder-driven and explosive type fasteners are not allowed.
- F. The end sprinkler on a branch line shall be restrained against excessive vertical and lateral movement by use of a wrap-around hook or by other approved means per NFPA 13.
- G. When static pressure exceeds 100 psi, arm over and drops 12 inches and over requires a hanger.
- H. Where beam or joist thickness will not accommodate a fastener of a required length, through bolt with the required diameter of the bolt and washer will be acceptable. All thread rods are not acceptable for the required bolt.

## 2.5 PRESSURE GAUGES

- A. U.L. listed and labeled for fire protection sprinkler service, three-inch (3") dial, 0-300 psi scale with 5 psi increments, dual range twice the system working pressure, moisture and weather resistant, 1/4" bottom connection, shut-off valve, and brass socket.

## 2.6 WATER FLOW SWITCHES

- A. U.L. listed, California State Fire Marshal listed, and FM Approved, vane type flow switch with retard mechanism or manual adjustment to prevent false alarm, listed for indoor/outdoor use and have tamperproof cover. Provide each with two sets of SPDT contacts and conduit connection for wiring to remote alarm system, Potter Electric Signal Co., VSR, Notifier WFD, or equal. Coordinate installation with Division 28.

## 2.7 SUPERVISORY (TAMPER) SWITCHES

- A. U.L. listed, California State Fire Marshal listed, and FM Approved. Switches shall be listed for indoor/outdoor use, have tamperproof cover, each with two sets of SPDT contacts and conduit connection for wiring to remote alarm system. Switches shall be Potter Electric Signal Co., OSYSU-2 or equal, for OS&Y gate valves, and PIVS-U, or equal for butterfly valves and post indicator valves. Coordinate installation with Division 28 and locate as required by Authorities Having Jurisdiction and as acceptable to the Architect.

## 2.8 EXTERIOR FIRE ALARM BELLS

- A. U.L. listed, California State Fire Marshal listed, and FM approved. Bells shall be listed for indoor/outdoor use, have under dome strikers and operating mechanisms and gongs on bells shall be no smaller than ten-inch (10") diameter with an operating voltage of 120 VAC and shall be suitable for surface or semi-flush mounting. Outdoor surface mounted installations shall be weatherproof using a weatherproof electrical box. Otherwise bells shall mount to a standard four-inch (4") square electrical box having a maximum projection of two and one-half inches (2-1/2"). Bells shall be Grinnell Model A with A3 trim, or equal. Coordinate installation with Division 28.

2.9 PIPING IDENTIFICATION

- A. All piping is to be identified as follows: Brady Perma-Code, MSI Marking Services Inc., or equal, pressure sensitive self-sticking pipe markers consisting of pipe content wording and arrow indicating directions of flow on ANSI color background. Arrow and wording are two separate markers which shall be placed immediately adjacent to each other. Provide at each end of each marker, two and one-fourth inch (2-1/4") wide self-sticking clear tape around periphery of pipe or insulation to further secure marker. All markers shall be applied to clean surfaces free of dust, grease, oil or any other material which will prevent adhesion. Install after cleaning, painting and insulation is complete. Pipe identification shall comply with ANSI A13.1 "Scheme for the Identification of Piping Systems".
- B. Location and visibility for pipe identification:
1. On all horizontal runs spaced twenty feet (20') maximum but not less than once in each room at entrance and exit of each concealed space.
  2. At each riser takeoff.
  3. Within one foot (1') of each valve and control device.
  4. At every change in directional flow.
  5. At every pipe passage through wall, floor and ceiling construction.
  6. Where capped piping is provided for future connections, provide legible and durable metal tags indicating symbol identification.
  7. At all wall and ceiling access panel/doors.
  8. Near major equipment items and other points of origination and termination.
  9. Pipe identification of sprinkler branch piping is not required.
  10. Attention shall be given to visibility with reference to pipe markings. Where pipe lines are located above or below the normal line of vision, the lettering shall be placed below or above the horizontal of the pipe.

C. Color Coding of Piping:

<u>ANSI</u> Color <u>Service</u>	<u>Color</u> of <u>Color Field</u>	<u>Color</u> of <u>Text</u>
Fire Protection Water	Red	White
Fire Sprinkler Water	Red	White

D. Size of Legend Letters:

<u>Outside</u> Diameter of <u>Pipe or Covering</u>	<u>Minimum</u> Length of <u>Color Field</u>	<u>Minimum</u> Size of <u>Text</u>
3/4" to 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"
8" to 10"	24"	2-1/2"
Over 10"	32"	3-1/2"

2.10 BURIED UTILITY WARNING AND TAPE

- A. All underground piping shall be identified with underground warning pipe markers as follows: Brady Perma-Code, Marking Services Inc., or equal, non-adhesive four (4) mil polyethylene plastic tape manufactured specifically for and identification of buried utility lines. Tape shall be of the type provided in rolls, six inches (6") width, color coded for the utility involved, with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning identification for lines shall be "CAUTION WATER LINE BURIED BELOW". Code and letter coloring shall be permanent, unaffected by moisture and other substances contained in trench backfill material.
- B. During back-filling of fire line systems, install continuous underground type plastic line markers. Run detector tape continuously along pipe and terminate in adjacent valve boxes or other suitable facilities. No splices will be allowed. Protect tape from damage during installation and backfilling. Tape that is broken, cut or crumpled shall be completely replaced. Install twelve inches (12") above the top of the respective pipe twelve inches (12") below the surface during backfill. Provide detectable type for buried non-metallic pipes.
- C. Color Code of underground tape shall be as follows:

<u>ANSI</u> <u>Color</u> <u>Service</u>	<u>Color</u> <u>of</u> <u>Color Field</u>	<u>Color</u> <u>of</u> <u>Text</u>
Fire Protection	Blue	Black

2.11 VALVE TAGS

- A. All valves shall have brass identification tag as follows: Brady Perma-Code, MSI Marking Services Inc., or equal, Brass valve identification tag secured with brass chain and "S" hook. Tags shall bear the service identification and numerical identification of the valve.
- B. Engrave identification tags with "normally open" (green) or "normally closed" (red).
- C. Tags:
  - 1. Minimum two inches (2") triangle for fire protection.
  - 2. No. 18 BS gauge brass with stamped numbers and letters filled in with black enamel paint. Engraving ink, dye and vinyl fill are not acceptable.
  - 3. Identifying number and system letter. Top line shall be 1/4" characters and should abbreviate the service. The second line shall be characters and should list the valve number. Example: 1st floor shall begin 101, second floor shall begin 201.
  - 4. Attach 6"-12" of brass jack chain around bonnet or stem of the valve in a way that it cannot accidentally come off. Attach appropriate size brass "S" hook to the chain in the most conspicuous location. Hang valve tag from the "S" hook. Valve tag should not be attached to the wheel causing interference with valve operation.
  - 5. Provide on: All valves and controls.

## 2.12 IDENTIFICATION

- A. Provide engraved plastic nameplates on all equipment, including but not limited to the following: Pumps (all types). Provide nameplates on each piece of equipment at disconnect and also at the breaker. Nameplates shall conform to the following, provided the equipment can accommodate the minimum sizes outlined:
  - 1. Black background with white lettering.
  - 2. Sizes: Equipment 2"x4", disconnect 1" x 2-1/2", breaker 1" x 3".
  - 3. Lettering shall be 3/4" (1/4" minimum or sized for the maximum per nameplate).
  - 4. Nameplate shall be provided with both adhesive backing and screw holes to insure permanent application.
  - 5. Material shall be 2 ply 1/16" thick with beveled edges.
- B. Properly identify each piece of equipment and controls pertaining thereto by nameplates mounted on equipment and controls using round head brass machine screws, pop rivets or contact cement. Cardholders in any form not acceptable. Install with corrosion resistant mechanical fasteners and adhesive and seal with clear lacquer.
- C. Place warning signs on machines driven by electric motors which are controlled by fully automatic starters, in accordance with Article 3281, General Industry Safety Orders.
- D. Small devices, such as inline pumps, may be identified with tags.
- E. Identify control panels and major control components outside panels with plastic nameplates.
- F. Identify equipment out of view behind access doors, in unfinished rooms on the face of the access door.

## 2.13 VALVE AND EQUIPMENT CHARTS

- A. Provide five typewritten schedules giving numbers, service and locations, and notations of open or closed, of all tagged valves. Enclose each schedule in separate transparent plastic binder. List piping systems with symbol and color coding on pipe identification chart. List valve model numbers and symbol for service corresponding to piping symbol on valve identification chart. Provide small "key plan" identifying valves as related to column lines. Schematic flow diagrams of each piping system indicating:
  - 1. Location and function of each tagged valve.
  - 2. Type, size and essential features of each system.
- B. Submit drafts of valve schedule for review before preparing final sets.

## 2.14 IDENTIFICATION SIGNS

- A. Provide systems with identification signs as specified and as required by NFPA 13, NFPA 14 and any other code requirements.
- B. Fire sprinkler signs shall be made of 18-gauge minimum baked enamel aluminum and meet NFPA 13. Signs shall be printed red on white background or white on red background. Each sign shall have holes or slots to facilitate field attachment. All signs shall be secured using of tamper-resistant screws.

- C. Provide identification signs in accordance with referenced standards, to include, but not be limited to: the fire department connection(s), each control valve, each main or auxiliary drain valve, each inspector's test valve, and, for hydraulically-designed systems, a hydraulic system calculation nameplate. In addition, provide signs identifying all access panels concealing sprinkler control or test valves. Provide a sign on or directly below the local water flow alarm.
- D. A permanently installed, metal calculation plate shall be attached at the sprinkler riser indicating sprinkler specifications as required by NFPA 13. Use of plastic tape shall not be permitted on the calculation plate.
- E. Approved identification signs shall be provided for outside alarm devices such as bells, etc. The sign shall be located near the device in a conspicuous position and shall be worded as follows: "SPRINKLER FIRE ALARM - WHEN BELL SOUNDS CALL 911".

#### 2.15 SLEEVES AND ESCUTCHEONS

- A. Sleeves: Provide sleeves for all pipes passing through slabs, concrete walls, lath and plaster ceilings (except drop nipples for sprinklers) and partitions. Sleeves shall extend three inches (3") above floors and be flush with walls, ceilings, and partitions. In concrete construction, sleeves shall be set in forms prior to pour. Clearance between sleeves and pipes shall be one inch for pipes up to three and one-half inches two inches (2") for pipe sizes four inches (4") and greater, and three inches (3") for seismic joints.
- B. Sleeve Materials:
  - 1. In concrete slabs and walls: Schedule 40 black steel pipe.
  - 2. Sleeves through waterproof membranes: Sleeves set in walls and slabs may be either cast iron or steel and shall be provided with a flashing clamp device and corrosion resistant clamping bolts.
- C. Escutcheons: Primer-coated steel set-screw type.

#### 2.16 IDENTIFICATION SIGNS

- A. Seals shall be modular type consisting of interlocking synthetic rubber links shaped to continuously fill the space between the pipe and the opening, zinc galvanized plated bolt and nut, Thunderline Corporation "Link-Seal", Calpico Model CSL Pipe Linx, or with "Link-Seal" WS series steel wall sleeve.

#### 2.17 ACCESS PANELS AND DOORS

- A. Furnish under this Division where shown, and required by Regulatory Agencies and for access of all concealed valves, etc. Doors in this Division shall be from same manufacturer as those specified under Section 08 31 13 for identical appearance and keying. Sizes: 24" x 24" inches minimum for ceilings and 12" x 12" minimum for walls. Furnish fire rated doors when located in rated walls and ceilings. Deliver doors for installation under Section 08 31 13. Mark each door to accurately establish its location.

2.18 FLEXIBLE, SPRINKLER HOSE FITTINGS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Vic-Flex
- B. Standard: UL 2443 and FM 1637.
- C. Type: Fully stainless steel AH2 flexible hose for connection to sprinkler, and with one-piece open-gate "Series AB1" bracket for connection to ceiling grid.
  - 1. The bracket shall allow installation before the ceiling tile is in place.
- D. Bend radius to manufacturer's requirements per hose clearance chart for proper installation in confined spaces.
- E. The hose shall be listed for (4) bends at 31" length. Union joints shall be provided for ease of installation.
- F. Pressure Rating: 175 psig minimum.
- G. Size: Same as connected piping, for sprinkler.

**PART 3 - EXECUTION**

3.1 PREPARATION

- A. Sprinkler heads in all finished areas shall be installed on a true axis line in both directions with a maximum deviation from the axis line of plus or minus 1/2 inch. At the completion of the installation, if any heads are found to exceed the above-mentioned tolerance, such heads shall be removed and satisfactorily reinstalled. In areas with ceiling tiles, sprinklers shall be installed in center of tiles.
- B. Locate pipe and sprinkler heads fully coordinated with the engineered diffusers, reflected ceiling plans, ducts, conduits, light fixtures, curtain tracks and all other ceiling elements. Maintain proper code clearances from all ceiling obstructions.

3.2 GENERAL INSTALLATION

- A. Light fixtures and other potential obstructions shall not interfere with the engineered spray patterns of sprinkler heads.
- B. Supervisory Switches: For each indicating valve, sprinkler system riser, sprinkler zone, standpipe system riser, main service entrance, and control valve provide a supervisory switch that is connected to the fire alarm system. Standpipe hose valves and test and drain valves shall not be provided with supervisory switches.
- C. Water flow Switches: For each sprinkler zone, each standpipe riser and where indicated on drawings, provide a water flow switch. Install water flow switch and adjacent valves in easily accessible locations.
- D. System valves and gauges shall be accessible for operation, inspection, tests; and maintenance.

- E. No valve and no piece of equipment or trim shall support the weight of any pipe.
- F. Provide a pressure gauge on the system side of all control valves, at the top of each sprinkler or standpipe riser.
- G. No cutting, drilling or taping of structural members shall be done without prior written approval of the Owner Representative.
- H. Powder actuated fastening will not be allowed. Embeds, beam clamps, or drilled fasteners will be required, unless otherwise noted.
- I. Provide hydraulic design information signage as required by NFPA 13 and 14.
- J. Install access doors in ceilings of rooms where above ceiling access is required.
- K. Prepare all piping having welds for Fire Marshal inspection prior to installation.

### 3.3 PIPING INSTALLATION

- A. Carry all exposed and concealed horizontal lines of pipe on specified hangers properly spaced and set to allow the pipe to adjust for expansion and contraction.
- B. Check all piping runs beforehand with all other trades. Run piping to maintain proper clearance for maintenance and to clear opening in exposed area. Run piping in strict coordination with mechanical piping, ducts, and equipment, plumbing work, all electrical conduit and equipment, structural, and architectural conditions. All piping shall be installed within designated finished ceiling height as noted on the architectural drawings.
- C. Install all exposed piping to or at right angles with building walls and tight to walls or ceilings wherever possible. Piping shall be arranged to form a symmetrical pattern. Horizontal piping shall be supported at intervals not to exceed spacing permitted by NFPA 13 & 14. Vertical risers shall be supported at the base and at each floor level with clamps and hangers.
- D. Provide sleeves wherever pipes are run through walls, footings, and slabs, to allow large enough openings for the passage of the pipe. Set sleeves in forms before concrete is poured. Sleeve size shall be not less than a nominal diameter two inches (2") larger than the nominal diameter of piping three and one-half inch (3-1/2") and smaller, and a nominal diameter four inches (4") larger than the nominal diameter of piping four inches (4") and larger. The space between each pipe and sleeve shall be completely closed by packing with code approved mineral fiber materials with a suitable binder or other approved packing material. Piping through rated walls and floors shall be sealed with UL fire rated fireproof material, all in accordance with Fire Marshal's requirements. Pipes through underground exterior walls shall be sealed watertight. Provide link seal protection at sleeves in underground exterior walls and as noted on the drawings.
- E. Fire stop all pipes penetrating fire rated construction in with specification Section 07 84 13, Penetration Firestopping.
- F. Where exposed pipes pass through walls, ceilings, or floors, provide escutcheon plates in all finished rooms and conspicuous locations. Escutcheon plates must be securely held in



position allowing enough clearance to allow for expansion and shall be sufficient size to cover the opening around the pipe.

- G. Support all pipe from the building structure so that there is no apparent deflection in pipe runs. Fit piping with steel sway braces and anchors to prevent vibration and/or horizontal displacement under load when required. Do not support pipe from or brace to ducts, other pipes, conduit, or any materials shown on the Drawings. Piping or equipment shall be immobile and shall not be supported or hung by wire, rope, plumber's tape or blocking of any kind.
- H. Arrange riser and piping to maintain minimum clear width at stairways of forty-four inches (44") and minimum headroom of seven feet six inches (7'-6") for all piping.
- I. Do not run piping through elevator hoist way, machine rooms, machinery spaces and enclosures unless piping is serving these spaces. Branch sprinkler piping serving these spaces shall be provided with a supervised branch shut-off valve and flow switch located at an accessible location outside these spaces. Provide supervisory switch on the branch shut-off valve.
- J. Do not run piping through stairways, vaults, electrical rooms and other electrical or electronic equipment spaces and enclosures unless piping is serving these spaces.
- K. Sprinkler piping shall not be installed within the vertical space above electrical switchboards, panel boards, distribution boards, or battery charging panels (refer to California Electrical Code).
- L. Clean pipe and fittings and keep interiors clean throughout installation. Provide caps on ends of cleaned piping.
- M. Use full pipe lengths; random lengths joined by couplings will not be accepted.
- N. Provide allowance for expansion and contraction of all pipes and for seismic movement.
- O. Provide reducing fittings for all changes in pipe size; provide fittings for all changes in pipe direction. Riser piping shall be installed plumb with offset fittings used where alignment adjustment is necessary.
- P. Provide unions for pipe sizes smaller than two inches (2") and flanged or grooved fittings for sizes two inches (2") and larger to permit.
- Q. Provide dielectric fittings where dissimilar piping materials are joined.
- R. Piping arrangement shall avoid beams, columns, ducts, lighting fixtures, doors, windows, and similar obstructions and openings.
- S. Drains, Test Pipes and Accessories: Provide a drain at the base of risers, drain connection on valved sections, and drains at other locations for complete drainage of the system. Provide valve in drain lines and connect to central drain riser. Discharge riser outside over splash block, indirectly over an approved indirect waste receptor as furnished by plumbing section, or as indicated. The main drain shall be capable of discharge test without allowing

water to flow onto the floor. If over an indirect waste receptor, verify that receptor is adequately sized to handle flow discharge rate.

- T. Install auxiliary drain valves for lines in accordance with NFPA 13.
- U. The inspector test valve and piping shall be installed in accordance with NFPA 13, and provided at conveniently accessible locations and shall be supplied from the hydraulically remote point. A sight glass with built-in orifice of the appropriate size shall be installed adjacent to each valve. Discharge shall be to the main or to the outside. Location will permit the valve to be opened wide for sufficient time for testing without causing water damage.
- V. The discharge area for the main drain and inspector's test valve shall be protected with a concrete splash pad to prevent damage to landscaping during periodic testing.

### 3.4 INSTALLATION OF EXTERIOR FIRE ALARM BELLS

- A. The bell shall be located on the face of the protected building adjacent to the fire department connection with a mounting height of eight feet (8') to ten feet (10') above finish grade. The bell shall be connected to one of the two sets of contacts on the building flow switch, with power supplied from a dedicated 120 VAC circuit other than that supplying power to the building fire alarm control panel, served by emergency or standby power source (if the building is so equipped). All wiring shall be in conduit, concealed in interior locations.

### 3.5 FLUSHING, TESTING, AND ADJUSTING

- A. Test automatic sprinkler system in accordance with NFPA 13.
- B. Perform tests in the presence of authorities having jurisdiction. Provide required labor, materials, equipment and connections and submit results for review. Repair or replace defective work and pay for restoring or replacing damaged work, due to tests, as directed.
- C. All equipment required for testing, including fittings for additional operating shall be provided by the Contractor.
- D. System Piping Flushing: Underground mains and lead-in connections to system risers shall be completely flushed before connection is made to sprinkler piping. The flushing operation shall be continued for a sufficient time to ensure thorough, cleaning. The minimum flow rate shall be not less than the hydraulically calculated water demand rate of the system including: hose requirements, or a flow necessary to provide a velocity of not less than ten (10) feet per second, or the maximum flow rate available to the system under fire conditions. After fire sprinkler piping installation has been completed and before piping is placed in service, flush entire sprinkler system, as required to remove foreign substances, under pressure as specified in NFPA 13 and NFPA 24. Continue flushing until water is clear, and check to ensure that debris has not clogged sprinklers. While conducting the flushing operation, the contractor shall exercise care that the water does not create any damage. The contractor shall be responsible for any damage caused by this operation.
- E. Hydrostatic Testing: After flushing system, test fire sprinkler piping hydrostatically as required by NFPA 13 but not less than for period of two (2) hours at two-hundred (200)

PSIG, or at fifty (50) PSI above maximum static pressure if it is greater than one hundred-fifty (150) PSI. Check system for leakage of joints. Measure hydrostatic pressure at low point of each system or zone being tested.

- F. Repair or replace piping system components as required to eliminate leakage.
- G. Water remaining in normally dry piping shall be evacuated at completion of testing.
- H. All water level sensors, alarm and supervisory signals, tanks and automatic valves shall be performance tested.
- I. The inspection, hydrostatic test and flushing of the sprinkler system shall be witnessed by the Authority Having Jurisdiction, and Owner Representative.
- J. Provisions shall be made for the proper disposal of water used for, flushing or testing.
- K. Provide complete adjustment of sensitivity of water flow and supervisory (tamper) switches. Coordinate with Division 28 Contractor.
- L. After the inspection has been approved, the Contractor shall certify in writing the time, date, name and title of the person reviewing the test. This shall also include the description and what portion of the system has been approved.
- M. A complete record shall be maintained of all testing that has been approved, and shall be made available at the job site.
- N. Upon completion of the work, all records and certifications approving testing requirements shall be submitted to the Owner Representative and before final payment is made.
- O. Defective work or material shall be replaced or repaired, as necessary, and the inspection and test repeated, all at Contractor's cost. Repairs shall be made with new materials.
- P. No part of any work shall be covered until after it is inspected, tested, and approved.

### 3.6 INSPECTION

- A. After completion of the fire protection installation and at the start of the guarantee period, execute the National Automatic Sprinkler and Fire Control Association, Inc. standard of Inspection Agreement, at no increase in Contract Sum, calling for four (4) inspections of the sprinkler system during the guarantee year (see "Guarantees"), plus the following maintenance to be performed during the course of the fourth inspection:
  - 1. Operating of all control valves.
  - 2. Lubrication of operating stems of all control valves.
  - 3. Operating of electrical alms.
  - 4. Cleaning of alarm valves.
  - 5. Lubrication of Fire Department hose connection inlets.
  - 6. Main drain test.
- B. Fill out Inspection Agreement in triplicate after each inspection and send copies to the Owner Representative.

### 3.7 PROTECTION, CARE, AND CLEANING

- A. Provide adequate means for, and fully protect, all finished parts of the materials and equipment against physical damage from whatever cause during the progress of this work and until completion.
- B. During construction, properly cap all lines and equipment nozzles to prevent entrance of sand, dirt, etc. Protect equipment against moisture, plaster, cement, paint or other work of other trades by covering it with polyethylene sheets.
- C. Thoroughly clean exterior and interior of piping, equipment, and materials before systems are put into operation. All systems of any nature shall be thoroughly cleaned and flushed of all pipe contaminants such as cuttings, filings, lubricant, rust, scale, grease, solder, flux, welding residue, debris, etc. Any piece of equipment or part of any system which malfunctions or is damaged due to failure or neglect on the part of this Division to observe this paragraph shall be repaired or replaced to the satisfaction of the Owner's Representative by and at the total expense of this Contract.
- D. After installation has been completed, clean all systems.
  - 1. Piping and Equipment: Clean exterior thoroughly to remove rust, plaster, cement, and dirt before insulation is applied.
  - 2. Piping and Equipment to Be Painted: Clean exterior of piping, and equipment, exposed in completed structure, removing rust, plaster, cement and dirt by wire brushing. Remove grease, oil, and similar materials by wiping with clean rags and suitable non-toxic solvents. Touch up primer coat as required.
  - 3. Motors, Pumps and Other Items with Factory Finish: Remove grease and oil, and leave surfaces clean and polished.
  - 4. Chrome or Nickel-Plated Work: Thoroughly polish.
  - 5. Factory Finished Items: Remove grease and oil and leave surfaces clean and polished.
  - 6. All code stamps and nameplates shall be protected from damage and must be and legible before final inspection.

### 3.8 PAINTING AND IDENTIFICATION

- A. After completion of hydrostatic tests, all system piping exposed to view in or on the building shall be painted in accordance with Section 09 91 00 - Painting.
- B. All valve hand wheels shall be painted red enamel.
- C. Provide pipe, valve, and equipment identification; and signage in accordance with referenced codes and specifications.

### 3.9 ACCESSIBILITY

- A. The installation of valves, gages, control devices or other specialties requiring reading, adjustment, inspection, repairs, removal or replacement shall be conveniently and accessibly located with reference to the finished building.

3.10 CLOSING IN OF WORK

- A. Do not allow or cause any work to be covered up or enclosed until inspected, tested and approved.

3.11 EMERGENCY REPAIRS

- A. The Owner reserves the right to make temporary repairs as necessary to keep equipment in operating condition without neither voiding the guarantee bond nor relieving the Contractor of their responsibility during the bonding period.

3.12 CLEANING UP AND REMOVAL OF SCRAP

- A. All trash and scrap shall be cleaned up and removed from the site as the work progresses.

3.13 PRELIMINARY OPERATIONS

- A. The Owner reserves the right to operate portions of the mechanical system on a preliminary basis without voiding the guarantee.

3.14 TRAINING

- A. Provide instruction to the Owner regarding proper use and operation of the system. Training shall include both classroom and "hands-on" sessions and shall occur after final inspection and testing. Location and timing of the training session is to be arranged with the Owner's Representative.
- B. Two weeks prior to scheduled training dates, furnish the Owner's Representative with six (6) bound copies of complete instructions, including catalog cuts, diagrams, drawings, and other descriptive data covering the proper testing, operation, and maintenance of each type of system installed, and the necessary information for ordering replacement parts. In addition, post one (1) copy of complete instructions at the control panel location.
- C. Session shall include detailed training and instructions covering the necessary and recommended testing, operating, and maintenance procedures for each type of system. Session shall include training and instructions covering the emergency operation procedures for each type of system

**END OF SECTION**

**SECTION 31 10 00**

**SITE PREPARATION**

**PART 1 - GENERAL**

1.1 RELATED WORK

- A. Section 02 40 00: Selective Demolition
- B. Section 32 12 00: Flexible Paving
- C. Section 32 16 00: Curb, Gutter, Sidewalks, Driveways

1.2 REFERENCES

- A. Current Caltrans Standard Specifications:
  - 1. Section 15 – Existing Highway Facilities
  - 2. Section 17 – Clearing and Grubbing

1.3 SUBMITTAL

1.4 SUMMARY

- A. The work consists of removing objectionable material from within the limits of work.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

3.1 DEMOLITION, STRIPPING, GRUBBING AND ROUGH GRADING

- A. Demolition
  - 1. Existing concrete and asphalt concrete paving, concrete curbs, and walks shall be sawcut, broken up and removed where shown on the plans for new construction. In addition, the base rock material underneath paved areas shall be removed where no new concrete or asphalt surfacing is to be placed. In areas to receive new paving, existing aggregate base may remain in place unless otherwise specified.
- B. Stripping
  - 1. Existing topsoil shall be stripped to a depth of 6” (or deeper where directed by the Project Manager) as necessary to remove all vegetation, organic matter, or other objectionable material in those areas to be graded.
  - 2. Topsoil not containing vegetation shall be stockpiled on-site for later use as topsoil backfill to the extent needed for the project.
- C. Grubbing:

1. In unpaved areas, where existing vegetation has been removed as shown on the drawings, neatly cut and remove all roots greater than one inch in diameter, to a depth of one foot.
2. In areas to be paved, neatly cut and remove all encountered roots to a depth of at least two feet below finished grade.

D. Excavation Around Trees to Remain:

1. Where trenching for utilities is required within drip lines, tunneling under and around roots shall be by hand digging. Main lateral roots and tap roots shall not be cut.
2. Where excavation for new construction is required within the drip line of trees, hand excavation shall be employed to minimize damage to root systems. Roots shall be relocated in backfill areas wherever possible. If large main lateral roots are encountered, they shall be exposed beyond excavation limits as required to bend and relocate without breaking.
3. If encountered immediately adjacent to the location of new construction and relocation is not practical, roots shall be cut approximately 6 inches back from new construction. Project Manager approval is required to cut roots greater than 3/4 inches in diameter.
4. Exposed roots shall not be allowed to dry out before permanent backfill is placed. Temporary earth cover shall be provided, or roots shall be packed with wet peat moss or 4 layers of wet untreated burlap and temporarily supported and protected from damage until permanently relocated and covered with backfill.
5. Branching structure shall be thinned in accordance with National Arborists Association "Pruning Standards and Practices" to balance loss to root system caused by damage or cutting of root system. Thinning shall not exceed 30% of existing branching structure.

E. Rough Grading

1. Existing stockpiled material shall be used on-site as backfill to meet the proposed subgrade elevations.
2. Existing stockpiled material shall be used as backfill based on the order of work listed below:
  - a. Building Site (1<sup>st</sup> Priority)
  - b. Parking lot (2<sup>nd</sup> Priority)
  - c. Field (3<sup>rd</sup> Priority)
3. If there is not enough stockpile material to meet the proposed subgrade elevations at the building and parking lot site contractor shall strip additional material from the field to be used as backfill as necessary. Contractor shall notify the engineer if there is a shortage of engineered fill for the building and parking lot site and shall provide the shortage quantity in cubic yards. Engineer shall provide the location for striping additional backfill material and provide new finish grade elevations in the field.
4. Contractor shall notify engineer if there is any remaining engineered fill from the existing stockpile after the completion of backfilling the building, parking lot and field to proposed subgrade elevations.

### 3.2 TREE TRIMMING

- A. Contractor shall advise Project Manager of all trees (roots or branches) that are in the way of his/her work or operations.

3.3 DISPOSAL

- A. All non-hazardous debris, site strippings, and objectionable material becomes the property of the Contractor and shall be removed and disposed of in a legal manner off the Owner's property.
- B. Contractor shall ensure optimal diversion of construction waste materials generated by the Work from landfill disposal.
- C. Disposal shall be performed within 24 hours after removal of the material and shall not be left until the final clean-up period.

**PART 4 - MEASUREMENT AND PAYMENT**

4.1 MEASUREMENT

- A. All work involved in CLEARING AND GRUBBING AND ROUGH GRADING, TREE REMOVAL and EARTHWORK will be measured by "each" complete in place, unless otherwise specified in the Contract Documents.

4.2 PAYMENT

- A. CLEARING AND GRUBBING AND ROUGH GRADING shall be at the cost indicated in the Bid Schedule. The contract price paid per lump sum basis for clearing, grubbing and rough grading shall include but not limited to full compensation for furnishing all labor, equipment, materials, and incidentals for doing all the work involved for clearing and grubbing and rough grading to meet the proposed subgrade elevations, including the utilization of the existing stockpiled material and stripping additional engineered fill from the field as necessary and removal of irrigation piping and appurtenances, tree root balls, tree stumps, large cobbles, and other miscellaneous items, as specified on the Plans and in the Standard Specifications, these Technical Specifications and the Special Provisions, and as directed by the Engineer. Additionally, no payment will be made for work, equipment, or materials not covered in these plans and specifications, but necessary to insure a completed project as specified.
- B. TREE REMOVAL shall be at the cost indicated in the Bid Schedule. The contract prices paid per lump sum basis for tree removal includes, but not limited to, full compensation for furnishing all labor, material, tools, equipment, and incidentals required to remove and dispose of existing trees as shown on the Plans, as specified in the Standard Specifications, these Technical Specifications and the Special Provisions, and as directed by the Engineer. Additionally, no payment will be made for work, equipment, or materials not covered in these plans and specifications, but necessary to insure a completed project as specified.
- C. EARTHWORK shall be at the cost indicated in the Bid Schedule. The contract price paid per cubic yard for earthwork includes, but not limited to, full compensation for furnishing all labor, material, tools, equipment and incidentals for doing all the work involved for earthwork to meet the proposed subgrade elevations, including the utilization of the existing stockpile material and stripping additional engineer fill from



the field as necessary and off-hauling material to an approved facility, as specified on the Plans, and in the Standard Specifications, these Technical Specifications and the Special Provisions, and as directed by the Engineer. Additionally, no payment will be made for work, equipment, or materials not covered in these plans and specifications, but necessary to insure a completed project as specified.

**END OF SECTION**

## SECTION 32 13 16

### DECORATIVE SITE CONCRETE

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. The scope of work outlined in this Section includes the following items of work, as detailed in these Contract Specifications, as shown on the Contract Drawings or reasonably implied therefrom and is not limited to the following items:
1. Concrete Seat Wall
  2. Concrete Retaining Wall
  3. Concrete Mowband
  4. Concrete Curb
  5. Concrete Ramp
  6. Concrete Deepened Curb
  7. Pedestrian Concrete Paving
  8. Vehicular Concrete Paving
  9. Curbs and Gutter
  10. Sidewalks
  11. Curb Ramps
  12. Driveways
- B. This document includes requirements that supplement the paragraphs of General Conditions, of the City's Standard Specifications for Public Works Construction.

##### 1.2 RELATED REQUIREMENTS

- A. These Contract Specifications are part of the Contract Drawings and shall include all labor, materials, equipment, reasonable incidentals, and services necessary for the execution of the Work installed complete in place.
- B. Refer to all other sections, determine the extent and character of related work, and coordinate all work to produce a complete, properly constructed product.

##### 1.3 RELATED SECTIONS

- |    |                  |  |
|----|------------------|--|
| A. | Section 31 10 00 | Site Preparation                       |
| B. | Section 32 16 00 | Curbs, Gutter, Sidewalks and Driveways |
| C. | Section 32 11 00 | Base Courses                           |

- E. Section 32 84 00 Irrigation System
- F. Division 1 General Requirements
- G. Geotechnical Exploration & Soil Characterization Results (Appendix A)

#### 1.4 REFERENCES

A. Materials and methods of construction shall comply with the following standards:

1. ASTM International, (ASTM).
2. American Concrete Institute, (ACI).
3. Specification for Measuring, Mixing and Placing Concrete, (ACI 304)
4. Specification for Hot Weather Concreting (ACI 305)
5. Specification for Cold Weather Concreting (ACI 306)
6. Building Code Requirements for Structural Concrete (ACI 318)
7. Specification for Formwork for Concrete (ACI 347)
8. ASTM A615 – Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
9. ASTM C309 – Liquid Membrane-Forming Compounds for Curing Concrete.
10. ASTM C979 – Pigments for Integrally Colored Concrete.
11. State Standard Specifications, California Department of Transportation.
12. American National Standards Institute, (ANSI).
13. Bay Area Air Quality Management District, Sandblasting Guidelines.

B. Current Caltrans Standard Specifications:

1. Section 51 – Concrete Structures
2. Section 52 – Reinforcement
3. Section 73 - Concrete curbs and Sidewalks
4. Section 90 - Portland Cement Concrete

#### 1.5 SUBMITTALS:

- A. General: Refer to Section 01 33 00 – Submittal Procedures for requirements and procedures.
- B. Submit concrete mix designs for each concrete type. Obtain approval before placing concrete.
  1. Pedestrian and Vehicular flatwork Concrete

- C. Product data:
1. Submit complete materials list of items proposed for the work. Identify materials source.
  2. Submit admixture, curing compound, retarder, and accessory item product data, if used.
  3. Submit material certificates for aggregates, fly ash, slag, reinforcing, dowels, sealants, diamond dowels, and joint fillers.
  4. Submit manufacturer's product data and specifications for all accessories and incidentals
- D. Submit concrete delivery tickets. Show the following:
1. Batch number.
  2. Mix by class or sack content with maximum size aggregate.
  3. Admixtures.
  4. Slump.
  5. Time of loading.
- E. Submit concrete test reports.
- F. Trial batch shrinkage tests, when required as specified herein, shall show conformance with the "Drying Shrinkage" requirements specified in Article 2.1.I.

#### 1.6 QUALITY ASSURANCE

- A. Inspection by City and Other Governing and Regulatory Authorities: Allow the Engineer and other governing and regulatory authorities to perform testing and inspection of materials and practices associated with construction within their jurisdiction on the Worksite during business hours for the purpose of ensuring that the Work is in compliance with the requirements of the Contract Drawings, Contract Specifications, and other local, state and federal laws and regulations.
- B. Contractor Quality Control:
1. The Contractor's Quality Control Testing Firm shall perform quality control through observation, inspection, sampling and testing in accordance with the requirements of Section 03 30 00, Cast in Place Concrete.
- C. All manufacturer's specifications and details shall be included as part of the Contract Documents. Contractor shall review all manufactures requirements, standards,

specifications and details prior to bid and include all mix designs, additives, and incidentals required.

- D. Installing Contractor shall have successfully completed within the last 3 years at least 30 concrete applications similar in type and size to that of this project and who will assign mechanics from these earlier applications to this project, of which one will serve as lead mechanic for the complete duration of the project. Workmen shall not be allowed to walk in the freshly mixed concrete with boots or shoes coated with earth or foreign substances.
- E. Supervision: On site Decorative Concrete foreman must have a minimum of 10 years of experience installing Architectural Cast-in-place concrete. Submit project list of installer qualifications, demonstration of square footage installed, number of projects, and contact information to verify experience. The supervising foreman shall be onsite during all decorative concrete placement and finishing work for the complete duration of the project.
- F. Maintain field records of time, date of placing, curing and removal of forms of concrete in each portion of work.
- G. The Contractor shall water test all new curbs and gutters, cross gutters, and other drainage facilities in the presence of the City's Inspector.
- H. Samples:
  - 1. Sample panel: Before ordering material for concrete paving, provide sample panel, minimum 4' x 4' of each color and finish, using specified materials. Show color, texture, pattern, edging, and joint treatments. Contractor to provide additional samples at no additional cost to Contract until all colors and finishes have been approved by the Engineer.
    - a. Where applicable, the approved sample panel may be a portion of the work and remain in place. Location as directed by the Engineer. Contractor will be required to provide additional panels as necessary, until approved.
    - b. All concrete flatwork shall be by set precedent for the Warm Springs District. First order concrete flatwork shall be determined by the project which places decorative Concrete flatwork first. Concrete work which follows shall match in colors, finishes, cement, sand, and aggregate. Contractor shall be responsible for matching First Order work of adjacent developments if applicable at no additional cost to the Contract.
  - 2. Sample wall: Before ordering material for concrete paving, provide sample panel, minimum 3' section of wall, using specified materials. Show color, texture, pattern, edging, graffiti coating, and joint treatments. Contractor to provide additional samples at no additional cost to Contract until all colors and finishes have been approved.

#### 1.7 DELIVERY, STORAGE, AND HANDLING:

- A. Work notification: Notify Engineer at least 24 hours prior to installation of concrete.
- B. Establish and maintain required lines and grade elevations. All concrete shall slope to drain with no ponding of water.
- C. Do not install concrete work over wet, saturated, muddy, or frozen subgrade.
- D. Do not install concrete when air temperature is below 40 degrees F. Use of calcium chloride, salt, or any other admixture to prevent concrete from freezing is prohibited.
- E. Protect adjacent work.
- F. Provide temporary barricades and warning lights as required for protection of project work and public safety.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS:**

- A. Portland Cement: ASTM C150, Type II, natural color, unless otherwise noted.
- B. Supplementary Cementitious Materials (SCM):
  - 1. Fly Ash: ASTM C618, Type F.
  - 2. Slag Cement: ASTM 989, GR 100 or GR 120.
  - 3. Metakaolin: ASTM C618, Type N.
    - a. MetaMax by BASF Kaolin (Part of BASF Corporation) (or approved equal)
- C. Aggregate: Provide minimum 50% ASTM C33 normal weight aggregates, 3/4" maximum size, clean, uncoated crushed stone or gravel coarse aggregate free of materials which cause staining or rust spots; fine aggregate shall be clean natural sand.
- D. Recycled Aggregate: Provide minimum 30%, maximum 50% Class 2 aggregate subbase, 3/4" size, meeting Caltrans Section 25 and Section 26 of the standard specifications.
- E. Water: ASTM C 1602, Clean, fresh, and potable.
- F. Chemical admixtures: ASTM C494.
  - 1. BASF Corporation – (800) 628-9990 (or approved equal)
- G. Latex Portland Cement Grout: ANSI A108.10. Color of grout to blend with stone veneer. Submit sample for review.

H. Concrete Admixtures and Color Additives: Color per Contract Drawings, as approved by the Engineer.

I. Drying Shrinkage of Concrete:

1. A trial batch of the proposed (mix design) concrete shall be prepared using the aggregates, cement, and admixture proposed for this work. From the trial batch, three specimens (4 inches by 4 inches by 11 inches) for determining "Drying Shrinkage" shall be prepared, cured, dried, and measured. Shrinkage of specimens for cast-in-place concrete shall not exceed 0.040 percent when measured in accordance with ASTM C157/C157M and ASTM C490/C490M after 21 days of drying.

## 2.2 MIXES:

A. Pedestrian Concrete Paving

1. Provide Class A ready-mixed concrete. Batch mixing at site not acceptable.

- a. For all decorative site concrete: Use Portland Cement Concrete with a 28-day compressive strength of 3,000 p.s.i.. Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of Portland Cement, which would otherwise be used, by not less than 40 percent.

B. Vehicular Concrete Paving

1. For all decorative site concrete: Use Portland Cement Concrete containing not less than 658 pounds of cementitious materials cubic yard, with a 28 day compressive strength of not less than 4000 p.s.i..

C. Indicate water added to mix at job site on each delivery ticket. Show quantity of water added. Site water tempered mixes exceeding specified slump range will be rejected as not complying with specification requirements.

## 2.3 ACCESSORIES

A. Granular base: Class II Aggregate Base shall be Section 32 11 00 Base Courses.

B. Forms: Wood or metal of sufficient strength to resist concrete placement pressure and to maintain horizontal and vertical alignment during concrete placement. Provide forms straight, free of defects and distortion, and height equal to full depth of concrete work.

1. Provide 2" nominal thickness, surfaced plank wood forms for straight sections. Use flexible metal, 1" lumber or plywood forms to form radius bends.
2. Lumber to be new #2 grade or better. Do not use used form lumber
3. Perform form layout with a digital electronic transit for line layout accuracy.

4. Allow forms to remain in place long enough to allow concrete to set properly. Remove forms when appropriate.
- C. Joint Filler: ASTM D1751, pre-molded non-extruding asphalt-impregnated fiberboard, thickness indicated.
- D. Curing compound: ASTM C309, non-yellowing, non-staining liquid membrane-forming type containing a fugitive dye. Chlorinated rubber compounds not acceptable for exterior use.
  1. BASF Corporation; MasterKure 1315 WB – (800) 243-6739
  2. Admixtures Inc.; Colorful Clear Curing Compound – (626) 357-3263 or [http://www.admixtures.biz/product\\_6.htm](http://www.admixtures.biz/product_6.htm)
  3. Cure & Sealer Lithocrete® Sealer or HLQ 125.
- E. Joint Sealants: Two-component polysulfide or polyurethane elastomeric type complying with FS TT-S-00227, self-leveling, designed for foot traffic. Provide vehicular rated sealant in all vehicular areas. Colors shall match paving.
- F. Reinforcing steel: ASTM A615, A616, or A617, Grade 60, new domestic deformed steel bars.
- G. Welded Steel Wire Reinforcement - Plain Wire: ASTM A1064/A1064M, wire sizes and center-to-center spacings as indicated.
- H. Welded Steel Wire Reinforcement - Deformed Wire: ASTM A1064/A1064M, wire sizes and center-to-center spacings as indicated.
- I. Steel Bar Mats - Deformed Bars: ASTM A184/A184M, using ASTM A706 deformed bars, sizes and spacings of members as indicated, welded or clipped at intersections.
- J. Accessories: Provide reinforcement accessories, consisting of bar supports, spacers, hangers, chairs, ties, and similar items as required for spacing, assembling, and supporting reinforcement in place. Conform with CRSI referenced standards and the following requirements:
  1. For footings, grade beams, and slabs on grade, provide supports with precast concrete or mortar bases or plates or horizontal runners where wetted base materials will not support chair legs.
- K. Form release agent: Non-staining chemical form release agent free of oils, waxes, and other materials harmful to concrete.
  1. BASF Corporation; “MasterFinish RL” Series – (800) 628-9990
- L. Reveals/Chamfer strips: Shall be plastic or polyvinyl coated for easy release. Available from Harris Rebar, [www.harrisrebar.com](http://www.harrisrebar.com), or approved equal.



- M. Provide all stirrups, ties, anchors, shown or required to be cast into precast members.
- N. Bolts, Nuts, and Washers: ASTM A307. Provide hot-dip galvanized fasteners for exterior use. Paint to match adjacent metal work.
- O. Waterproofing at Seat Walls
  - 1. Tremco 250GC, Tremco 150
  - 2. Approved equal.
- P. Glare Reducing Agents
  - 1. Lampblack in dry form, in accordance with the requirements of ASTM “ Standard Specification for Lampblack”, Designation D 209. Concrete shall include two (2) pounds of liquid lamp black per cubic yard of concrete. Liquid lamp black color shall be “David A 8090 Black” or equal.
  - 2. An approved liquid or semi-paste black colorant intended for use integrally in concrete mixes. The proportion required, generally from 10 to 40 ounces liquid measure per cubic yard of concrete, may be affected by the colorant used. Curing in this case shall be by the pigmented curing compound method.
  - 3. All visible Standard Gray pedestrian and vehicular concrete work shall include Lampblack as indicated above.
- Q. Surface retarder
  - 1. BASF Corporation; “MasterFinish” Series
  - 2. Dayton Superior Top Cast or approved equal.
- R. Detectable Warning Surface
  - 1. The Contractor shall furnish and install detectable warning surface material on curb ramps in conformance with City of Oakley Standard Details and current ADA requirements. On all new concrete construction, detectable warning surface shall be ‘wet-set’ system embedded into new concrete. Surface applied or ‘mat’ systems for detectable warning surface material only allowed if prior approval is made by the City’s Engineer.

### **PART 3 - EXECUTION**

#### **3.1 INSPECTION:**

- A. Examine subgrades and installation conditions. Do not start concrete work until unsatisfactory conditions are corrected.

- B. Review all Architectural, Civil and Structural Contract Drawings for items which require coordination.
- C. Contractor and Engineer to field review location, orientation, and elevations of all utility boxes, structures, drainage elements, and footings with the proposed grades, walls, score pattern and joint layouts prior to the placement of work. Correct any deficient items prior to proceeding with Decorative Concrete work.
- D. The existing concrete shall be sawcut full depth prior to removal. Any concrete broken due to the Contractor's failure to comply with these requirements shall be removed and replaced at the Contractor's expense.
- E. The line and grade of the replaced facilities shall conform to the existing facilities. In most instances, this will consist of a straight line between existing facilities. Replace sidewalk and curb and gutter to next score mark.

3.2 PREPARATION:

- A. Prepare subgrade in accordance with Site Preparation, Section 31 10 00.
- B. Subgrade Preparation
  - 1. General:
    - a. All subgrade should be firm and stable.
    - b. All compaction requirements refer to relative compaction as a percentage of the laboratory standard described by ASTM D 1557.
  - 2. Exterior Flatwork:
    - a. Compact upper 12 inches of subgrade to a minimum of 90 percent compaction near optimum moisture content.
    - b. All Curb and Gutter shall be placed on a minimum of 4" Aggregate Base Class II 95% maximum compaction ASTM D 1557.
  - 3. Vehicular Pavement:
    - a. Compact upper 12 inches of subgrade and aggregate base to a minimum of 95% compaction near optimum moisture content.
- C. Remove loose material and debris from base surface before placing concrete.
- D. Install, align, and level forms. Stake and brace forms in place. In some instances, particularly in critical drainage areas, tolerances may be reduced to zero. Concrete facilities shall be installed to maintain or provide positive drainage. Questions regarding applicable

tolerances shall be directed to the Engineer 48 hours in advance of the work. Maintain following grade and alignment tolerances:

1. Top of form: Maximum 1/8" in 10'-0".
  2. Vertical face: Maximum 1/2" in 10'-0".
- E. Coat form surfaces in contact with concrete with form release agent. Clean forms after each use and coat with form release agent as necessary to assure separation from concrete without damage.
- F. Install, set, and build-in work furnished under other specification sections. Provide adequate notification for installation of necessary items.
- G. Install pipe sleeves for irrigation system furnished under Section 32 84 00. Stake location of irrigation sleeves.
- H. All waterproof membranes and drainage courses shall be reviewed and approved in writing by the associated manufacturer's representative or Engineer.

### 3.3 PLACING REINFORCEMENT

- A. Place all reinforcement as shown on the Contract Drawings. Place accurately and securely fasten and support reinforcement to prevent displacement before or during pouring. Hang footing bars from forms. Support wire mesh with suitable metal cradles.
- B. Clean, bend and place reinforcement in accordance with current requirements of the ACI Manual of Concrete Practice.
- C. Dowels: Provide dowels where indicated or required for connecting construction and for maintaining structural and reinforcement continuity. Dowels shall be tied securely in place before concrete is deposited. Provide additional bars for proper support and anchorage where required. Do not bend dowels after embedment.
- D. Welded Wire Reinforcement:
1. Wire fabric shall be installed in lengths as long as practicable and shall be wire-tied at all laps and splices. End laps shall be offset in adjacent widths. Lap welded wire fabric in accordance with applicable requirements of ACI 318.
  2. Where required welded wire fabric shall be secured in position with suitable supports, accessories, and tie wire as indicated and required to ensure against movement from workers and placement of concrete lift fabric as concrete is placed to assure proper embedment at position indicated.
- E. Reinforcement Splices:
1. Reinforcing bars - 24 bar diameter minimum, except as otherwise noted.

### 3.4 INSTALLATION

#### A. Concrete placement:

1. Comply with ACI 304 “Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete”, and as specified.
2. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing, and curing. In cold weather comply with ACI 306, “Standard Specification for Cold Weather Concreting”. In hot weather comply with ACI 305, “Standard Specification for Hot Weather Concreting”.
3. Moisten base to provide a uniform dampened condition at the time concrete is placed. Verify structures are at required finish elevation and alignment before placing concrete.
4. Place and spread concrete to the full depth of the forms. Use only square-end shovels or concrete rakes for hand-spreading and consolidating operations to prevent segregation of aggregate and dislocation of reinforcement.
5. Place concrete in a continuous operation between expansion joints. Provide construction joints where sections cannot be placed continuously.
6. Place concrete as indicated on the plans in one course, monolith construction, for the full width and depth of concrete work.
7. Strike-off and bull-float concrete after consolidating. Level ridges and fill voids. Check surface with a 10'-0" straightedge. Fill depressions and refloat repaired areas. Darby the concrete surface to provide a smooth level surface ready for finishing. In general, adding water to the surface of the concrete to assist in finishing operations shall not be permitted. Before final finishing is completed and before the concrete has taken its initial set, the edges shall be carefully finished with the radius shown on the plans or a radius to match the existing construction. Concrete shall be thoroughly consolidated against and along the faces of all forms and adjacent concrete. After the forms are removed, excess concrete below the form surface shall be removed to be flush with the form face. All new concrete shall match existing facilities in texture, color, and appearance.

#### B. Curb Ramps:

1. Curb ramps shall be constructed in general conformance with City of Oakley Standard Details and current ADA requirements. Curb ramp construction will typically include removal and replacement of sidewalk, curb and gutter adjacent to new ramp, and installation of detectable warning surface (truncated domes). Truncated dome material shall be Safety Yellow in color.

2. At those locations where box lids fall within the area of the detectable warning surface the Contractor shall present solution(s) for relocating utility box lids to maintain a continuous field of domes as specified in the standard specifications. The City will review proposed solutions and approve those method(s) which are found to be suitable prior to implementation by the Contractor.
3. The Contractor's duties as part of curb ramp construction shall include coordinating with utility company representatives for those locations where existing utility boxes fall within the limits of new ramp and/or sidewalk construction. Coordination efforts should be made early on in the Contract for those items which may require a long lead-in time or may involve significant interaction with utility company personnel.
4. Limits of removal and replacement work shall be determined by the Plans and Specifications and current ADA guidelines. The Contractor at each curb ramp location shall meet with the Engineer or Inspector to determine the limits of curb ramp removal and replacement.

C. Joints:

1. Provide expansion joints using premolded joint filler at concrete work abutting curbs, walls, structures, walks, utility boxes and other fixed objects.
  - a. Locate expansion joints as indicated or at a distance at 20' maximum, where paving patterns collide, between existing and new work, between pedestrian and vehicular paving, around all light post foundations and around all structural foundations.
  - b. Coordinate all expansion joints with interlocking paver fields and fixed objects.
  - c. Install joint fillers full-width and depth of joint. Recess top edge below finish grade for joint sealants.
  - d. Provide joint fillers in single lengths for the full slab width, whenever possible. Fasten joint filler sections together when multiple lengths are required.
  - e. Protect the top edge of the joint filler during concrete placement.
  - f. Brooming. After the curing period, expansion joints shall be carefully cleaned and filled with approved joint sealant to just below adjacent paved surface in such a manner as to avoid spilling on paved surfaces or overflow from joint.
2. Saw cut joints  $\frac{1}{4}$  depth of slab as indicated on the Contract Drawings. Contractor to allow concrete to cure as required before beginning operations.
3. Saw cuts shall be of a consistent depth, and visually straight.

D. Finishes:

1. Broom Finish: Shall be obtained by drawing a stiff bristled broom across a floated finish. Direction of brooming to be perpendicular to direction of work or otherwise shown on Contract Drawings.
2. Sand Blast Finish:
  - a. Perform in as continuous an operation as possible, utilizing the same work crew to maintain continuity of finish.
  - b. Depth of Cut: Use an abrasive grit of the proper type and gradation to expose the aggregate and surrounding matrix surfaces to match approved sample panel.
  - c. Blast corners and edge patterns carefully, using backup boards, in order to maintain a uniform corner or edge line.
  - d. Use same nozzle, nozzle pressure and blasting technique as used for sample panel.
  - e. Maintain control of abrasive grit and concrete dust in each area of blasting. Clean up and remove all expended abrasive grit, concrete dust, and debris at the end of each day of blasting operations.
3. Top Cast Finish: Install per manufacture's specifications and details

E. Curing:

1. Cure concrete with a clear, non-staining liquid membrane-forming compound. Spray apply in accordance with manufacturer's recommended coverage rate. Apply curing compound immediately after completing surface finish.
2. After Concrete is placed, cure concrete for a minimum of seven (7) days without foot traffic and a minimum thirty (30) days without vehicular traffic. If a curing compound is required, refer to Section 2.03 of this specification for acceptable curing compounds or install a moisture retaining, non-staining, non-woven, curing cover and maintain sufficient moisture under cover to provide for 100% humidity conditions at concrete surface for a minimum of 7 days. Cover shall be reflective in nature to prevent excessive heat build up under cover and allow for optimal curing conditions.

3.5 FIELD QUALITY CONTROL

- A. Contractor shall perform field quality control in accordance with the requirements of Section 03 30 00, Cast in Place Concrete.

3.6 TOLERANCES

- A. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials"

### 3.7 PROTECTION

- A. The contractor shall always have materials available to protect the surface of the fresh concrete against rain. These materials shall consist of burlap, curing paper, or plastic sheeting. If plastic sheeting is used, it shall not be allowed to contact finished concrete surfaces. The Contractor shall also protect against traffic and vandalism. If the concrete is damaged or vandalized the Contractor shall remove and replace these sections at its own expense. Protect concrete work from damage due to construction and vehicular traffic until Final acceptance. Exclude construction and vehicular traffic from concrete pavements for at least 14 days.
- B. Protection: Protect precast concrete items from chipping, spalling, cracking, or other damage until the Work is accepted by the Engineer.
- C. Concrete work subject to traffic shall be heavily protected by the Contractor as required to ensure damage does not occur. Damaged concrete shall be considered Defective Concrete as specified in section 3.8 herein.

### 3.8 DEFECTIVE CONCRETE

- A. Concrete work which does not meet the Contract Specifications or Contract Drawings shall be considered defective concrete.
- B. Color and finish of all concrete work shall match. Inconsistent color, and finishing shall be considered defective concrete.
- C. All walls shall be plumb, straight with top of wall held level. Walls which are not plumb, straight, or level shall be considered defective concrete.
- D. All joints shall be straight and true. Joints which are not straight shall be considered defective concrete.
- E. Concrete work which ponds, does not conform to ADA requirements, does not match grading, is of poor finish, has poor scoring depth, map cracking, chipped, cracked, or otherwise deemed non acceptable shall be considered defective concrete.
- F. Defective concrete shall be repaired or replaced as directed by the Engineer, at no added expense to the Contract. Repair means and methods shall be provided to the Engineer for review. Approval of means and method of repair does not provide an acceptance of defective concrete.
  - 1. Engineer's authorization for the Contractor to repair defective concrete work does not provide an acceptance of defective concrete work. All final repair work that does not meet the approval of the Engineer shall be rejected, removed and replaced at no additional cost to the Contract.

2. In general, minor defective work may be repaired by use of dry pack. If defective work is serious or affects the strength of the structure or the appearance, the Engineer may require the removal and replacement of the portion of the structure.
3. Immediately after removing forms, all concrete surfaces shall be inspected any poor joints voids, rock pockets, tie holes, except as specified, etc., shall be patched at once, but not until the surfaces have first been reviewed by the Engineer. Submit patching mixture and method proposed for use, for review prior to commencing work.
4. Repaired or Replaced work shall match existing work. Work which does not match may require full removal and replacement.
5. All labor, materials, equipment, incidentals, and work related to the repairs or replacement of Concrete work shall be done at no additional cost to the Contract.

### 3.9 CLEANING

- A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from concrete operations.
- B. Sweep concrete sidewalks and pavement; wash free of stains, discoloration, dirt, and other foreign material immediately prior to final acceptance.

## **PART 4 – MEASUREMENT AND PAYMENT**

### 4.1 MEASUREMENT

- A. All work shall be done in conformance with the applicable provisions of the Standard Specifications.
- B. All work involving in installing WALL (A), WALL (B), WALL (C), WALL (D), WALL (E) AND 12” CONCRETE MOW BAND will be measured by linear foot complete in place, unless otherwise specified in the Contract Documents.
- C. All work involved in installing CONCRETE SIDEWALK, CONCRETE VEHICULAR PAVEMENT, CITY STANDARD VERTICAL CONCRETE CURB ADJACENT TO HARDSCAPED AREAS, DEEPENED VERTICAL CONCRETE CURB ADJACENT TO LANDSCAPED AREAS, DEEPENED VERTICAL CONCRETE CURB AND GUTTER, CURB RAMPS, TRUNCATED DOMES, and JENSEN PRECAST CONCRETE WHEEL STOP MODEL S-48 will be measured by “each” complete in place, unless otherwise specified in the Contract Documents.

### 4.2 PAYMENT

- A. The contract unit price paid per linear foot for WALL (A) shall include but not limited to full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing



all the work involved in installing WALL (A), including Portland cement, reinforcing steel, concrete footing, sub-base preparation, sub-base compaction, caulking, field mock-ups and finish, complete in place, as shown on the plans, as specified in these specifications and the special provisions and as directed by the Engineer.

- B. The contract unit price paid per linear foot for WALL (B) shall include but not limited to full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing all the work involved in installing WALL (B), including Portland cement, reinforcing steel, dowel, concrete footing, weep hole, reveal, sub-base preparation, sub-base compaction, field mock-ups and finish, caulking, skatestops, complete in place, as shown on the plans, as specified in these specifications and the special provisions and as directed by the Engineer.
- C. The contract unit price paid lump sum t for STAIRS AND HANDRAIL shall include but not limited to full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing all the work involved in installing STAIRS AND HANDRAIL, including Portland cement, reinforcing steel, dowel, concrete footing, reveal, caulking, handrails, sub-base preparation, sub-base compaction, field mock-ups and finish, complete in place, as shown on the plans, as specified in these specifications and the special provisions and as directed by the Engineer.
- D. The contract unit price paid per linear foot for WALL (D) shall include but not limited to full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing all the work involved in installing WALL (D), including Portland cement, reinforcing steel, dowel, concrete footing, reveal, caulking, sub-base preparation, sub-base compaction, field mock-ups and finish, complete in place, as shown on the plans, as specified in these specifications and the special provisions and as directed by the Engineer.
- E. The contract unit price paid per linear foot for 12" CONCRETE MOWBAND shall include but not limited to full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing all the work involved in installing 12" CONCRETE MOWBAND, including Portland cement, reinforcing steel, concrete footing, sub-base preparation, sub-base compaction, field mock-ups and finish, complete in place, as shown on the plans, as specified in these specifications and the special provisions and as directed by the Engineer.
- F. The CONCRETE SIDEWALK shall be at the cost indicated in the Bid Schedule. The contract price paid per square foot for the construction of concrete sidewalk of various alignments, colors and finishes shall include, but not limited to, full compensation for furnishing all labor, materials, tools, equipment, and incidentals required for doing all the work involved in constructing concrete sidewalks of various alignments, colors, and finishes, including subgrade compaction, formwork, expansion joints, concrete, class 2 aggregate base and reinforcement, complete in place, as shown on the Plans, as specified in the Standard Specifications, these Technical Specifications and the Special Provisions, and as directed by the Engineer. Additionally, no payment will be made for work, equipment, or materials not covered in these plans and specifications, but necessary to insure a completed project as specified.
- G. CONCRETE VEHICULAR PAVEMENT shall be at the cost indicated in the bid Schedule. The contract prices paid per square feet for concrete vehicular pavement shall include, but not

limited to, full compensation for furnishing all labor, materials, tools, equipment and incidentals required for doing all the work involved in constructing Concrete Vehicular Pavement, including saw cutting, pavement, spreading, compacting compaction, excavation and backfill, formwork, expansion joints, concrete, class 2 aggregate base and reinforcement, complete in place, as shown on the Plans, as specified in the Standard Specifications, these Technical Specifications and the Special Provisions and as directed by the Engineer. Additionally, no payment will be made for work, equipment or materials not covered in these plans and specifications, but necessary to insure a complete project as specified.

- H. CITY STANDARD VERTICAL CONCRETE CURB ADJACENT TO HARDSCAPED AREAS shall be at the cost indicated in the Bid Schedule. The contract prices paid per linear foot for the construction of City standard vertical concrete curb adjacent to hardscaped areas shall include, but not limited to, full compensation for furnishing all labor, materials, tools, equipment, and incidentals required for doing all the work involved in constructing City standard vertical concrete curb, including compaction, excavation and backfill, formwork, expansion joints, concrete, class 2 aggregate base and reinforcement, complete in place, as shown on the Plans, as specified in the Standard Specifications, these Technical Specifications and the Special Provisions, and as directed by the Engineer. Additionally, no payment will be made for work, equipment, or materials not covered in these plans and specifications, but necessary to insure a completed project as specified.
- I. DEEPENED VERTICAL CONCRETE CURB ADJACENT TO LANDSCAPED AREAS shall be at the cost indicated in the Bid Schedule. The contract prices paid per linear foot for the construction of deepened vertical concrete curb shall include, but not limited to, full compensation for furnishing all labor, materials, tools, equipment, and incidentals required for doing all the work involved in constructing deep vertical concrete curb, including subgrade compaction, excavation and backfill, formwork, expansion joints, concrete, class 2 aggregate base and reinforcement, complete in place, as shown on the Plans, as specified in the Standard Specifications, these Technical Specifications and the Special Provisions, and as directed by the Engineer. Additionally, no payment will be made for work, equipment, or materials not covered in these plans and specifications, but necessary to insure a completed project as specified.
- J. DEEPENED VERTICAL CONCRETE CURB AND GUTTER shall be at the cost indicated in the Bid Schedule. The contract prices paid per linear foot for the construction of deepened vertical concrete curb and gutter shall include, but not limited to, full compensation for furnishing all labor, materials, tools, equipment, and incidentals required for doing all the work involved in constructing miscellaneous concrete items, including subgrade compaction, excavation and backfill, formwork, expansion joints, concrete, class 2 aggregate base and reinforcement, complete in place, as shown on the Plans, as specified in the Standard Specifications, these Technical Specifications and the Special Provisions, and as directed by the Engineer. Additionally, no payment will be made for work, equipment, or materials not covered in these plans and specifications, but necessary to insure a completed project as specified.
- K. CURB RAMPS shall be at the cost indicated in the Bid Schedule. The contract price paid per each for the construction of curb ramp with truncated domes shall include, but not limited to, full compensation for furnishing all labor, materials, tools, equipment, and incidentals

required for doing all the work involved in constructing curb ramp, including subgrade compaction, excavation and backfill, formwork, expansion joints, class 2 aggregate base, concrete, and reinforcement, complete in place, as shown on the Plans, as specified in the Standard Specifications, these Technical Specifications and the Special Provisions, and as directed by the Engineer. Additionally, no payment will be made for work, equipment, or materials not covered in these plans and specifications, but necessary, to insure a completed project as specified.

- L. TRUNCATED DOMES shall be at the cost indicated in the Bid Schedule. The contract price paid per lump sum for the installation of truncated domes shall include, but not limited to, full compensation for furnishing all labor, materials, tools, equipment, and incidental required for doing all work involved in installing truncated domes.
  
- M. JENSEN PRECAST CONCRETE WHEEL STOP MODEL S-48 shall be at the cost indicated in the Bid Schedule. The contract price paid per each for the installation of wheel stops shall include, but not limited to, full compensation for furnishing all labor, materials, tools, equipment, and incidentals required for doing all the work involved in installing wheel stops.

**END OF SECTION**

**OAKLEY RECREATION CENTER  
1250 O'HARA AVENUE, OAKLEY, CA 94561**

## **FIRE SPRINKLER SYSTEM**

1. Hydraulic Calculations
2. Fire Sprinkler Heads



## **HYDRAULIC CALCULATIONS**

1. STORAGE 105 - REMOTE AREA : # 1
2. GREATER ROOM 102 - REMOTE AREA : # 2
3. KITCHEN 107 - REMOTE AREA : # 3

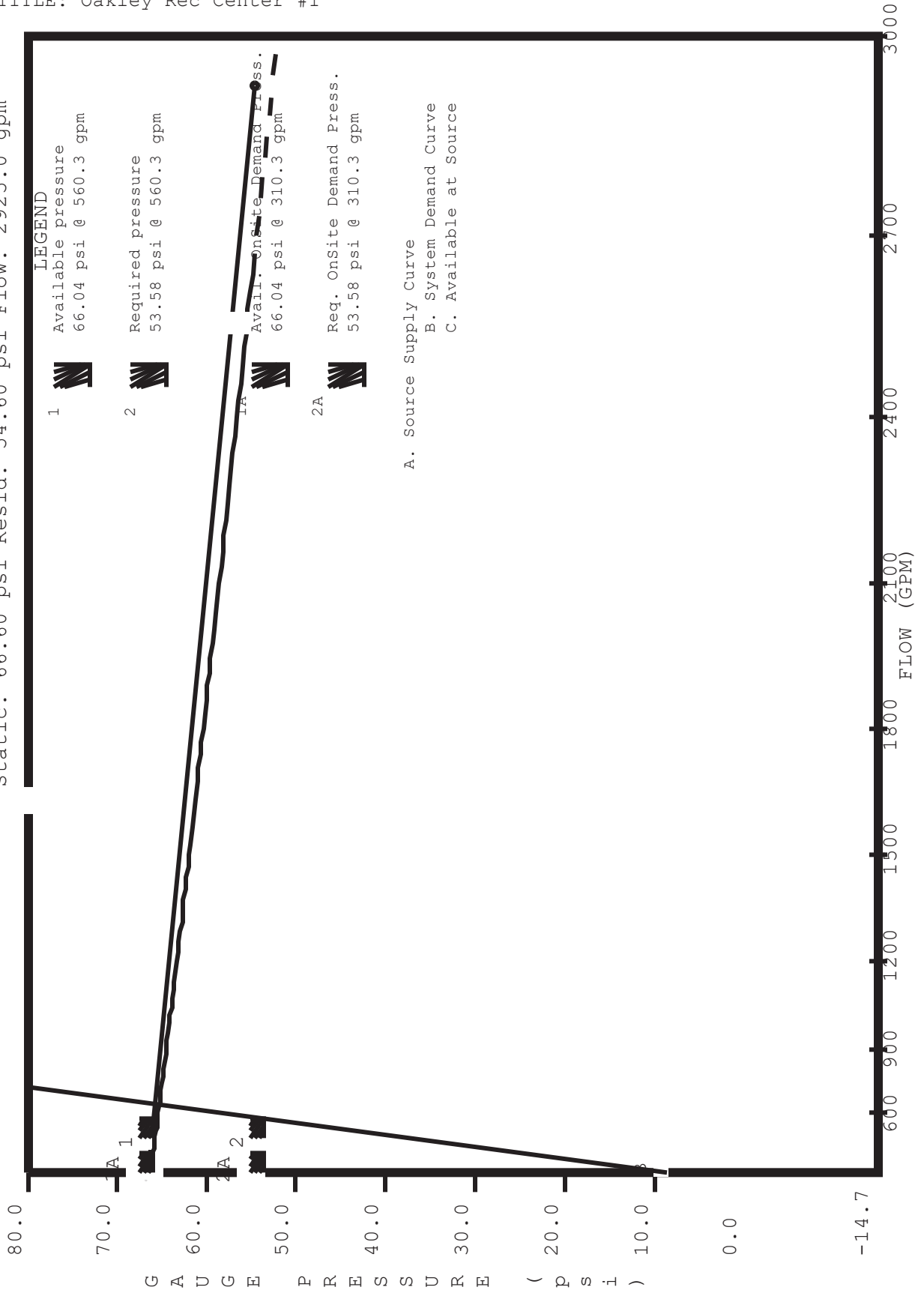


SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/22/2018N CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #1.SDF  
 JOB TITLE: Oakley Rec Center #1

WATER SUPPLY ANALYSIS

Static: 66.60 psi Resid: 54.60 psi Flow: 2925.0 gpm



Note: (1) Dashed Lines indicate extrapolated values from Test Results  
 (2) On Site pressures are based on hose stream deduction at the source

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NFPA WATER SUPPLY DATA

FDC's NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	FLOW @ (GPM)	AVAIL. PRESS. (PSI)	TOTAL @ DEMAND (GPM)	REQ'D PRESS. (PSI)
SR	66.6	54.6	2925.0	66.0	560.3	53.6

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	560.3 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	250.0 GPM
OTHER HOSE STREAM ALLOWANCES	0.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	310.3 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)	Notes
SR	-3.0	SOURCE	53.6	310.3	
U1	-3.0	- - - -	53.4	- - -	
U2	-3.0	- - - -	43.4	- - -	
U3	-3.0	- - - -	43.2	- - -	
U4	-3.0	- - - -	41.2	- - -	
U5	-3.0	- - - -	37.5	- - -	
BOR	1.0	- - - -	35.3	- - -	
TOR	10.8	- - - -	30.8	- - -	
43	16.0	- - - -	27.7	- - -	
16	16.0	- - - -	26.3	- - -	
15	26.5	- - - -	21.3	- - -	
14	26.5	- - - -	20.8	- - -	
13	26.5	- - - -	20.1	- - -	
12	26.2	- - - -	19.0	- - -	
11	25.4	- - - -	18.7	- - -	
10	24.8	- - - -	17.8	- - -	
9	23.5	- - - -	17.6	- - -	
8	22.2	- - - -	17.0	- - -	
7	20.6	- - - -	17.0	- - -	
6	19.6	- - - -	16.2	- - -	
5	17.8	- - - -	16.3	- - -	
4	16.6	- - - -	15.5	- - -	
3	14.9	- - - -	15.5	- - -	
2	12.6	- - - -	15.9	- - -	
1	10.6	- - - -	16.6	- - -	
36	16.0	- - - -	26.5	- - -	
35	26.5	- - - -	21.5	- - -	
34	26.5	- - - -	20.8	- - -	



SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/22/2018N CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #1.SDF  
 JOB TITLE: Oakley Rec Center #1

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)	Notes
33	26.5	- - - -	20.1	- - -	
32	26.2	- - - -	19.0	- - -	
31	25.4	- - - -	18.7	- - -	
30	24.8	- - - -	17.8	- - -	
29	23.5	- - - -	17.6	- - -	
28	22.2	- - - -	17.0	- - -	
27	20.6	- - - -	17.1	- - -	
26	19.6	- - - -	16.4	- - -	
25	17.8	- - - -	16.6	- - -	
24	16.6	- - - -	16.2	- - -	
23	14.9	- - - -	16.4	- - -	
22	12.6	- - - -	16.9	- - -	
21	10.6	- - - -	17.6	- - -	
51	10.6	- - - -	15.8	- - -	
52	10.6	- - - -	15.4	- - -	
53	10.6	- - - -	15.4	- - -	
54	10.6	- - - -	15.4	- - -	
55	10.6	- - - -	15.7	- - -	
56	12.6	- - - -	15.8	- - -	
57	12.6	- - - -	15.4	- - -	
58	12.6	- - - -	15.3	- - -	
59	12.6	- - - -	15.4	- - -	
60	12.6	- - - -	15.6	- - -	
61	14.9	- - - -	15.5	- - -	
62	14.9	- - - -	15.0	- - -	
63	14.9	- - - -	14.8	- - -	
64	14.9	- - - -	14.8	- - -	
65	14.9	- - - -	15.0	- - -	
S1	10.4	K= 5.60	14.3	21.2	
S2	10.4	K= 5.60	13.9	20.9	
S3	10.4	K= 5.60	13.9	20.9	
S4	10.4	K= 5.60	13.9	20.9	
S5	10.4	K= 5.60	14.2	21.1	
S6	12.5	K= 5.60	14.3	21.2	
S7	12.5	K= 5.60	13.9	20.9	
S8	12.5	K= 5.60	13.8	20.8	
S9	12.5	K= 5.60	13.9	20.8	
S10	12.5	K= 5.60	14.1	21.0	
S11	16.4	K= 5.60	13.3	20.4	
S12	16.4	K= 5.60	12.9	20.1	
S13	16.4	K= 5.60	12.8	20.0	
S14	16.4	K= 5.60	12.8	20.0	
S15	16.4	K= 5.60	12.9	20.1	

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/22/2018N CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #1.SDF  
 JOB TITLE: Oakley Rec Center #1

NFPA3 PIPE DATA

Pipe Tag	K-fac	Add Fl	Add Fl To	Fit:	L	C	(Pt)	Note
To Node	El (ft)	PT	(q) Node/	Nom ID	Eq.Ln.	F	(Pe)	
Frm Node	El (ft)	PT	Tot.(Q) Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 1	0.0	0.0			2E:54.0	107.00	150	53.4
U1	-3.0	53.4	310.3	U2	E8.000 T:53.0	113.00		0.0
SR	-3.0	53.6	310.3		7.980 G: 6.0	220.00	0.001	0.2
Pipe: 2		0.0			FIXED PRESSURE LOSS DEVICE			
U2	-3.0	43.4	310.3	U3	10.0 psi,	310.3 gpm		
U1	-3.0	53.4	310.3					
Pipe: 3	0.0	0.0				256.00	150	43.2
U3	-3.0	43.2	310.3	U4	E8.000 3E:81.0	81.00		0.0
U2	-3.0	43.4	310.3		7.980	337.00	0.001	0.2
Pipe: 4	0.0	0.0			T:39.0	47.00	150	41.2
U4	-3.0	41.2	310.3	U5	E4.000 C:43.0	86.00		0.0
U3	-3.0	43.2	310.3		4.240 G: 4.0	133.00	0.015	2.0
Pipe: 5	0.0	0.0				161.00	150	37.5
U5	-3.0	37.5	310.3	BOR	E4.000 2E:40.0	76.00		0.0
U4	-3.0	41.2	310.3		4.240 3L:36.0	237.00	0.015	3.6
Pipe: 6	0.0	0.0				11.40	140	35.3
BOR	1.0	35.3	310.3	TOR	D4.000 E:17.0	17.00		1.7
U5	-3.0	37.5	310.3		4.220	28.40	0.018	0.5
Pipe: 7	0.0	0.0				9.75	120	30.8
TOR	10.8	30.8	310.3	43	B4.000 G: 3.0	3.00		4.2
BOR	1.0	35.3	310.3		4.260	12.75	0.023	0.3
Pipe: 8	0.0	161.7	36			34.60	120	27.7
43	16.0	27.7	148.6	16	B4.000 ----	0.00		2.3
TOR	10.8	30.8	310.3		4.260	34.60	0.023	0.8
Pipe: 9	0.0	0.0				36.80	120	26.3
16	16.0	26.3	148.6	15	B3.000 E:10.0	30.00		0.0
43	16.0	27.7	148.6		3.260 T:20.0	66.80	0.021	1.4
Pipe: 10	0.0	0.0				10.50	120	21.3
15	26.5	21.3	148.6	14	B3.000 E:10.0	10.00		4.5
16	16.0	26.3	148.6		3.260	20.50	0.021	0.4
Pipe: 11	0.0	153.1	13			5.50	120	20.8
14	26.5	20.8	-4.5	34	B3.000 2E:20.0	20.00		0.0
15	26.5	21.3	148.6		3.260	25.50	0.021	0.5

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DATE: 1/22/2018N CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #1.SDF  
 JOB TITLE: Oakley Rec Center #1

Pipe Tag	K-fac	Add Fl	Add Fl	To	Fit:	L	C	(Pt)	
To Node	El (ft)	PT	(q)	Node/	Nom ID	Eq.Ln.	F	(Pe)	Note
Frm Node	El (ft)	PT	Tot. (Q)	Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 12		0.0	154.7	12			11.40	120	20.1
13	26.5	20.1	-1.6	33	B3.000	T:20.0	20.00		0.0
14	26.5	20.8	153.1		3.260		31.40	0.022	0.7
Pipe: 13		0.0	155.0	11			12.33	120	19.0
12	26.2	19.0	-0.4	32	B3.000	2E:20.0	40.00		-0.1
13	26.5	20.1	154.7		3.260	T:20.0	52.33	0.023	1.2
Pipe: 14		0.0	0.0				11.00	120	18.7
11	25.4	18.7	155.0	10	B3.000	T:20.0	20.00		-0.4
12	26.2	19.0	155.0		3.260		31.00	0.023	0.7
Pipe: 15		0.0	155.6	9			8.60	120	17.8
10	24.8	17.8	-0.4	30	B3.000	2E:20.0	40.00		-0.3
11	25.4	18.7	155.3		3.260	T:20.0	48.60	0.023	1.1
Pipe: 16		0.0	156.3	8			11.00	120	17.6
9	23.5	17.6	-0.6	29	B3.000	T:20.0	20.00		-0.5
10	24.8	17.8	155.6		3.260		31.00	0.023	0.7
Pipe: 17		0.0	157.6	7			11.00	120	17.0
8	22.2	17.0	-1.3	28	B3.000	2E:20.0	40.00		-0.5
9	23.5	17.6	156.3		3.260	T:20.0	51.00	0.023	1.2
Pipe: 18		0.0	159.5	6			11.00	120	17.0
7	20.6	17.0	-1.8	27	B3.000	T:20.0	20.00		-0.7
8	22.2	17.0	157.6		3.260		31.00	0.024	0.7
Pipe: 19		0.0	162.5	5			7.80	120	16.2
6	19.6	16.2	-3.0	26	B3.000	2E:20.0	40.00		-0.4
7	20.6	17.0	159.5		3.260	T:20.0	47.80	0.024	1.2
Pipe: 20		0.0	166.2	4			10.00	120	16.3
5	17.8	16.3	-3.7	4	B3.000	T:20.0	20.00		-0.8
6	19.6	16.2	162.5		3.260		30.00	0.025	0.8
Pipe: 21		0.0	171.7	3			7.50	120	15.5
4	16.6	15.5	-5.5	24	B3.000	2E:20.0	40.00		-0.5
5	17.8	16.3	166.2		3.260	T:20.0	47.50	0.026	1.2
Pipe: 22		0.0	60.5	61			7.80	120	15.5
3	14.9	15.5	111.2	2	B3.000	T:20.0	20.00		-0.7
4	16.6	15.5	171.7		3.260		27.80	0.028	0.8

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 JOB TITLE: Oakley Rec Center #1

Pipe Tag	K-fac	Add Fl	Add Fl	To	Fit:	L	C	(Pt)	
To Node	El (ft)	PT	(q)	Node/	Nom ID	Eq.Ln.	F	(Pe)	Note
Frm Node	El (ft)	PT	Tot. (Q)	Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 23	0.0	57.1	56				11.60	120	15.9
2	12.6	15.9	54.1	1	B3.000	2E:20.0	40.00		-1.0
3	14.9	15.5	111.2		3.260	T:20.0	51.60	0.012	0.6
Pipe: 24	0.0	0.0					8.20	120	16.6
1	10.6	16.6	54.1	51	B3.000	T:20.0	20.00		-0.9
2	12.6	15.9	54.1		3.260		28.20	0.003	0.1
Pipe: 25	0.0	0.0					18.33	120	26.5
36	16.0	26.5	161.7	35	B3.000	E:10.0	30.00		0.0
43	16.0	27.7	161.7		3.260	T:20.0	48.33	0.025	1.2
Pipe: 26	0.0	0.0					10.50	120	21.5
35	26.5	21.5	161.7	34	B3.000	E:10.0	10.00		4.5
36	16.0	26.5	161.7		3.260		20.50	0.025	0.5
Pipe: 27	0.0	4.5	14				5.50	120	20.8
34	26.5	20.8	157.2	33	B3.000	2E:20.0	20.00		0.0
35	26.5	21.5	161.7		3.260		25.50	0.025	0.6
Pipe: 28	0.0	1.6	13				11.40	120	20.1
33	26.5	20.1	155.6	32	B3.000	T:20.0	20.00		0.0
34	26.5	20.8	157.2		3.260		31.40	0.024	0.7
Pipe: 29	0.0	0.4	12				12.33	120	19.0
32	26.2	19.0	155.3	31	B3.000	2E:20.0	40.00		-0.1
33	26.5	20.1	155.6		3.260	T:20.0	52.33	0.023	1.2
Pipe: 30	0.0	0.2	11				11.00	120	18.7
31	25.4	18.7	155.3	30	B3.000	T:20.0	20.00		-0.4
32	26.2	19.0	155.3		3.260		31.00	0.023	0.7
Pipe: 31	0.0	0.4	10				8.60	120	17.8
30	24.8	17.8	154.7	29	B3.000	2E:20.0	40.00		-0.3
31	25.4	18.7	155.1		3.260	T:20.0	48.60	0.023	1.1
Pipe: 32	0.0	0.6	9				11.00	120	17.6
29	23.5	17.6	154.0	28	B3.000	T:20.0	20.00		-0.5
30	24.8	17.8	154.7		3.260		31.00	0.023	0.7
Pipe: 33	0.0	1.3	8				11.00	120	17.0
28	22.2	17.0	152.7	27	B3.000	2E:20.0	40.00		-0.5
29	23.5	17.6	154.0		3.260	T:20.0	51.00	0.023	1.2

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Pipe Tag	K-fac	Add Fl	Add Fl	To	Fit:	L	C	(Pt)	
To Node	El (ft)	PT	(q)	Node/	Nom ID	Eq.Ln.	F	(Pe)	Note
Frm Node	El (ft)	PT	Tot. (Q)	Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 34	0.0	1.8	7				11.00	120	17.1
27	20.6	17.1	150.8	26	B3.000	T:20.0	20.00		-0.7
28	22.2	17.0	152.7		3.260		31.00	0.022	0.7
Pipe: 35	0.0	3.0	6				7.80	120	16.4
26	19.6	16.4	147.8	25	B3.000	2E:20.0	40.00		-0.4
27	20.6	17.1	150.8		3.260	T:20.0	47.80	0.022	1.0
Pipe: 36	0.0	3.7	5				10.00	120	16.6
25	17.8	16.6	144.1	24	B3.000	T:20.0	20.00		-0.8
26	19.6	16.4	147.8		3.260		30.00	0.021	0.6
Pipe: 37	0.0	5.5	4				7.50	120	16.2
24	16.6	16.2	138.6	23	B3.000	2E:20.0	40.00		-0.5
25	17.8	16.6	144.1		3.260	T:20.0	47.50	0.020	1.0
Pipe: 38	0.0	40.2	65				7.80	120	16.4
23	14.9	16.4	98.4	22	B3.000	T:20.0	20.00		-0.7
24	16.6	16.2	138.6		3.260		27.80	0.019	0.5
Pipe: 39	0.0	47.6	60				11.50	120	16.9
22	12.6	16.9	50.8	21	B3.000	2E:20.0	40.00		-1.0
23	14.9	16.4	98.4		3.260	T:20.0	51.50	0.010	0.5
Pipe: 40	0.0	0.0					8.20	120	17.6
21	10.6	17.6	50.8	55	B3.000	T:20.0	20.00		-0.9
22	12.6	16.9	50.8		3.260		28.20	0.003	0.1
Pipe: 41	0.0	153.1	13				50.67	120	20.8
14	26.5	20.8	-148.6	15	1.500	----	0.00		0.0
34	26.5	20.8	4.5		1.610		50.67	0.001	0.1
Pipe: 42	0.0	154.7	12				50.67	120	20.1
13	26.5	20.1	-153.1	14	1.250	T: 6.0	6.00		0.0
33	26.5	20.1	1.6		1.380		56.67	0.000	0.0
Pipe: 43	0.0	155.0	11				50.67	120	19.0
12	26.2	19.0	-154.7	13	1.000	----	0.00		0.0
32	26.2	19.0	0.4		1.049		50.67	0.000	0.0
Pipe: 44	0.0	155.3	10				50.67	120	18.7
11	25.4	18.7	-155.0	12	1.000	T: 5.0	5.00		0.0
31	25.4	18.7	0.2		1.049		55.67	0.000	0.0

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DATE: 1/22/2018N CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #1.SDF  
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Pipe Tag	K-fac	Add Fl	Add Fl	To	Fit:	L	C	(Pt)	
To Node	El (ft)	PT	(q)	Node/	Nom ID	Eq.Ln.	F	(Pe)	Note
Frm Node	El (ft)	PT	Tot. (Q)	Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 45	0.0	155.6	9				50.67	120	17.8
10	24.8	17.8	-155.3	11	1.000	----	0.00		0.0
30	24.8	17.8	0.4		1.049		50.67	0.000	0.0
Pipe: 46	0.0	156.3	8				50.67	120	17.6
9	23.5	17.6	-155.6	10	1.000	T: 5.0	5.00		0.0
29	23.5	17.6	0.6		1.049		55.67	0.000	0.0
Pipe: 47	0.0	157.6	7				50.67	120	17.0
8	22.2	17.0	-156.3	9	1.000	----	0.00		0.0
28	22.2	17.0	1.3		1.049		50.67	0.001	0.0
Pipe: 48	0.0	159.5	6				50.67	120	17.0
7	20.6	17.0	-157.6	8	1.000	T: 5.0	5.00		0.0
27	20.6	17.1	1.8		1.049		55.67	0.002	0.1
Pipe: 49	0.0	162.5	5				50.67	120	16.2
6	19.6	16.2	-159.5	7	1.000	----	0.00		0.0
26	19.6	16.4	3.0		1.049		50.67	0.004	0.2
Pipe: 50	0.0	166.2	4				50.67	120	16.3
5	17.8	16.3	-162.5	6	1.000	T: 5.0	5.00		0.0
25	17.8	16.6	3.7		1.049		55.67	0.006	0.3
Pipe: 51	0.0	171.7	3				50.67	120	15.5
4	16.6	15.5	-166.2	5	1.000	----	0.00		0.0
24	16.6	16.2	5.5		1.049		50.67	0.012	0.6
Pipe: 52	0.0	20.1	64				15.75	120	15.0
65	14.9	15.0	20.1	S15	1.500	T: 8.0	8.00		0.0
23	14.9	16.4	40.2		1.610		23.75	0.059	1.4
Pipe: 53	0.0	0.0					8.90	120	14.8
64	14.9	14.8	20.1		1.500	----	0.00		0.0
65	14.9	15.0	20.1		1.610		8.90	0.016	0.1
Pipe: 54	0.0	0.0					8.90	120	14.8
64	14.9	14.8	0.1		1.500	----	0.00		0.0
63	14.9	14.8	0.1		1.610		8.90	0.000	0.0
Pipe: 55	0.0	0.0					8.25	120	14.8
63	14.9	14.8	19.9	64	1.500	----	0.00		0.0
62	14.9	15.0	19.9		1.610		8.25	0.016	0.1

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/22/2018N CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #1.SDF  
 JOB TITLE: Oakley Rec Center #1

Pipe Tag	K-fac	Add Fl	Add Fl	To	Fit:	L	C	(Pt)	
To Node	El (ft)	PT	(q)	Node/	Nom ID	Eq.Ln.	F	(Pe)	Note
Frm Node	El (ft)	PT	Tot. (Q)	Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 56		0.0	19.9	63			8.50	120	15.0
62	14.9	15.0	20.1	S12	1.500	----	0.00		0.0
61	14.9	15.5	40.0		1.610		8.50	0.058	0.5
Pipe: 57		0.0	40.0	62			0.40	120	15.5
61	14.9	15.5	20.4	S11	1.500	----	0.00		0.0
3	14.9	15.5	60.5		1.610		0.40	0.125	0.1
Pipe: 58		0.0	26.6	59			15.75	120	15.6
60	12.6	15.6	21.0	S10	1.500	----	0.00		0.0
22	12.6	16.9	47.6		1.610		15.75	0.080	1.3
Pipe: 59		0.0	5.7	58			8.90	120	15.4
59	12.6	15.4	20.8	S9	1.500	----	0.00		0.0
60	12.6	15.6	26.6		1.610		8.90	0.027	0.2
Pipe: 60		0.0	0.0				8.90	120	15.3
58	12.6	15.3	5.7		1.500	----	0.00		0.0
59	12.6	15.4	5.7		1.610		8.90	0.002	0.0
Pipe: 61		0.0	0.0				8.25	120	15.3
58	12.6	15.3	15.1		1.500	----	0.00		0.0
57	12.6	15.4	15.1		1.610		8.25	0.010	0.1
Pipe: 62		0.0	15.1	58			8.50	120	15.4
57	12.6	15.4	20.9	S7	1.500	----	0.00		0.0
56	12.6	15.8	36.0		1.610		8.50	0.048	0.4
Pipe: 63		0.0	36.0	57			0.40	120	15.8
56	12.6	15.8	21.2	S6	1.500	----	0.00		0.0
2	12.6	15.9	57.1		1.610		0.40	0.113	0.0
Pipe: 64		0.0	29.7	54			13.50	120	15.7
55	10.6	15.7	21.1	S5	1.500	T: 8.0	8.00		0.0
21	10.6	17.6	50.8		1.610		21.50	0.091	2.0
Pipe: 65		0.0	8.8	53			9.20	120	15.4
54	10.6	15.4	20.9	S4	1.500	----	0.00		0.0
55	10.6	15.7	29.7		1.610		9.20	0.034	0.3
Pipe: 66		0.0	0.0				9.25	120	15.4
53	10.6	15.4	8.8		1.500	----	0.00		0.0
54	10.6	15.4	8.8		1.610		9.25	0.004	0.0

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/22/2018N CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #1.SDF  
 JOB TITLE: Oakley Rec Center #1

Pipe Tag	K-fac	Add Fl	Add Fl	To	Fit:	L	C	(Pt)	
To Node	El (ft)	PT	(q)	Node/	Nom ID	Eq.Ln.	F	(Pe)	Note
Frm Node	El (ft)	PT	Tot. (Q)	Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 67		0.0	0.0				9.25	120	15.4
53	10.6	15.4	12.0		1.500	----	0.00		0.0
52	10.6	15.4	12.0		1.610		9.25	0.006	0.1
Pipe: 68		0.0	12.0	53			9.25	120	15.4
52	10.6	15.4	20.9	S2	1.500	----	0.00		0.0
51	10.6	15.8	33.0		1.610		9.25	0.041	0.4
Pipe: 69		0.0	33.0	52			0.40	120	15.8
51	10.6	15.8	21.2	S1	1.500	T: 8.0	8.00		0.0
1	10.6	16.6	54.1		1.610		8.40	0.102	0.9
Pipe: 70		5.60	21.2	Disch			2.00	120	14.3
S1	10.4	14.3	0.0		1.000	2E: 4.0	9.00		-0.1
51	10.6	15.8	21.2		1.049	T: 5.0	11.00	0.144	1.6
Pipe: 71		5.60	20.9	Disch			2.00	120	13.9
S2	10.4	13.9	0.0		1.000	2E: 4.0	9.00		-0.1
52	10.6	15.4	20.9		1.049	T: 5.0	11.00	0.141	1.6
Pipe: 72		5.60	20.9	Disch			2.00	120	13.9
S3	10.4	13.9	0.0		1.000	2E: 4.0	9.00		-0.1
53	10.6	15.4	20.9		1.049	T: 5.0	11.00	0.141	1.5
Pipe: 73		5.60	20.9	Disch			2.00	120	13.9
S4	10.4	13.9	0.0		1.000	2E: 4.0	9.00		-0.1
54	10.6	15.4	20.9		1.049	T: 5.0	11.00	0.141	1.6
Pipe: 74		5.60	21.1	Disch			2.00	120	14.2
S5	10.4	14.2	0.0		1.000	2E: 4.0	9.00		-0.1
55	10.6	15.7	21.1		1.049	T: 5.0	11.00	0.144	1.6
Pipe: 75		5.60	21.2	Disch			2.00	120	14.3
S6	12.5	14.3	0.0		1.000	2E: 4.0	9.00		0.0
56	12.6	15.8	21.2		1.049	T: 5.0	11.00	0.144	1.6
Pipe: 76		5.60	20.9	Disch			2.00	120	13.9
S7	12.5	13.9	0.0		1.000	2E: 4.0	9.00		0.0
57	12.6	15.4	20.9		1.049	T: 5.0	11.00	0.141	1.6
Pipe: 77		5.60	20.8	Disch			2.00	120	13.8
S8	12.5	13.8	0.0		1.000	2E: 4.0	9.00		0.0
58	12.6	15.3	20.8		1.049	T: 5.0	11.00	0.140	1.5



SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/22/2018N CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #1.SDF  
 JOB TITLE: Oakley Rec Center #1

Pipe Tag	K-fac	Add Fl	Add Fl To	Fit:	L	C	(Pt)	
To Node	El (ft)	PT	Node/	Nom ID	Eq.Ln.	F	(Pe)	Note
Frm Node	El (ft)	PT	Tot. (Q) Disch	Act ID	(ft.)	T	(Pf)	
Pipe: 78	5.60	20.8	Disch			2.00	120	13.9
S9	12.5	13.9	0.0	1.000	2E: 4.0	9.00		0.0
59	12.6	15.4	20.8	1.049	T: 5.0	11.00	0.140	1.5
Pipe: 79	5.60	21.0	Disch			2.00	120	14.1
S10	12.5	14.1	0.0	1.000	2E: 4.0	9.00		0.0
60	12.6	15.6	21.0	1.049	T: 5.0	11.00	0.142	1.6
Pipe: 80	5.60	20.4	Disch			2.00	120	13.3
S11	16.4	13.3	0.0	1.000	2E: 4.0	9.00		0.6
61	14.9	15.5	20.4	1.049	T: 5.0	11.00	0.135	1.5
Pipe: 81	5.60	20.1	Disch			2.00	120	12.9
S12	16.4	12.9	0.0	1.000	2E: 4.0	9.00		0.6
62	14.9	15.0	20.1	1.049	T: 5.0	11.00	0.131	1.4
Pipe: 82	5.60	20.0	Disch			2.00	120	12.8
S13	16.4	12.8	0.0	1.000	2E: 4.0	9.00		0.6
63	14.9	14.8	20.0	1.049	T: 5.0	11.00	0.130	1.4
Pipe: 83	5.60	20.0	Disch			2.00	120	12.8
S14	16.4	12.8	0.0	1.000	2E: 4.0	9.00		0.6
64	14.9	14.8	20.0	1.049	T: 5.0	11.00	0.130	1.4
Pipe: 84	5.60	20.1	Disch			2.00	120	12.9
S15	16.4	12.9	0.0	1.000	2E: 4.0	9.00		0.6
65	14.9	15.0	20.1	1.049	T: 5.0	11.00	0.131	1.4

NOTES (HASS):

- (1) Calculations were performed by the HASS 8.7 computer program in accordance with NFPA13 (2016) under license no. 50121774 granted by  
 HRS Systems, Inc.  
 208 Southside Square  
 Petersburg, TN 37144  
 (931) 659-9760
- (2) The system has been calculated to provide an average imbalance at each node of 0.002 gpm and a maximum imbalance at any node of 0.111 gpm.
- (3) Total pressure at each node is used in balancing the system. Maximum water velocity is 9.5 ft/sec at pipe 57.

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 JOB TITLE: Oakley Rec Center #1

- (4) Items listed in bold print on the cover sheet  
 are automatically transferred from the calculation report.
- (5) Column Headers have been translated from the English by the user.
- (6) Available pressure at source node SR under full flow conditions is  
 65.94 psi with a flow of 611.52 gpm.

(7) PIPE FITTINGS TABLE

Pipe Table Name: STANDARD.PIP

PAGE: A MATERIAL: S40 HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet								
	E	T	L	C	B	G	A	D	N
	Ell	Tee	LngEll	ChkVlv	BfyVlv	GatVlv	AlmChk	DPVlv	Tee
1.049	2.00	5.00	2.00	5.00	6.00	1.00	10.00	2.00	5.00
1.380	3.00	6.00	2.00	7.00	6.00	1.00	10.00	10.00	6.00
1.610	4.00	8.00	2.00	9.00	6.00	1.00	10.00	10.00	8.00

PAGE: B MATERIAL: THNWL HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet								
	E	T	L	C	B	G	A	D	N
	Ell	Tee	LngEll	ChkVlv	BfyVlv	GatVlv	AlmChk	DPVlv	NP Tee
3.260	10.00	20.00	7.00	22.00	14.00	1.00	18.00	18.00	20.00
4.260	13.00	26.00	8.00	29.00	16.00	3.00	26.00	26.00	26.00

PAGE: D MATERIAL: DIRON HWC: 140

Diameter (in)	Equivalent Fitting Lengths in Feet							
	E	T	L	C	B	G	N	
	Ell	Tee	LngEll	ChkVlv	BfyVlv	GatVlv	NP Tee	
4.220	17.00	34.00	10.00	37.00	20.00	3.00	34.00	

PAGE: E MATERIAL: PVC150 HWC: 150

Diameter (in)	Equivalent Fitting Lengths in Feet							
	E	T	L	C	B	G	N	
	Ell	Tee	LngEll	ChkVlv	BfyVlv	GatVlv	NP Tee	
4.240	20.00	39.00	12.00	43.00	23.00	4.00	39.00	
7.980	27.00	53.00	20.00	68.00	18.00	6.00	53.00	

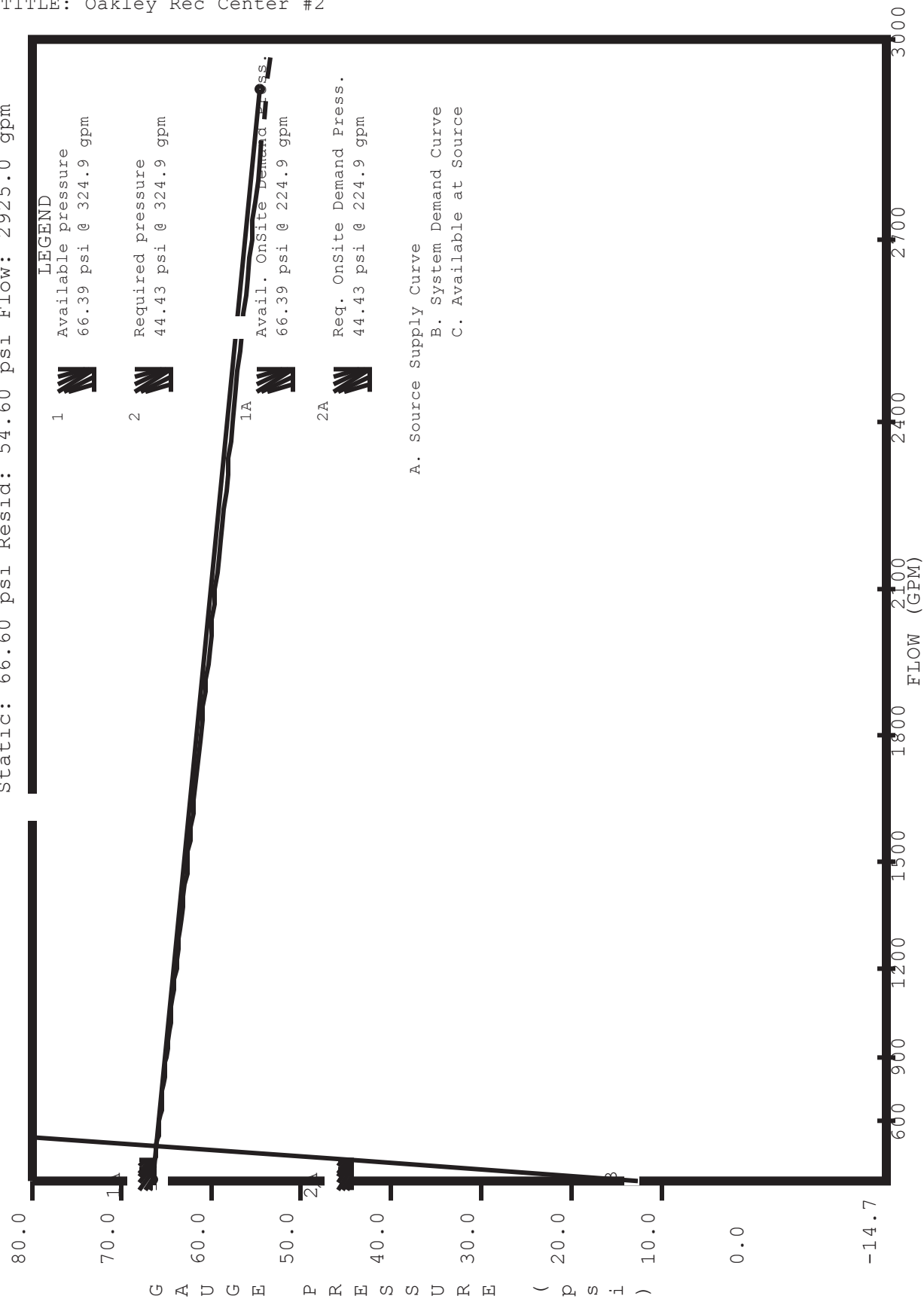


SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #2.SDF  
 JOB TITLE: Oakley Rec Center #2

WATER SUPPLY ANALYSIS

Static: 66.60 psi Resid: 54.60 psi Flow: 2925.0 gpm



Note: (1) Dashed Lines indicate extrapolated values from Test Results

(2) On Site pressures are based on hose stream deduction at the source

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #2.SDF  
 JOB TITLE: Oakley Rec Center #2

NFPA WATER SUPPLY DATA

FDC's NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	FLOW @ (GPM)	AVAIL. PRESS. (PSI)	TOTAL @ DEMAND (GPM)	REQ'D PRESS. (PSI)
SR	66.6	54.6	2925.0	66.4	324.9	44.4

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	324.9 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	100.0 GPM
OTHER HOSE STREAM ALLOWANCES	0.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	224.9 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)	Notes
SR	-3.0	SOURCE	44.4	224.9	
U1	-3.0	- - - -	44.3	- - -	
U2	-3.0	- - - -	34.3	- - -	
U3	-3.0	- - - -	34.2	- - -	
U4	-3.0	- - - -	33.1	- - -	
U5	-3.0	- - - -	31.1	- - -	
BOR	1.0	- - - -	29.1	- - -	
TOR	10.8	- - - -	24.7	- - -	
43	16.0	- - - -	22.0	- - -	
16	16.0	- - - -	21.2	- - -	
15	26.5	- - - -	16.4	- - -	
14	26.5	- - - -	16.1	- - -	
13	26.5	- - - -	15.7	- - -	
12	26.2	- - - -	15.1	- - -	
11	25.4	- - - -	15.2	- - -	
10	24.8	- - - -	15.3	- - -	
9	23.5	- - - -	15.9	- - -	
8	22.2	- - - -	16.4	- - -	
7	20.6	- - - -	17.2	- - -	
6	19.6	- - - -	17.6	- - -	
5	17.8	- - - -	18.4	- - -	
4	16.6	- - - -	18.9	- - -	
3	14.9	- - - -	19.7	- - -	
2	12.6	- - - -	20.7	- - -	
1	10.6	- - - -	21.5	- - -	
36	16.0	- - - -	21.4	- - -	
35	26.5	- - - -	16.5	- - -	
34	26.5	- - - -	16.2	- - -	

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #2.SDF  
 JOB TITLE: Oakley Rec Center #2

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)	Notes
33	26.5	- - - -	15.8	- - -	
32	26.2	- - - -	15.3	- - -	
31	25.4	- - - -	15.4	- - -	
30	24.8	- - - -	15.5	- - -	
29	23.5	- - - -	16.0	- - -	
28	22.2	- - - -	16.5	- - -	
27	20.6	- - - -	17.2	- - -	
26	19.6	- - - -	17.7	- - -	
25	17.8	- - - -	18.5	- - -	
24	16.6	- - - -	18.9	- - -	
23	14.9	- - - -	19.7	- - -	
22	12.6	- - - -	20.7	- - -	
21	10.6	- - - -	21.5	- - -	
71	23.5	- - - -	12.7	- - -	
72	23.5	- - - -	11.9	- - -	
73	23.5	- - - -	12.0	- - -	
74	24.8	- - - -	13.6	- - -	
75	24.8	- - - -	12.4	- - -	
76	24.8	- - - -	12.5	- - -	
77	25.4	- - - -	12.2	- - -	
78	25.4	- - - -	11.4	- - -	
79	25.4	- - - -	11.5	- - -	
80	26.2	- - - -	13.3	- - -	
81	26.2	- - - -	12.3	- - -	
82	26.2	- - - -	12.4	- - -	
S21	23.2	K= 5.60	11.5	19.0	
S22	23.2	K= 5.60	10.8	18.4	
S23	23.2	K= 5.60	10.9	18.5	
S24	24.4	K= 5.60	12.4	19.7	
S25	24.4	K= 5.60	11.3	18.8	
S26	24.4	K= 5.60	11.3	18.8	
S27	25.1	K= 5.60	11.1	18.6	
S28	25.1	K= 5.60	10.3	18.0	
S29	25.1	K= 5.60	10.4	18.1	
S30	25.9	K= 5.60	12.1	19.5	
S31	25.9	K= 5.60	11.2	18.7	
S32	25.9	K= 5.60	11.2	18.8	

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #2.SDF  
 JOB TITLE: Oakley Rec Center #2

NFPA PIPE DATA

Pipe Tag	K-fac	Add Fl	Add Fl To	Fit:	L	C	(Pt)	Note
Frm Node	El (ft)	PT	(q) Node/	Nom ID	Eq.Ln.	F	(Pe)	
To Node	El (ft)	PT	Tot.(Q) Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 1		FDC's	0.0		2E:54.0	107.00	150	0.1
SR	-3.0	44.4	224.9	U2	E8.000	T:53.0	113.00	0.0
U1	-3.0	44.3	224.9		7.980	G: 6.0	220.00	0.000
Pipe: 2			0.0		FIXED PRESSURE LOSS DEVICE			
U1	-3.0	44.3	224.9	U3	10.0 psi, 224.9 gpm			
U2	-3.0	34.3	224.9					
Pipe: 3		0.0	0.0			256.00	150	0.1
U2	-3.0	34.3	224.9	U4	E8.000	3E:81.0	81.00	0.0
U3	-3.0	34.2	224.9		7.980		337.00	0.000
Pipe: 4		0.0	0.0		T:39.0	47.00	150	1.1
U3	-3.0	34.2	224.9	U5	E4.000	C:43.0	86.00	0.0
U4	-3.0	33.1	224.9		4.240	G: 4.0	133.00	0.008
Pipe: 5		0.0	0.0			161.00	150	2.0
U4	-3.0	33.1	224.9	BOR	E4.000	2E:40.0	76.00	0.0
U5	-3.0	31.1	224.9		4.240	3L:36.0	237.00	0.008
Pipe: 6		0.0	0.0			11.40	140	2.0
U5	-3.0	31.1	224.9	TOR	D4.000	E:17.0	17.00	1.7
BOR	1.0	29.1	224.9		4.220		28.40	0.010
Pipe: 7		0.0	0.0			9.75	120	4.4
BOR	1.0	29.1	224.9	43	B4.000	G: 3.0	3.00	4.2
TOR	10.8	24.7	224.9		4.260		12.75	0.012
Pipe: 8		0.0	115.6	36		34.60	120	2.7
TOR	10.8	24.7	109.3	16	B4.000	----	0.00	2.3
43	16.0	22.0	224.9		4.260		34.60	0.012
Pipe: 9		0.0	0.0			36.80	120	0.8
43	16.0	22.0	109.3	15	B3.000	E:10.0	30.00	0.0
16	16.0	21.2	109.3		3.260	T:20.0	66.80	0.012
Pipe: 10		0.0	0.0			10.50	120	4.8
16	16.0	21.2	109.3	14	B3.000	E:10.0	10.00	4.5
15	26.5	16.4	109.3		3.260		20.50	0.012
Pipe: 11		0.0	113.6	13		5.50	120	0.3
15	26.5	16.4	-4.3	34	B3.000	2E:20.0	20.00	0.0
14	26.5	16.1	109.3		3.260		25.50	0.012

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #2.SDF  
 JOB TITLE: Oakley Rec Center #2

Pipe Tag	K-fac	Add Fl	Add Fl	To	Fit:	L	C	(Pt)	
Frm Node	El (ft)	PT	(q)	Node/	Nom ID	Eq.Ln.	F	(Pe)	Note
To Node	El (ft)	PT	Tot. (Q)	Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 12		0.0	117.9	12			11.40	120	0.4
14	26.5	16.1	-4.3	33	B3.000	T:20.0	20.00		0.0
13	26.5	15.7	113.6		3.260		31.40	0.013	0.4
Pipe: 13		0.0	34.7	80			12.33	120	0.6
13	26.5	15.7	83.3	11	B3.000	2E:20.0	40.00		-0.1
12	26.2	15.1	117.9		3.260	T:20.0	52.33	0.014	0.7
Pipe: 14		0.0	31.8	77			11.00	120	-0.1
12	26.2	15.1	51.4	10	B3.000	T:20.0	20.00		-0.4
11	25.4	15.2	83.3		3.260		31.00	0.007	0.2
Pipe: 15		0.0	34.6	74			8.60	120	-0.1
11	25.4	15.2	16.9	9	B3.000	2E:20.0	40.00		-0.3
10	24.8	15.3	51.4		3.260	T:20.0	48.60	0.003	0.1
Pipe: 16		0.0	32.6	71			11.00	120	-0.5
10	24.8	15.3	-15.8	8	B3.000	T:20.0	20.00		-0.5
9	23.5	15.9	16.9		3.260		31.00	0.000	0.0
Pipe: 17		0.0	32.6	71			11.00	120	0.6
8	22.2	16.4	-16.9	10	B3.000	2E:20.0	40.00		0.5
9	23.5	15.9	15.8		3.260	T:20.0	51.00	0.000	0.0
Pipe: 18		0.0	15.8	9			11.00	120	0.7
7	20.6	17.2	-2.0	28	B3.000	T:20.0	20.00		0.7
8	22.2	16.4	13.8		3.260		31.00	0.000	0.0
Pipe: 19		0.0	13.8	8			7.80	120	0.4
6	19.6	17.6	-1.7	27	B3.000	2E:20.0	40.00		0.4
7	20.6	17.2	12.1		3.260	T:20.0	47.80	0.000	0.0
Pipe: 20		0.0	12.1	7			10.00	120	0.8
5	17.8	18.4	-1.5	26	B3.000	T:20.0	20.00		0.8
6	19.6	17.6	10.7		3.260		30.00	0.000	0.0
Pipe: 21		0.0	10.7	6			7.50	120	0.5
4	16.6	18.9	-1.3	25	B3.000	2E:20.0	40.00		0.5
5	17.8	18.4	9.4		3.260	T:20.0	47.50	0.000	0.0
Pipe: 22		0.0	9.4	5			7.80	120	0.7
3	14.9	19.7	-1.1	24	B3.000	T:20.0	20.00		0.7
4	16.6	18.9	8.3		3.260		27.80	0.000	0.0



SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #2.SDF  
 JOB TITLE: Oakley Rec Center #2

Pipe Tag	K-fac	Add Fl	Add Fl	To	Fit:	L	C	(Pt)	
Frm Node	El (ft)	PT	(q)	Node/	Nom ID	Eq.Ln.	F	(Pe)	Note
To Node	El (ft)	PT	Tot. (Q)	Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 23		0.0	8.3	4			11.60	120	1.0
2	12.6	20.7	-2.9	4	B3.000	2E:20.0	40.00		1.0
3	14.9	19.7	5.4		3.260	T:20.0	51.60	0.000	0.0
Pipe: 24		0.0	5.4	3			8.20	120	0.9
1	10.6	21.5	-2.8	22	B3.000	T:20.0	20.00		0.9
2	12.6	20.7	2.6		3.260		28.20	0.000	0.0
Pipe: 25		0.0	0.0				18.33	120	0.6
43	16.0	22.0	115.6	35	B3.000	E:10.0	30.00		0.0
36	16.0	21.4	115.6		3.260	T:20.0	48.33	0.013	0.6
Pipe: 26		0.0	0.0				10.50	120	4.8
36	16.0	21.4	115.6	34	B3.000	E:10.0	10.00		4.5
35	26.5	16.5	115.6		3.260		20.50	0.013	0.3
Pipe: 27		0.0	4.3	14			5.50	120	0.3
35	26.5	16.5	111.3	33	B3.000	2E:20.0	20.00		0.0
34	26.5	16.2	115.6		3.260		25.50	0.013	0.3
Pipe: 28		0.0	4.3	13			11.40	120	0.4
34	26.5	16.2	107.0	32	B3.000	T:20.0	20.00		0.0
33	26.5	15.8	111.3		3.260		31.40	0.012	0.4
Pipe: 29		0.0	22.3	82			12.33	120	0.5
33	26.5	15.8	84.7	31	B3.000	2E:20.0	40.00		-0.1
32	26.2	15.3	107.0		3.260	T:20.0	52.33	0.012	0.6
Pipe: 30		0.0	22.9	79			11.00	120	-0.1
32	26.2	15.3	61.8	30	B3.000	T:20.0	20.00		-0.4
31	25.4	15.4	84.7		3.260		31.00	0.008	0.2
Pipe: 31		0.0	22.8	76			8.60	120	-0.1
31	25.4	15.4	39.0	29	B3.000	2E:20.0	40.00		-0.3
30	24.8	15.5	61.8		3.260	T:20.0	48.60	0.004	0.2
Pipe: 32		0.0	23.2	73			11.00	120	-0.5
30	24.8	15.5	15.8	28	B3.000	T:20.0	20.00		-0.5
29	23.5	16.0	39.0		3.260		31.00	0.002	0.1
Pipe: 33		0.0	2.0	8			11.00	120	-0.5
29	23.5	16.0	13.8	27	B3.000	2E:20.0	40.00		-0.5
28	22.2	16.5	15.8		3.260	T:20.0	51.00	0.000	0.0

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #2.SDF  
 JOB TITLE: Oakley Rec Center #2

Pipe Tag	K-fac	Add Fl	Add Fl	To	Fit:	L	C	(Pt)	
Frm Node	El (ft)	PT	(q)	Node/	Nom ID	Eq.Ln.	F	(Pe)	Note
To Node	El (ft)	PT	Tot. (Q)	Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 34		0.0	1.7	7			11.00	120	-0.7
28	22.2	16.5	12.1	26	B3.000	T:20.0	20.00		-0.7
27	20.6	17.2	13.8		3.260		31.00	0.000	0.0
Pipe: 35		0.0	1.5	6			7.80	120	-0.4
27	20.6	17.2	10.7	25	B3.000	2E:20.0	40.00		-0.4
26	19.6	17.7	12.1		3.260	T:20.0	47.80	0.000	0.0
Pipe: 36		0.0	1.3	5			10.00	120	-0.8
26	19.6	17.7	9.4	24	B3.000	T:20.0	20.00		-0.8
25	17.8	18.5	10.7		3.260		30.00	0.000	0.0
Pipe: 37		0.0	1.1	4			7.50	120	-0.5
25	17.8	18.5	8.3	23	B3.000	2E:20.0	40.00		-0.5
24	16.6	18.9	9.4		3.260	T:20.0	47.50	0.000	0.0
Pipe: 38		0.0	2.9	3			7.80	120	-0.7
24	16.6	18.9	5.4	22	B3.000	T:20.0	20.00		-0.7
23	14.9	19.7	8.3		3.260		27.80	0.000	0.0
Pipe: 39		0.0	2.8	2			11.50	120	-1.0
23	14.9	19.7	2.6	21	B3.000	2E:20.0	40.00		-1.0
22	12.6	20.7	5.4		3.260	T:20.0	51.50	0.000	0.0
Pipe: 40		0.0	0.0				8.20	120	-0.9
22	12.6	20.7	2.6	1	B3.000	T:20.0	20.00		-0.9
21	10.6	21.5	2.6		3.260		28.20	0.000	0.0
Pipe: 41		0.0	113.6	13			50.67	120	0.1
34	26.5	16.2	-109.3	15	1.250	----	0.00		0.0
14	26.5	16.1	4.3		1.380		50.67	0.002	0.1
Pipe: 42		0.0	117.9	12			50.67	120	0.1
33	26.5	15.8	-113.6	14	1.250	T: 6.0	6.00		0.0
13	26.5	15.7	4.3		1.380		56.67	0.002	0.1
Pipe: 43		0.0	3.6	81			18.50	120	3.0
32	26.2	15.3	18.8	S32	1.000	----	0.00		0.0
82	26.2	12.4	22.3		1.049		18.50	0.160	3.0
Pipe: 44		0.0	0.0				13.67	120	0.1
82	26.2	12.4	3.6		1.000	----	0.00		0.0
81	26.2	12.3	3.6		1.049		13.67	0.005	0.1

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #2.SDF  
 JOB TITLE: Oakley Rec Center #2

Pipe Tag	K-fac	Add Fl	Add Fl	To	Fit:	L	C	(Pt)	
Frm Node	El (ft)	PT	(q)	Node/	Nom ID	Eq.Ln.	F	(Pe)	Note
To Node	El (ft)	PT	Tot.(Q)	Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 45		0.0	0.0				13.67	120	1.1
80	26.2	13.3	15.2		1.000	----	0.00		0.0
81	26.2	12.3	15.2		1.049		13.67	0.078	1.1
Pipe: 46		0.0	15.2	81			4.80	120	1.7
12	26.2	15.1	19.5	S30	1.000	----	0.00		0.0
80	26.2	13.3	34.7		1.049		4.80	0.360	1.7
Pipe: 47		0.0	4.8	78			18.50	120	3.9
31	25.4	15.4	18.1	S29	1.000	T: 5.0	5.00		0.0
79	25.4	11.5	22.9		1.049		23.50	0.167	3.9
Pipe: 48		0.0	0.0				13.67	120	0.1
79	25.4	11.5	4.8		1.000	----	0.00		0.0
78	25.4	11.4	4.8		1.049		13.67	0.009	0.1
Pipe: 49		0.0	0.0				13.67	120	0.8
77	25.4	12.2	13.2		1.000	----	0.00		0.0
78	25.4	11.4	13.2		1.049		13.67	0.060	0.8
Pipe: 50		0.0	13.2	78			4.80	120	3.0
11	25.4	15.2	18.6	S27	1.000	T: 5.0	5.00		0.0
77	25.4	12.2	31.8		1.049		9.80	0.307	3.0
Pipe: 51		0.0	3.9	75			18.50	120	3.1
30	24.8	15.5	18.8	S26	1.000	----	0.00		0.0
76	24.8	12.5	22.8		1.049		18.50	0.165	3.1
Pipe: 52		0.0	0.0				13.67	120	0.1
76	24.8	12.5	3.9		1.000	----	0.00		0.0
75	24.8	12.4	3.9		1.049		13.67	0.006	0.1
Pipe: 53		0.0	0.0				16.67	120	1.3
74	24.8	13.6	14.9		1.000	----	0.00		0.0
75	24.8	12.4	14.9		1.049		16.67	0.075	1.3
Pipe: 54		0.0	14.9	75			4.80	120	1.7
10	24.8	15.3	19.7	S24	1.000	----	0.00		0.0
74	24.8	13.6	34.6		1.049		4.80	0.358	1.7
Pipe: 55		0.0	4.8	72			18.50	120	4.0
29	23.5	16.0	18.5	S23	1.000	T: 5.0	5.00		0.0
73	23.5	12.0	23.2		1.049		23.50	0.171	4.0

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #2.SDF  
 JOB TITLE: Oakley Rec Center #2

Pipe Tag	K-fac	Add Fl	Add Fl	To	Fit:	L	C	(Pt)	
Frm Node	El (ft)	PT	(q)	Node/	Nom ID	Eq.Ln.	F	(Pe)	Note
To Node	El (ft)	PT	Tot. (Q)	Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 56		0.0	0.0				13.67	120	0.1
73	23.5	12.0	4.8		1.000	----	0.00		0.0
72	23.5	11.9	4.8		1.049		13.67	0.009	0.1
Pipe: 57		0.0	0.0				13.67	120	0.9
71	23.5	12.7	13.6		1.000	----	0.00		0.0
72	23.5	11.9	13.6		1.049		13.67	0.064	0.9
Pipe: 58		0.0	13.6	72			4.80	120	3.2
9	23.5	15.9	19.0	S21	1.000	T: 5.0	5.00		0.0
71	23.5	12.7	32.6		1.049		9.80	0.322	3.2
Pipe: 59		0.0	15.8	9			50.67	120	0.1
28	22.2	16.5	-13.8	7	1.000	----	0.00		0.0
8	22.2	16.4	2.0		1.049		50.67	0.002	0.1
Pipe: 60		0.0	13.8	8			50.67	120	0.1
27	20.6	17.2	-12.1	6	1.000	T: 5.0	5.00		0.0
7	20.6	17.2	1.7		1.049		55.67	0.001	0.1
Pipe: 61		0.0	12.1	7			50.67	120	0.1
26	19.6	17.7	-10.7	5	1.000	----	0.00		0.0
6	19.6	17.6	1.5		1.049		50.67	0.001	0.1
Pipe: 62		0.0	10.7	6			50.67	120	0.0
25	17.8	18.5	-9.4	4	1.000	T: 5.0	5.00		0.0
5	17.8	18.4	1.3		1.049		55.67	0.001	0.0
Pipe: 63		0.0	9.4	5			50.67	120	0.0
24	16.6	18.9	-8.3	3	1.000	----	0.00		0.0
4	16.6	18.9	1.1		1.049		50.67	0.001	0.0
Pipe: 64		0.0	8.3	4			50.67	120	0.0
23	14.9	19.7	-5.4	4	1.500	T: 8.0	8.00		0.0
3	14.9	19.7	2.9		1.610		58.67	0.000	0.0
Pipe: 65		0.0	5.4	3			50.67	120	0.0
22	12.6	20.7	-2.6	1	1.500	----	0.00		0.0
2	12.6	20.7	2.8		1.610		50.67	0.000	0.0
Pipe: 66		0.0	0.0				50.67	120	0.0
21	10.6	21.5	2.6	2	1.500	T: 8.0	8.00		0.0
1	10.6	21.5	2.6		1.610		58.67	0.000	0.0

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #2.SDF  
 JOB TITLE: Oakley Rec Center #2

Pipe Tag	K-fac	Add Fl	Add Fl	To	Fit:	L	C	(Pt)	
Frm Node	El (ft)	PT	(q)	Node/	Nom ID	Eq.Ln.	F	(Pe)	Note
To Node	El (ft)	PT	Tot.(Q)	Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 67		5.60	19.0	Disch			2.00	120	1.2
71	23.5	12.7	0.0		1.000	2E: 4.0	9.00		-0.1
S21	23.2	11.5	19.0		1.049	T: 5.0	11.00	0.119	1.3
Pipe: 68		5.60	18.4	Disch			2.00	120	1.1
72	23.5	11.9	0.0		1.000	2E: 4.0	9.00		-0.1
S22	23.2	10.8	18.4		1.049	T: 5.0	11.00	0.111	1.2
Pipe: 69		5.60	18.5	Disch			2.00	120	1.1
73	23.5	12.0	0.0		1.000	2E: 4.0	9.00		-0.1
S23	23.2	10.9	18.5		1.049	T: 5.0	11.00	0.112	1.2
Pipe: 70		5.60	19.7	Disch			2.00	120	1.2
74	24.8	13.6	0.0		1.000	2E: 4.0	9.00		-0.2
S24	24.4	12.4	19.7		1.049	T: 5.0	11.00	0.127	1.4
Pipe: 71		5.60	18.8	Disch			2.00	120	1.1
75	24.8	12.4	0.0		1.000	2E: 4.0	9.00		-0.2
S25	24.4	11.3	18.8		1.049	T: 5.0	11.00	0.116	1.3
Pipe: 72		5.60	18.8	Disch			2.00	120	1.1
76	24.8	12.5	0.0		1.000	2E: 4.0	9.00		-0.2
S26	24.4	11.3	18.8		1.049	T: 5.0	11.00	0.117	1.3
Pipe: 73		5.60	18.6	Disch			2.00	120	1.1
77	25.4	12.2	0.0		1.000	2E: 4.0	9.00		-0.1
S27	25.1	11.1	18.6		1.049	T: 5.0	11.00	0.114	1.3
Pipe: 74		5.60	18.0	Disch			2.00	120	1.0
78	25.4	11.4	0.0		1.000	2E: 4.0	9.00		-0.1
S28	25.1	10.3	18.0		1.049	T: 5.0	11.00	0.107	1.2
Pipe: 75		5.60	18.1	Disch			2.00	120	1.1
79	25.4	11.5	0.0		1.000	2E: 4.0	9.00		-0.1
S29	25.1	10.4	18.1		1.049	T: 5.0	11.00	0.108	1.2
Pipe: 76		5.60	19.5	Disch			2.00	120	1.2
80	26.2	13.3	0.0		1.000	2E: 4.0	9.00		-0.2
S30	25.9	12.1	19.5		1.049	T: 5.0	11.00	0.124	1.4
Pipe: 77		5.60	18.7	Disch			2.00	120	1.1
81	26.2	12.3	0.0		1.000	2E: 4.0	9.00		-0.2
S31	25.9	11.2	18.7		1.049	T: 5.0	11.00	0.115	1.3

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #2.SDF  
 JOB TITLE: Oakley Rec Center #2

Pipe Tag	K-fac	Add Fl	Add Fl To	Fit:	L	C	(Pt)	
Frm Node	El (ft)	PT	(q) Node/	Nom ID	Eq.Ln.	F	(Pe)	Note
To Node	El (ft)	PT	Tot.(Q) Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 78	5.60		18.8 Disch			2.00	120	1.1
82	26.2	12.4	0.0	1.000	2E: 4.0	9.00		-0.2
S32	25.9	11.2	18.8	1.049	T: 5.0	11.00	0.116	1.3

NOTES (HASS):

- (1) Calculations were performed by the HASS 8.7 computer program in accordance with NFPA13 (2016) under license no. 50121774 granted by  
 HRS Systems, Inc.  
 208 Southside Square  
 Petersburg, TN 37144  
 (931) 659-9760
- (2) The system has been calculated to provide an average imbalance at each node of 0.002 gpm and a maximum imbalance at any node of 0.142 gpm.
- (3) Total pressure at each node is used in balancing the system. Maximum water velocity is 12.9 ft/sec at pipe 46.
- (4) Items listed in bold print on the cover sheet  
 are automatically transferred from the calculation report.
- (5) Column Headers have been translated from the English by the user.
- (6) Available pressure at source node SR under full flow conditions is 66.27 psi with a flow of 420.10 gpm.
- (7) PIPE FITTINGS TABLE

Pipe Table Name: STANDARD.PIP

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #2.SDF  
 JOB TITLE: Oakley Rec Center #2

PAGE: A MATERIAL: S40 HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet								
	E	T	L	C	B	G	A	D	N
	Ell	Tee	LngEll	ChkVlv	BfyVlv	GatVlv	AlmChk	DPVlv	Tee
1.049	2.00	5.00	2.00	5.00	6.00	1.00	10.00	2.00	5.00
1.380	3.00	6.00	2.00	7.00	6.00	1.00	10.00	10.00	6.00
1.610	4.00	8.00	2.00	9.00	6.00	1.00	10.00	10.00	8.00

PAGE: B MATERIAL: THNWL HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet								
	E	T	L	C	B	G	A	D	N
	Ell	Tee	LngEll	ChkVlv	BfyVlv	GatVlv	AlmChk	DPVlv	NP Tee
3.260	10.00	20.00	7.00	22.00	14.00	1.00	18.00	18.00	20.00
4.260	13.00	26.00	8.00	29.00	16.00	3.00	26.00	26.00	26.00

PAGE: D MATERIAL: DIRON HWC: 140

Diameter (in)	Equivalent Fitting Lengths in Feet						
	E	T	L	C	B	G	N
	Ell	Tee	LngEll	ChkVlv	BfyVlv	GatVlv	NP Tee
4.220	17.00	34.00	10.00	37.00	20.00	3.00	34.00

PAGE: E MATERIAL: PVC150 HWC: 150

Diameter (in)	Equivalent Fitting Lengths in Feet						
	E	T	L	C	B	G	N
	Ell	Tee	LngEll	ChkVlv	BfyVlv	GatVlv	NP Tee
4.240	20.00	39.00	12.00	43.00	23.00	4.00	39.00
7.980	27.00	53.00	20.00	68.00	18.00	6.00	53.00



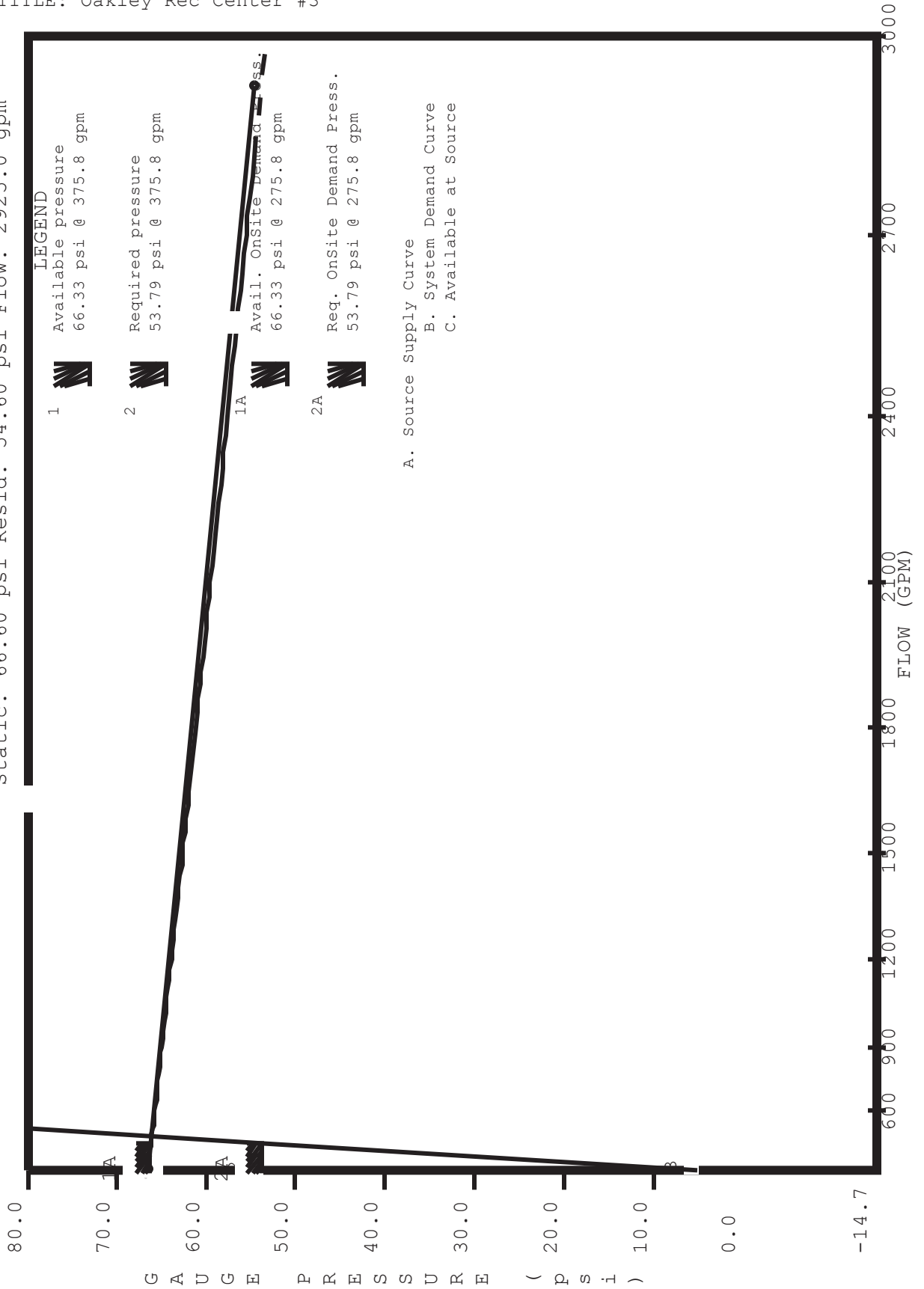


SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #3.SDF  
 JOB TITLE: Oakley Rec Center #3

WATER SUPPLY ANALYSIS

Static: 66.60 psi Resid: 54.60 psi Flow: 2925.0 gpm



Note: (1) Dashed Lines indicate extrapolated values from Test Results  
 (2) On Site pressures are based on hose stream deduction at the source

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #3.SDF  
 JOB TITLE: Oakley Rec Center #3

NFPA WATER SUPPLY DATA

FDC's NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	FLOW @ (GPM)	AVAIL. PRESS. (PSI)	TOTAL @ DEMAND (GPM)	REQ'D PRESS. (PSI)
SR	66.6	54.6	2925.0	66.3	375.8	53.8

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	375.8 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	100.0 GPM
OTHER HOSE STREAM ALLOWANCES	0.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	275.8 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)	Notes
SR	-3.0	SOURCE	53.8	275.8	
U1	-3.0	- - - -	53.7	- - -	
U2	-3.0	- - - -	43.7	- - -	
U3	-3.0	- - - -	43.5	- - -	
U4	-3.0	- - - -	41.8	- - -	
U5	-3.0	- - - -	38.9	- - -	
BOR	1.0	- - - -	36.8	- - -	
TOR	10.8	- - - -	32.3	- - -	
47	9.5	- - - -	20.9	- - -	
46	16.0	- - - -	27.6	- - -	
45	10.2	- - - -	32.3	- - -	
44	10.2	- - - -	31.7	- - -	
43	16.0	- - - -	29.0	- - -	
42	16.0	- - - -	27.7	- - -	
41	16.0	- - - -	27.6	- - -	
91	11.8	- - - -	18.6	- - -	
92	11.8	- - - -	23.1	- - -	
93	11.8	- - - -	25.3	- - -	
94	11.8	- - - -	22.8	- - -	
95	11.8	- - - -	28.0	- - -	
96	11.8	- - - -	28.4	- - -	
97	9.2	- - - -	23.0	- - -	
98	9.2	- - - -	22.5	- - -	
99	9.2	- - - -	27.6	- - -	
S41	8.7	K= 5.60	12.1	19.5	
S42	8.7	K= 5.60	12.4	19.7	
S43	8.7	K= 5.60	15.3	21.9	
S44	8.7	K= 5.60	16.6	22.8	

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #3.SDF  
 JOB TITLE: Oakley Rec Center #3

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE Notes (GPM)
S45	8.7	K= 5.60	14.4	21.2
S46	8.7	K= 5.60	15.6	22.1
S47	8.7	K= 5.60	14.0	21.0
S48	8.7	K= 5.60	14.5	21.3
S49	8.7	K= 5.60	13.9	20.9
S50	8.7	K= 5.60	14.2	21.1
S51	8.7	K= 5.60	17.4	23.4
S52	8.7	K= 5.60	12.6	19.9
S53	5.7	K= 5.60	14.1	21.0

SPRINKLER SYSTEM HYDRAULIC ANALYSIS







DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #3.SDF  
 JOB TITLE: Oakley Rec Center #3

NFPA PIPE DATA

Pipe Tag	K-fac	Add Fl	Add Fl To	Fit:	L	C	(Pt)	Note
Frm Node	El (ft)	PT	(q) Node/	Nom ID	Eq.Ln.	F	(Pe)	
To Node	El (ft)	PT	Tot.(Q) Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 1		FDC's	0.0		2E:54.0	107.00	150	0.1
SR	-3.0	53.8	275.8	U2	E8.000	T:53.0	113.00	0.0
U1	-3.0	53.7	275.8		7.980	G: 6.0	220.00	0.001
Pipe: 2			0.0		FIXED PRESSURE LOSS DEVICE			
U1	-3.0	53.7	275.7	U3	10.0 psi, 275.7 gpm			
U2	-3.0	43.7	275.7					
Pipe: 3		0.0	0.0			256.00	150	0.2
U2	-3.0	43.7	275.7	U4	E8.000	3E:81.0	81.00	0.0
U3	-3.0	43.5	275.7		7.980		337.00	0.001
Pipe: 4		0.0	0.0		T:39.0	47.00	150	1.6
U3	-3.0	43.5	275.7	U5	E4.000	C:43.0	86.00	0.0
U4	-3.0	41.8	275.7		4.240	G: 4.0	133.00	0.012
Pipe: 5		0.0	0.0			161.00	150	2.9
U4	-3.0	41.8	275.7	BOR	E4.000	2E:40.0	76.00	0.0
U5	-3.0	38.9	275.7		4.240	3L:36.0	237.00	0.012
Pipe: 6		0.0	0.0			11.40	140	2.1
U5	-3.0	38.9	275.7	TOR	D4.000	E:17.0	17.00	1.7
BOR	1.0	36.8	275.7		4.220		28.40	0.014
Pipe: 7		0.0	0.0			9.75	120	4.5
BOR	1.0	36.8	275.7	45	B4.000	G: 3.0	3.00	4.2
TOR	10.8	32.3	275.7		4.260		12.75	0.018
Pipe: 8		0.0	65.3	99		3.67	120	0.1
TOR	10.8	32.3	210.4	44	B4.000	E:13.0	13.00	-0.2
45	10.2	32.3	275.7		4.260		16.67	0.018
Pipe: 9		0.0	42.3	97		11.80	120	0.6
45	10.2	32.3	168.1	43	B4.000	E:13.0	39.00	0.0
44	10.2	31.7	210.4		4.260	T:26.0	50.80	0.011
Pipe: 10		0.0	0.0			19.00	120	2.7
44	10.2	31.7	168.1	42	B4.000	E:13.0	13.00	2.5
43	16.0	29.0	168.1		4.260		32.00	0.007
Pipe: 11		0.0	43.3	96		26.80	120	1.2
43	16.0	29.0	124.8	46	B3.000	T:20.0	20.00	0.0
42	16.0	27.7	168.1		3.260		46.80	0.027

SPRINKLER SYSTEM HYDRAULIC ANALYSIS






DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #3.SDF  
 JOB TITLE: Oakley Rec Center #3

Pipe Tag	K-fac	Add Fl	Add Fl To	Fit:	L	C	(Pt)		
Frm Node	El (ft)	PT	(q) Node/	Eq.Ln.	F		(Pe)	Note	
To Node	El (ft)	PT	Tot. (Q) Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)	
Pipe: 12	0.0	40.9	47			5.25	120	0.1	
42	16.0	27.7	83.9	41	B3.000	----	0.00	0.0	
46	16.0	27.6	124.8		3.260	5.25	0.015	0.1	
Pipe: 13	0.0	0.0				2.25	120	0.0	
46	16.0	27.6	83.9	93	B3.000	----	0.00	0.0	
41	16.0	27.6	83.9		3.260	2.25	0.007	0.0	
Pipe: 14	5.60	19.5	Disch				63.00	120	6.5
91	11.8	18.6	0.0		1.000	----	0.00		-1.3
S41	8.7	12.1	19.5		1.049		63.00	0.124	7.8
Pipe: 15	5.60	19.7	Disch				55.00	120	6.2
91	11.8	18.6	0.0		1.000	T: 5.0	5.00		-1.3
S42	8.7	12.4	19.7		1.049		60.00	0.126	7.6
Pipe: 16	0.0	0.0				10.00	120	4.5	
92	11.8	23.1	39.2		1.000	----	0.00		0.0
91	11.8	18.6	39.2		1.049		10.00	0.452	4.5
Pipe: 17	5.60	21.9	Disch				55.00	120	7.9
92	11.8	23.1	0.0		1.000	T: 5.0	5.00		-1.3
S43	8.7	15.3	21.9		1.049		60.00	0.154	9.2
Pipe: 18	0.0	39.2	91			8.00	120	2.2	
93	11.8	25.3	21.9	S43	1.250	----	0.00		0.0
92	11.8	23.1	61.1		1.380		8.00	0.270	2.2
Pipe: 19	5.60	22.8	Disch				55.00	120	8.6
93	11.8	25.3	0.0		1.000	T: 5.0	5.00		-1.3
S44	8.7	16.6	22.8		1.049		60.00	0.166	10.0
Pipe: 20	0.0	61.1	92			6.25	120	2.3	
41	16.0	27.6	22.8	S44	1.500	E: 4.0	12.00		-1.8
93	11.8	25.3	83.9		1.610	T: 8.0	18.25	0.229	4.2
Pipe: 21	5.60	21.2	Disch				67.00	120	8.4
94	11.8	22.8	0.0		1.000	----	0.00		-1.3
S45	8.7	14.4	21.2		1.049		67.00	0.146	9.7
Pipe: 22	5.60	22.1	Disch				55.00	120	7.3
94	11.8	22.8	0.0		1.000	----	0.00		-1.3
S46	8.7	15.6	22.1		1.049		55.00	0.156	8.6

 FLEXIBLE SPRINKLER FITTING

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #3.SDF  
 JOB TITLE: Oakley Rec Center #3

Pipe Tag	K-fac	Add Fl	Add Fl To	Fit:	L	C	(Pt)	
Frm Node	El (ft)	PT	(q) Node/	Nom ID	Eq.Ln.	F	(Pe)	Note
To Node	El (ft)	PT	Tot. (Q) Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 23	0.0	0.0				9.60	120	5.2
95	11.8	28.0	43.3	1.000	----	0.00		0.0
94	11.8	22.8	43.3	1.049		9.60	0.544	5.2
Pipe: 24	0.0	0.0				2.40	120	0.3
96	11.8	28.4	43.3	94 1.250	----	0.00		0.0
95	11.8	28.0	43.3	1.380		2.40	0.143	0.3
Pipe: 25	0.0	0.0				5.67	120	-0.6
42	16.0	27.7	43.3	95 1.500	E: 4.0	12.00		-1.8
96	11.8	28.4	43.3	1.610	T: 8.0	17.67	0.068	1.2
Pipe: 26	5.60	21.0	Disch			 65.00	120	9.0
97	9.2	23.0	0.0	1.000	----	0.00		-0.3
S47	8.7	14.0	21.0	1.049		65.00	0.142	9.2
Pipe: 27	5.60	21.3	Disch			 55.00	120	8.5
97	9.2	23.0	0.0	1.000	T: 5.0	5.00		-0.3
S48	8.7	14.5	21.3	1.049		60.00	0.146	8.8
Pipe: 28	0.0	0.0				8.60	120	8.7
44	10.2	31.7	42.3	1.000	2E: 4.0	9.00		-0.4
97	9.2	23.0	42.3	1.049	T: 5.0	17.60	0.519	9.1
Pipe: 29	5.60	20.9	Disch			 63.00	120	8.6
98	9.2	22.5	0.0	1.000	----	0.00		-0.3
S49	8.7	13.9	20.9	1.049		63.00	0.141	8.9
Pipe: 30	5.60	21.1	Disch			 55.00	120	8.3
98	9.2	22.5	0.0	1.000	T: 5.0	5.00		-0.3
S50	8.7	14.2	21.1	1.049		60.00	0.143	8.6
Pipe: 31	0.0	0.0				10.00	120	5.1
99	9.2	27.6	41.9	1.000	----	0.00		0.0
98	9.2	22.5	41.9	1.049		10.00	0.512	5.1
Pipe: 32	5.60	23.4	Disch			 55.00	120	10.2
99	9.2	27.6	0.0	1.000	T: 5.0	5.00		-0.3
S51	8.7	17.4	23.4	1.049		60.00	0.174	10.4
Pipe: 33	0.0	41.9	98			4.60	120	4.6
45	10.2	32.3	23.4	S51 1.250	2E: 6.0	12.00		-0.4
99	9.2	27.6	65.3	1.380	T: 6.0	16.60	0.306	5.1

 FLEXIBLE SPRINKLER FITTING

SPRINKLER SYSTEM HYDRAULIC ANALYSIS

DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #3.SDF  
 JOB TITLE: Oakley Rec Center #3

Pipe Tag	K-fac	Add Fl	Add Fl To	Fit:	L	C	(Pt)		
Frm Node	El (ft)	PT	(q)	Node/	Nom ID	Eq.Ln.	F	(Pe)	
To Node	El (ft)	PT	Tot.(Q)	Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 34	5.60	19.9	Disch					8.3	
47	9.5	20.9	0.0		1.000	----	X 67.00	-0.4	
S52	8.7	12.6	19.9		1.049		0.00	8.6	
							67.00	0.129	
Pipe: 35	5.60	21.0	Disch					6.9	
47	9.5	20.9	0.0		1.000	T: 5.0	X 55.00	-1.7	
S53	5.7	14.1	21.0		1.049		5.00	8.5	
							60.00	0.142	
Pipe: 36	0.0	0.0						6.7	
46	16.0	27.6	40.9		1.000	E: 2.0	12.50	-2.8	
47	9.5	20.9	40.9		1.049	T: 5.0	7.00	9.5	
							19.50	0.489	

**X FLEXIBLE SPRINKLER FITTING**

NOTES (HASS):

- (1) Calculations were performed by the HASS 8.7 computer program in accordance with NFPA13 (2016) under license no. 50121774 granted by HRS Systems, Inc. 208 Southside Square Petersburg, TN 37144 (931) 659-9760
- (2) The system has been calculated to provide an average imbalance at each node of 0.003 gpm and a maximum imbalance at any node of 0.096 gpm.
- (3) Total pressure at each node is used in balancing the system. Maximum water velocity is 16.1 ft/sec at pipe 23.
- (4) Items listed in bold print on the cover sheet are automatically transferred from the calculation report.
- (5) Column Headers have been translated from the English by the user.
- (6) Available pressure at source node SR under full flow conditions is 66.27 psi with a flow of 419.13 gpm.

DATE: 1/2/2018 ON CENTER\OFFICE\FIRE\CALCULATIONS\OAKLEY REC CENTER #3.SDF  
 JOB TITLE: Oakley Rec Center #3

(7) PIPE FITTINGS TABLE

Pipe Table Name: STANDARD.PIP

PAGE: A MATERIAL: S40 HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet								
	E	T	L	C	B	G	A	D	N
	Ell	Tee	LngEll	ChkVlv	BfyVlv	GatVlv	AlmChk	DPVlv	Tee
1.049	2.00	5.00	2.00	5.00	6.00	1.00	10.00	2.00	5.00
1.380	3.00	6.00	2.00	7.00	6.00	1.00	10.00	10.00	6.00
1.610	4.00	8.00	2.00	9.00	6.00	1.00	10.00	10.00	8.00

PAGE: B MATERIAL: THNWL HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet								
	E	T	L	C	B	G	A	D	N
	Ell	Tee	LngEll	ChkVlv	BfyVlv	GatVlv	AlmChk	DPVlv	NPTee
3.260	10.00	20.00	7.00	22.00	14.00	1.00	18.00	18.00	20.00
4.260	13.00	26.00	8.00	29.00	16.00	3.00	26.00	26.00	26.00

PAGE: D MATERIAL: DIRON HWC: 140


Diameter (in)	Equivalent Fitting Lengths in Feet						
	E	T	L	C	B	G	N
	Ell	Tee	LngEll	ChkVlv	BfyVlv	GatVlv	NPTee
4.220	17.00	34.00	10.00	37.00	20.00	3.00	34.00


PAGE: E MATERIAL: PVC150 HWC: 150

Diameter (in)	Equivalent Fitting Lengths in Feet						
	E	T	L	C	B	G	N
	Ell	Tee	LngEll	ChkVlv	BfyVlv	GatVlv	NPTee
4.240	20.00	39.00	12.00	43.00	23.00	4.00	39.00
7.980	27.00	53.00	20.00	68.00	18.00	6.00	53.00

[victaulic.com](http://victaulic.com)

5.0 PERFORMANCE – FRICTION LOSS DATA

 Series AH2 Braided Hose with Straight 5.75" Reducers  
 Style AB1, AB2, AB4, and AB10 Brackets

Length of Stainless Steel Flexible Hose	Outlet Size	Series AH2 Hose	
		Equivalent Length of 1" / 33.7 mm Sch. 40 Pipe (C=120)	Maximum Number of 90° Bends at 2" / 51 mm Bend Radius
inches/mm	inches/mm/type	feet/meters	
31/775	½"/15/Straight	16/4.9	4
	¾"/20/Straight	17/5.2	4
36/900	½"/15/Straight	21/6.4	5
	¾"/20/Straight	23/7.0	5
 48/1200	½"/15/Straight	32/9.8	8
	¾"/20/Straight	37/11.3	8
60/1500	½"/15/Straight	46/14.0	10
	¾"/20/Straight	46/14.0	10
72/1800	½"/15/Straight	55/16.8	12
	¾"/20/Straight	53/16.2	12



## **SPRINKLER HEADS**

- VIKING MICROFAST VK300
- VIKING MICROFAST VK302
- VIKING MODEL F-1 ADJUSTABLE ESCUTCHEON
- VIKING MIRAGE VK462



## TECHNICAL DATA

### MICROFAST® QUICK RESPONSE UPRIGHT SPRINKLER VK300 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

#### 1. DESCRIPTION

The Viking Microfast® Quick Response Upright Sprinkler VK300 is a small, thermosensitive, glass-bulb spray sprinkler available in several different finishes and temperature ratings to meet design requirements. The special Polyester and Electroless Nickel PTFE (ENT) coatings can be used in decorative applications where colors are desired. In addition, these coatings have been investigated for installation in corrosive atmospheres and are listed/approved as corrosion resistant as indicated in the Approval Charts. (Note: **FM global approves the ENT coating as corrosion resistant.** FM Global has no approval classification Polyester coatings as corrosion resistant.)



#### 2. LISTINGS AND APPROVALS



cULus Listed: Category VNIV

FM Approved: Classes 2002 and 2020

Refer to Approval Chart 1 and Design Criteria on for cULus Listing requirements and refer to Approval Chart 2 and Design Criteria FM Approval requirements that must be followed.

#### 3. TECHNICAL DATA

##### Specifications:

Minimum Operating Pressure: 7 psi (0.5 bar)\*  
 Maximum Working Pressure: 175 psi (12 bar) wwp.  
 Factory tested hydrostatically to 500 psi (34.5 bar)  
 Testing: U.S.A. Patent No. 4,831,870  
 Thread size: 1/2" NPT, 15 mm BSP  
 Nominal K-Factor: 5.6 U.S. (80.6 metric\*\*)  
 Glass-bulb fluid temperature rated to -65 °F (-55 °C)  
 Overall Length: 2-3/16" (56 mm)

\*cULus Listing, FM Approval, and NFPA 13 installs require a minimum of 7 psi (0.5 bar). The minimum operating pressure for LPCB and CE Approvals ONLY is 5 psi (0.35 bar).

##### Material Standards:

Frame Casting: Brass UNS-C84400 or QM Brass  
 Deflector: Brass UNS-C23000 or Copper UNS-C19500  
 Bulb: Glass, nominal 3 mm diameter  
 Belleville Spring Sealing Assembly: Nickel Alloy, coated on both sides with PTFE Tape  
 Screw: Brass UNS-C36000  
 Pip Cap and Insert Assembly: Copper UNS-C11000 and Stainless Steel UNS-S30400

For Polyester Coated Sprinklers: Belleville Spring-Exposed

For ENT Coated Sprinklers: Belleville Spring-Exposed, Screw and Pipcap - ENT plated

**Ordering Information:** (Also refer to the current Viking price list.)

Order Viking Microfast® Quick Response Upright Sprinkler VK300 by first adding the appropriate suffix for the sprinkler finish and then the appropriate suffix for the temperature rating to the sprinkler base part number.

Finish Suffix: Brass = A, Chrome = F, White Polyester = M-/W, Black Polyester = M-/B, and ENT = JN

Temperature Suffix (°F/°C): 135°/57° = A, 155°/68° = B, 175°/79° = D, 200°/93° = E, and 286°/141° = G

For example, sprinkler VK300 with a 1/2" NPT thread, Brass finish and a 155 °F/68 °C temperature rating = Part No. 12978AB

**Available Finishes And Temperature Ratings:** Refer to Table 1.

**Accessories:** (Also refer to the "Sprinkler Accessories" section of the Viking data book.)

**Sprinkler Wrench:** Standard Wrench: Part No. 10896W/B (available since 2000)

##### Sprinkler Cabinets:

A. Six-head capacity: Part No. 01724A (available since 1971)

B. Twelve-head capacity: Part No. 01725A (available since 1971)

Viking Technical Data may be found on  
 The Viking Corporation's Web site at  
<http://www.vikinggroupinc.com>.  
 The Web site may include a more recent  
 edition of this Technical Data Page.

#### 4. INSTALLATION

Refer to appropriate NFPA Installation Standards.

	<b>TECHNICAL DATA</b>	<b>MICROFAST® QUICK RESPONSE UPRIGHT SPRINKLER VK300 (K5.6)</b>
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The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058  
 Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

**5. OPERATION**

During fire conditions, the heat-sensitive liquid in the glass bulb expands, causing the glass to shatter, releasing the pip cap and sealing spring assembly. Water flowing through the sprinkler orifice strikes the sprinkler deflector, forming a uniform spray pattern to extinguish or control the fire.

**6. INSPECTIONS, TESTS AND MAINTENANCE**

Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

**7. AVAILABILITY**

The Viking Microfast® Quick Response Upright Sprinkler VK300 is available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

**8. GUARANTEE**

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.

**TABLE 1: AVAILABLE SPRINKLER TEMPERATURE RATINGS AND FINISHES**

Sprinkler Temperature Classification	Sprinkler Nominal Temperature Rating <sup>1</sup>	Maximum Ambient Ceiling Temperature <sup>2</sup>	Bulb Color
Ordinary	135 °F (57 °C)	100 °F (38 °C)	Orange
Ordinary	155 °F (68 °C)	100 °F (38 °C)	Red
Intermediate	175 °F (79 °C)	150 °F (65 °C)	Yellow
Intermediate	200 °F (93 °C)	150 °F (65 °C)	Green
High	286 °F (141 °C)	225 °F (107 °C)	Blue

**Sprinkler Finishes:** Brass, Chrome, White Polyester, Black Polyester, and ENT

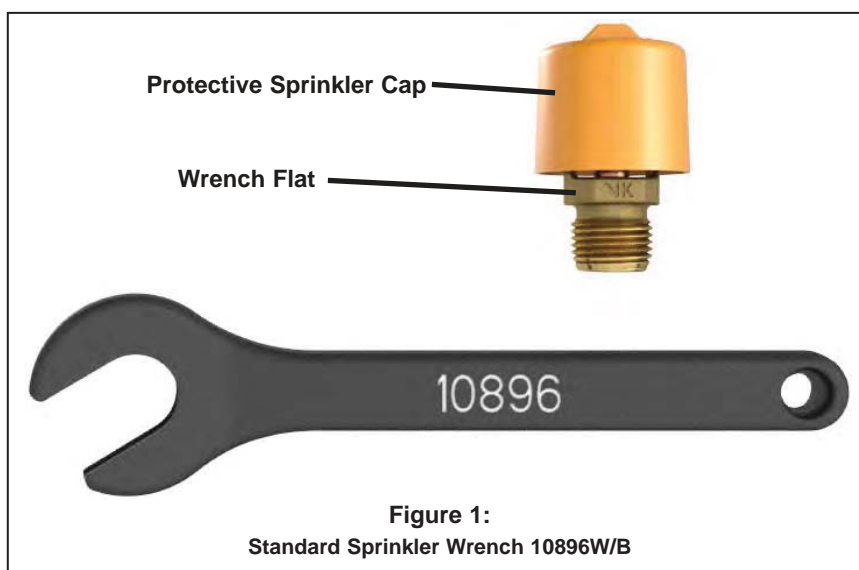
**Corrosion-Resistant Coatings<sup>3</sup>:** White Polyester, Black Polyester, and Black PTFE. ENT in all temperature ratings except 135 °F (57 °C)

**Footnotes**

<sup>1</sup> The sprinkler temperature rating is stamped on the deflector.

<sup>2</sup> Based on NFPA-13. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.

<sup>3</sup> The corrosion-resistant coatings have passed the standard corrosion test required by the approving agencies indicated in the Approval Charts. These tests cannot and do not represent all possible corrosive environments. Prior to installation, verify through the end-user that the coatings are compatible with or suitable for the proposed environment. For automatic sprinklers, the coatings indicated are applied to the exposed exterior surfaces only. Note that the spring is exposed on sprinklers with Polyester, ENT, and PTFE coatings. For ENT coated automatic sprinklers, the waterway is coated.



**Figure 1:  
Standard Sprinkler Wrench 10896W/B**



**TECHNICAL DATA**

**MICROFAST® QUICK RESPONSE UPRIGHT SPRINKLER VK300 (K5.6)**

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058  
 Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

**Approval Chart 1 (UL)**

Microfast® Quick Response Upright Sprinkler VK300  
 Maximum 175 PSI (12 bar) WWP

Temperature	KEY
Finish	
A1X ← Escutcheon (if applicable)	

Base Part Number <sup>1</sup>	SIN	Thread Size		Nominal K-Factor		Overall Length		Listings and Approvals <sup>3</sup>			
		NPT	BSP	U.S.	metric <sup>2</sup>	Inches	mm	cULus	VdS	LPCB	CE
12978	VK300	1/2"	15 mm	5.6	80.6	2-3/16	56	A1, B2	--	--	--

<p><b>Approved Temperature Ratings</b></p> <p>A - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), and 286 °F (141°C)</p> <p>B - 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), and 286 °F (141°C)</p>	<p><b>Approved Finishes</b></p> <p>1 - Brass, Chrome, White Polyester<sup>5,6</sup>, and Black Polyester<sup>5,6</sup></p> <p>2 - ENT<sup>6</sup></p>
--	---

**Footnotes**

- <sup>1</sup> Base part number is shown. For complete part number, refer to Viking's current price schedule.
- <sup>2</sup> Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.
- <sup>3</sup> This table shows the listings and approvals available at the time of printing. Check with the manufacturer for any additional approvals.
- <sup>4</sup> Listed by Underwriters Laboratories Inc. for us in the U.S. and Canada
- <sup>5</sup> Other colors are available on request with the same Listings and Approvals as the standard colors.
- <sup>6</sup> cULus Listed as corrosion resistant.

**DESIGN CRITERIA - UL**

(Also refer to Approval Chart 1 above.)

**cULus Listing Requirements:**

The Viking Microfast® Quick Response Upright Sprinkler VK300 is cULus Listed as indicated in Approval Chart 1 for installation in accordance with the latest edition of NFPA 13 for standard spray sprinklers.

- Designed for use in Light and Ordinary Hazard occupancies.
- The sprinkler installation rules contained in NFPA 13 for standard spray upright sprinklers must be followed.

**IMPORTANT: Always refer to Bulletin Form No. F\_091699 - Care and Handling of Sprinklers. Also refer to page QR1-3 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, FM Global, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.**



## TECHNICAL DATA

## MICROFAST® QUICK RESPONSE UPRIGHT SPRINKLER VK300 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058  
 Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

### Approval Chart 2 (FM)

Microfast® Quick Response  
 Upright Sprinkler VK300  
 Maximum 175 PSI (12 bar) WWP

KEY	
Temperature	↓
Finish	←
A1X	← Escutcheon (if applicable)

Base Part Number <sup>1</sup>	SIN	Thread Size		Nominal K-Factor		Overall Length		FM Approvals <sup>3</sup> (Refer also to Design Criteria below.)
		NPT	BSP	U.S.	metric <sup>2</sup>	Inches	mm	
12978	VK300	1/2"	15 mm	5.6	80.6	2-3/16	56	A1

#### Approved Temperature Ratings

A - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), and 286 °F (141°C)  
 B - 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), and 286 °F (141°C)

#### Approved Finishes

1 - Brass, Chrome, White Polyester<sup>5</sup>, and Black Polyester<sup>5</sup>  
 2 - ENT<sup>6</sup>

#### Footnotes

- <sup>1</sup> Base part number is shown. For complete part number, refer to Viking's current price schedule.  
<sup>2</sup> Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.  
<sup>3</sup> This table shows the FM Approvals available at the time of printing. Check with the manufacturer for any additional approvals.  
<sup>5</sup> Other colors are available on request with the same Approvals as the standard colors.  
<sup>6</sup> FM approved as corrosion resistant.

### DESIGN CRITERIA - FM

(Also refer to Approval Chart 2 above.)

#### FM Approval Requirements:

The Microfast® Quick Response Upright Sprinkler VK300 is FM Approved as a quick response **Non-Storage** upright sprinkler as indicated in the FM Approval Guide. For specific application and installation requirements, reference the latest applicable FM Loss Prevention Data Sheets (including Data Sheet 2-0). FM Global Loss Prevention Data Sheets contain guidelines relating to, but not limited to: minimum water supply requirements, hydraulic design, ceiling slope and obstructions, minimum and maximum allowable spacing, and deflector distance below the ceiling.

**NOTE: The FM installation guidelines may differ from cULus and/or NFPA criteria.**

**IMPORTANT: Always refer to Bulletin Form No. F\_091699 - Care and Handling of Sprinklers. Also refer to page QR1-3 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, FM Global, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.**



## TECHNICAL DATA

### MICROFAST® QUICK RESPONSE PENDENT SPRINKLER VK302 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

#### 1. DESCRIPTION

The Viking Microfast® Quick Response Pendent Sprinkler VK302 is a small thermosensitive glass bulb spray sprinkler available with various finishes and temperature ratings to meet design requirements. The special Polyester, Polytetrafluoroethylene (PTFE), and Electroless Nickel PTFE (ENT) coatings can be used in decorative applications where colors are desired. In addition, these coatings have been investigated for installation in corrosive atmospheres and are listed/approved as corrosion resistant as indicated in the Approval Charts. (Note: **FM Global approves ENT finish as corrosion resistant.** FM Global has no approval classification for PTFE and Polyester coatings as corrosion resistant.)



#### 2. LISTINGS AND APPROVALS



**cULus Listed:** Category VNIV



**FM Approved:** Class Series 2000



**VdS Approved:** Certificates G414009 and G414010



**LPCB Approved**



**CE Certified:** Standard EN 12259-1, EC-certificate of conformity 0832-CPD-2001

Refer to Approval Chart 1 and Design Criteria cULus Listing requirements, and refer to Approval Chart 2 and Design Criteria for FM Approval requirements that must be followed.

#### 3. TECHNICAL DATA

##### Specifications:

Minimum Operating Pressure: 7 psi (0.5 bar)  
 Rated to 175 psi (12 bar) water working pressure  
 Factory tested hydrostatically to 500 psi (34.5 bar)  
 Thread size: 1/2" NPT, 15 mm BSP  
 Nominal K-Factor: 5.6 U.S. (80.6 metric\*\*)  
 Glass-bulb fluid temperature rated to -65 °F (-55 °C)  
 Overall Length: 2-1/4" (58 mm)

\*cULus Listing, FM Approval, and NFPA 13 installs require a minimum of 7 psi (0.5 bar). The minimum operating pressure for LPCB and CE Approvals ONLY is 5 psi (0.35 bar).

##### Material Standards:

Frame Casting: Brass UNS-C84400 or QM Brass  
 Deflector: Phosphor Bronze UNS-C51000 or Copper UNS-C19500  
 Bulb: Glass, nominal 3 mm diameter  
 Belleville Spring Sealing Assembly: Nickel Alloy, coated on both sides with PTFE Tape  
 Screw: Brass UNS-C36000  
 Pip Cap and Insert Assembly: Copper UNS-C11000 and Stainless Steel UNS-S30400  
For PTFE Coated Sprinklers: Belleville Spring-Exposed, Screw-Nickel Plated, Pip Cap-PTFE Coated  
For Polyester Coated Sprinklers: Belleville Spring-Exposed  
For ENT Coated Sprinklers: Belleville Spring-Exposed, Screw and Pipcap - ENT plated.

**Ordering Information:** (Also refer to the current Viking price list.)

Order Quick Response Pendent Sprinklers by first adding the appropriate suffix for the sprinkler finish and then the appropriate suffix for the temperature rating to the sprinkler base part number.

Finish Suffix: Brass = A, Chrome = F, White Polyester = M-W, Black Polyester = M-B, Black PTFE = N, and ENT = JN  
 Temperature Suffix: 135 °F (68 °C) = A, 155 °F (68 °C) = B, 175 °F (79 °C) = D, 200 °F (93 °C) = E, 286 °F (141 °C) = G  
 For example, sprinkler VK302 with a Brass finish and a 155 °F (68 °C) temperature rating = Part No. 12979AB

**Available Finishes And Temperature Ratings:** Refer to Table 1.

**Accessories:** (Also refer to the "Sprinkler Accessories" section of the Viking data book.)

Viking Technical Data may be found on  
 The Viking Corporation's Web site at  
<http://www.vikinggroupinc.com>.  
 The Web site may include a more recent  
 edition of this Technical Data Page.



## TECHNICAL DATA

## MICROFAST® QUICK RESPONSE PENDENT SPRINKLER VK302 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

### Sprinkler Wrenches:

- A. Standard Wrench: Part No. 10896W/B (available since 2000).
- B. Wrench for Recessed Pendent Sprinklers: Part No. 16036W/B\*\* (available since 2011)
- C. Optional Protective Sprinkler Cap Remover/Escutcheon Installer Tool\*\*\* Part No. 15915 (available since 2010)

\*\*A ½" ratchet is required (not available from Viking).

\*\*\*Allows use from the floor by attaching a length of 1" diameter CPVC tubing to the tool. Ideal for sprinkler cabinets. Refer to Bulletin F\_051808.

### Sprinkler Cabinets:

- A. Six-head capacity: Part No. 01724A (available since 1971)
- B. Twelve-head capacity: Part No. 01725A (available since 1971)

## 4. INSTALLATION

Refer to appropriate NFPA Installation Standards.

## 5. OPERATION

During fire conditions, the heat-sensitive liquid in the glass bulb expands, causing the glass to shatter, releasing the pip cap and sealing spring assembly. Water flowing through the sprinkler orifice strikes the sprinkler deflector, forming a uniform spray pattern to extinguish or control the fire.

## 6. INSPECTIONS, TESTS AND MAINTENANCE

Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

## 7. AVAILABILITY

The Viking Microfast® Quick Response Pendent Sprinkler VK302 is available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

## 8. GUARANTEE

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.

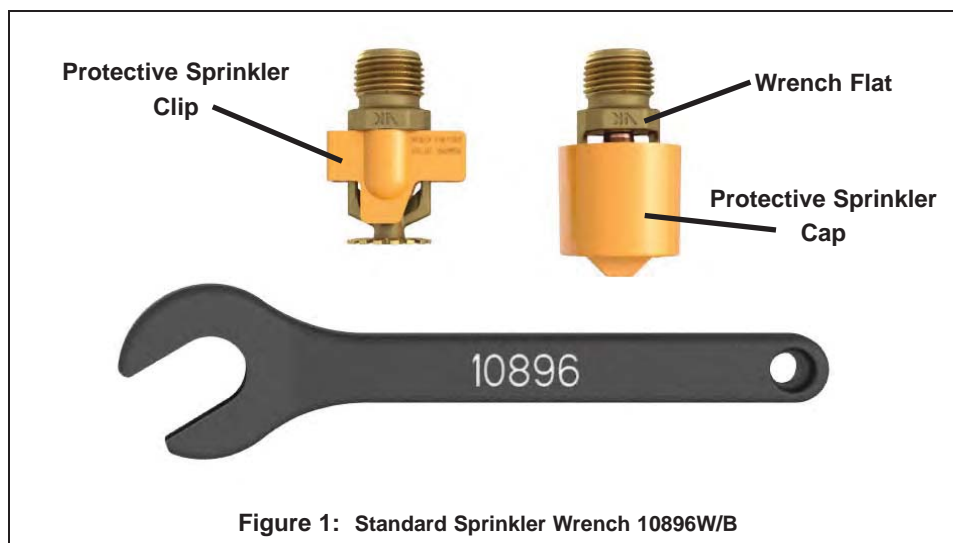


Figure 1: Standard Sprinkler Wrench 10896W/B



**TECHNICAL DATA**

**MICROFAST® QUICK  
RESPONSE PENDENT  
SPRINKLER VK302 (K5.6)**

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058  
 Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

**TABLE 1: AVAILABLE SPRINKLER TEMPERATURE RATINGS AND FINISHES**

Sprinkler Temperature Classification	Sprinkler Nominal Temperature Rating <sup>1</sup>	Maximum Ambient Ceiling Temperature <sup>2</sup>	Bulb Color
Ordinary	135 °F (57 °C)	100 °F (38 °C)	Orange
Ordinary	155 °F (68 °C)	100 °F (38 °C)	Red
Intermediate	175 °F (79 °C)	150 °F (65 °C)	Yellow
Intermediate	200 °F (93 °C)	150 °F (65 °C)	Green
High	286 °F (141 °C)	225 °F (107 °C)	Blue

**Sprinkler Finishes:** Brass, Chrome, White Polyester, Black Polyester, Black PTFE, and ENT

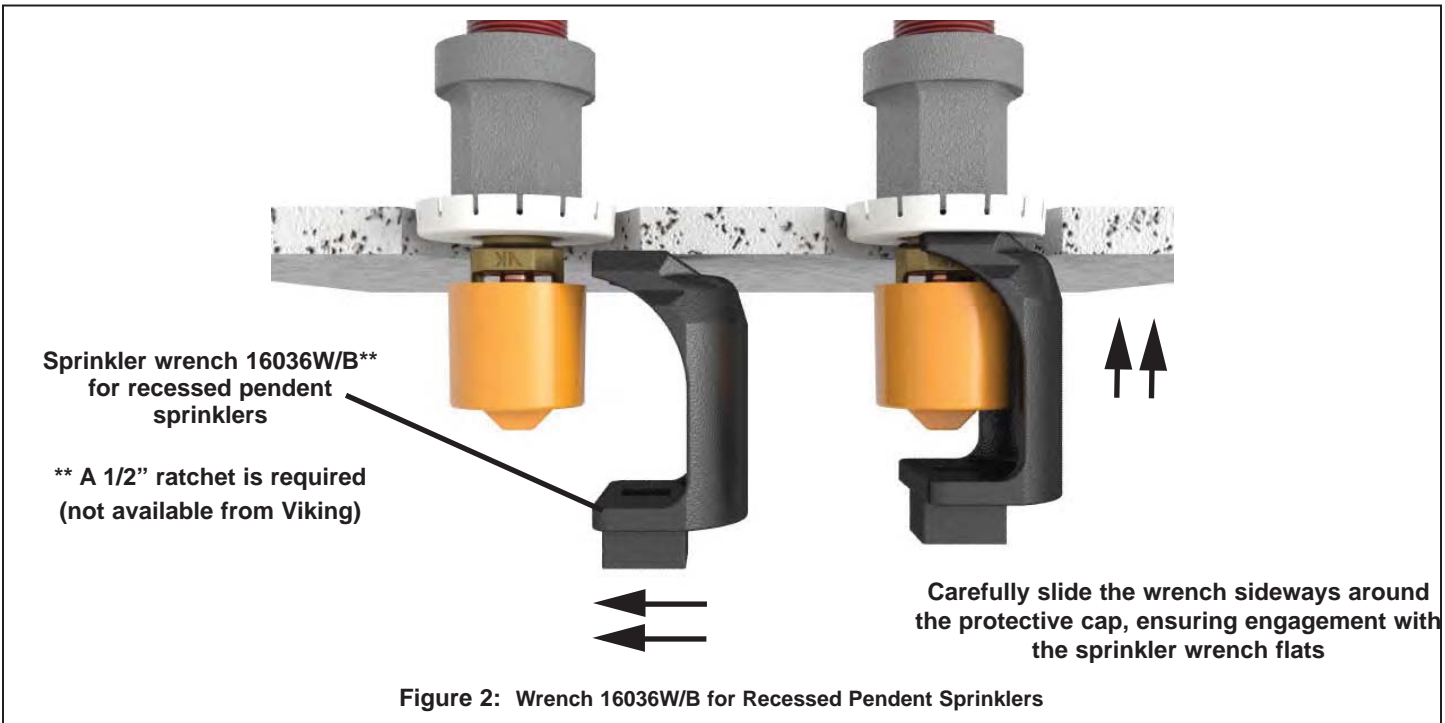
**Corrosion-Resistant Coatings<sup>3</sup>:** White Polyester, Black Polyester, and Black PTFE. ENT in all temperature ratings except 135 °F (57 °C)

**Footnotes**

<sup>1</sup> The sprinkler temperature rating is stamped on the deflector.

<sup>2</sup> Based on NFPA-13. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.

<sup>3</sup> The corrosion-resistant coatings have passed the standard corrosion test required by the approving agencies indicated in the Approval Charts. These tests cannot and do not represent all possible corrosive environments. Prior to installation, verify through the end-user that the coatings are compatible with or suitable for the proposed environment. For automatic sprinklers, the coatings indicated are applied to the exposed exterior surfaces only. Note that the spring is exposed on sprinklers with Polyester, PTFE, and ENT coatings. For ENT coated automatic sprinklers, the waterway is coated



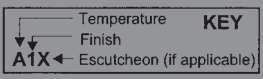
**Figure 2: Wrench 16036W/B for Recessed Pendent Sprinklers**



	<b>TECHNICAL DATA</b>	<b>MICROFAST® QUICK RESPONSE PENDENT SPRINKLER VK302 (K5.6)</b>
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The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058  
 Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

<b>Approval Chart 1 (UL)</b> The Viking Microfast® Quick Response Pendent Sprinkler VK302 Maximum 175 PSI (12 Bar) WWP												
Base Part Number <sup>1</sup>	SIN	Sprinkler Style	Thread Size		Nominal K-Factor		Overall Length		Listings and Approvals <sup>3</sup> (Refer also to Design Criteria.)			
			NPT	BSP	U.S.	metric <sup>2</sup>	Inches	mm	cULus <sup>4</sup>	VdS	LPCB	CE <sup>7</sup>
12979	VK302	Pendent	1/2"	15 mm	5.6	80.6	2-1/4	58	A1Z, B1Y, C2X, D2	A3	A3Z, B3Y	D3Z, C3Y
<b>Approved Temperature Ratings</b> A - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), 286 °F (141 °C) B - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), and 200 °F (93 °C) C - 155 °F (68 °C), 175 °F (79 °C), and 200 °F (93 °C) D - 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), 286 °F (141 °C)			<b>Approved Finishes</b> 1 - Brass, Chrome, White Polyester <sup>5,6</sup> , Black Polyester <sup>5,6</sup> , and Black PTFE 2 - ENT <sup>5</sup> 3 - Brass, Chrome, White Polyester <sup>5,6</sup> , and Black Polyester <sup>5,6</sup>			<b>Approved Escutcheons</b> X - Standard surface-mounted escutcheon or the Viking Micromatic® Model E-1 Recessed Escutcheon Y - Standard surface-mounted escutcheon or the Viking Microfast® Model F-1 Adjustable Escutcheon, or recessed with the Viking Micromatic® Model E-1 or E-2 Recessed Escutcheon Z - Standard surface-mounted escutcheon or the Viking Microfast® Model F-1 Adjustable Escutcheon						
<b>Footnotes</b> <sup>1</sup> Base part number shown. For complete part number, refer to Viking's current price schedule. <sup>2</sup> Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0. <sup>3</sup> This table shows the listings and approvals available at the time of printing. Other approvals may be in process. <sup>4</sup> Listed by Underwriters Laboratories Inc. for use in the U.S. and Canada. <sup>5</sup> cULus Listed as corrosion-resistant. <sup>6</sup> Other colors are available on request with the same Listings and Approvals as the standard colors. <sup>7</sup> CE Certified, Standard EN 12259-1, EC-certificate of conformity 0832-CPD-2001.												



**DESIGN CRITERIA - UL**  
(Also refer to Approval Chart 1 above.)

**cULus Listing Requirements:**  
 The Viking Microfast® Quick Response Pendent Sprinkler VK302 is cULus Listed as indicated in the Approval Chart for installation in accordance with the latest edition of NFPA 13 for standard spray sprinklers.

- Designed for use in Light and Ordinary occupancies.
- The sprinkler installation rules contained in NFPA 13 for standard spray pendent sprinklers must be followed.

**IMPORTANT: Always refer to Bulletin Form No. F\_091699 - Care and Handling of Sprinklers. Also refer to page QR1-3 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.**



## TECHNICAL DATA

## MICROFAST® QUICK RESPONSE PENDENT SPRINKLER VK302 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

### Approval Chart 2 (FM) The Viking Microfast® Quick Response Pendent Sprinkler VK302 Maximum 175 PSI (12 Bar) WWP

KEY	
Temperature	↓
Finish	→
Escutcheon (if applicable)	←

Base Part Number <sup>1</sup>	SIN	Sprinkler Style	Thread Size		Nominal K-Factor		Overall Length		FM Approvals <sup>3</sup> (Refer also to Design Criteria.)
			NPT	BSP	U.S.	metric <sup>2</sup>	Inches	mm	
12979	VK302	Pendent	1/2"	15 mm	5.6	80.6	2-1/4	58	A1Z, B1Y, D2X, C2
<b>Approved Temperature Ratings</b> A - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), 286 °F (141 °C) B - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), and 200 °F (93 °C) C - 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), 286 °F (141 °C) D - 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C)			<b>Approved Finishes</b> 1 - Brass, Chrome, White Polyester <sup>4</sup> , and Black Polyester <sup>4</sup> 2 - ENT <sup>5</sup>			<b>Approved Escutcheons</b> X - Standard surface-mounted escutcheon or the Viking Micromatic® Model E-1 Recessed Escutcheon Y - Standard surface-mounted escutcheon or the Viking Microfast® Model F-1 Adjustable Escutcheon, or recessed with the Viking Micromatic® Model E-1 or E-2 Recessed Escutcheon Z - Standard surface-mounted escutcheon or the Viking Microfast® Model F-1 Adjustable Escutcheon			
<b>Footnotes</b>									
<sup>1</sup> Base part number shown. For complete part number, refer to Viking's current price schedule. <sup>2</sup> Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0. <sup>3</sup> This table shows the FM Approvals available at the time of printing. Other approvals may be in process. <sup>4</sup> Other colors are available on request with the same Approvals as the standard colors. <sup>5</sup> FM approved as corrosion resistant.									

### DESIGN CRITERIA - FM

(Also refer to Approval Chart 2 above.)

#### FM Approval Requirements:

The Viking Microfast® Quick Response Pendent Sprinkler VK302 is FM Approved as quick response **Non-storage** upright and pendent sprinklers as indicated in the FM Approval Guide. For specific application and installation requirements, reference the latest applicable FM Loss Prevention Data Sheets (including Data Sheet 2-0). FM Global Loss Prevention Data Sheets contain guidelines relating to, but not limited to: minimum water supply requirements, hydraulic design, ceiling slope and obstructions, minimum and maximum allowable spacing, and deflector distance below the ceiling.

**NOTE:** The FM installation guidelines may differ from cULus and/or NFPA criteria.

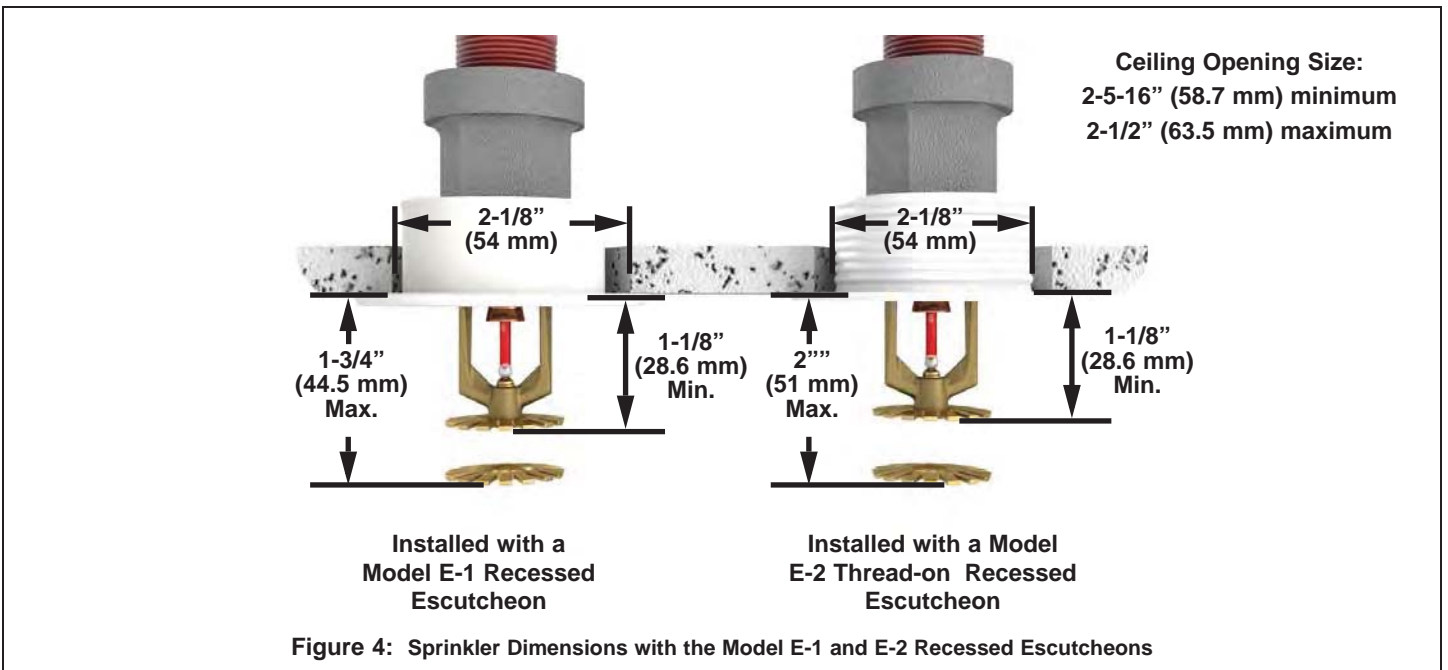
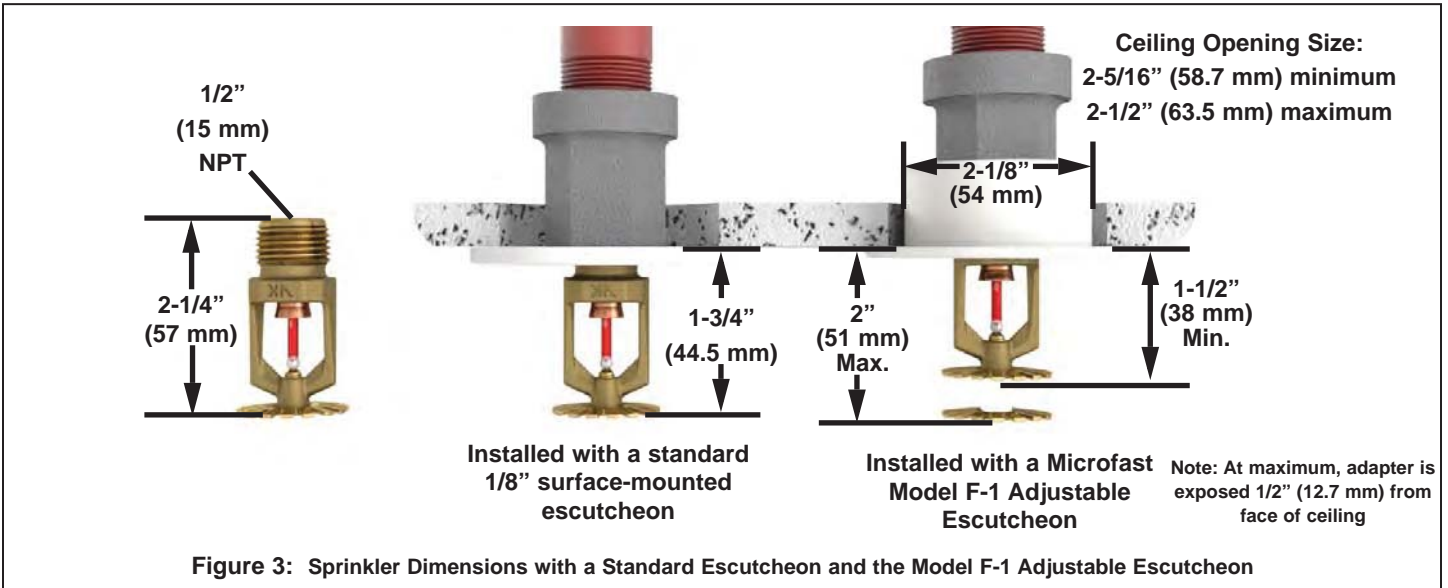
**IMPORTANT:** Always refer to Bulletin Form No. F\_091699 - Care and Handling of Sprinklers. Also refer to page QR1-3 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, FM Global, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.



**TECHNICAL DATA**

**MICROFAST® QUICK RESPONSE PENDENT SPRINKLER VK302 (K5.6)**

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058  
 Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com





## TECHNICAL DATA

## SPRINKLER ESCUTCHEONS

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

### 1. DESCRIPTION

Viking sprinkler escutcheons are ornamental plates used with 3/8" NPT (10 mm BSP)\*, 1/2" NPT (15 mm BSP)\*, and 3/4" NPT (20 mm BSP)\* frame-style pendent and sidewall\* sprinklers. The escutcheons are installed between the sprinklers and the ceiling or wall for a pleasing appearance. They are available with several finish options to meet design requirements.

Viking recessed and adjustable escutcheons provide a low-profile decorative recessed sprinkler installation. The E-1 Recessed Escutcheon may be recessed up to 5/8" (16 mm). The Model G-1 Recessed Escutcheon allows horizontal sidewall sprinklers to be recessed up to 1/2" (12.7 mm). The Model F-1 Adjustable Escutcheon has 1/2" (12.7 mm) total adjustment available.

The two-piece design of Viking's recessed and adjustable escutcheons allows installation and testing of the sprinklers prior to installing the ceiling or wall. Viking's Model E-1, F-1, and G-1 Escutcheons feature a slip-on design, while the Model E-2 and E-3 escutcheons are threaded (outer cup threads onto the adapter).

The Viking adjustable and recessed escutcheons are made to allow for minor adjustments due to pipe or ceiling pitch. These escutcheons can be removed and reinstalled, allowing access above removable ceiling panels for servicing building equipment without shutting down the sprinkler system and removing the sprinkler.

Viking standard 1/8" (3 mm) style flat and 1" (25 mm) style raised surface-mounted escutcheons have a one-piece design.

**\*Refer to the specific sprinkler technical data page for the escutcheon(s) listed and approved for use with the sprinkler.**



### 2. LISTINGS AND APPROVALS

Refer to the specific sprinkler technical data pages for sprinkler listings and approvals. Sprinklers must be specifically listed and/or approved for recessed installation. When using Viking Model E-1, E-2, E-3, F-1, and G-1 escutcheons for recessed applications, refer to technical data describing the sprinkler model to be used to verify whether the sprinkler is listed and/or approved for recessed installations. **NOTE:** Viking's thread-on style Model E-2 and E-3 Recessed Escutcheons carry the same listings and approvals as the slip-on style Model E-1 Recessed Escutcheons. **Model E-3 Recessed Escutcheon also meets IBC-ASCE/SEI 7 Codes for Seismic Areas C, D, and E.**

### 3. TECHNICAL DATA

#### Specifications:

#### A. Slip-on Style Model E-1 Recessed Escutcheons

- Depth of Outer Cup: 1-1/16" (26.9 mm)
- Outside Diameter of Outer Cup: 3-1/16" (77.7 mm)
- Depth of Center Adapter Ring: 11/32" (8.7 mm) +/- 1/32" (0.8 mm)
- Adjustment Range: Flush to 5/8" (16 mm) recessed
- NOTE:** Escutcheon adapter is stamped "Viking Model E-1".
- Available since 1987.

#### B. Threaded Style Model E-2 Recessed Escutcheons

- Depth of Outer Cup: 13/16" (20.6 mm)
- Outside Diameter of Outer Cup: 3-1/8" (79.4 mm)
- Depth of Center Adapter Ring: 21/32" (16.6 mm)
- Adjustment Range: 27/32" (21.4 mm) total adjustment with 1/2" (12.7 mm) maximum recess available. **Note:** Face of escutcheon adapter may extend up to 11/32" (8.7 mm) beyond edge of escutcheon cup.
- Available since 2000.

Viking Technical Data may be found on  
The Viking Corporation's Web site at  
<http://www.vikinggroupinc.com>.  
The Web site may include a more recent  
edition of this Technical Data Page.



## TECHNICAL DATA

## SPRINKLER ESCUTCHEONS

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

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### C. Threaded Style Model E-3 Recessed Escutcheons

Depth of Outer Cup: 13/16" (20.6 mm)

Outside Diameter of Outer Cup: 5-1/8" (130.2 mm). (See Figure 4)

Depth of Center Adapter Ring: 21/32" (16.6 mm)

Adjustment Range: 27/32" (21.4 mm) total adjustment with 1/2" (12.7 mm) maximum recess available. **Note:** Face of escutcheon adapter may extend up to 11/32" (8.7 mm) beyond edge of escutcheon cup.

Available since 2012.

### D. Model F-1 Adjustable Escutcheons

Depth of Outer Cup: 1-1/16" (26.9 mm)

Outside Diameter of Outer Cup: 3-1/16" (77.7 mm)

Depth of Center Adapter Ring: 23/32" (18.3 mm)

Adjustment Range: 1/2" (12.7 mm) total adjustment with 1/4" (6.4 mm) maximum recess available. **Note:** The face of escutcheon adapter may extend up to 1/4" (6.4 mm) beyond the edge of the escutcheon cup.

**NOTE:** Escutcheon adapter is stamped "Viking Model F-1".

Available since 1988.

### E. Slip-on Style Model G-1 Recessed Escutcheons (US Patent No. 8,376,060)

Depth of Outer Cup: 1-1/16" (26.9 mm)

Outside Diameter of Outer Cup: 4" (101.6 mm)

Depth of Center Adapter Ring: 1-7/16" (36.5 mm)

Adjustment Range: Up to 5/8" (16 mm) total adjustment available for use with ceilings sloped up to 8/12 (33.7°). May be recessed up to 1/2" (12.7 mm), depending on degree of slope. **Note:** The face of escutcheon adapter may extend up to 1/2" (12.7 mm) beyond the edge of the escutcheon cup.

**NOTE:** Escutcheon adapter is stamped "Viking Model G-1".

Available since 2007.

### F. Expansion Plate (optional)

1. Base Part No. 12620 for use with Model E-1, E-2, and F-1 Escutcheons. May also be used with dry recessed sprinklers, dry standard adjustable sprinklers, and flat plate concealed sprinklers.

Outside Diameter: 5" (127 mm)

Inside Diameter: 2-3/16" (55.5 mm)

Available since 2005.

2. Base Part No. 13128 for use with Domed Concealed Sprinklers.

Outside Diameter: 5" (127 mm)

Inside Diameter: 2-15/32" (62.7 mm) for Part No. 13128.

Available since 2005.

3. Base Part No. 16340 for use with Concealed Sprinkler VK636.

Outside Diameter: 5-5/16" (135 mm)

Inside Diameter: 2-3/8" (60.6 mm)

Available since 2010.

### G. Standard Flat and Raised Surface-Mounted Escutcheons

Depth of Escutcheons: Flat: 1/8" (3.2 mm), Raised: 1" (25 mm)

Available since 1972.

### Material Standards:

#### A. Slip-on Style Model E-1 Recessed Escutcheons:

Cold Rolled Steel UNS-G10080 or Stainless Steel UNS-S30400

#### B. Threaded Style Model E-2 and E-3 Recessed Escutcheons:

24 ga. (0.61 mm) thick 1010-1018 mild steel

#### C. Model G-1 Recessed Escutcheons and Model F-1 Adjustable Escutcheons:

Cold Rolled Steel UNS-G10080

#### D. Expansion Plate (optional):

Cold Rolled Steel UNS-G10080

#### E. Standard Flat and Raised Surface-Mounted Escutcheons:

Flat Style Part Numbers 01960A, 01015A, 02960A, and 05464A:

Cold Rolled Steel UNS-G10080.

Flat Style Part Numbers 09488, 07526, and 09596\*: Stainless Steel

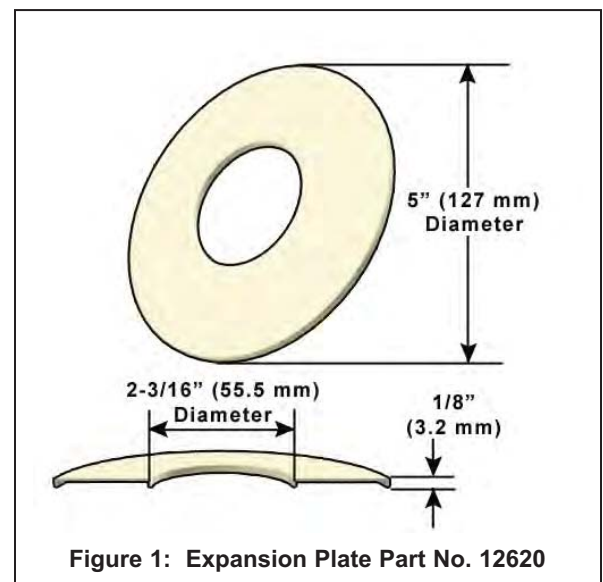


Figure 1: Expansion Plate Part No. 12620



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UNS-S43000

\* These may also be special ordered and manufactured from Brass (non-magnetic material). Contact the manufacturer for more information.

Raised Style Part Numbers 01961B and 01016A: Brass UNS-C26000 or UNS-C26800.

### Ordering Information: (Also refer to the current Viking price list.)

Viking recessed and adjustable escutcheons are available as escutcheon packages (includes outer cup and adapter). Escutcheon cups are also available to order separately as individual pieces for Model E-1, E-2, E3, or F-1 Escutcheons (refer to Table 1 on page 5. Order Viking escutcheons by adding the appropriate suffix for the finish to the base part number.

#### A. Model F-1 Adjustable and Model E-1, E-2, E-3, and G-1 Recessed Escutcheons:

1. To order as an escutcheon package (includes outer cup and adapter), specify the appropriate package part number from Table 1.
2. To order individual outer cup separately for Model E-1, E-2, E-3, or F-1 Escutcheons, specify the appropriate part number for the individual piece from Table 1.

#### B. Standard Flat and Raised Surface-Mounted Escutcheons: Specify the flat or raised escutcheon part number from Table 1.

Finish Suffix: Bright Brass = B, Polished Chrome = F, White Polyester = M-W, and Black Polyester = M-B.

For example, the Model E-1 Recessed Escutcheon for 1/2" NPT sprinkler, Brass finish = Part No. 06419AB. The 1/2" Model E-1 Recessed Escutcheon is also available in Antique Brass, Brushed Copper, Brushed Chrome, and Brushed Brass as standard finishes.

**NOTE:** Sprinklers are not included and must be ordered separately.

## 4. INSTALLATION

A. If the proposed installation of Model E-1, E-2, E-3, F-1, or G-1 Escutcheons requires recessing any of the heat-sensitive operating element, some Authorities Having Jurisdiction may limit the use, depending on the occupancy classification. Refer to the Authority Having Jurisdiction prior to installation. The use of quick response sprinklers may also be limited due to occupancy and hazard. Refer to the Authority Having Jurisdiction prior to installation.

B. All escutcheon styles are made to thread onto the sprinkler head prior to installing the sprinkler into the fitting. The escutcheon must be attached to the sprinkler prior to applying pipe-joint compound or PTFE tape to the sprinkler threads. **NOTE:** Sprinklers with protective caps or bulb shields must be contained within the caps or shields before applying pipe-joint compound or tape.

C. Refer to the appropriate sprinkler technical data page for additional warnings and installation instructions and then install the escutcheons according to the following sequence.

#### D. Model F-1 Adjustable and Model E-1, E-2, E-3, and G-1 Recessed Escutcheons:

(Refer to Figures 2-5.)

Step 1: Install all piping and cut the sprinkler nipple so that the reducing coupling is at the desired location and centered in a minimum 2-5/16" (59 mm) to a maximum 2-1/2" (64 mm) diameter opening in the ceiling or wall for Model E-1, E-2, or F-1 Escutcheons, 2-5/16" (59 mm) to 4-1/2" (115mm) for Model E-3, or 2-5/8" (66 mm) to 3-3/4" (95 mm) for Model G-1 Escutcheons.

Step 2: Secure the escutcheon adapter onto the sprinkler by hand turning the adapter clockwise onto the sprinkler threads. The face of the adapter should rest on the shoulder of the sprinkler wrench boss.

Step 3: Apply a small amount of pipe-joint compound or PTFE tape to the external threads of the sprinkler only, taking care not to allow a build-up of compound in the sprinkler inlet. **NOTE:** Sprinklers with protective caps or bulb shields must be contained within the caps or shields before applying pipe-joint compound or tape.

Step 4: Install the sprinkler into the coupling using the special recessed sprinkler wrench only, taking care not to over-tighten or damage the sprinkler operating parts. DO NOT use the escutcheon, sprinkler deflector, or fusible element to start or thread the sprinkler into a fitting.

Step 5: Test the system as required and repair all leaks. If a thread leak occurs, normally the unit must be removed, new pipe-joint compound or PTFE tape applied, and then reinstalled. This is due to the fact that when the joint seal leaks, the sealing compound or tape is washed out of the joint.

Step 6: **Remove plastic protective sprinkler caps and bulb shields AFTER the wall or ceiling finish work is completed where the sprinkler is installed and there no longer is a potential for mechanical damage to the sprinkler operating elements.** To remove the bulb shields, simply pull the ends of the shields apart where they are snapped together. To remove caps from frame style sprinklers, turn the caps slightly and pull them off the sprinklers. **SPRINKLER CAPS AND BULB SHIELDS MUST BE REMOVED FROM SPRINKLERS BEFORE PLACING THE SYSTEM IN SERVICE!** Retain a protective cap in the spare sprinkler cabinet.

Step 7: After installing the ceiling or wall with the required opening size, press on or thread on (depends on the style of escutcheon used) the outer escutcheon cup until the flanges touch the surface of the ceiling or wall.



## TECHNICAL DATA

## SPRINKLER ESCUTCHEONS

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(NOTE: If the optional escutcheon expansion plate is used, first slide it onto the escutcheon cup. The flange on the expansion plate should touch the surface of the ceiling or wall.)

With the slip-on style Model E-1 Recessed Escutcheon, the maximum adapter recess is 5/8" (16 mm).

With the threaded style Model E-2 and E-3 Recessed Escutcheons, the maximum recess is 1/2" (12.7 mm). **Note:** The face of the escutcheon adapter may extend up to 11/32" (8.7 mm) beyond edge of escutcheon cup, resulting in 27/32" (21.4 mm) total adjustment range.

With the Model F-1 Adjustable Escutcheon, the maximum recess is 1/4" (6.4 mm). **Note:** The face of the escutcheon adapter may extend up to 1/4" (6.4 mm) beyond the edge of the escutcheon cup, resulting in 1/2" (12.7 mm) total adjustment range.

With the slip-on style Model G-1 Recessed Escutcheon, the maximum adapter recess is 1/2" (12.7 mm).

DO NOT modify the unit. If necessary, re-cut the sprinkler drop nipple as required.

### E. Standard Flat and Raised Surface-Mounted Escutcheons:

Step 1: Install all piping and cut the sprinkler nipple so that the reducing coupling is at the desired location and centered in a maximum 2-1/2" (64 mm) diameter opening in the ceiling or wall.

Step 2: Secure the escutcheon onto the sprinkler by hand turning the escutcheon clockwise onto the sprinkler threads. (The convex surface of the escutcheon must face toward the deflector of the sprinkler.)

Step 3: Apply a small amount of pipe-joint compound or PTFE tape to the external threads of the sprinkler only, taking care not to allow a build-up of compound in the sprinkler inlet. **NOTE:** Sprinklers with protective caps or bulb shields must be contained within the caps or shields before applying pipe-joint compound or tape.

Step 4: Install the sprinkler into the coupling using the special sprinkler wrench only, taking care not to over-tighten or damage the sprinkler operating parts. DO NOT use the escutcheon, sprinkler deflector, or fusible element to start or thread the sprinkler into a fitting.

Step 5: After installation, the entire sprinkler system must be tested. The test must be conducted to comply with the installation standards. Make sure the sprinkler is properly tightened. If a thread leak occurs, normally the unit must be removed, new pipe-joint compound or tape applied, and then reinstalled. This is due to the fact that when the joint seal leaks, the sealing compound or tape is washed out of the joint.

Step 6: **Remove plastic protective sprinkler caps and bulb shields AFTER the wall or ceiling finish work is completed where the sprinkler is installed and there no longer is a potential for mechanical damage to the sprinkler operating elements.** To remove the bulb shields, simply pull the ends of the shields apart where they are snapped together. To remove caps from frame style sprinklers, turn the caps slightly and pull them off the sprinklers. **SPRINKLER CAPS AND BULB SHIELDS MUST BE REMOVED FROM SPRINKLERS BEFORE PLACING THE SYSTEM IN SERVICE!** Retain a protective cap in the spare sprinkler cabinet.

DO NOT modify the unit. If necessary, re-cut the sprinkler drop nipple as required.

### F. Disassembly:

The outer cups of Viking adjustable and recessed escutcheons can be removed and reinstalled without removing the sprinklers to allow access above the ceiling or to replace it, if necessary.

1. For slip-on style Model E-1 or G-1 Recessed Escutcheons and Model F-1 Adjustable Escutcheons, remove the outer cup simply by pulling it outward and away from the wall or ceiling.
2. To remove the outer cup of the threaded style Model E-2 and E-3 Recessed Escutcheons, turn it counterclockwise to unthread it from the adapter.

If it is necessary to remove the entire unit, the system must be removed from service. Refer to maintenance instructions on the appropriate sprinkler technical data page and follow all warnings and instructions.

## 5. OPERATION

Refer to the sprinkler technical data page for the sprinkler model used.

## 6. INSPECTIONS, TESTS AND MAINTENANCE

Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

## 7. AVAILABILITY

Viking sprinklers and escutcheons are available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

## 8. GUARANTEE

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.



## TECHNICAL DATA

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Base Part Number	Material	Style	Sprinkler Thread Size	Available Finishes	Outside Diameter
<b>Standard Flat and Raised Surface-Mounted Escutcheons</b>					
01960A	Steel	Flat	1/2" (15 mm)	B, F	3-5/16" (84.1 mm)
09488	Stainless Steel††	Flat	1/2" (15 mm)	F, JN	3-5/16" (84.1 mm)
01015A	Steel	Flat	3/4" (20 mm)	F	3-5/16" (84.1 mm)
02960A	Steel	Flat	1/2" (15 mm)	B, F, M/W, M/B	2-3/4" (69.9 mm)
07526	Stainless Steel††	Flat	1/2" (15 mm)	F, M/W, JN	2-3/4" (69.9 mm)
05464A	Steel	Flat	3/4" (20 mm)	B, F, M/W	2-3/4" (69.9 mm)
09596	Stainless Steel††	Flat	3/4" (20 mm)	F, JN	2-3/4" (69.9 mm)
01961B	Brass	Raised	1/2" (15 mm)	F	3-1/16" (77.7 mm)
01016A	Brass	Raised	3/4" (20 mm)	F	3-1/16" (77.7 mm)
<b>E-1 Slip-on Style Recessed Escutcheon Packages (includes adapter and outer cup)</b>					
11123	Steel	Recessed Slip-on	3/8" (10 mm)	F, M/W	3-1/16" (77.7 mm)
06419A	Steel	Recessed Slip-on	1/2" (15 mm)	B, F, M/W, M/B	3-1/16" (77.7 mm)
07902	Stainless Steel	Recessed Slip-on	1/2" (15 mm)	F, M/W, JN	3-1/16" (77.7 mm)
13220	Stainless Steel	Recessed Slip-on	3/4" (20 mm)	F, M/W, JN	3-1/16" (77.7 mm)
06420A	Steel	Recessed Slip-on	3/4" (20 mm)	B, F, M/W, M/B	3-1/16" (77.7 mm)
<b>E-2 Threaded Style Recessed Escutcheon Packages (includes adapter and outer cup)</b>					
11038	Steel	Recessed Threaded	1/2" (15 mm)	F, M/W	3-1/8" (79.4 mm)
11625	Steel	Recessed Threaded	3/4" (20 mm)	F, M/W	3-1/8" (79.4 mm)
<b>E-3 Threaded Style Recessed Escutcheon Packages (includes adapter and outer cup)</b>					
18347	Steel	Recessed Threaded	1/2" (15 mm)	F, M/W	5 -1/8" (130.2mm)
18348	Steel	Recessed Threaded	3/4" (20 mm)	F, M/W	5 -1/8" (130.2mm)
<b>F-1 Adjustable Escutcheon Packages (includes adapter and outer cup)</b>					
06911A	Steel	Adjustable	1/2" (15 mm)	B, F, M/W, M/B	3-1/16" (77.7 mm)
06912A	Steel	Adjustable	3/4" (20 mm)	B, F, M/W, M/B	3-1/16" (77.7 mm)
<b>G-1 Recessed Escutcheon Package (includes adapter and outer cup)</b>					
14315	Steel	Recessed Slip-on	1/2" (15 mm)	B, F, M/W, M/B	4" (101.6 mm)
14955	Steel	Recessed Slip-on	3/4" (20 mm)	B, F, M/W, M/B	4" (101.6 mm)
<b>Optional Expansion Plates Available Separately</b>					
12620	Steel	E-1, E-2 Recessed & F-1 Adjustable	3/8", 1/2", & 3/4" (10, 15, & 20 mm)	B, F, M/W, M/B, M/SW1641, B/B, F/B, E/B	5" (127 mm)
13128	Steel	Domed Concealed	1/2" & 3/4" (15 & 20 mm)	F, M/W	5" (127 mm)
16340	Steel	Concealed (for Sprinkler VK636)	3/4" (20 mm)	F, M/W	5-5/16" (135 mm)
<p><b>Escutcheon Finishes:</b> B = Bright Brass, F = Polished Chrome, M/W = White Polyester, M/B = Black Polyester, JN = Electroless Nickel PTFE, M/ SW1641 = Navajo White Paint, B/A = Antique Brass, B/B = Brushed Brass, F/B = Brushed Chrome, E/B = Brushed Copper. <b>Note:</b> Other colors are available on request with the same listings and approvals as the standard colors. See Sherwin-Williams® Color Answers™ Interior Color Selection color chart.</p> <p>††Escutcheons 09488, 07526, and 09596 may also be special ordered and manufactured from Brass (non-magnetic material). Contact the manufacturer for more details.</p>					
<b>Table 1</b>					



	<b>TECHNICAL DATA</b>	<b>SPRINKLER ESCUTCHEONS</b>
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The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058  
 Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

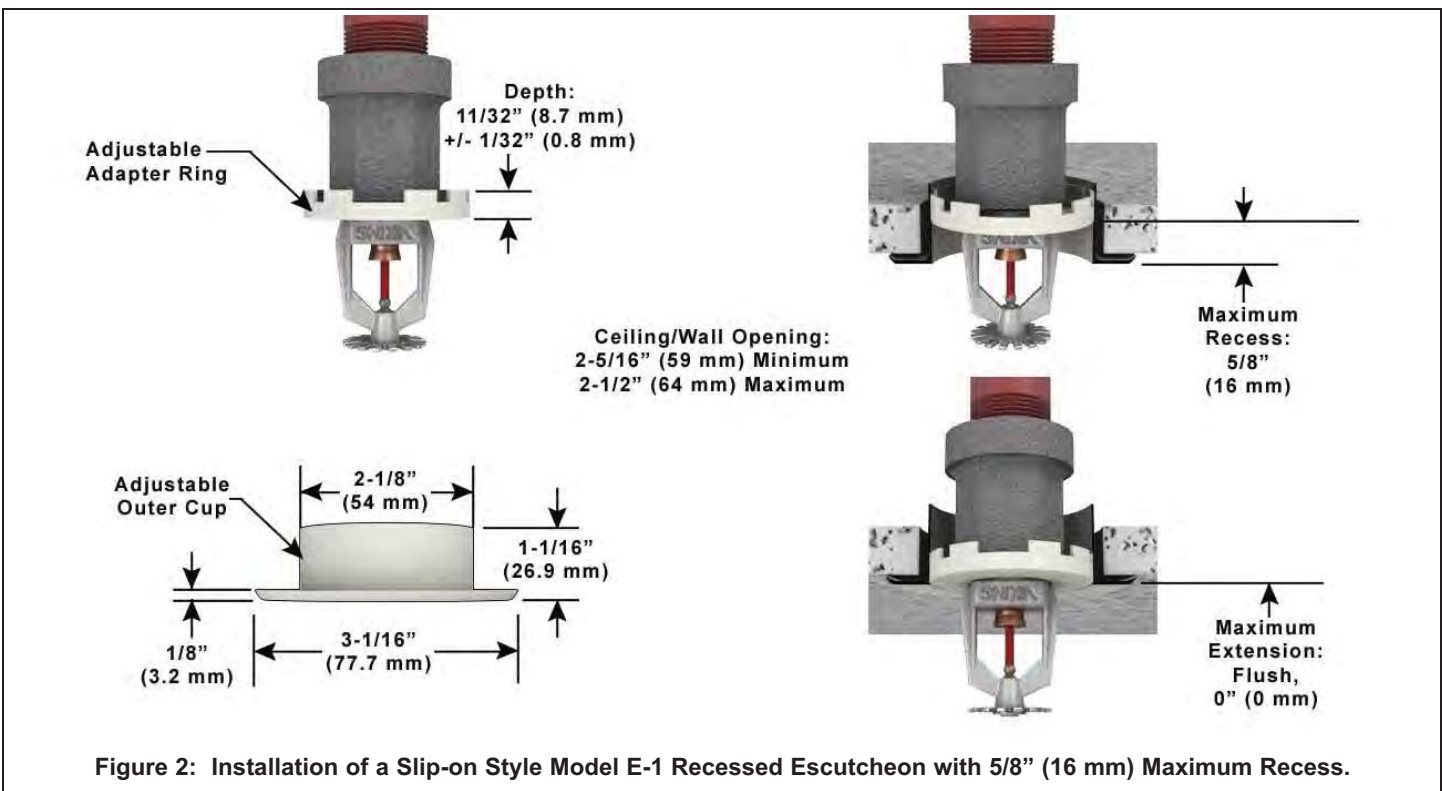
**IMPORTANT NOTES**

Per the current edition of NFPA 13: "Escutcheons used with recessed, flush-type, or concealed sprinklers shall be part of a listed sprinkler assembly." The Viking Corporation will not authorize the sale of unlisted recessed sprinkler assemblies nor assume any liability involving recessed sprinkler assemblies that are not considered cULus Listed, FM Approved, or in full compliance with NFPA requirements".

Listings and approvals vary, depending on the sprinkler model, temperature rating, finish, and occupancy classification.

**WARNING** Viking products are manufactured and tested to meet the rigid requirements of the approving agency. The sprinklers are designed to be installed in accordance with recognized installation standards. Deviation from the standards or any alteration to the sprinkler after it leaves the factory including, but not limited to: painting, plating, coating, or modification, may render the sprinkler inoperative and will nullify the approval and any guarantee made by The Viking Corporation.

**IMPORTANT:** Always refer to Bulletin Form No. F\_091699 - Care and Handling of Sprinklers. Also refer to the appropriate sprinkler data page. Viking sprinklers are designed to be installed in accordance with the latest edition of Viking technical data, the latest standards of NFPA, FM Global, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards whenever applicable. The use of certain types of sprinklers may be limited due to occupancy and hazard. Refer to the Authority Having Jurisdiction prior to installation.



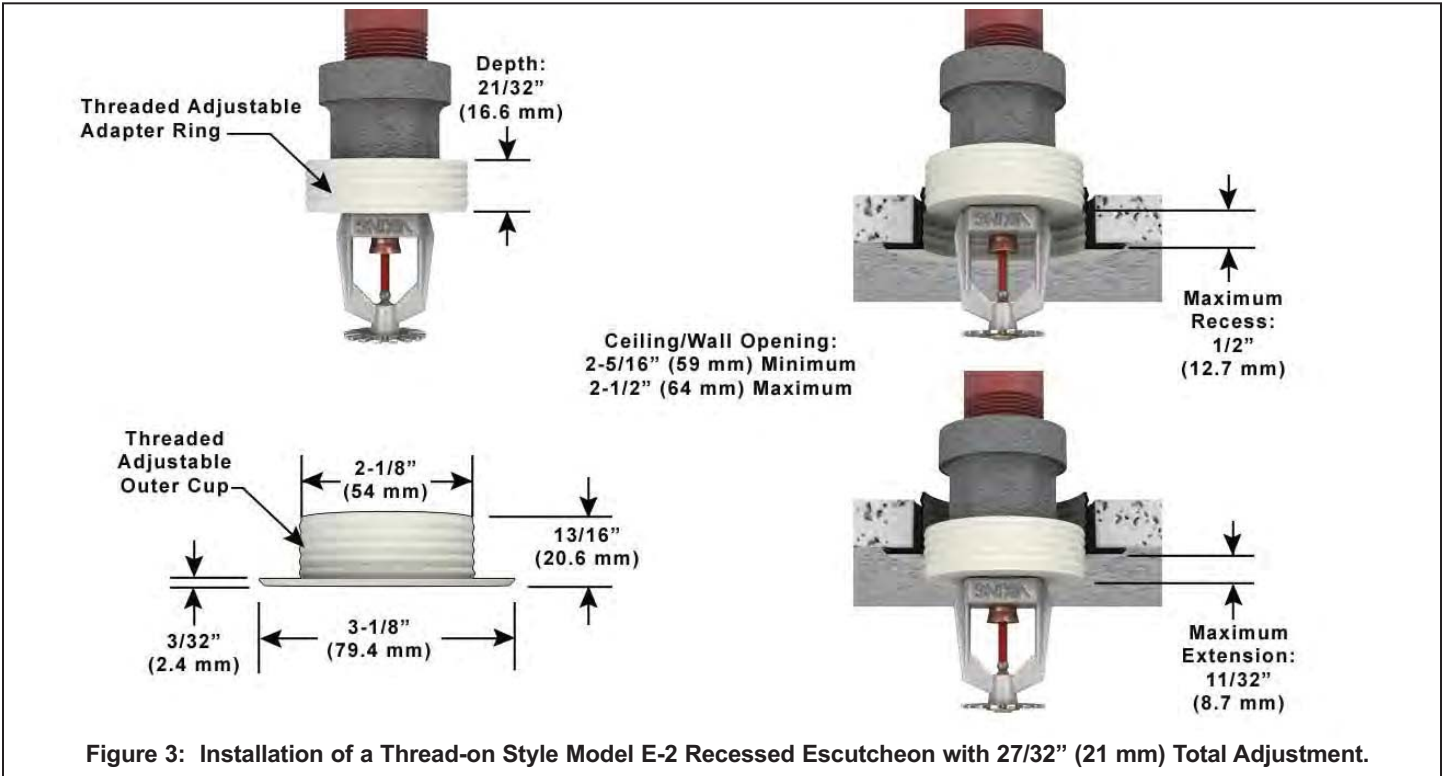


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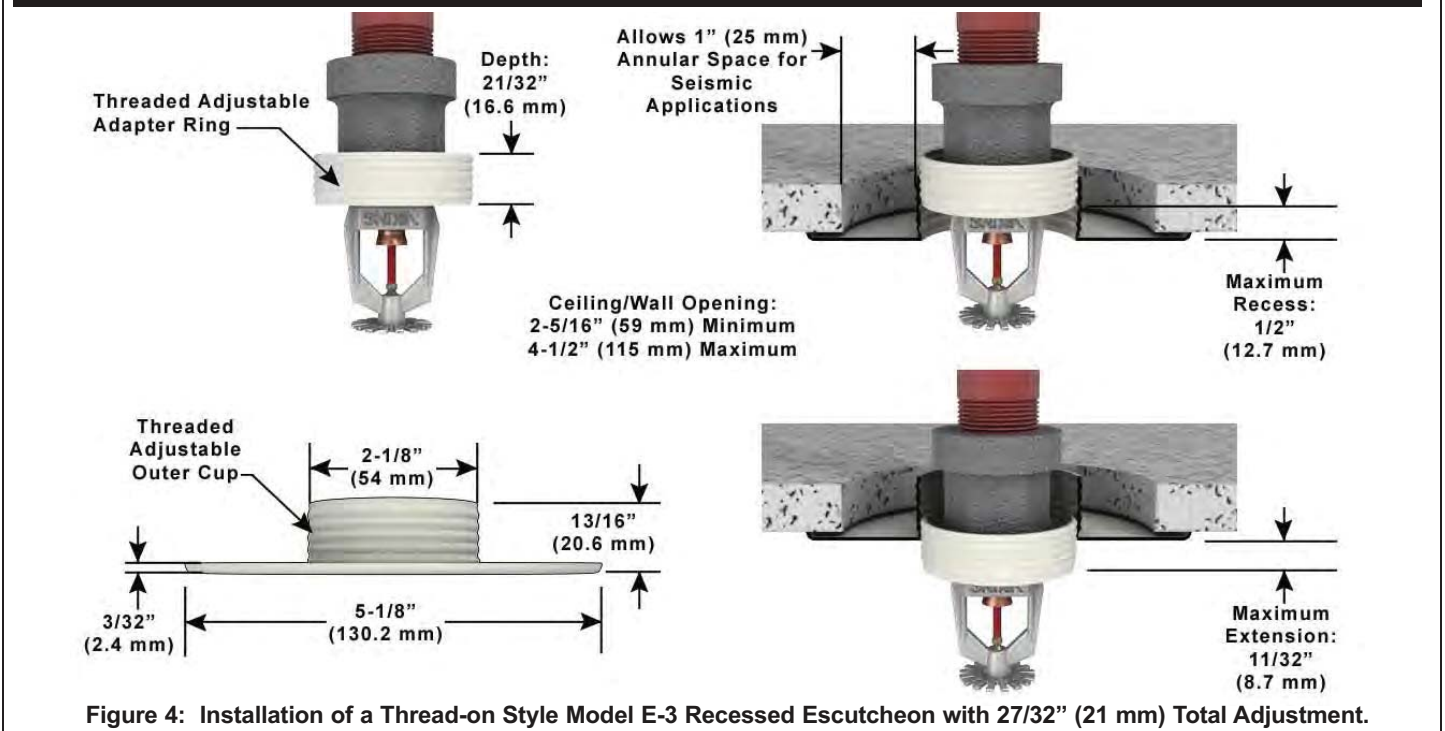
SPRINKLER ESCUTCHEONS

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Model E-3 Recessed Escutcheon meets IBC-ASCE/SEI 7 Codes for Seismic Areas C, D, and E





TECHNICAL DATA

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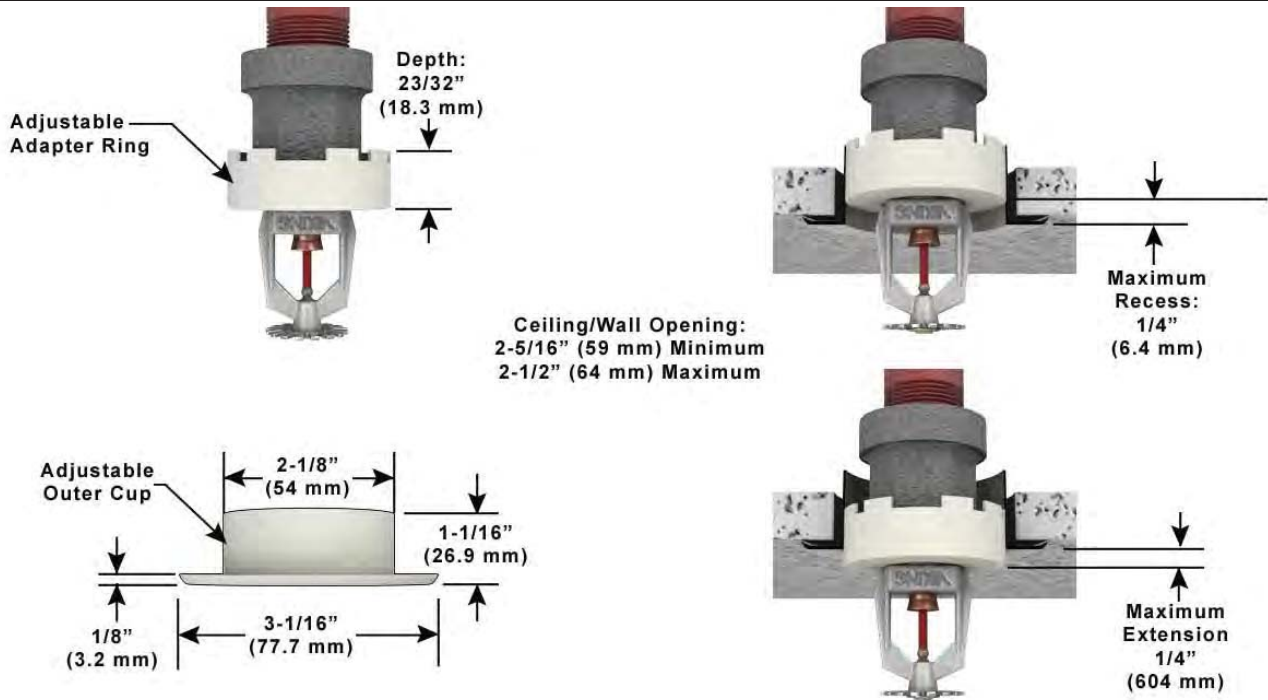


Figure 5: Installation of a Model F-1 Adjustable Escutcheon with  $\frac{1}{2}$ " (12 mm) Total Adjustment.

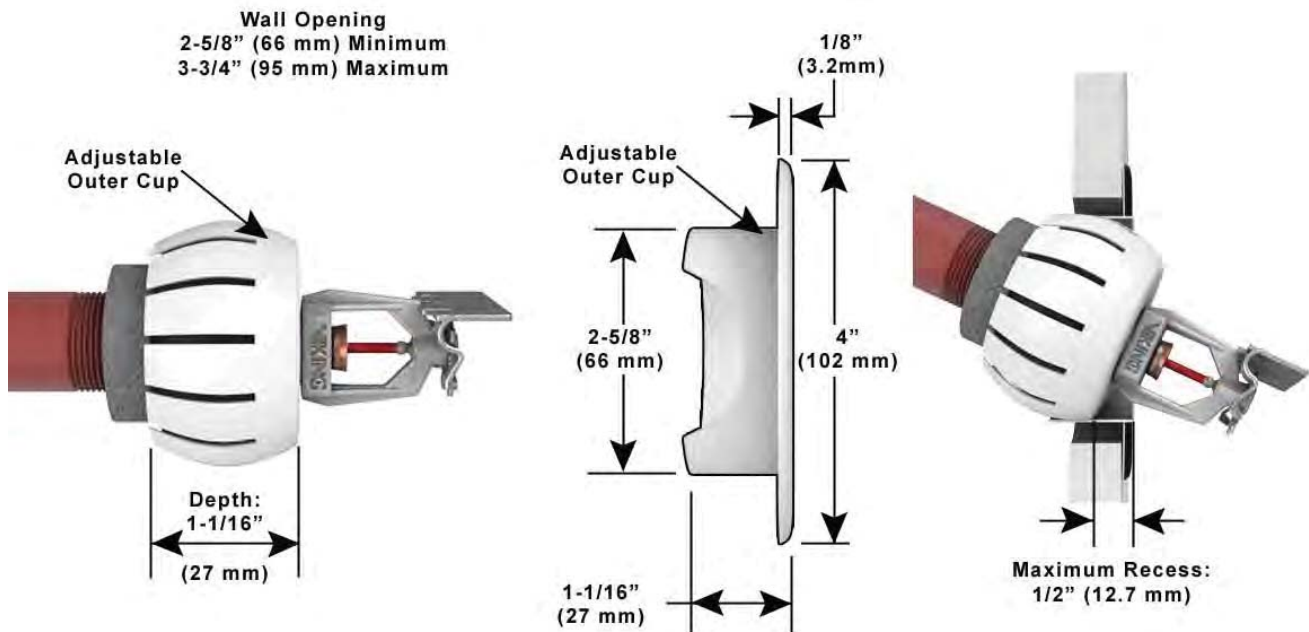


Figure 6: Installation of the Model G-1 Recessed Escutcheon with up to  $\frac{1}{2}$ " (12.7 mm) Adjustment.

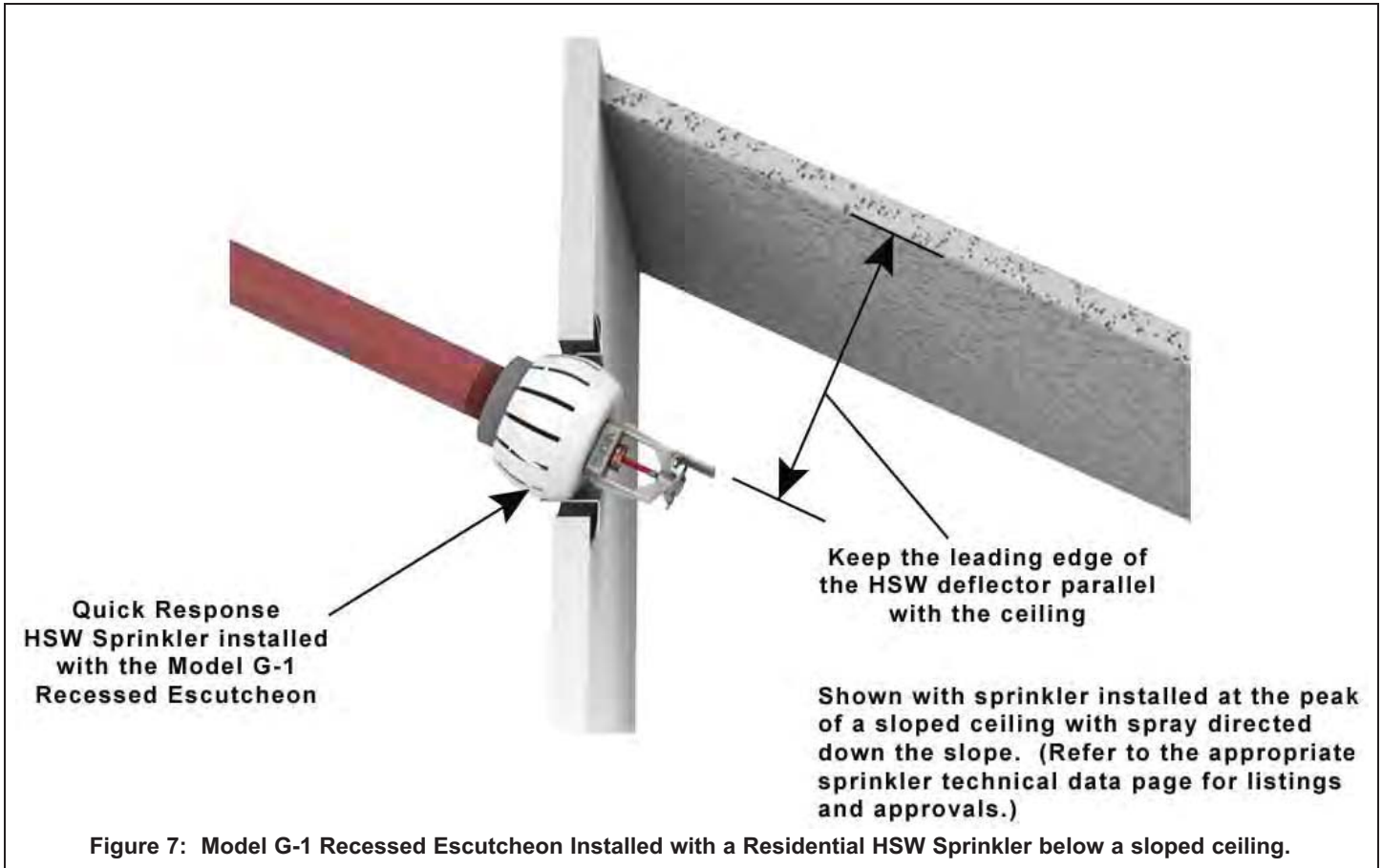


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## TECHNICAL DATA

### MIRAGE® STANDARD AND QR CONCEALED PENDENT SPRINKLER VK462 AND HP SPRINKLER VK463 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

#### 1. DESCRIPTION

Viking Mirage® Standard and Quick Response Concealed Pendent Sprinkler VK462 and HP Sprinkler VK463 are thermosensitive glass-bulb spray sprinklers designed for installation on concealed pipe systems where the appearance of a smooth ceiling is desired.

The sprinkler is pre-assembled with a threaded adapter for installation with a low-profile cover assembly that provides up to ½" (12.7 mm) of vertical adjustment. The two-piece design allows installation and testing of the sprinkler prior to installation of the cover plate. The "push-on", "thread-off" design of the concealed cover plate assembly allows easy installation of the cover plate after the system has been tested and the ceiling finish has been applied. The cover assembly can be removed and reinstalled, allowing temporary removal of ceiling panels without taking the sprinkler system out of service or removing the sprinkler. The Electroless Nickel PTFE (ENT) coating has been investigated for installation in corrosive atmospheres and is cULus Listed as corrosion resistant as indicated in the Approval Charts. The ENT finish is only available for the sprinkler assembly, the cover plate is not plated.



#### 2. LISTINGS AND APPROVALS



**cULus Listed:** Category VNIV



**FM Approval:** Class 2015



**NYC Approved:** MEA 89-92-E, Volume 32



**VdS Approved:** Certificate G4080021



**LPCB Approved:** Ref. No. 096e/12



**CE Certified:** Standard EN 12259-1, EC-certificate of conformity 0832-CPD-2032



**CCCF Approved:** Approved by the China Certification Center for Fire Products (CCCF)

Refer to Approval Chart 1 Design Criteria for cULus Listing requirements, and refer to Approval Chart 2 and Design Criteria on page for FM Approval requirements that must be followed.

Viking Technical Data may be found on  
The Viking Corporation's Web site at  
<http://www.vikinggroupinc.com>.  
The Web site may include a more recent  
edition of this Technical Data Page.

#### 3. TECHNICAL DATA

##### Specifications:

Available since 2006.

Minimum Operating Pressure: 7 psi (0.5 bar)\*

**Maximum Working Pressure: Sprinkler VK463 is rated for use with water working pressures ranging from the minimum 7 psi (0.5 bar) up to 250 psi (17.2 bar) for high-pressure systems. High-pressure (HP) sprinklers can be identified by locating "250" stamped on the deflector. Sprinkler VK462 is rated to a maximum 175 psi (12 bar) wwp.**

Factory tested hydrostatically to 500 psi (34.5 bar)

Thread size: 1/2" (15 mm) NPT

Nominal K-Factor: 5.6 U.S. (80.6 metric†)

Glass-bulb fluid temperature rated to -65°F (-55°C)

Patents Pending

\*cULus Listing, FM Approval, and NFPA 13 installs require a minimum of 7 psi (0.5 bar). The minimum operating pressure for LPCB and CE Approvals ONLY is 5 psi (0.35 bar).

†Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

##### Material Standards:

Sprinkler Body: Brass UNS-C84400

Deflector: Copper UNS-C19500 for Sprinkler VK462

Phosphor Bronze UNS-C51000 for Sprinkler VK463

Deflector Pins: Stainless Steel Alloy

Bulb: Glass, nominal 3 mm diameter

Pip Cap and Insert Assembly: Copper UNS-C11000 and Stainless Steel UNS-S30400

Button: Brass UNS-C36000

Screws: 18-8 Stainless Steel

Belleville Spring Sealing Assembly: Nickel Alloy, coated on both sides with Teflon Tape

Yoke: Phosphor Bronze UNS-C51000

Cover Adapter: Cold Rolled Steel UNS-G10080, Finish: Clear Chromate over Zinc Plating



## TECHNICAL DATA

## MIRAGE® STANDARD AND QR CONCEALED PENDENT SPRINKLER VK462 AND HP SPRINKLER VK463 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

### Cover Assembly Materials:

Cover: Copper UNS-C11000

Base: Brass UNS-C26000 or UNS-C26800

Springs: Nickel Alloy

Solder: Eutectic

### Ordering Information: (Also refer to the current Viking price list.)

Viking Mirage® Standard and Quick Response Concealed Pendent Sprinklers and Cover Plate Assemblies must be ordered separately:

**Sprinkler:** Base Part No. VK462 - 13503A for Brass finish and 13503JN for ENT finish. VK463 - HP Base Part No. 13667A

Specify sprinkler temperature rating by adding the appropriate suffix for the temperature rating to the base part number:

Temperature Suffix: 155 °F (68 °C) = B, 175 °F (79 °C) = D, 200 °F (93 °C) = E

For example, sprinkler VK463 with a 155 °F (68 °C) temperature rating = 13667AB.

**Cover Plate Assembly:** Base Part No. 13504 (2-3/4" diameter), Base Part No. 13642 (3-5/16" diameter), or Base Part No. 15394 (square cover plate, 3-5/16" diameter)

Specify finish and temperature rating of the cover plate assembly by adding the appropriate suffixes for the finish and the cover temperature rating to the base part number:

Finish Suffix: Polished Chrome = F, Brushed Chrome = F-/B, Bright Brass = B, Antique Brass = B-/A, Brushed Brass = B-/B, Brushed Copper = E-/B, Painted White = M-/W, Painted Ivory = M-/I, Painted Black = M-/B

Temperature Suffix: 135 °F (57 °C) UL (139 °F (59 °C) FM and LPCB) = A, 165 °F (74 °C) = C

For example, cover 13504 with a Polished Chrome finish and a 165 °F (74 °C) temperature rating = 13504FC.

Note: Square cover plate 15394 cULus Listing is for the 135 °F (57 °C) temperature rated cover plate only. Refer to the Approval Chart.

**Available Finishes And Temperature Ratings:** Refer to Table 1.

**Accessories:** (Also refer to the "Sprinkler Accessories" section of the Viking data book.)

### Sprinkler Wrenches\*\*:

A. Heavy Duty Wrench Part No. 14047W/B (available since 2006), or

B. Head Cabinet Wrench Part No. 14031\*\*\* (available since 2006)

C. Optional Concealed Cover Plate Installer Tool Part No. 14412 for cover 13504, or Part No. 14867 for the large diameter cover (available since 2007)

\*\*Requires a 1/2" ratchet (not available from Viking). \*\*\*Optional for removal of the protective cap. Ideal for sprinkler cabinets.

**Sprinkler Cabinet:** Part No. 01731A (available since 1971)

## 4. INSTALLATION

Refer to appropriate NFPA Installation Standards.

## 5. OPERATION

During fire conditions, when the temperature around the sprinkler approaches its operating temperature, the cover plate detaches. Continued heating of the exposed sprinkler causes the heat-sensitive liquid in the glass bulb to expand and the bulb to shatter, releasing the yoke, pip-cap and sealing spring assembly. Water flowing through the sprinkler orifice strikes the sprinkler deflector, forming a uniform spray pattern to extinguish or control the fire.

## 6. INSPECTIONS, TESTS AND MAINTENANCE

Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

## 7. AVAILABILITY

Viking Sprinklers VK462 and VK463 are available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

## 8. GUARANTEE

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.



## TECHNICAL DATA

## MIRAGE® STANDARD AND QR CONCEALED PENDENT SPRINKLER VK462 AND HP SPRINKLER VK463 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

**TABLE 1: AVAILABLE SPRINKLER TEMPERATURE RATINGS AND FINISHES**

Sprinkler Temperature Classification	Sprinkler Nominal Temperature Rating <sup>1</sup>	Maximum Ambient Ceiling Temperature <sup>2</sup>	Temperature Rating of Cover Assembly (Required)	Bulb Color
Ordinary	155 °F (68° C)	100 °F (38 °C)	135 °F (57 °C) cULus 139 °F (59 °C) FM and LPCB	Red
Intermediate	175 °F (79 °C)	150 °F (65 °C)	165 °F (74 °C)	Yellow
Intermediate	200 °F (93 °C)	150 °F (65 °C)	165 °F (74 °C)	Green

**Cover Plate Finishes:** Polished Chrome, Brushed Chrome, Bright Brass, Antique Brass, Brushed Brass, Brushed Copper, Painted White, Painted Ivory, or Painted Black

**Sprinkler Finishes:** Brass and ENT

**Corrosion Resistant Coatings<sup>3</sup>:** ENT

### Footnotes

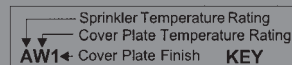
<sup>1</sup> The sprinkler temperature rating is stamped on the sprinkler deflector.

<sup>2</sup> Based on NFPA-13. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.

<sup>3</sup> The corrosion resistant coatings have passed the standard corrosion test required by the approving agencies indicated in the Approval Charts. These tests cannot and do not represent all possible corrosive environments. Prior to installation, verify through the end-user that the coatings are compatible with or suitable for the proposed environment. For automatic sprinklers, the ENT coating is applied to all exposed exterior surfaces, including the waterway, but the Belleville spring is exposed.

## Approval Chart 1 (UL)

Mirage® Concealed Pendent Sprinklers VK462 and VK463



Sprinkler Base Part No. <sup>1</sup>	SIN	NPT Thread Size		Nominal K-Factor		Maximum Water Working Pressure	Listings and Approvals <sup>4</sup> (Refer also to Design Criteria)					
		Inch	mm	U.S.	metric <sup>2</sup>		cULus <sup>5</sup>	NYC	VdS <sup>7</sup>	LPCB	CE	CCC
<b>Standard Response Applications</b>												
13503A	VK462	1/2"	15	5.6	80.6	175 psi (12 bar)	--	--	AY1, CZ1	AY1, BZ1	AY1, CZ1 <sup>8</sup>	AV1, CW1
<b>Quick Response Applications</b>												
13503A	VK462	1/2"	15	5.6	80.6	175 psi (12 bar)	AV1, BX1	AV1, BW1 <sup>6</sup>	--	--	--	--
13503JN <sup>11</sup>	VK462	1/2"	15	5.6	80.6	175 psi (12 bar)	AV1, BX1	AV1, BW1 <sup>6</sup>	--	--	--	--
13667A	VK463	1/2"	15	5.6	80.6	250 psi (17.2 bar) <sup>3</sup>	AV1, BX1	AV1, BW1 <sup>6</sup>	--	--	--	--
<b>Sprinkler Temperature Ratings</b>		<b>Cover Plate Assembly Temperature Ratings<sup>9</sup></b>					<b>Cover Plate Assembly Finishes<sup>10</sup></b>					
A - 155 °F (68 °C) B - 175 °F (79 °C) and 200 °F (93 °C) C - 200 °F (93 °C)		V - 135 °F (57 °C) cULus Listed cover 13504 <sup>1</sup> , 13642 <sup>1</sup> (large diameter), or 15394 <sup>1</sup> (square cover plate) W - 165 °F (74 °C) cover 13504 <sup>1</sup> or 13642 <sup>1</sup> (large diameter) X - 165 °F (74 °C) cover 13504 <sup>1</sup> , or 13642 <sup>1</sup> (large diameter) Y - 135 °F (57 °C) cover 13504 <sup>1</sup> LPCB Approved as 139 °F (59 °C) Z - 165 °F (74 °C) cover 13504 <sup>1</sup>					1 - Polished Chrome, Brushed Chrome, Bright Brass, Antique Brass, Brushed Brass, Brushed Copper, Painted White, Painted Ivory, or Painted Black					

### Footnotes

<sup>1</sup> Part number shown is the base part number. For complete part number, refer to current Viking price list schedule.

<sup>2</sup> Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

<sup>3</sup> The Water Working Pressure rating is stamped on the deflector.

<sup>4</sup> This chart shows the listings and approvals available at the time of printing. Other approvals may be in process. Check with the manufacturer for any additional approvals.

<sup>5</sup> Listed by Underwriter's Laboratories for use in the U.S. and Canada.

<sup>6</sup> Accepted for use, City of New York Department of Buildings, MEA Number 89-92-E, Vol. 32.

<sup>7</sup> VdS Approved, standards VdS 2344:2005-12, VdS 2100-25:2008-01, and EN 12259-1:1999 + A1:2001 + A2:2004 + A3:2006, Certificate G4080021.

<sup>8</sup> CE Certified, Standard EN 12259-1, EC-certificate of conformity 0832-CPD-2032.

<sup>9</sup> The 135/139 °F cover has an orange label. The 165 °F (74 °C) cover has a white label.

<sup>10</sup> Painted finish consists of Polyester Baked Enamel. Other paint colors are available on request with the same listings as the standard paint colors. Listings and approvals apply for any paint manufacturer. Contact Viking for additional information.

<sup>11</sup> cULus Listed as corrosion resistant.

**NOTE:** Custom colors are indicated on a label inside the cover assembly. Refer to Figure 1.

	<b>TECHNICAL DATA</b>	<b>MIRAGE® STANDARD AND QR CONCEALED PENDENT SPRINKLER VK462 AND HP SPRINKLER VK463 (K5.6)</b>
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**The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058**  
**Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com**

**DESIGN CRITERIA - UL**  
(Also refer to Approval Chart 1)

**cULus Listing Requirements:**

Mirage® Concealed Pendent Sprinklers VK462 and VK463 are cULus Listed as quick response for installation in accordance with the latest edition of NFPA 13 for standard coverage pendent spray sprinklers as indicated below.

- For hazard occupancies up to and including Ordinary Hazard, Group II.
- Protection areas and maximum spacing shall be in accordance with the tables provided in NFPA 13. Maximum spacing allowed is 15 ft. (4.6 m).
- Minimum spacing allowed is 6 ft. (1.8 m) unless baffles are installed in accordance with NFPA 13.
- Minimum distance from walls is 4 in. (102 mm).
- Maximum distance from walls shall be no more than one-half of the allowable distance between sprinklers. The distance shall be measured perpendicular to the wall.
- The sprinkler obstruction rules contained in NFPA 13 for standard coverage pendent spray sprinklers must be followed.

**NOTE: Concealed sprinklers must be installed in neutral or negative pressure plenums only.**

**VdS Approval Requirements:**

- a) The sprinkler can be installed in a concrete ceiling (massive ceiling) or in a false ceiling made of light materials.
- b) This sprinkler is deflector fixed type and can be only activated by heat. The housing is not tight.
- c) Follow installation guidelines of current standards, CEA4001VdS and EN12845. These sprinklers can only be installed in LH and OH occupancies, except in OH4.

**NOTES:** Due to the design the sprinkler type 'Domed-CCP' shall not be installed in false ceilings in which the false ceiling space is protected by a water extinguishing system.

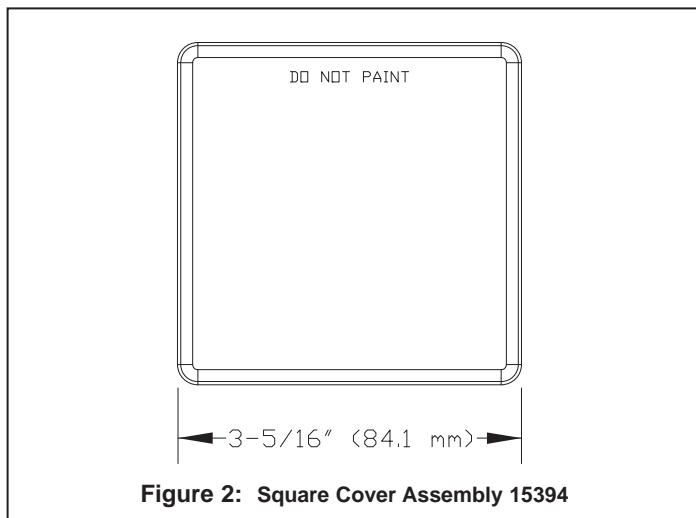
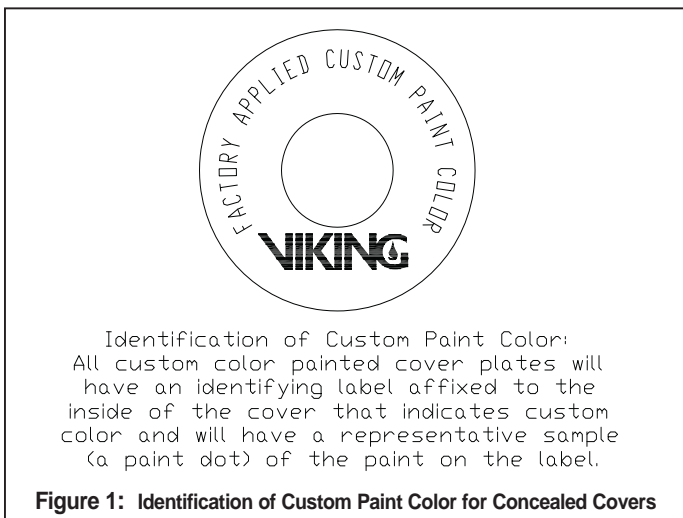
Due to the design the sprinkler type 'Domed-CCP' shall not be installed in false ceilings in which during a fire the pressure above the false ceiling may be assumed to be higher than the pressure below the false ceiling.

The criterion for the dropping of the cover relevant for this approval is heat.

Steps of installation:

1. Prepare the sprinkler key.
2. Remove the plastic cover.
3. Hold the sprinkler with the wrench and fasten it.
4. Replace the plastic cover and do not remove until the cover is installed.

**IMPORTANT: Always refer to Bulletin Form No. F\_091699 - Care and Handling of Sprinklers. Also refer to page SR1-3 or QR1-3 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.**







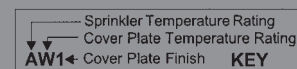
## TECHNICAL DATA

### MIRAGE® STANDARD AND QR CONCEALED PENDENT SPRINKLER VK462 AND HP SPRINKLER VK463 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058  
 Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

### Approval Chart 2 (FM)

Mirage® Standard Response Concealed Pendent Sprinkler VK462



Sprinkler Base Part No. <sup>1</sup>	SIN	NPT Thread Size		Nominal K-Factor		Maximum Water Working Pressure	FM Approvals <sup>3</sup> (Refer also to Design Criteria below.)
		Inch	mm	U.S.	metric <sup>2</sup>		
13503A	VK462	1/2"	15	5.6	80.6	175 psi (12 bar)	AW1, BX1
<b>Sprinkler Temperature Ratings</b> A - 155 °F (68 °C) B - 175 °F (79 °C) and 200 °F (93 °C)		<b>Cover Plate Assembly Temperature Ratings<sup>4</sup></b> W - 139 °F (59 °C) cover 13504 <sup>1</sup> , 13642 <sup>1</sup> (large diameter), or 15394 <sup>1</sup> (square cover plate) X - 165 °F (74 °C) cover 13504 <sup>1</sup> , 13642 <sup>1</sup> (large diameter), or 15394 <sup>1</sup> (square cover plate)				<b>Cover Plate Assembly Finishes<sup>5</sup></b> 1 - Polished Chrome, Brushed Chrome, Bright Brass, Antique Brass, Brushed Brass, Brushed Copper, Painted White, Painted Ivory, or Painted Black	

#### Footnotes

- <sup>1</sup> Part number shown is the base part number. For complete part number, refer to current Viking price list schedule.
- <sup>2</sup> Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.
- <sup>3</sup> This chart shows the FM Approvals available at the time of printing. Other approvals may be in process. Check with the manufacturer for any additional approvals.
- <sup>4</sup> The 139 °F (59 °C) cover has an orange label. The 165 °F (74 °C) cover has a white label.
- <sup>5</sup> Painted finish consists of Polyester Baked Enamel. Other paint colors are available on request with the same listings as the standard paint colors. Listings and approvals apply for any paint manufacturer. Contact Viking for additional information.

**NOTE:** Custom colors are indicated on a label inside the cover assembly. Refer to Figure 1.

### DESIGN CRITERIA - FM

(Also refer to Approval Chart 2 above.)

#### FM Approval Requirements:

Viking Concealed Pendent Sprinkler VK462 is FM Approved as a standard response **Non-Storage** concealed pendent sprinkler as indicated in the FM Approval Guide. For specific application and installation requirements, reference the latest applicable FM Loss Prevention Data Sheets (including Data Sheet 2-0). FM Global Loss Prevention Data Sheets contain guidelines relating to, but not limited to: minimum water supply requirements, hydraulic design, ceiling slope and obstructions, minimum and maximum allowable spacing, and deflector distance below the ceiling.

**NOTE:** The FM installation guidelines may differ from cULus and/or NFPA criteria.

**IMPORTANT:** Always refer to Bulletin Form No. F\_091699 - Care and Handling of Sprinklers. Also refer to page SR1-3 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, FM Global, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.



TECHNICAL DATA

MIRAGE® STANDARD AND QR CONCEALED PENDENT SPRINKLER VK462 AND HP SPRINKLER VK463 (K5.6)

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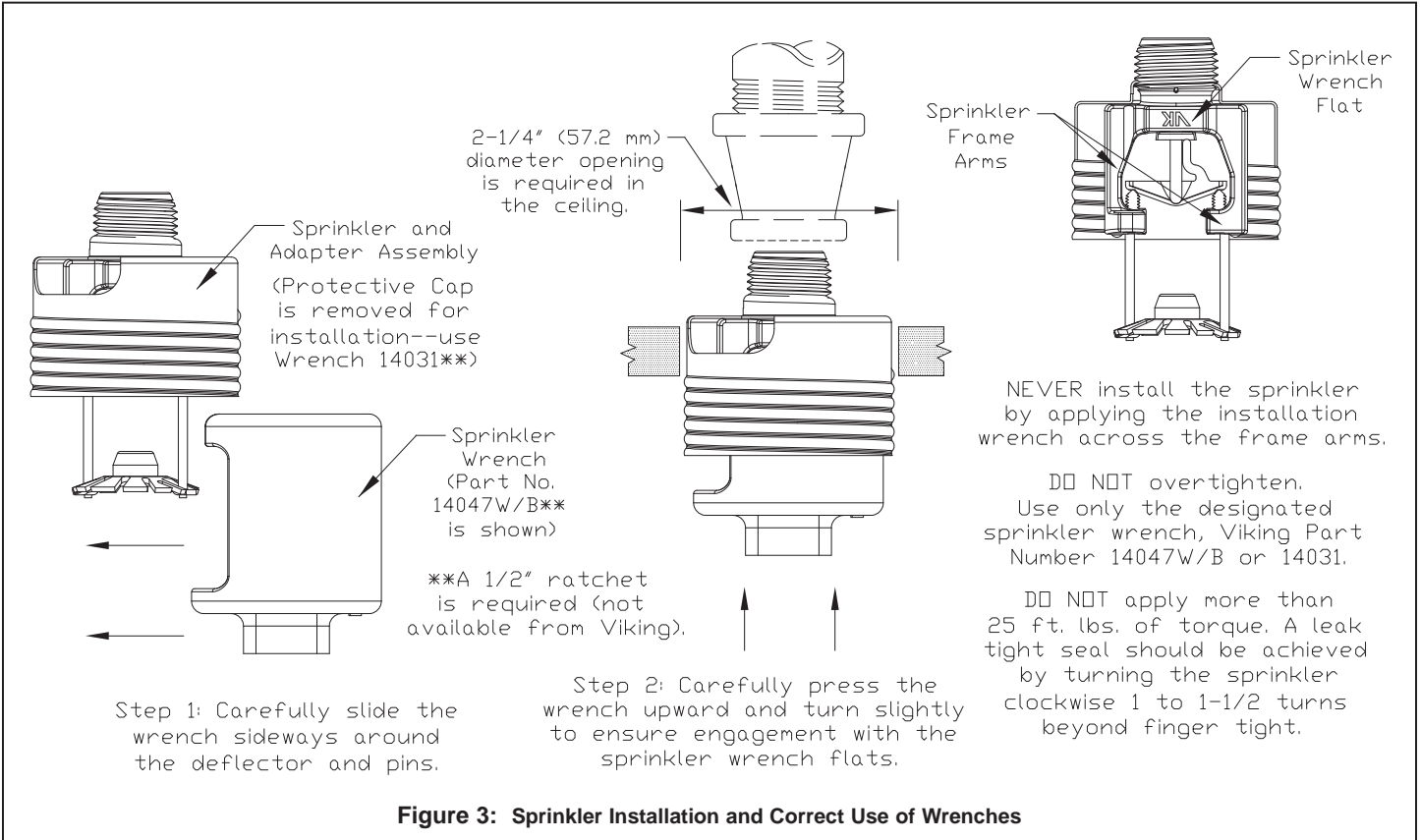


Figure 3: Sprinkler Installation and Correct Use of Wrenches

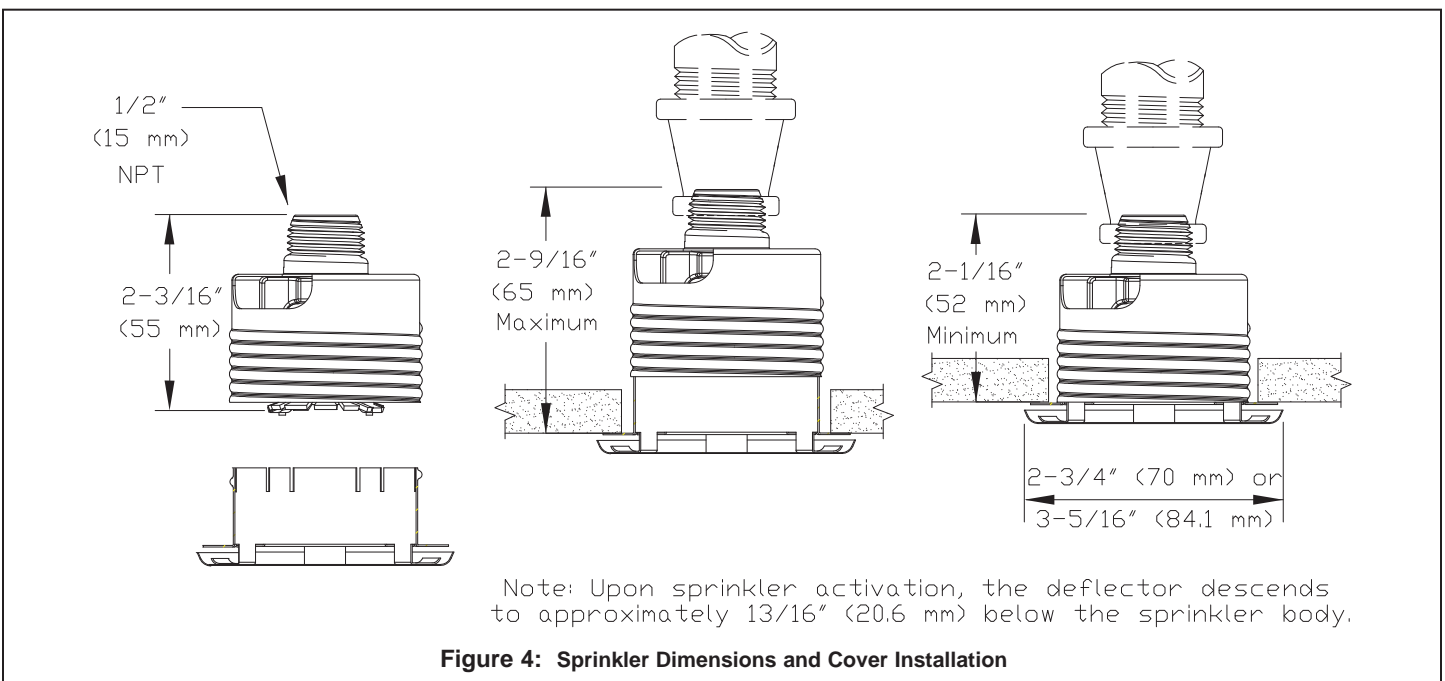
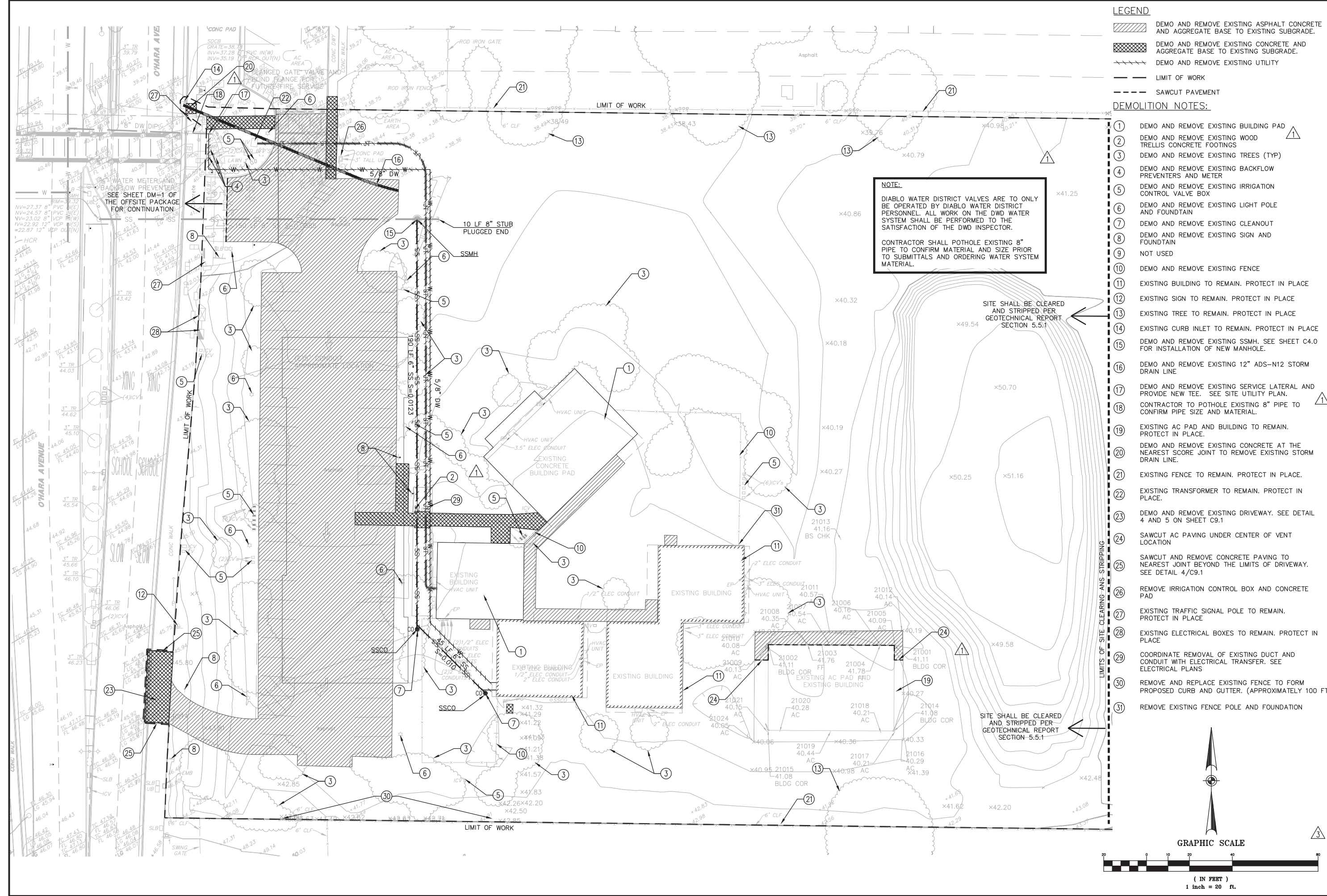


Figure 4: Sprinkler Dimensions and Cover Installation



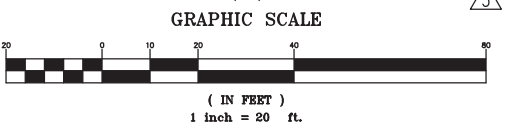
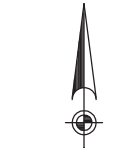


- LEGEND**
- DEMO AND REMOVE EXISTING ASPHALT CONCRETE AND AGGREGATE BASE TO EXISTING SUBGRADE.
  - DEMO AND REMOVE EXISTING CONCRETE AND AGGREGATE BASE TO EXISTING SUBGRADE.
  - DEMO AND REMOVE EXISTING UTILITY
  - LIMIT OF WORK
  - SAWCUT PAVEMENT
- DEMOLITION NOTES:**
- 1 DEMO AND REMOVE EXISTING BUILDING PAD
  - 2 DEMO AND REMOVE EXISTING WOOD TRELLIS CONCRETE FOOTINGS
  - 3 DEMO AND REMOVE EXISTING TREES (TYP)
  - 4 DEMO AND REMOVE EXISTING BACKFLOW PREVENTERS AND METER
  - 5 DEMO AND REMOVE EXISTING IRRIGATION CONTROL VALVE BOX
  - 6 DEMO AND REMOVE EXISTING LIGHT POLE AND FOUNDATION
  - 7 DEMO AND REMOVE EXISTING CLEANOUT
  - 8 DEMO AND REMOVE EXISTING SIGN AND FOUNDATION
  - 9 NOT USED
  - 10 DEMO AND REMOVE EXISTING FENCE
  - 11 EXISTING BUILDING TO REMAIN. PROTECT IN PLACE
  - 12 EXISTING SIGN TO REMAIN. PROTECT IN PLACE
  - 13 EXISTING TREE TO REMAIN. PROTECT IN PLACE
  - 14 EXISTING CURB INLET TO REMAIN. PROTECT IN PLACE
  - 15 DEMO AND REMOVE EXISTING SSMH. SEE SHEET C4.0 FOR INSTALLATION OF NEW MANHOLE.
  - 16 DEMO AND REMOVE EXISTING 12" ADS-N12 STORM DRAIN LINE
  - 17 DEMO AND REMOVE EXISTING SERVICE LATERAL AND PROVIDE NEW TEE. SEE SITE UTILITY PLAN.
  - 18 CONTRACTOR TO POTHOLE EXISTING 8" PIPE TO CONFIRM PIPE SIZE AND MATERIAL.
  - 19 EXISTING AC PAD AND BUILDING TO REMAIN. PROTECT IN PLACE.
  - 20 DEMO AND REMOVE EXISTING CONCRETE AT THE NEAREST SCORE JOINT TO REMOVE EXISTING STORM DRAIN LINE.
  - 21 EXISTING FENCE TO REMAIN. PROTECT IN PLACE.
  - 22 EXISTING TRANSFORMER TO REMAIN. PROTECT IN PLACE.
  - 23 DEMO AND REMOVE EXISTING DRIVEWAY. SEE DETAIL 4 AND 5 ON SHEET C9.1
  - 24 SAWCUT AC PAVING UNDER CENTER OF VENT LOCATION
  - 25 SAWCUT AND REMOVE CONCRETE PAVING TO NEAREST JOINT BEYOND THE LIMITS OF DRIVEWAY. SEE DETAIL 4/C9.1
  - 26 REMOVE IRRIGATION CONTROL BOX AND CONCRETE PAD
  - 27 EXISTING TRAFFIC SIGNAL POLE TO REMAIN. PROTECT IN PLACE
  - 28 EXISTING ELECTRICAL BOXES TO REMAIN. PROTECT IN PLACE
  - 29 COORDINATE REMOVAL OF EXISTING DUCT AND CONDUIT WITH ELECTRICAL TRANSFER. SEE ELECTRICAL PLANS
  - 30 REMOVE AND REPLACE EXISTING FENCE TO FORM PROPOSED CURB AND GUTTER. (APPROXIMATELY 100 FT)
  - 31 REMOVE EXISTING FENCE POLE AND FOUNDATION

**NOTE:**  
 DIABLO WATER DISTRICT VALVES ARE TO ONLY BE OPERATED BY DIABLO WATER DISTRICT PERSONNEL. ALL WORK ON THE DWD WATER SYSTEM SHALL BE PERFORMED TO THE SATISFACTION OF THE DWD INSPECTOR.  
 CONTRACTOR SHALL POTHOLE EXISTING 8" PIPE TO CONFIRM MATERIAL AND SIZE PRIOR TO SUBMITTALS AND ORDERING WATER SYSTEM MATERIAL.

SITE SHALL BE CLEARED AND STRIPPED PER GEOTECHNICAL REPORT SECTION 5.5.1

SITE SHALL BE CLEARED AND STRIPPED PER GEOTECHNICAL REPORT SECTION 5.5.1



4670 WILLOW RD  
 SUITE 250  
 PLEASANTON, CA 94568  
 925-396-7700  
 925-396-7799 (FAX)

**BKF**  
 BUSINESS / SERVICES / PLANNING

REGISTERED PROFESSIONAL ENGINEER  
 CIVIL  
 STATE OF CALIFORNIA  
 077988  
 Peter Reynolds

**OAKLEY CALIFORNIA**

**OAKLEY RECREATION CENTER**  
 CONTRA COSTA COUNTY CALIFORNIA

OAKLEY  
 SITE DEMOLITION PLAN

Date: 07/23/18	PERMIT SET	ISSUE	
Scale: AS NOTED	ENV. HEALTH PERMIT REVISIONS		
Design: SR	PERMIT SET REV. / BID SET		
Drawn: AR	ADDENDUM 3		
Approved: JL			
Job No: 17-005			

Drawing Number: **C3.0**

**ABBREVIATIONS**

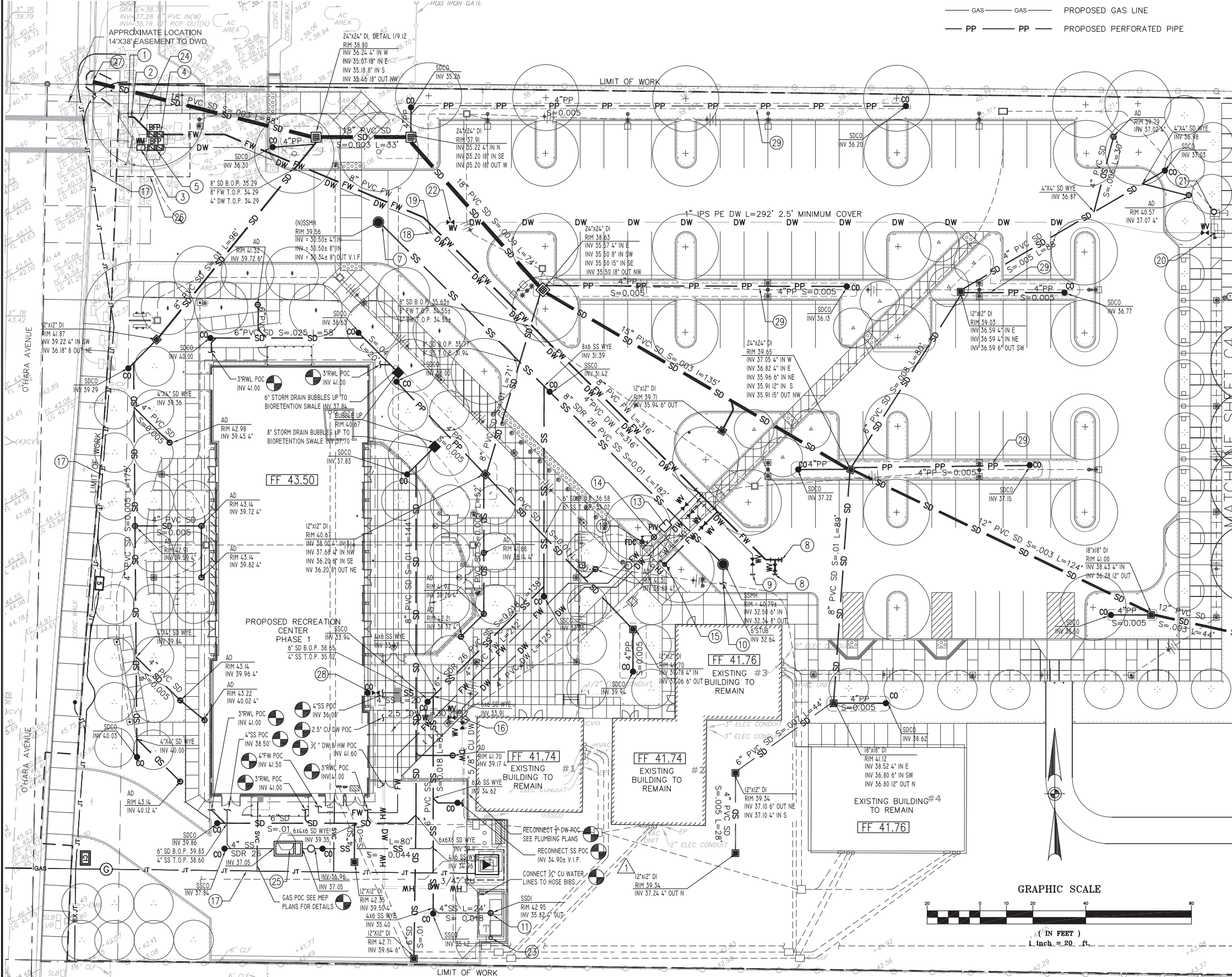
BFP	BACK FLOW PREVENTER	(E)	EXISTING	PP	PERFORATED PIPE	SSDI	SANITARY SEWER DRAIN INLET	WM	WATER METER
B.O.P.	BOTTOM OF PIPE	FDC	FIRE DEPARTMENT CONNECTION	POC	POINT OF CONNECTION	SSMH	SANITARY SEWER MANHOLE	WV	WATER VALVE
CO	CLEANOUT	FH	FIRE HYDRANT	PVC	POLYVINYL CHLORIDE PIPE	SD	STORM DRAIN		
CU	COPPER PIPE	FW	FIRE WATER	RWL	ROOF WATER LEADER	SDCO	STORM DRAIN CLEANOUT		
DW	DOMESTIC WATER	INV	INVERT	SS	SANITARY SEWER	T.O.P.	TOP OF PIPE		
DI	DRAIN INLET	PE	POLYETHYLENE PIPE	SSCO	SANITARY SEWER CLEANOUT	V.I.F.	VERIFY IN FIELD		

**LEGEND**

SD	SD	PROPOSED STORM DRAIN LINE	JT	JT	PROPOSED JOINT TRENCH
SS	SS	PROPOSED SANITARY SEWER LINE	---	---	LIMIT OF WORK
DW	DW	PROPOSED DOMESTIC WATER LINE	■	■	PROPOSED STORM DRAIN INLET
FW	FW	PROPOSED FIRE WATER LINE	■	■	PROPOSED STORM DRAIN BUBBLER
HW	HW	PROPOSED HOT WATER LINE	●	●	PROPOSED CLEANOUT
GAS	GAS	PROPOSED GAS LINE	●	●	PROPOSED MANHOLE
PP	PP	PROPOSED PERFORATED PIPE	○	○	PROPOSED SEWER DRAIN INLET
			⊕	⊕	PROPOSED WATER VALVE
			⊕	⊕	PROPOSED FIRE HYDRANT
			⊕	⊕	PROPOSED FIRE DEPARTMENT CONNECTION
			⊕	⊕	PROPOSED BACKFLOW PREVENTER
			⊕	⊕	PROPOSED WATER METER
			⊕	⊕	PROPOSED POST INDICATOR VALVE
			⊕	⊕	PROPOSED POINT OF CONNECTION

**UTILITY NOTES**

- ALL WATER RELATED WORK SHALL COMPLY WITH DIABLO WATER DISTRICT STANDARD SPECIFICATIONS AND PLANS
- ALL SANITARY SEWER WORK SHALL COMPLY WITH IRON HOUSE SANITARY SEWER DISTRICT STANDARD SPECIFICATIONS AND PLANS.
- ON-SITE ROADWAY IMPROVEMENTS AND NEW HYDRANT SHALL BE INSTALLED, IN SERVICE, AND INSPECTED BY THE FIRE DISTRICT PRIOR TO CONSTRUCTION OR COMBUSTIBLE STORAGE ON SITE. THE FIRST LIFT OF ASPHALT PAVING SHALL BE INSTALLED AS THE MINIMUM ROADWAY MATERIAL.
- INSTALL NEW 2" TAP PER DWD 8
  - CUT EXISTING PIPE BACK TO ELIMINATE HOLE FROM EXISTING 1" SERVICE, BEVEL AND STUB NEW PIPE. LENGTH AS REQUIRED.
  - INSTALL NEW 1-1/2" SENSUS OMNI C2 WATER METER AND B-16 CHRISTY METER BOX
  - INSTALL NEW 8" FIRE WATER DOUBLE DETECTOR CHECK (DDC) BACKFLOW PREVENTER PER DWD 13
  - INSTALL NEW 4" DOMESTIC WATER REDUCE PRESSURE PRINCIPLE BACKFLOW PREVENTER PER DWD 12
  - NOT USED
  - CONNECT NEW 8" SS TO NEW SSMH. CONTRACTOR SHALL INSTALL NEW MANHOLE AND CONFIRM EXISTING INVERT ELEVATION PRIOR TO INSTALLING ANY SEWER PIPES.
  - STUB FIRE WATER LINE AND INSTALL 8" BLIND FLANGE FOR FUTURE USE
  - STUB DOMESTIC WATER LINE AND INSTALL 4" BLIND FLANGE FOR FUTURE USE
  - STUB SANITARY SEWER LINE AND INSTALL 6" BLIND FLANGE FOR FUTURE USE.
  - INSTALL NEW SANITARY SEWER DRAIN AND CONNECT NEW 4" SEWER LINE.
  - INSTALL NEW FIRE DEPARTMENT CONNECTION WITH SINGLE CHECK VALVE IN COMPLIANCE WITH CONTRA COSTA COUNTY FIRE PROTECTION DISTRICT
  - INSTALL NEW SINGLE CHECK VALVE WITH TRAFFIC RATED UTILITY BOX IN COMPLIANCE WITH CONTRA COSTA COUNTY FIRE PROTECTION DISTRICT STANDARDS
  - INSTALL NEW MUELLER A-20806 ADJUSTABLE POST INDICATOR VALVE IN COMPLIANCE WITH CONTRA COSTA COUNTY FIRE PROTECTION DISTRICT
  - INSTALL NEW FIRE HYDRANT PER DIABLO WATER DISTRICT STANDARD DRAWINGS AND SPECIFICATIONS
  - INSTALL NEW 4"x4"x4" TEE. REDUCE TO 2.5" AFTER TEE FOR NEW BUILDING SERVICE. REDUCE TO 3/4" AFTER TEE TO RECONNECT EXISTING BUILDING SERVICE.
  - JOINT TRENCH SHOWN FOR REFERENCE ONLY
  - INSTALL A BRONZE WIDE BAND OR DOUBLE STRAP SADDLE, AWWA STANDARD (CC) THREAD ONLY AND CONNECT 1" IPS PE PIPE AT AN UPWARD 45° ANGLE TO A 2.5 FOOT MINIMUM COVER.
  - INSTALL CORPORATION STOP, KEY OR BALL TYPE, INLET: AWWA STD (CC) THREAD ONLY AT THE SERVICE SADDLE.
  - CONNECT 1" IPS PE PIPE TO NEW DRINKING FOUNTAIN BY REDUCING TO A 1/2" PIPE WITH A FEMALE PIPE THREAD (FIP) CONNECTION. INSTALL SHUT-OFF VALVE AND PRESSURE REDUCER PRIOR TO CONNECTION. SEE LANDSCAPE DRAWINGS FOR DRINKING FOUNTAIN DETAIL.
  - INSTALL 1.5" SCHEDULE 40 PVC PIPE TO CONNECT THE DRINKING FOUNTAIN TO THE DRY WELL/DRAINAGE SUMP. SEE LANDSCAPE DRAWINGS FOR DRAINAGE SUMP DETAILS.
  - INSTALL MUELLER 300 BALL CURB VALVE COMPATIBLE WITH 1" IPS PE PIPE.
  - INSTALL SEWER TRAP VENT. SEE ARCHITECTURAL PLANS FOR DETAILS
  - CONTRACTOR TO POTHOLE AND VERIFY PIPE SIZE AND MATERIAL. MATCH EXISTING PIPE SIZE AND MATERIAL, WITH MJ FITTINGS, THRUST BLOCKS AND MEGALUGS AT ALL JOINTS.
  - INSTALL GREASE INTERCEPTOR WITH SAMPLING MANHOLE. SEE DETAILS 5 AND 6 ON SHEET C9.11. FOR ADDITIONAL INFORMATION REFER TO THE IRONHOUSE SANITARY DISTRICT STANDARD DRAWINGS AND SPECIFICATIONS.
  - PROPOSED DWD EASEMENT 10' CLEAR OF METER AND BACKFLOWS
  - CONTRACTOR SHALL INSTALL STORM DRAIN PIPING STARTING AT THE DOWNSTREAM POINT OF CONNECTION AND WORK HIS/HER WAY UPSTREAM.
  - CONTRACTOR SHALL INSTALL NEW SANITARY SEWER CLEANOUT AND BACKCHECK VALVE AT FACE OF BUILDING. SEE PLUMBING PLANS FOR DETAILS.
  - CONTRACTOR SHALL PROVIDE 12" CLEAR BETWEEN PERFORATED PIPES AND LIGHT POST FOUNDATIONS (TYP.)



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CONTRA COSTA COUNTY CALIFORNIA

OAKLEY  
CONTRA COSTA COUNTY CALIFORNIA

Date: 07/23/18  
Scale: AS NOTED  
Design: SR

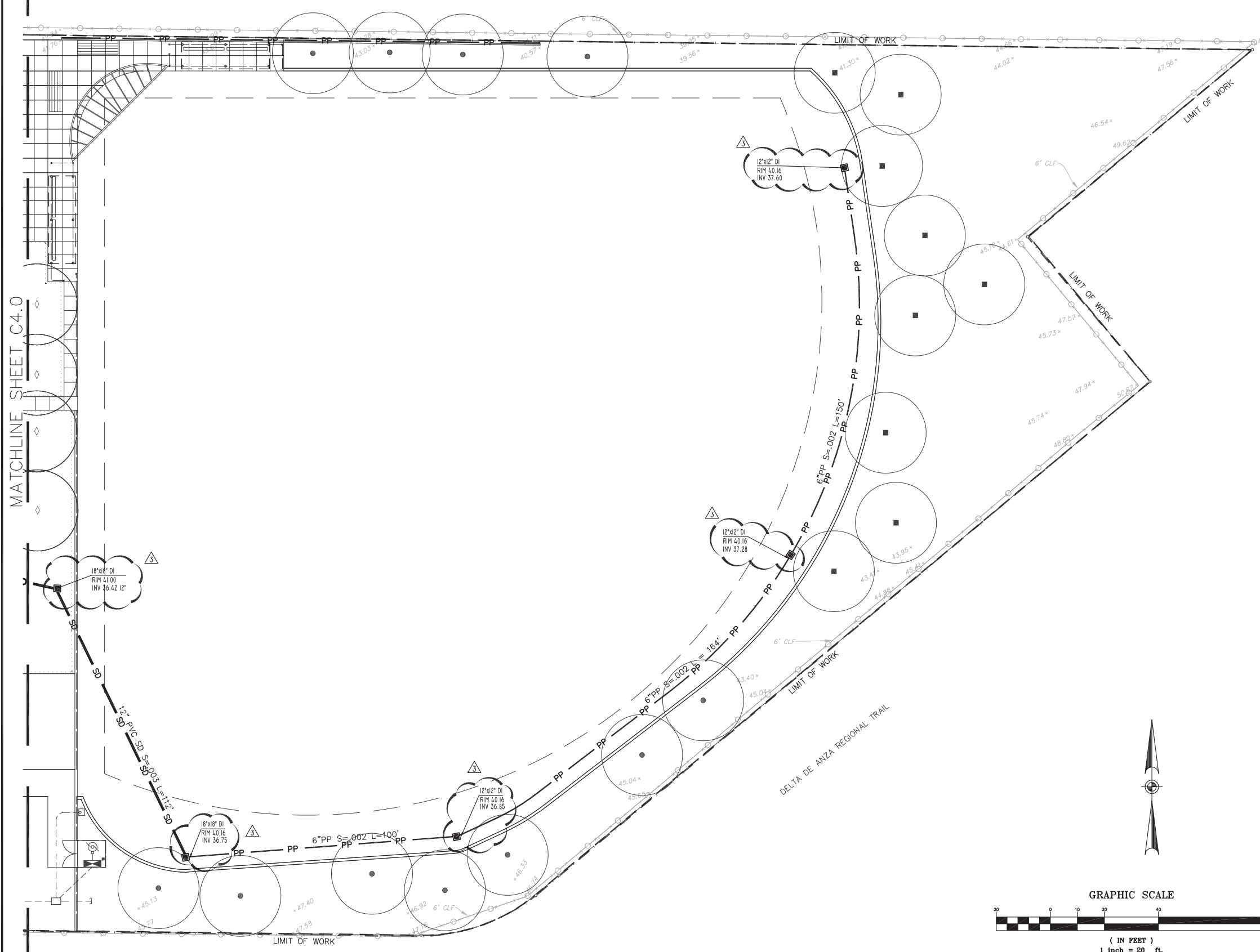
Issue  
PERMIT SET  
ENV. HEALTH PERMIT REVISIONS

Job No: 17-005

PERMIT SET REV. / BID SET  
APPENDIX 3

Drawing Number:

MATCHLINE SHEET C4.0



LEGEND

- SD — SD — PROPOSED STORM DRAIN LINE
- SS — SS — PROPOSED SANITARY SEWER LINE
- DW — DW — PROPOSED DOMESTIC WATER LINE
- FW — FW — PROPOSED FIRE WATER LINE
- HW — HW — PROPOSED HOT WATER LINE
- GAS — GAS — PROPOSED GAS LINE
- PP — PP — PROPOSED PERFORATED PIPE

- JT — JT — PROPOSED JOINT TRENCH
- --- LIMIT OF WORK
- PROPOSED STORM DRAIN INLET (1/3.1, 2/3.1, 3/3.1, 4/3.1)
- PROPOSED STORM DRAIN BUBBLER (4/3.5, 5/3.5) ⚠
- CO PROPOSED CLEANOUT (6/3.1)
- MH PROPOSED MANHOLE (1/3.1, 2/3.1)
- PROPOSED SEWER DRAIN INLET
- ⊕ WV PROPOSED WATER VALVE (5/3.5, 1/3.5)
- ⊕ FH PROPOSED FIRE HYDRANT (3/3.5, 4/3.5)
- ⊕ FDC PROPOSED FIRE DEPARTMENT CONNECTION
- ⊕ BFP PROPOSED BACKFLOW PREVENTER (1/3.5, 2/3.5)
- ⊕ WM PROPOSED WATER METER (3/3.5, 1/3.5)
- ⊕ PIV PROPOSED POST INDICATOR VALVE
- ⊕ PROPOSED POINT OF CONNECTION

UTILITY NOTES

ALL WATER RELATED WORK SHALL COMPLY WITH DIABLO WATER DISTRICT STANDARD SPECIFICATIONS AND PLANS

ALL SANITARY SEWER WORK SHALL COMPLY WITH IRON HOUSE SANITARY SEWER DISTRICT STANDARD SPECIFICATIONS AND PLANS.

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- 1 INSTALL NEW 2" TAP PER DWD 8
- 2 CUT EXISTING PIPE BACK TO ELIMINATE HOLE FROM EXISTING 1" SERVICE, BEVEL AND STUB NEW PIPE. LENGTH AS REQUIRED.
- 3 INSTALL NEW 1-1/2" SENSUS OMNI C2 WATER METER AND B-16 CHRISTY METER BOX
- 4 INSTALL NEW 8" FIRE WATER DOUBLE DETECTOR CHECK (DDC) BACKFLOW PREVENTER PER DWD 13
- 5 INSTALL NEW 4" DOMESTIC WATER REDUCE PRESSURE PRINCIPLE BACKFLOW PREVENTER PER DWD 12
- 6 NOT USED
- 7 CONNECT NEW 8" SS TO NEW SSMH. CONTRACTOR SHALL INSTALL NEW MANHOLE AND CONFIRM EXISTING INVERT ELEVATION PRIOR TO INSTALLING ANY SEWER PIPES.
- 8 STUB FIRE WATER LINE AND INSTALL 8" BLIND FLANGE FOR FUTURE USE
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- 24 CONTRACTOR TO POTHOLE AND VERIFY PIPE SIZE AND MATERIAL. MATCH EXISTING PIPE SIZE AND MATERIAL, WITH MJ FITTINGS, THRUST BLOCKS AND MEGALUGS AT ALL JOINTS.
- 25 INSTALL GREASE INTERCEPTOR WITH SAMPLING MANHOLE. SEE DETAILS 5 AND 6 ON SHEET C9.11. FOR ADDITIONAL INFORMATION REFER TO THE IRONHOUSE SANITARY DISTRICT STANDARD DRAWINGS AND SPECIFICATIONS.
- 26 PROPOSED DWD EASEMENT 10' CLEAR OF METER AND BACKFLOWS
- 27 CONTRACTOR SHALL INSTALL STORM DRAIN PIPING STARTING AT THE DOWNSTREAM POINT OF CONNECTION AND WORK HIS/HER WAY UPSTREAM.
- 28 CONTRACTOR SHALL INSTALL NEW SANITARY SEWER CLEANOUT AND BACKCHECK VALVE AT FACE OF BUILDING. SEE PLUMBING PLANS FOR DETAILS.
- 29 CONTRACTOR SHALL PROVIDE 12" CLEAR BETWEEN PERFORATED PIPES AND LIGHT POST FOUNDATIONS (TYP.)

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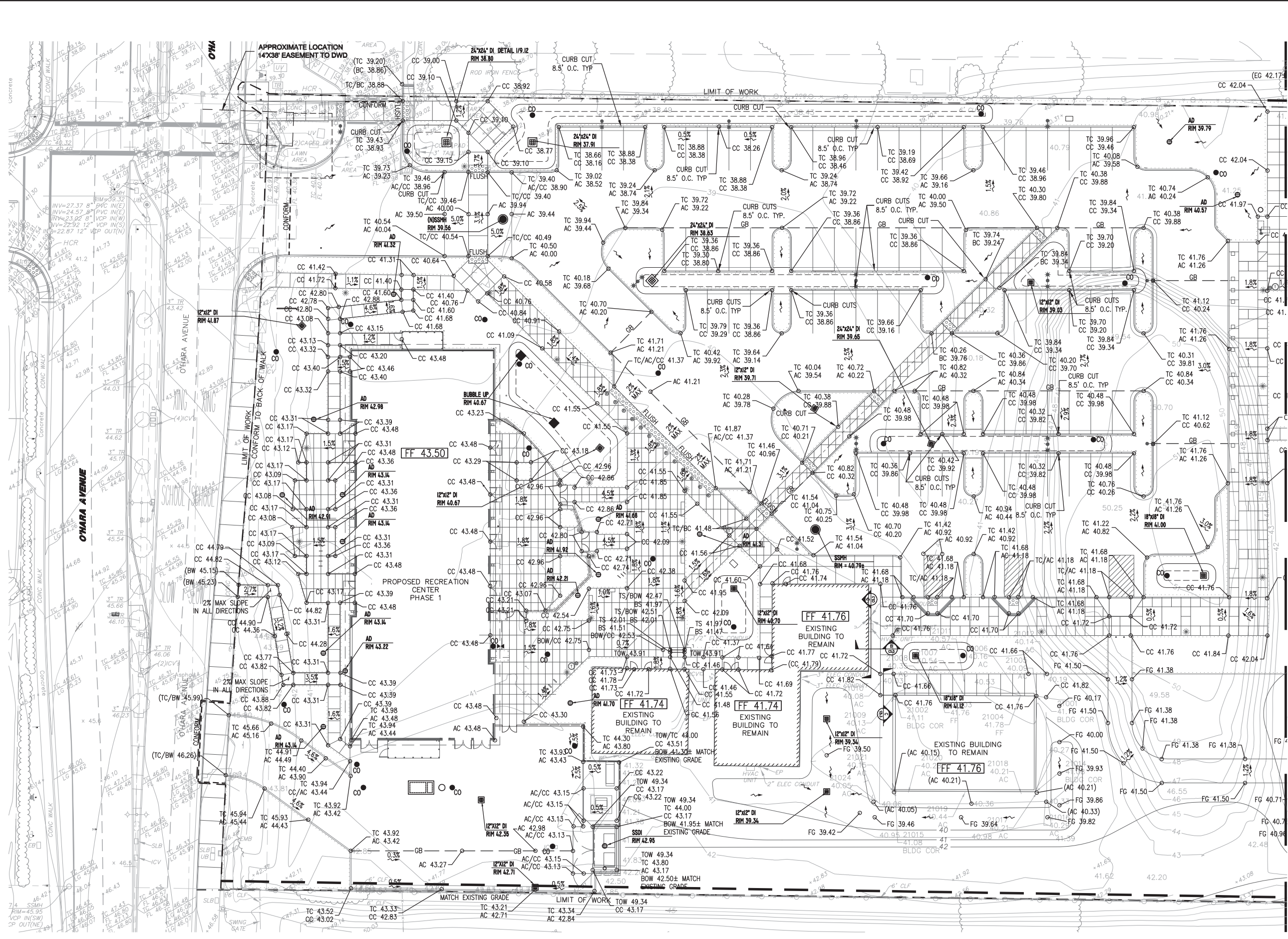
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**OAKLEY RECREATION CENTER**  
CONTRA COSTA COUNTY CALIFORNIA

Date: 07/23/18	Issue
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Drawn: AR	PERMIT SET REV. / BID SET
Approved: JL	ADDENDUM 3
Job No: 17-005	
Drawing Number:	
<b>C4.1</b>	

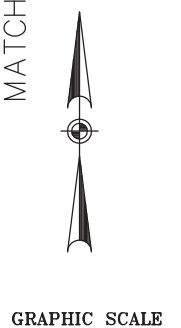


- LEGEND**
- GRADE BREAK
  - LIMIT OF WORK
  - CONFORM
- GRADING NOTES**
1. ALL ADA PATH OF TRAVELS SHALL HAVE A MAXIMUM CROSS SLOPE OF 2.0% AND A MAXIMUM LONGITUDINAL SLOPE OF 5.0%.
  2. VERTICAL CHANGE IN FRONT OF BUILDING ENTRANCES SHALL NOT EXCEED 1/4" WITHOUT EDGE TREATMENT. 1/4" MAX VERTICAL OFFSET ALONG ALL PATHS OF TRAVEL WHICH INCLUDE ALL DOORS, LANDINGS, WALK WAYS, PATIO AREAS AND ALIKE
  3. SLOPE OF EXTERIOR PAVING SHALL NOT EXCEED 1/4" PER FOOT (2%) UP TO DOOR'S THRESHOLD FOR A MINIMUM DISTANCE OF 5 FEET OUT FROM THE EXTERIOR DOOR OPENINGS
  4. SEE SHEET C4.0 FOR UTILITY STRUCTURE RIM ELEVATIONS.
  5. EXISTING STOCKPILED MATERIAL SHALL BE USED ON-SITE AS BACKFILL TO MEET THE PROPOSED SUBGRADE ELEVATIONS BASED ON THE ORDER OF WORK LISTED BELOW
    - 5.1. BUILDING SITE (1ST PRIORITY)
    - 5.2. PARKING LOT (2ND PRIORITY)
    - 5.3. FIELD (3RD PRIORITY)
 SEE SPECIFICATION SECTION 31 10 00 SITE PREPARATION FOR ADDITIONAL ROUGH GRADING INFORMATION
  6. CONSTRUCTION EQUIPMENT SHALL NOT BE ALLOWED TO DRIVE OVER OR COMPACT THE BOTTOM OF BIOSWALES AND INFILTRATION BASINS
  7. SEE SHEET C5.3 FOR ADA PARKING STALL SLOPES AND SPOT ELEVATIONS

**ABBREVIATIONS**

AC	ASPHALT CONCRETE
BS	BOTTOM OF STEP
BOW	BOTTOM OF WALL
BW	BACK OF WALK
CC	CONCRETE PAVEMENT
EG	EXISTING GRADE
FF	FINISH FLOOR
FG	FINISHED GRADE
GB	GRADE BREAK
TC	TOP OF CURB
TOW	TOP OF WALL
TS	TOP OF STEP

MATCHLINE SHEET C5.1



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DATE: 07/23/18

ISSUE

SCALE: AS NOTED

PERMIT SET

DESIGN: SR

ENV. HEALTH PERMIT REVISIONS

DRAWN: AR

PERMIT SET REV. / BID SET

APPROVED: JL

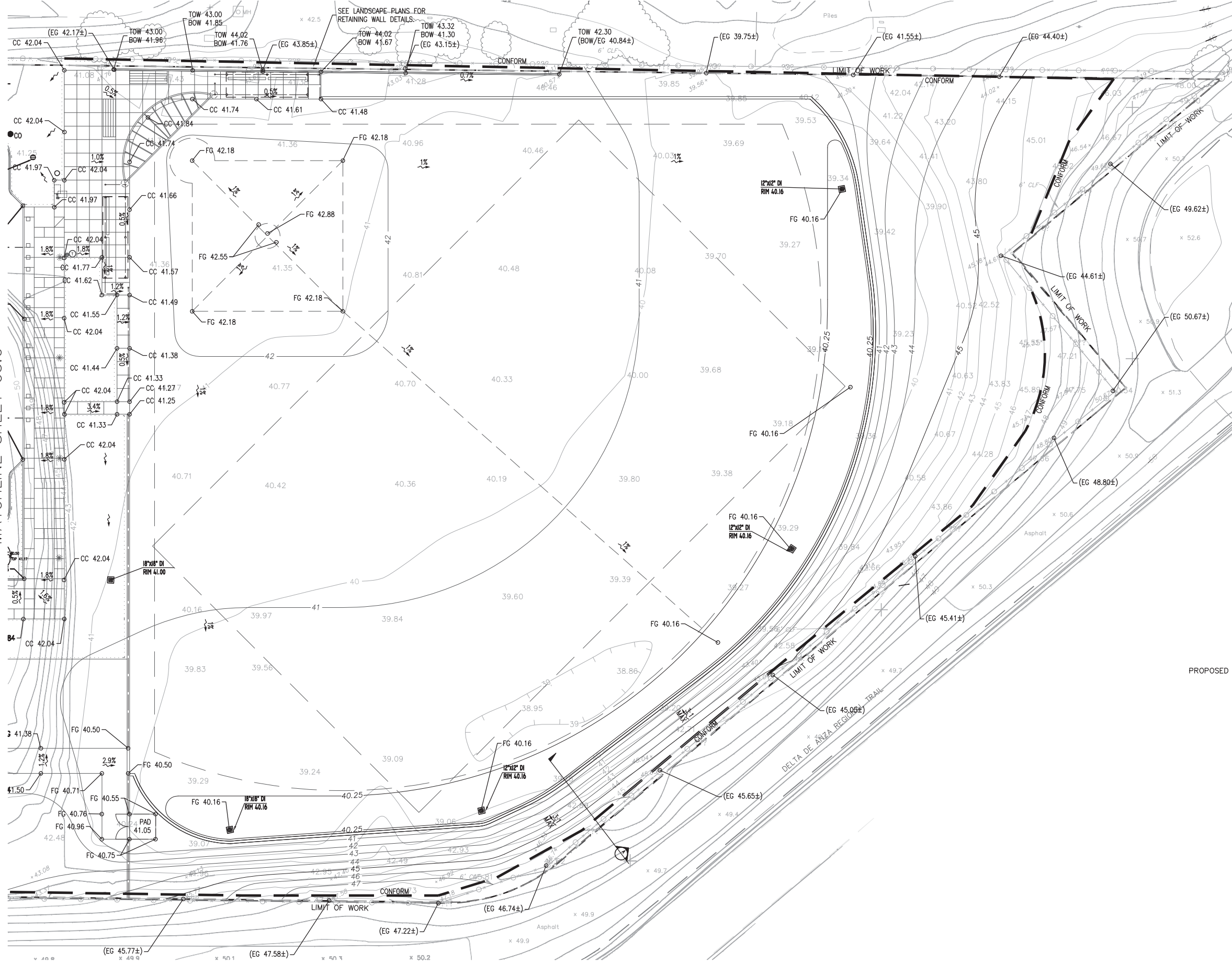
ADDENDUM 3

DRAWING NUMBER:

JOB NO: 17-005

C5.0

MATCHLINE SHEET C5.0



**LEGEND**

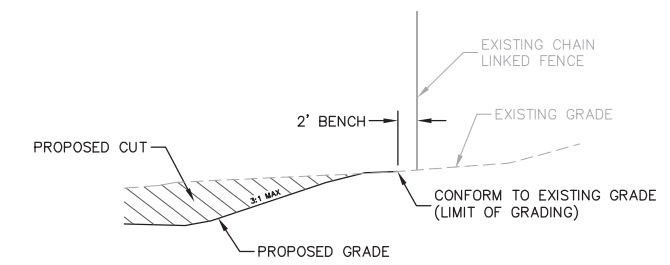
- GRADE BREAK
- - - - - LIMIT OF WORK
- CONFORM

**GRADING NOTES**

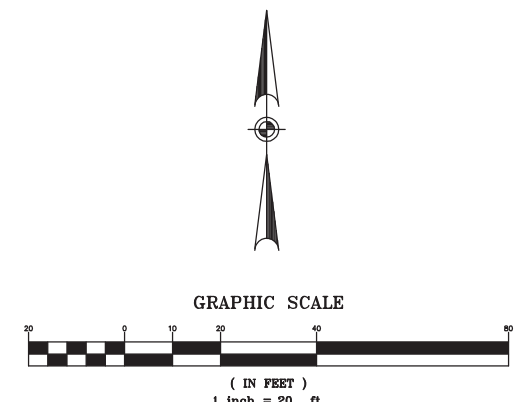
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3. SLOPE OF EXTERIOR PAVING SHALL NOT EXCEED 1/4 INCH PER FOOT (2%) UP TO DOOR'S THRESHOLD FOR A MINIMUM DISTANCE OF 5 FEET OUT FROM THE EXTERIOR DOOR OPENINGS.
4. SEE SHEET C4.0 FOR UTILITY STRUCTURE RIM ELEVATIONS.
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  - 5.3. FIELD (3RD PRIORITY)
 SEE SPECIFICATION SECTION 31 10 00 SITE PREPARATION FOR ADDITIONAL ROUGH GRADING INFORMATION
6. CONSTRUCTION EQUIPMENT SHALL NOT BE ALLOWED TO DRIVE OVER OR COMPACT THE BOTTOM OF BIOSWALES AND INFILTRATION BASINS.
7. SEE SHEET C5.3 FOR ADA PARKING STALL SLOPES AND SPOT ELEVATIONS

**ABBREVIATIONS**

- AC ASPHALT CONCRETE
- BS BOTTOM OF STEP
- BOW BOTTOM OF WALL
- BW BACK OF WALK
- CC CONCRETE PAVEMENT
- EG EXISTING GRADE
- FF FINISH FLOOR
- FG FINISHED GRADE
- GB GRADE BREAK
- TC TOP OF CURB
- TOW TOP OF WALL
- TS TOP OF STEP



SECTION A-A



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CALIFORNIA

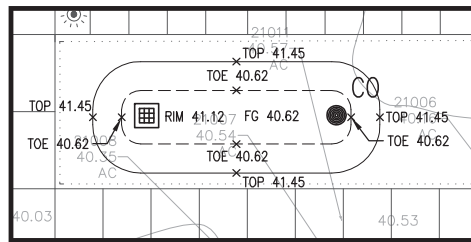
**OAKLEY RECREATION CENTER**  
OAKLEY CONTRA COSTA COUNTY CALIFORNIA

SITE GRADING PLAN

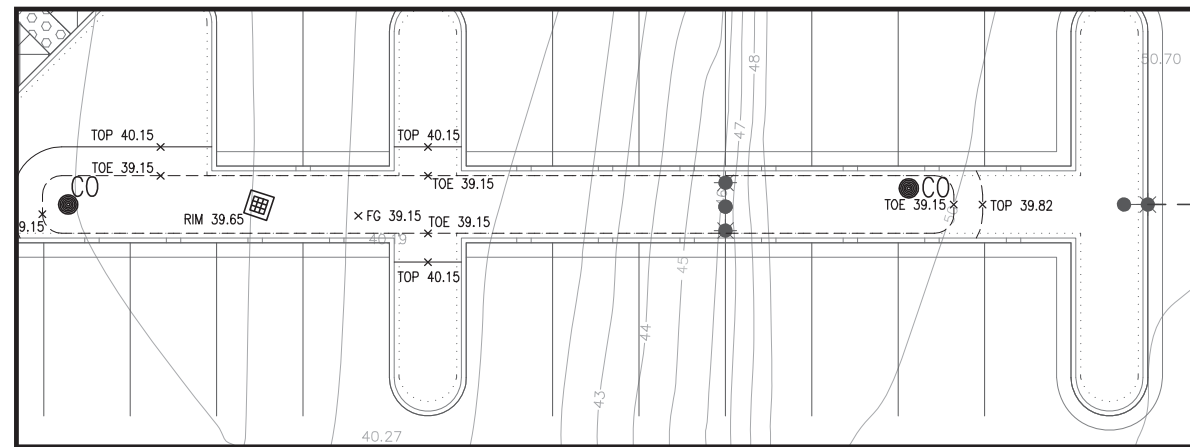
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Approved: JL	ADDENDUM 3
Job No: 17-005	



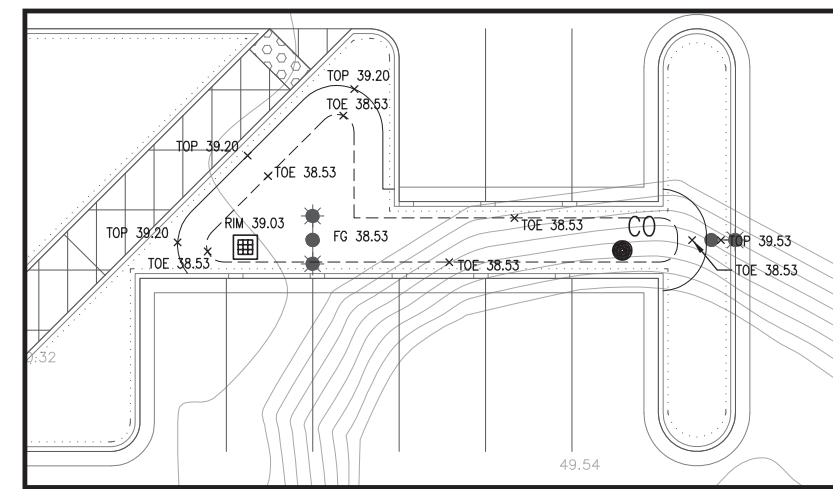




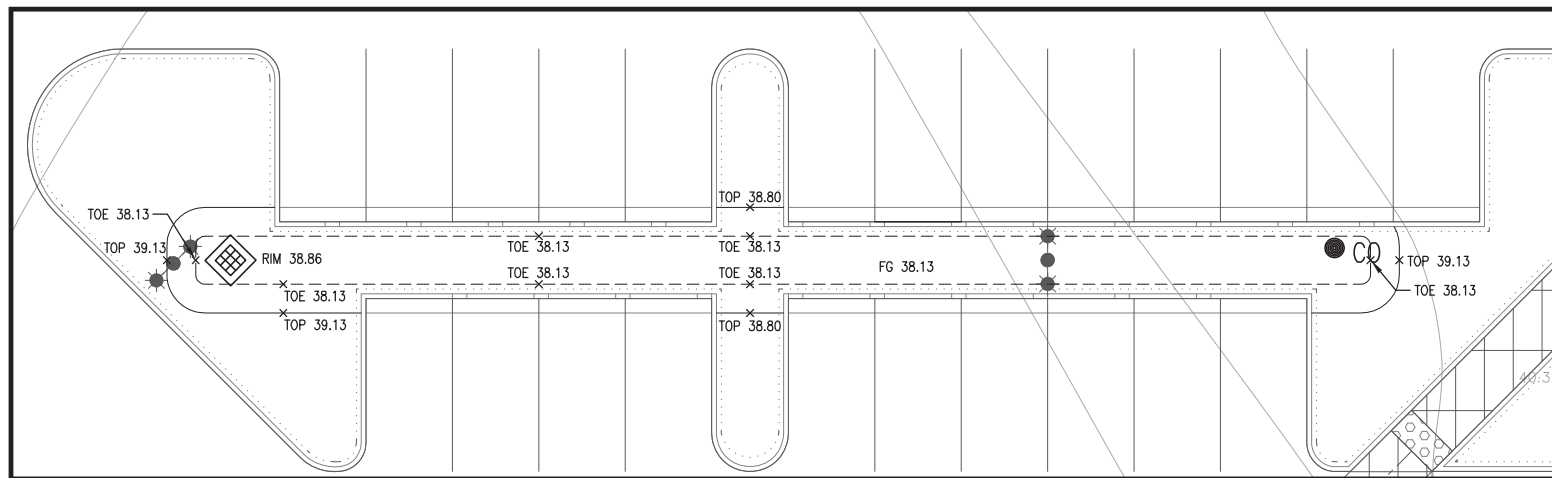
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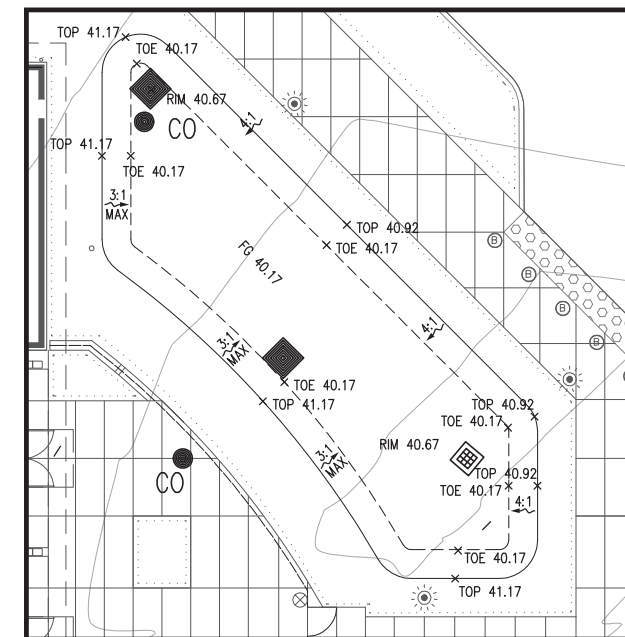
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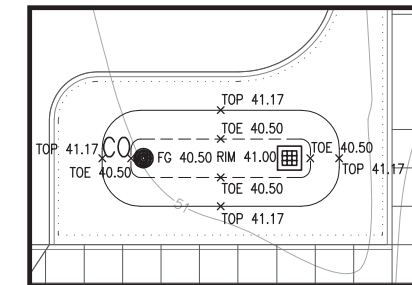
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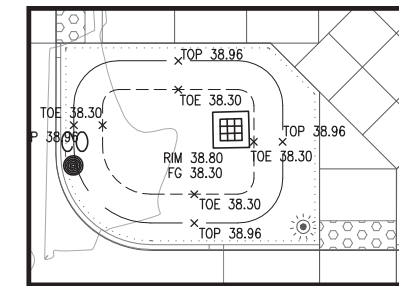
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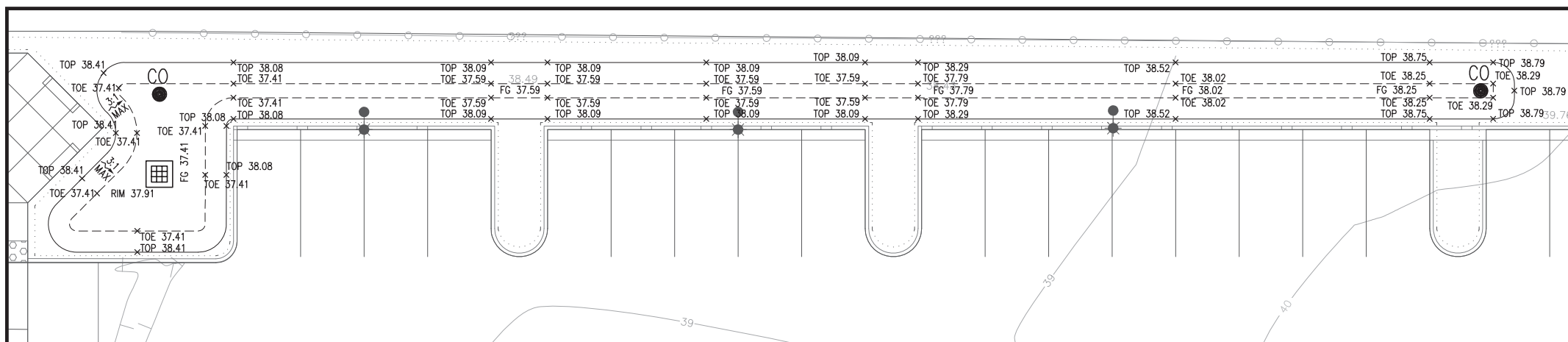
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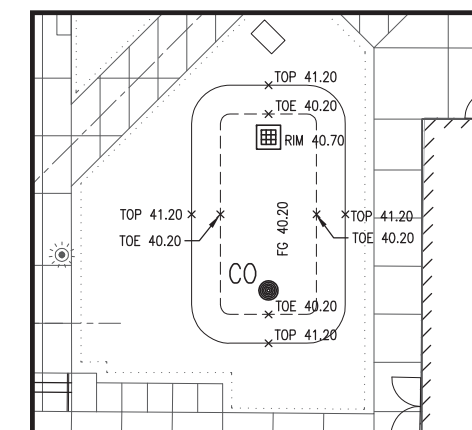
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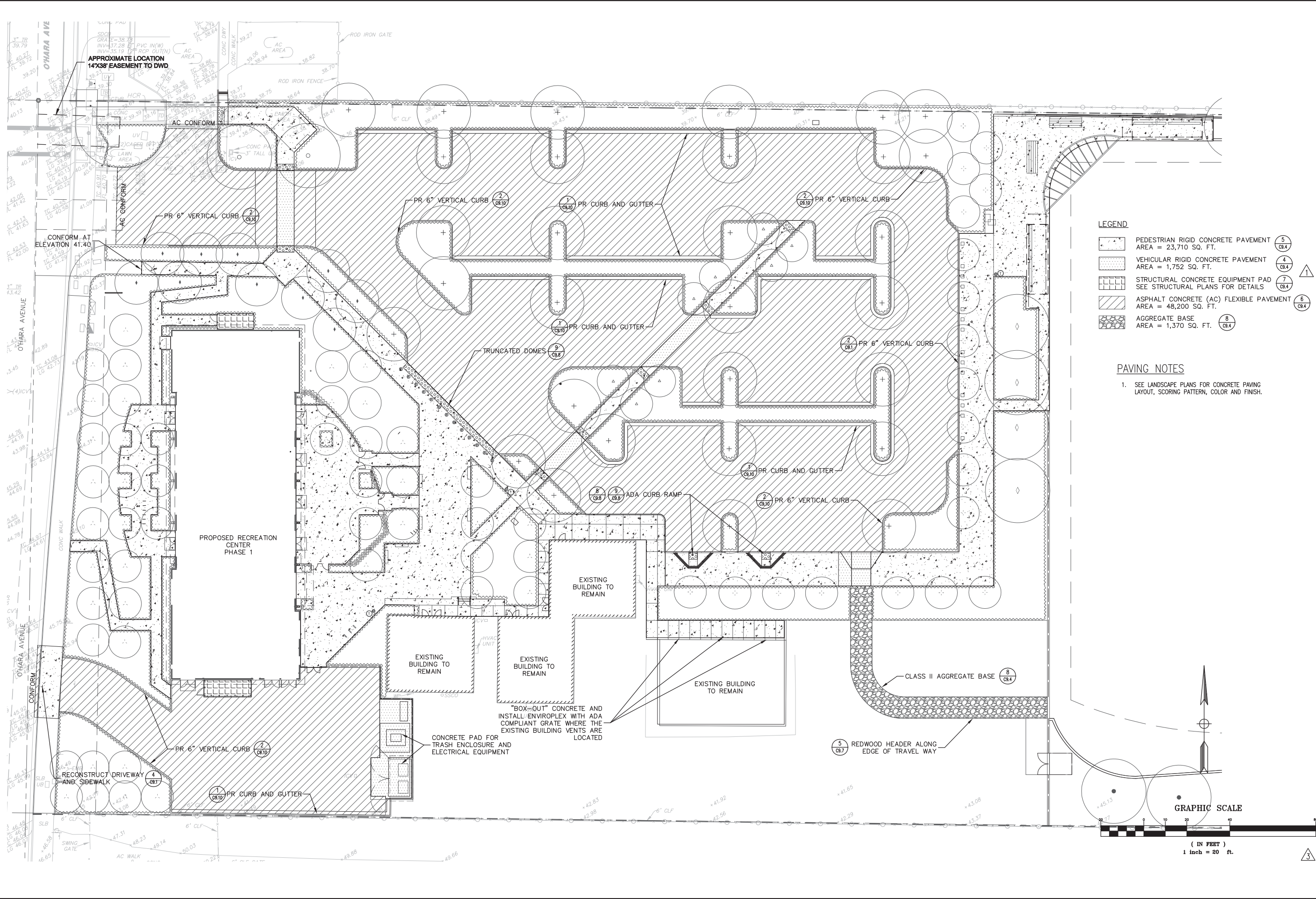
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TA H  
SCALE: 1"=10'

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Scale: AS NOTED	PERMIT SET	
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Approved: JL	ADDENDUM 3	
Job No: 17-005		

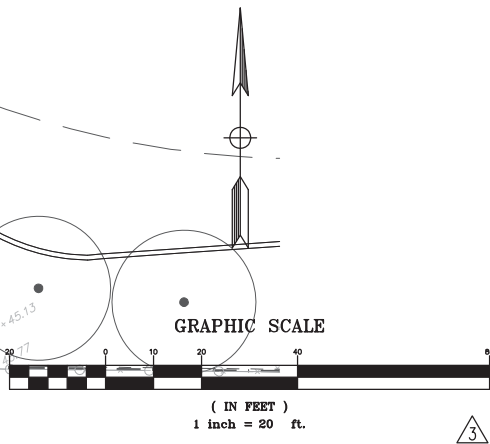




- LEGEND**
- PEDESTRIAN RIGID CONCRETE PAVEMENT  
AREA = 23,710 SQ. FT. (5) (C8.4)
  - VEHICULAR RIGID CONCRETE PAVEMENT  
AREA = 1,752 SQ. FT. (4) (C8.4)
  - STRUCTURAL CONCRETE EQUIPMENT PAD  
SEE STRUCTURAL PLANS FOR DETAILS (7) (C8.4)
  - ASPHALT CONCRETE (AC) FLEXIBLE PAVEMENT  
AREA = 48,200 SQ. FT. (6) (C8.4)
  - AGGREGATE BASE  
AREA = 1,370 SQ. FT. (8) (C8.4)

**PAVING NOTES**

- SEE LANDSCAPE PLANS FOR CONCRETE PAVING LAYOUT, SCORING PATTERN, COLOR AND FINISH.



DATE: 07/23/18  
SCALE: AS NOTED  
DESIGN: SR  
DRAWN: AR  
APPROVED: JL

ISSUE:  
PERMIT SET  
ENV. HEALTH PERMIT REVISIONS  
PERMIT SET REV. / BID SET  
ADDENDUM 3

JOB NO: 17-005  
DRAWING NUMBER:

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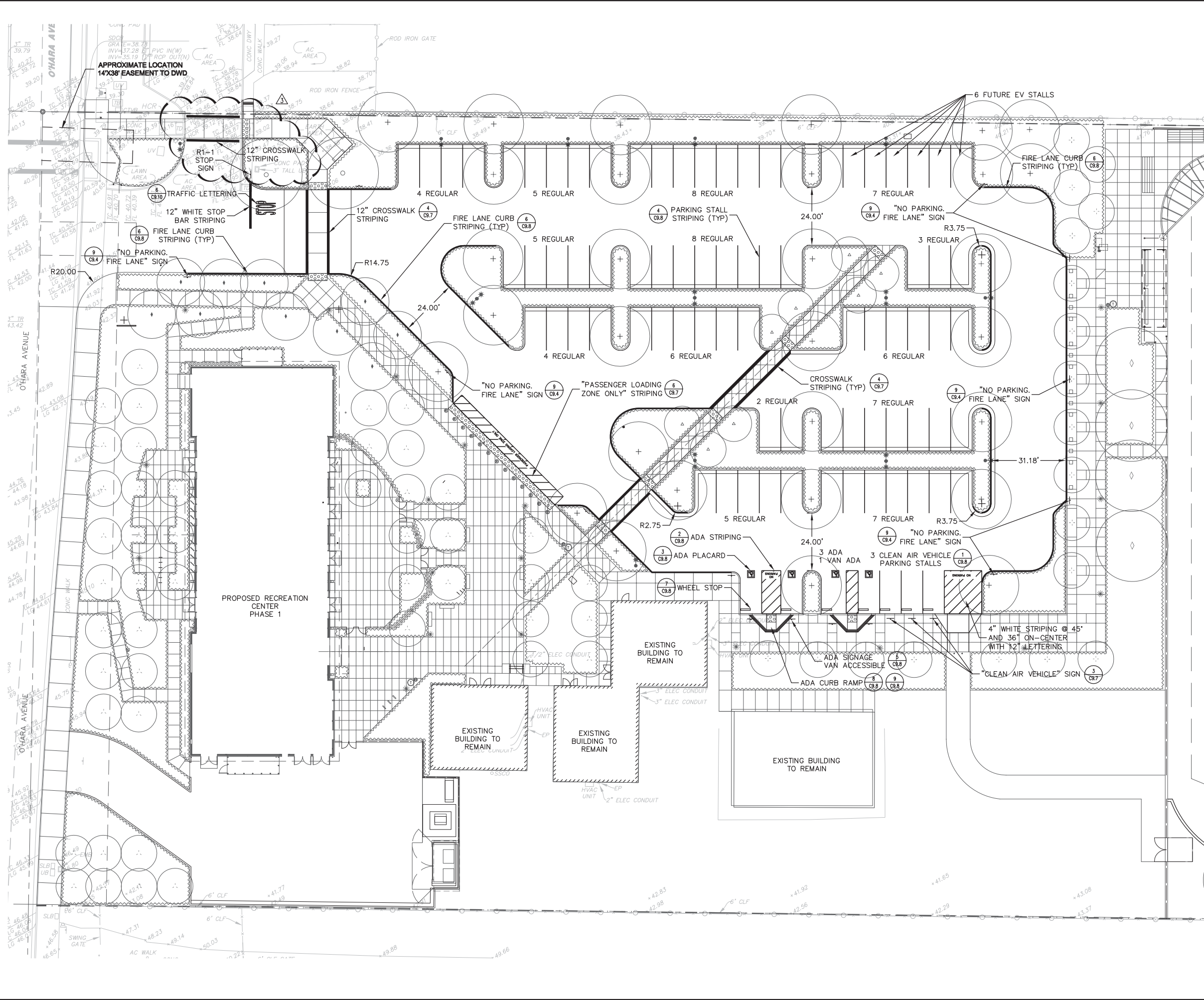
**BKF**  
ENGINEERS / ARCHITECTS / PLANNERS

REGISTERED PROFESSIONAL ENGINEER  
STEVEN REYNOLDS  
CIVIL  
STATE OF CALIFORNIA  
C77988

**OAKLEY**  
CALIFORNIA

**OAKLEY RECREATION CENTER**  
OAKLEY CONTRA COSTA COUNTY CALIFORNIA

PAVING PLAN



**PARKING SUMMARY**

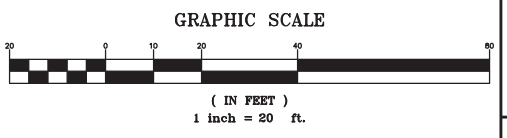
REGULAR PARKING STALLS: 77  
 CLEAN AIR VEHICLES STALLS: 3  
 ADA PARKING STALLS: 3  
 VAN ADA PARKING STALLS: 1  
 TOTAL PARKING STALLS: 84

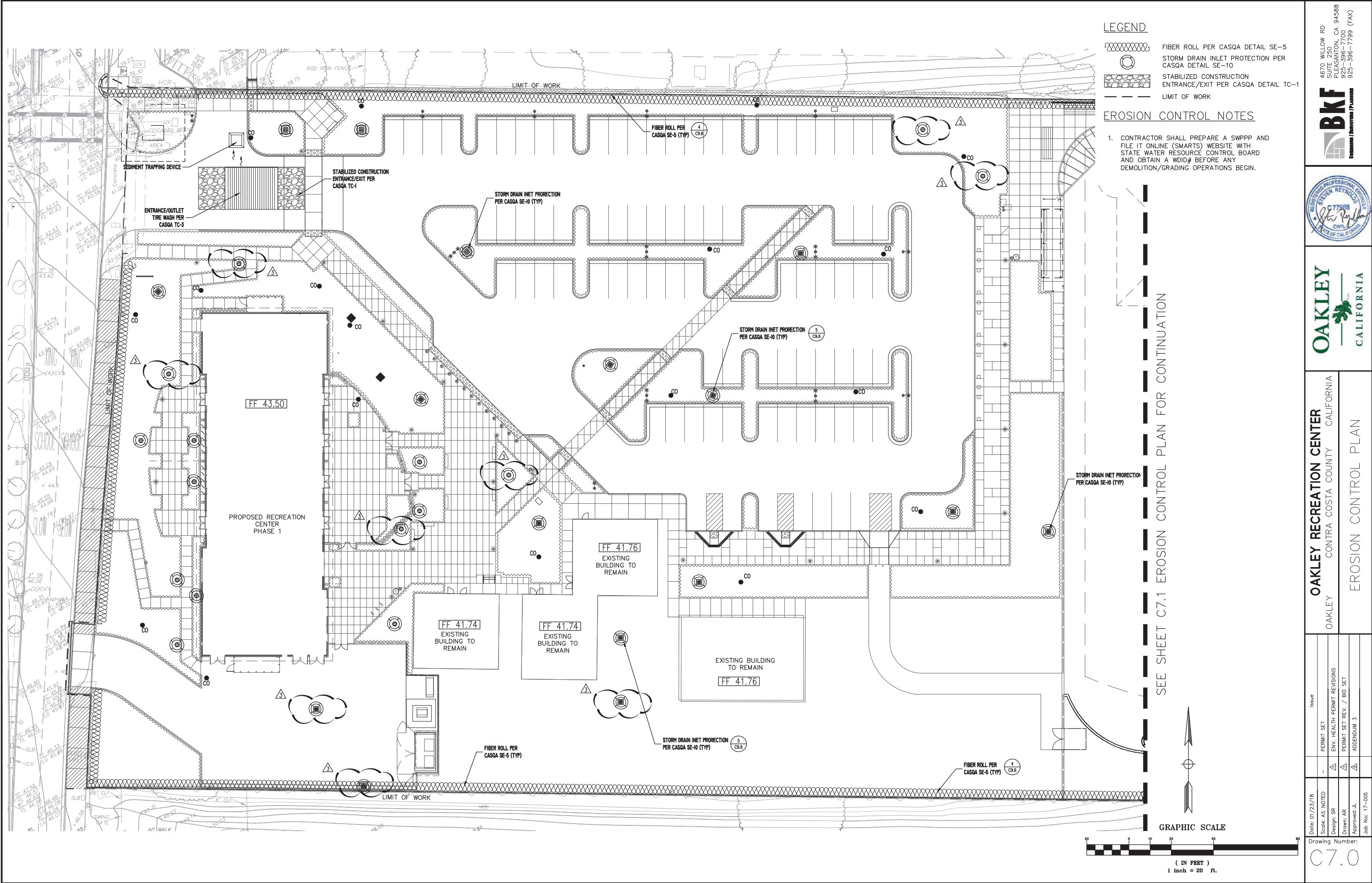


**OAKLEY RECREATION CENTER**  
 OAKLEY CONTRA COSTA COUNTY CALIFORNIA  
 STRIPING PLAN





Date: 07/23/18	Issue:
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Approved: JL	ADDENDUM 3
Job No: 17-005	

Drawing Number:  
**C6.1**





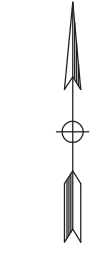
**LEGEND**

-  FIBER ROLL PER CASQA DETAIL SE-5
-  STORM DRAIN INLET PROTECTION PER CASQA DETAIL SE-10
-  STABILIZED CONSTRUCTION ENTRANCE/EXIT PER CASQA DETAIL TC-1
-  LIMIT OF WORK

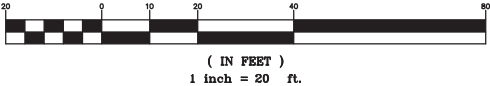
**EROSION CONTROL NOTES**

1. CONTRACTOR SHALL PREPARE A SWPPP AND FILE IT ONLINE (SMARTS) WEBSITE WITH STATE WATER RESOURCE CONTROL BOARD AND OBTAIN A WQID# BEFORE ANY DEMOLITION/GRADING OPERATIONS BEGIN.

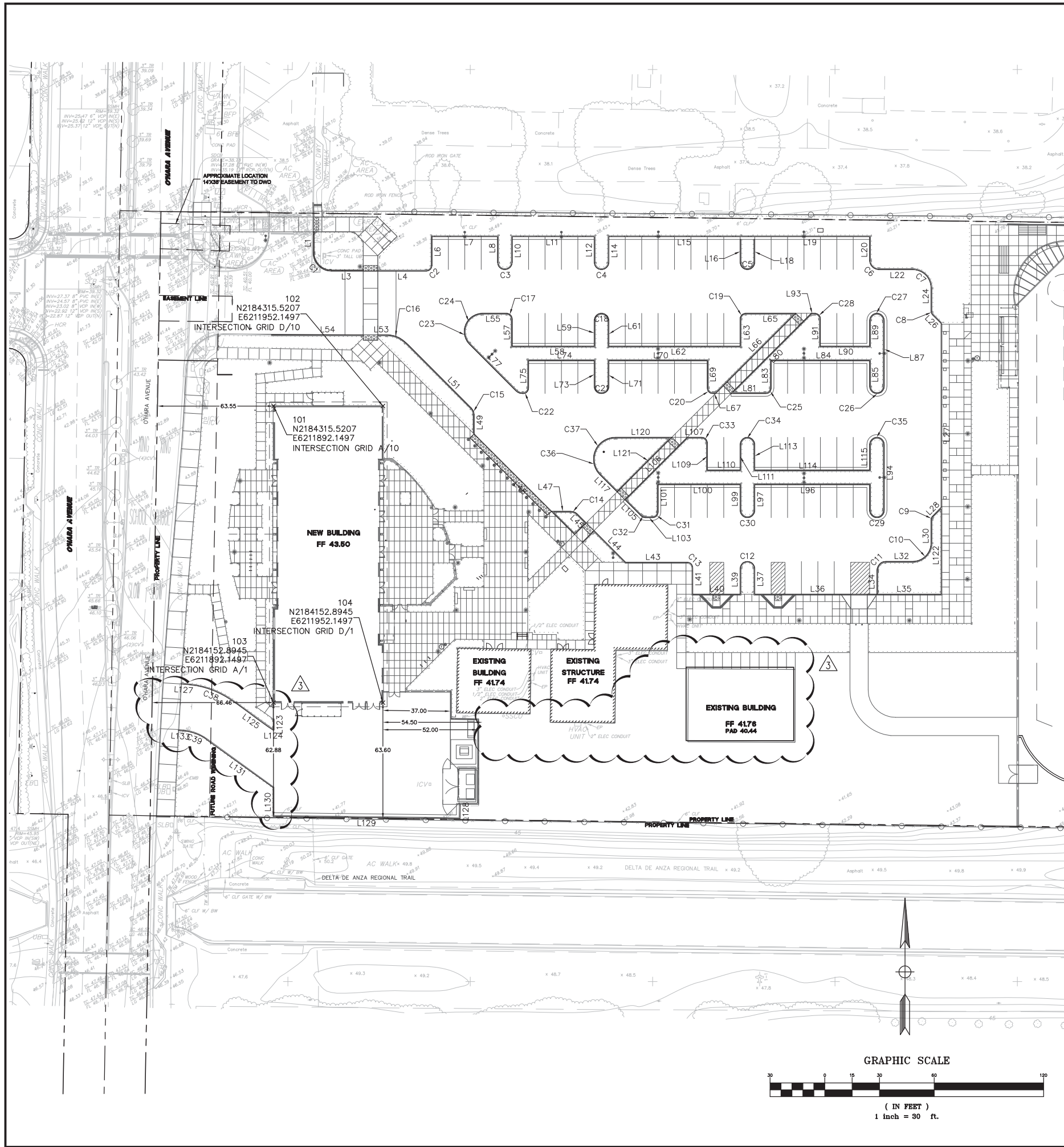
SEE SHEET C7.1 EROSION CONTROL PLAN FOR CONTINUATION



GRAPHIC SCALE



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Design: SR	ENV. HEALTH PERMIT REVISIONS
Drawn: AR	PERMIT SET REV. / BID SET
Approved: JL	ADDENDUM 3
Job No: 17-005	
Drawing Number:	<b>C7.0</b>



LINE TABLE		
LINE NO.	LENGTH	DIRECTION
L1	11.49	N00°00'00"E
L3	52.10	N89°58'33"W
L4	52.10	N89°58'33"W
L6	15.79	S00°00'00"E
L7	36.00	N90°00'00"W
L8	14.00	N00°00'00"E
L10	14.00	S00°00'00"E
L11	45.00	N90°00'00"W
L12	14.00	N00°00'00"E
L14	14.00	S00°00'00"E
L15	143.00	N90°00'00"W
L16	12.50	S00°00'00"E
L18	12.50	N00°00'00"E
L19	143.00	N90°00'00"W
L20	13.00	N00°00'00"E
L22	18.68	N90°00'00"W
L24	12.76	N00°00'00"E
L26	6.54	N45°00'00"W
L27	101.00	S00°00'00"E
L28	6.54	N45°00'00"E

LINE TABLE		
LINE NO.	LENGTH	DIRECTION
L30	12.76	N00°00'00"E
L32	14.68	N90°00'00"E
L34	13.00	N00°00'00"E
L35	35.18	N90°00'00"E
L36	67.00	N90°00'00"E
L37	14.00	S00°00'00"E
L39	14.00	N00°00'00"E
L40	26.00	N90°00'00"E
L41	14.49	S00°00'00"E
L43	33.78	N90°00'00"E
L44	24.54	S45°00'32"E
L45	6.93	N45°00'18"W
L47	10.66	N90°00'00"W
L48	60.00	N45°00'32"W
L49	10.66	S00°01'03"E
L51	49.17	S45°00'32"E
L53	4.90	S89°58'33"E
L54	50.44	S89°58'33"E
L55	13.24	N90°00'00"W
L57	15.00	N00°00'00"E

LINE TABLE		
LINE NO.	LENGTH	DIRECTION
L58	45.00	N90°00'00"W
L59	14.00	S00°00'00"E
L61	14.00	N00°00'00"E
L62	72.00	N90°00'00"W
L63	15.50	S00°00'00"E
L65	27.54	N90°00'00"W
L66	60.81	N45°00'00"E
L67	1.54	N90°00'00"E
L69	15.00	S00°00'00"E
L70	54.00	N90°00'00"E
L71	14.00	N00°00'00"E
L73	14.00	S00°00'00"E
L74	36.00	N90°00'00"E
L75	15.00	N00°00'00"E
L77	36.02	S45°00'32"E
L80	62.23	S45°00'00"W
L81	18.97	N90°00'00"E
L83	15.50	N00°00'00"E
L84	54.00	N90°00'00"E
L85	14.00	S00°00'00"E

LINE TABLE		
LINE NO.	LENGTH	DIRECTION
L87	36.00	N00°00'00"E
L89	14.00	S00°00'00"E
L90	27.00	N90°00'00"W
L91	15.00	N00°00'00"E
L93	1.97	N90°00'00"W
L94	36.00	S00°00'00"E
L96	63.00	N90°00'00"W
L97	14.00	S00°00'00"E
L99	14.00	N00°00'00"E
L100	45.00	N90°00'00"W
L101	15.00	S00°00'00"E
L103	4.12	N90°00'00"W
L105	12.63	N45°00'32"W
L106	48.36	N45°00'00"E
L107	7.97	N90°00'00"E
L109	15.00	S00°00'00"E
L110	18.00	N90°00'00"E
L111	14.00	N00°00'00"E
L113	14.00	S00°00'00"E
L114	64.00	N90°00'00"E

CURVE TABLE			
CURVE NO.	LENGTH	RADIUS	DELTA
C1	15.70	10.00	089°58'33"
C2	4.71	3.00	090°01'27"
C3	12.57	4.00	180°00'00"
C4	12.57	4.00	180°00'00"
C5	12.57	4.00	180°00'00"
C6	7.85	5.00	090°00'00"
C7	15.71	10.00	090°00'00"
C8	2.36	3.00	045°00'00"
C9	2.36	3.00	045°00'00"
C10	15.71	10.00	090°00'00"
C11	7.85	5.00	090°00'00"
C12	12.57	4.00	180°00'00"
C13	4.71	3.00	090°00'00"
C14	3.93	5.00	044°59'28"
C15	3.86	5.00	044°12'51"
C16	11.77	15.00	044°58'02"
C17	4.71	3.00	090°00'00"
C18	12.57	4.00	180°00'00"
C19	4.71	3.00	090°00'00"
C20	4.71	3.00	090°00'00"

CURVE TABLE			
CURVE NO.	LENGTH	RADIUS	DELTA
C21	12.57	4.00	180°00'00"
C22	5.02	3.02	095°13'33"
C23	23.56	10.00	135°00'32"
C24	22.39	9.50	135°00'32"
C25	4.71	3.00	090°00'00"
C26	12.57	4.00	180°00'00"
C27	12.57	4.00	180°00'00"
C28	4.71	3.00	090°00'00"
C29	12.57	4.00	180°00'00"
C30	12.57	4.00	180°00'00"
C31	4.71	3.00	090°00'00"
C32	1.96	2.50	044°59'28"
C33	4.71	3.00	090°00'00"
C34	11.00	3.50	180°00'00"
C35	12.57	4.00	180°00'00"
C36	28.28	12.00	135°00'32"
C37	28.28	12.00	135°00'32"
C38	28.93	50.00	033°09'23"
C39	14.53	24.50	033°58'18"

LINE TABLE		
LINE NO.	LENGTH	DIRECTION
L115	14.00	N00°00'00"E
L117	13.39	N45°00'46"W
L120	30.93	N90°00'00"E
L121	42.36	S45°00'00"W
L122	46.79	N00°00'00"E
L123	6.19	S00°00'00"E
L124	0.50	N90°00'00"W
L125	25.13	N54°08'24"W
L127	3.50	N85°23'39"W
L128	7.80	S00°43'36"W
L129	102.51	N89°18'59"W
L130	15.79	N00°00'00"E
L131	44.06	N54°08'24"W
L133	2.96	N85°23'39"W

**3**

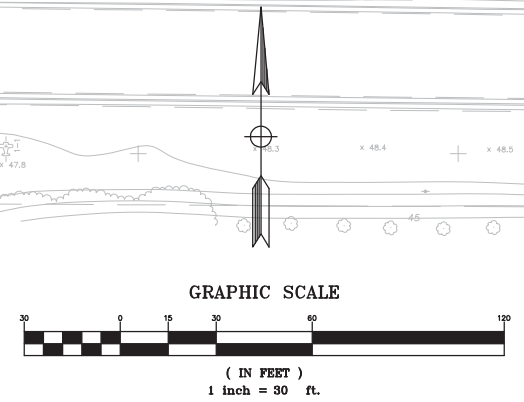
**SURVEYOR NOTES**

1) HORIZONTAL COORDINATES ARE BASED ON THE CALIFORNIA COORDINATE SYSTEM, ZONE 3, NORTH AMERICAN DATUM OF 1983, AS DERIVED BY GPS.

2) VERTICAL ELEVATIONS ARE BASED ON THE BENCHMARK BELOW:

FOUND BRASS CAP MONUMENT IN MONUMENT HAND WELL AT THE CENTERLINE OF THE INTERSECTION OF LAUREL AVENUE AND MELLOWOOD DRIVE.

ELEVATION = 31.70'



4670 WILLOW RD  
SUITE 250  
PLEASANTON, CA 94566  
925-396-7700  
925-396-7799 (FAX)

BKF

REGISTERED PROFESSIONAL ENGINEER  
STEVEN REYNOLDS  
CIVIL  
STATE OF CALIFORNIA

**OAKLEY RECREATION CENTER**  
OAKLEY CONTRA COSTA COUNTY CALIFORNIA

**HORIZONTAL CONTROL PLAN**

Date: 07/23/18

Scale: AS NOTED

Design: SR

Drawn: AR

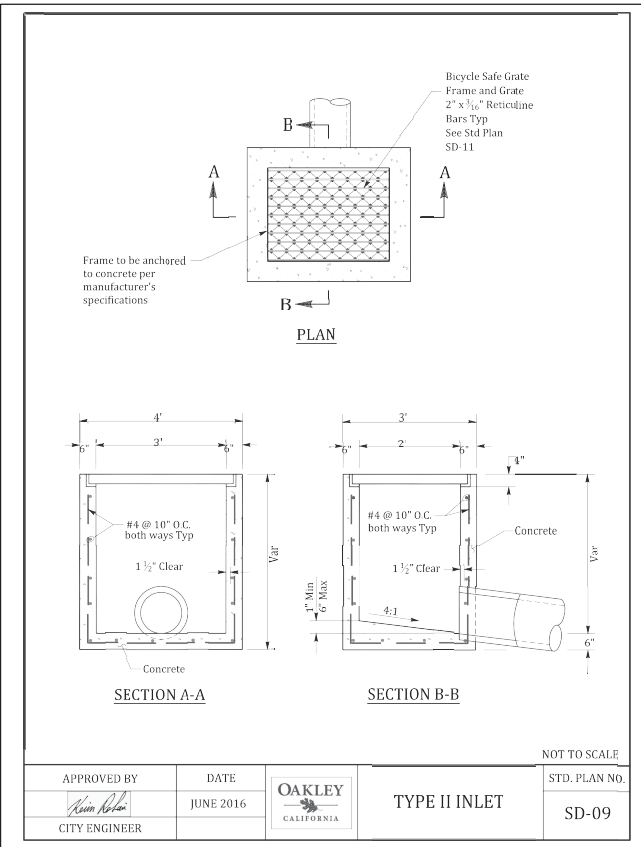
Approved: JL

Job No: 17-005

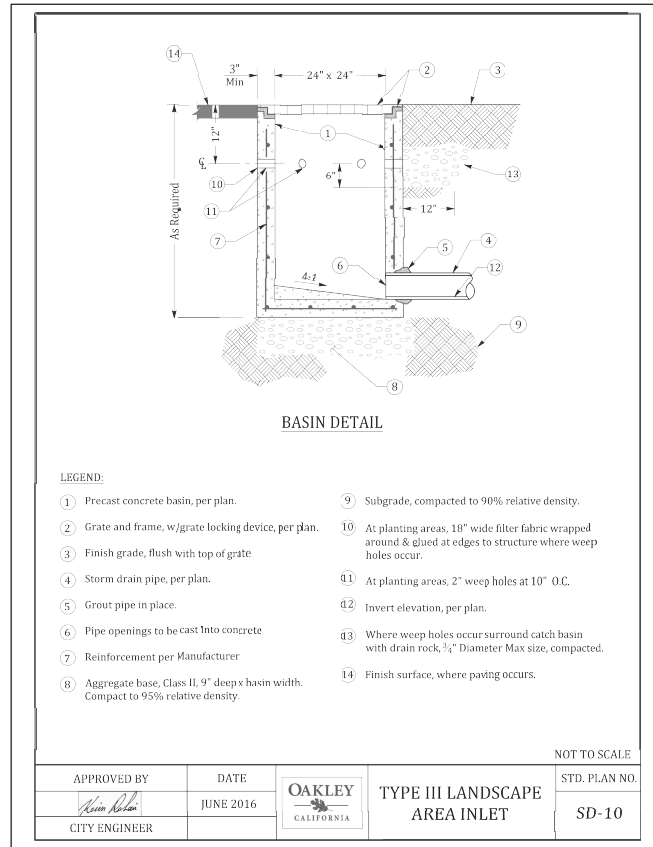
ISSUE

PERMIT SET	-	ENV. HEALTH PERMIT REVISIONS	△	PERMIT SET REV. / BID SET	△	ADDENDUM 3	△
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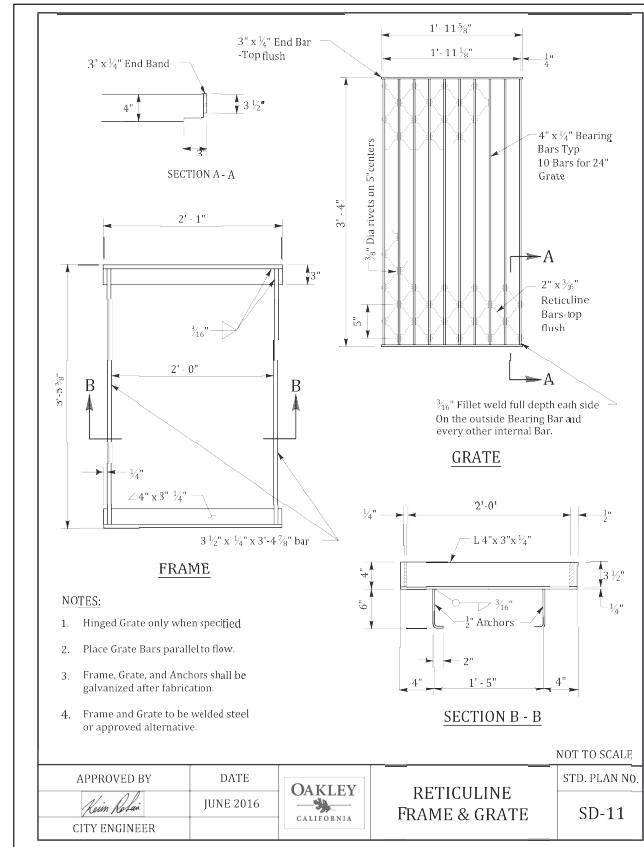
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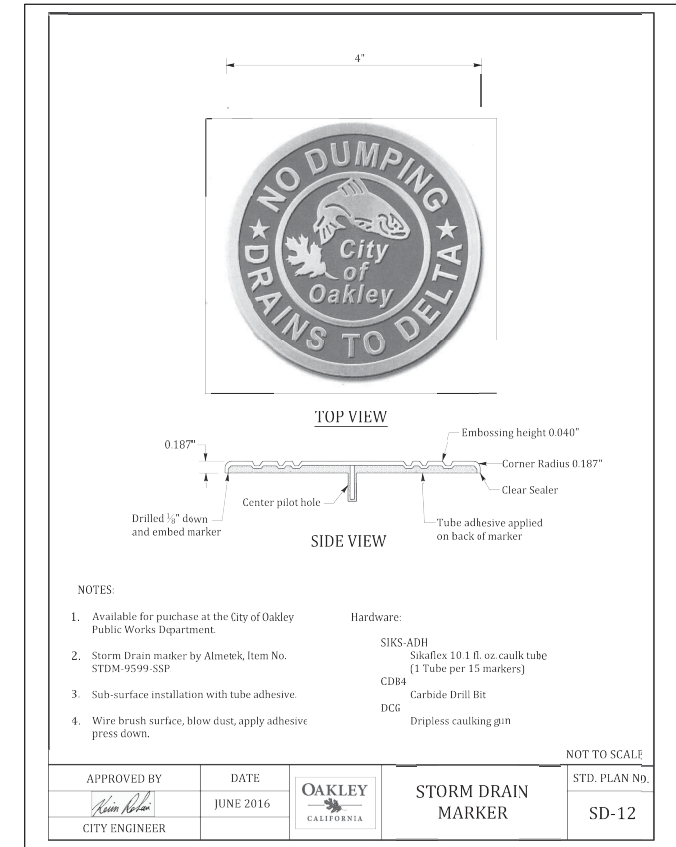
1 TYPE II INLET  
NOT TO SCALE



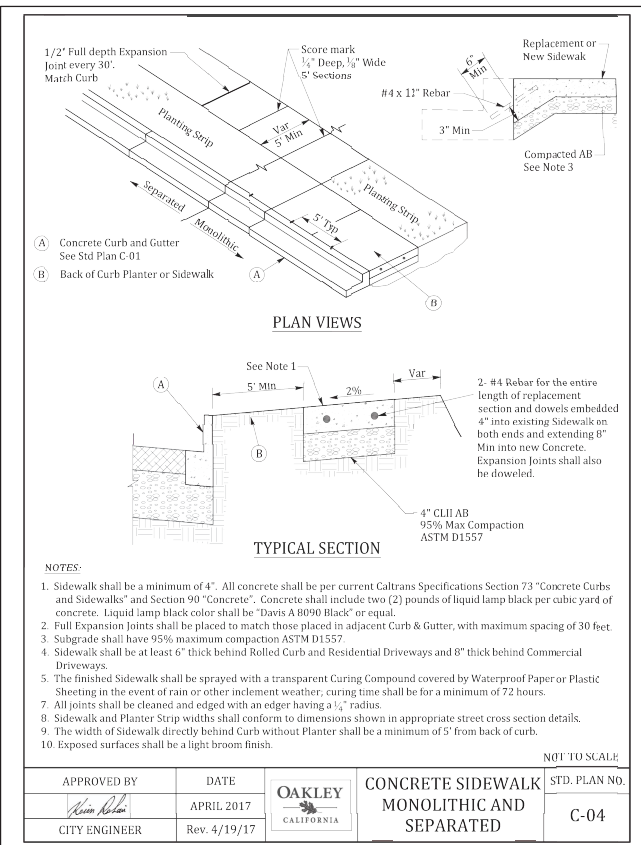
2 TYPE III LANDSCAPE AREA INLET  
NOT TO SCALE



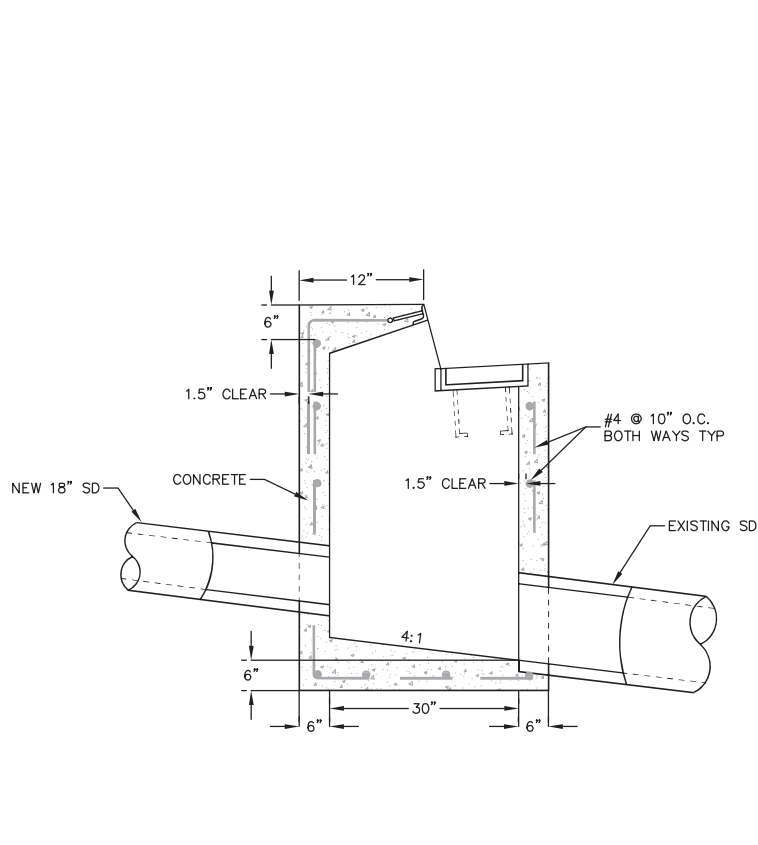
3 RETICULINE FRAME AND GRATE  
NOT TO SCALE



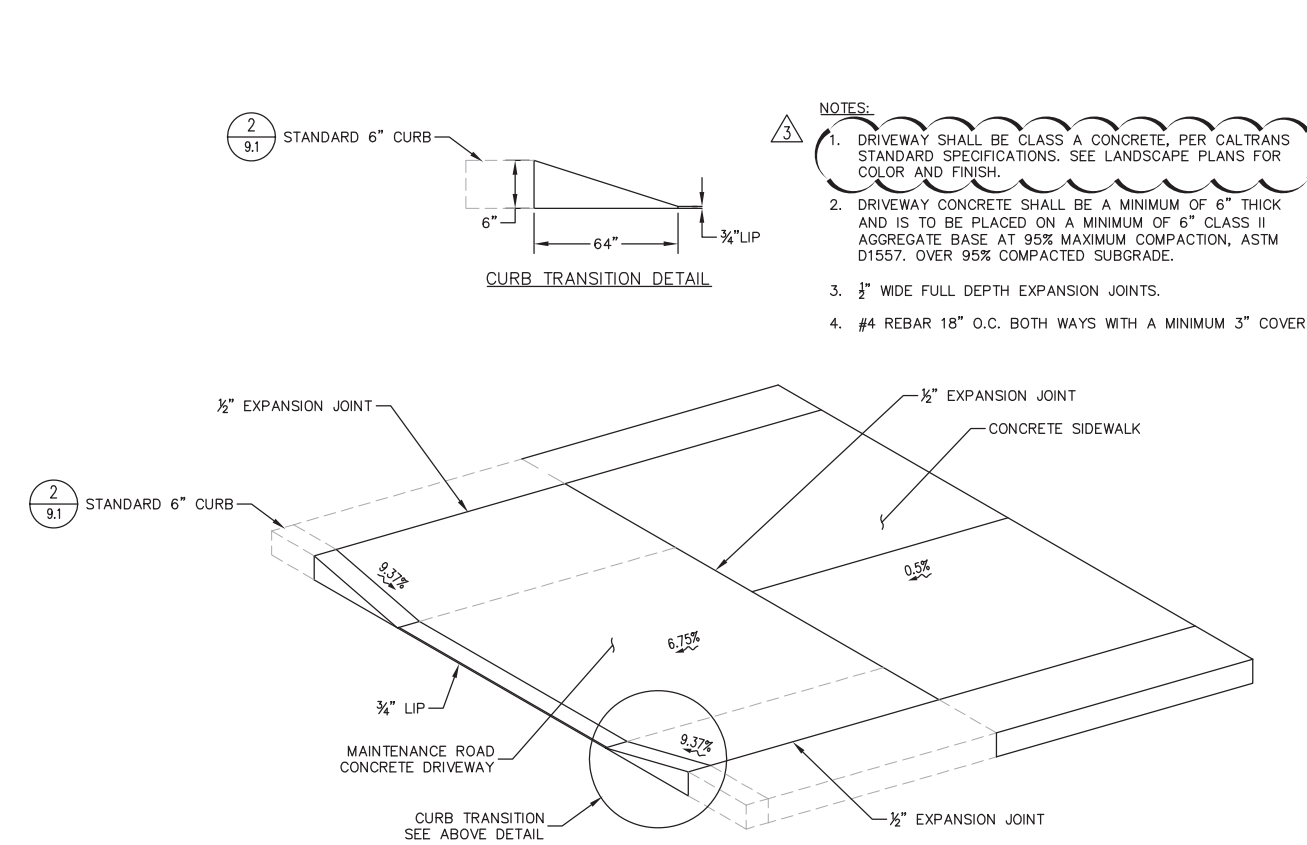
4 STORM DRAIN MARKER  
NOT TO SCALE



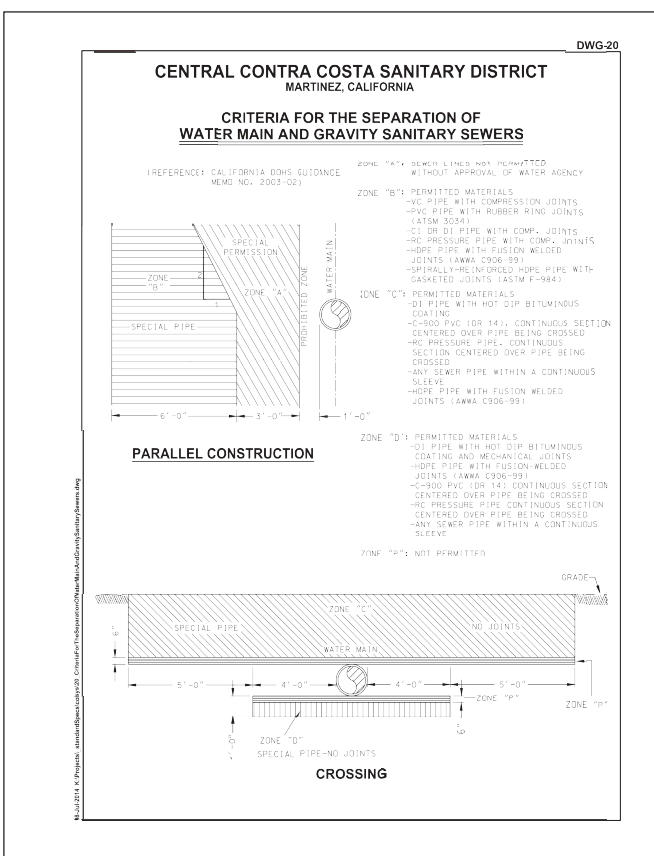
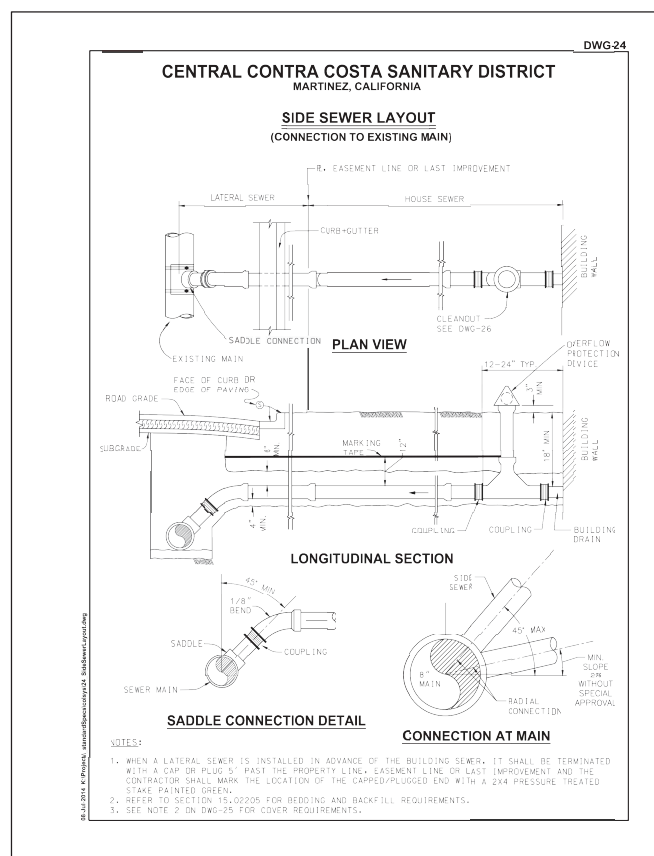
5 CONCRETE SIDEWALK MONOLITHIC AND SEPARATED  
NOT TO SCALE



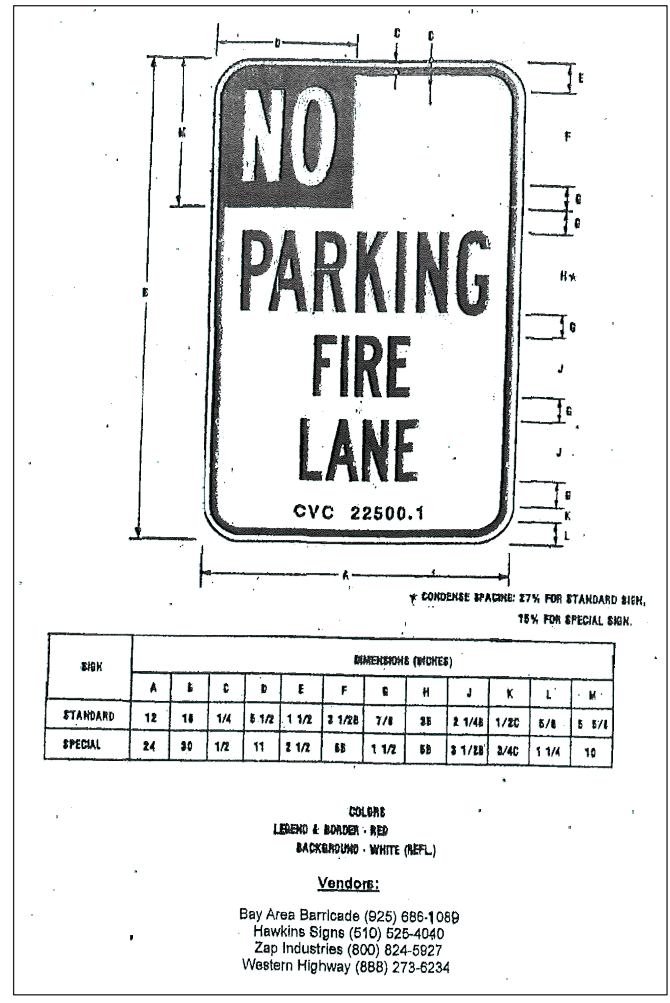
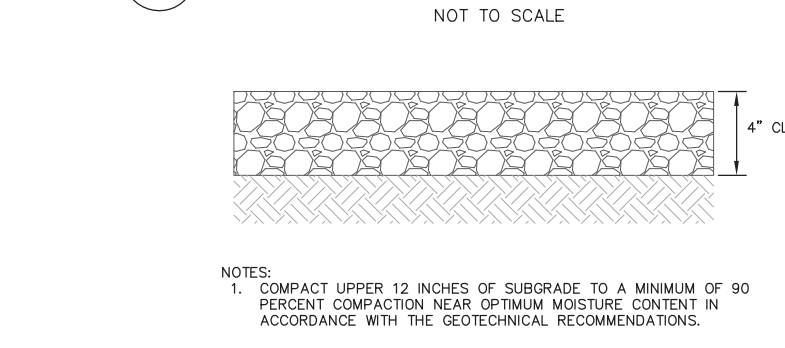
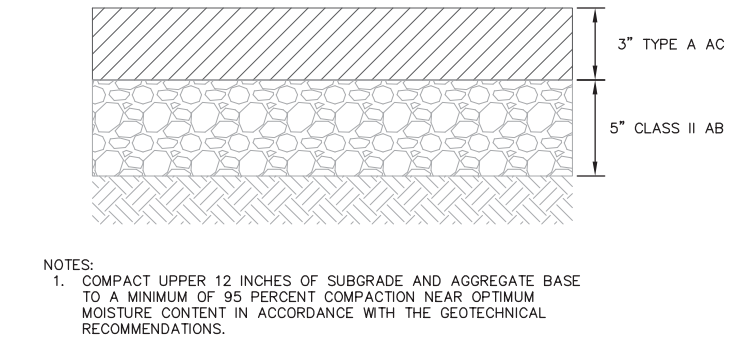
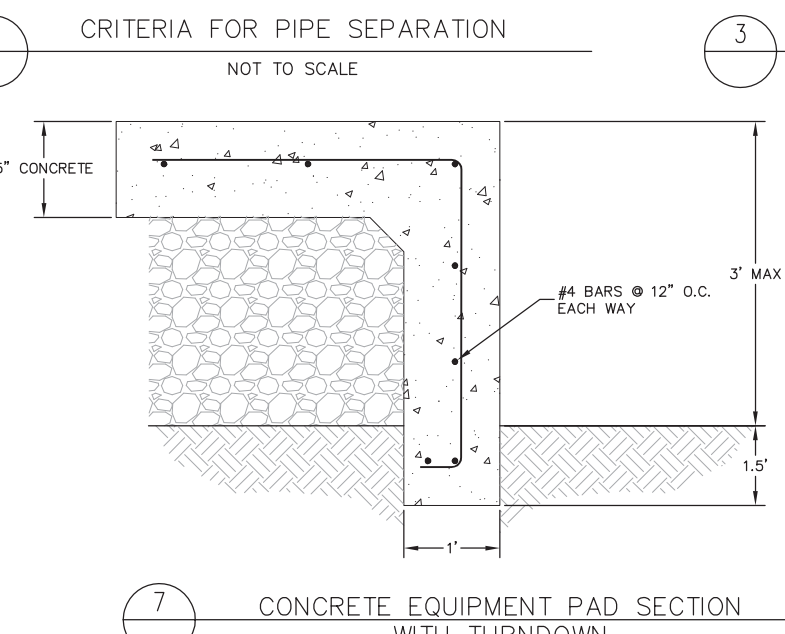
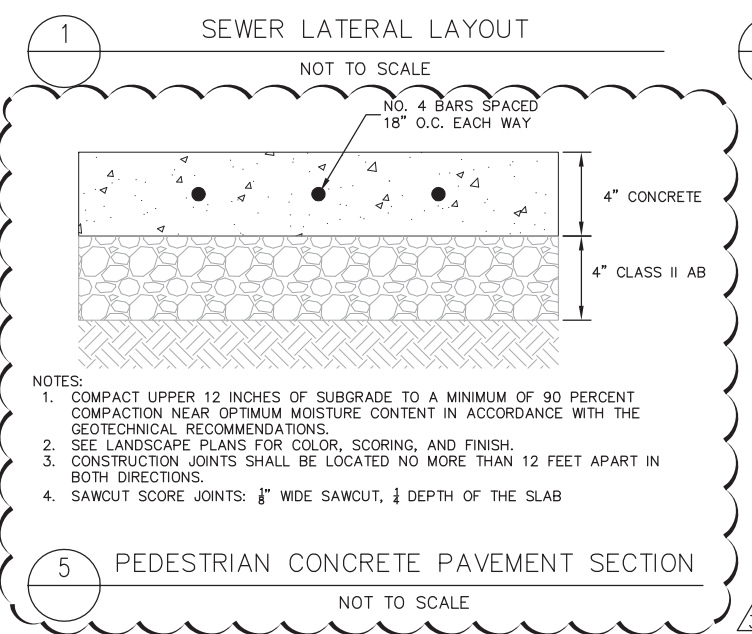
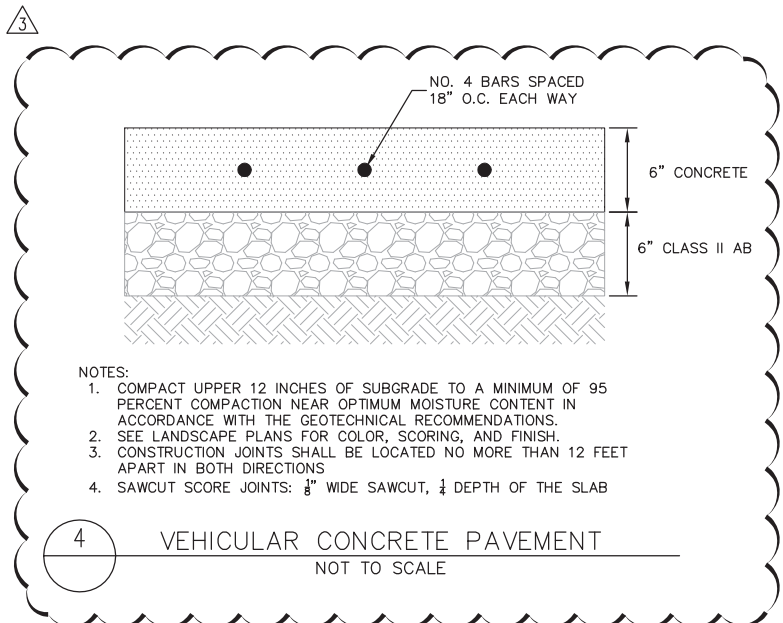
6 TYPE I CURB INLET CONNECTION  
NOT TO SCALE



7 MAINTENANCE ROAD DRIVEWAY  
NOT TO SCALE



PIPE COVER LIMITATION TABLE			
SIZE	MATERIAL	TYPE AND MINIMUM CLASS	MIN. - MAX. COVER (IN FT.)
<b>BUILDING SEWERS</b>			
4" - 6"	VC	CLASS 52	1.5 - 3.0
4" - 6"	GI	CLASS 52	1.5 - 3.0
4" - 6"	PE	CLASS 52	1.5 - 3.0
4" - 6"	ABS	SCORING 60	2.5 - 2.8
4" - 6"	PVC	SDR 26	2.5 - 2.8
4" - 6"	HDPE	SDR 11	2.5 - 2.8
<b>MAIN SEWERS</b>			
6"	VC	CLASS 52	3 - 3.5
6"	GI	CLASS 52	3 - 3.5
6"	PE	CLASS 52	3 - 3.5
6"	ABS	SCORING 60	3 - 3.5
6"	PVC	SDR 26	3 - 3.5
6"	HDPE	SDR 11	3 - 3.5
<b>SMALL TRUNK SEWERS</b>			
8" - 10"	VC	CLASS 52	3 - 3.5
8" - 10"	GI	CLASS 52	3 - 3.5
8" - 10"	PE	CLASS 52	3 - 3.5
8" - 10"	ABS	SCORING 60	3 - 3.5
8" - 10"	PVC	SDR 26	3 - 3.5
8" - 10"	HDPE	SDR 11	3 - 3.5



4670 WILLOW RD  
SUITE 250  
PLEASANTON, CA 94568  
925-396-7700  
925-396-7799 (FAX)

**BKF**  
Business / Services / Insurance

REGISTERED PROFESSIONAL ENGINEER  
CIVIL  
STATE OF CALIFORNIA  
077988  
Peter Reynolds

**OAKLEY CALIFORNIA**

OAKLEY RECREATION CENTER  
CONTRA COSTA COUNTY CALIFORNIA

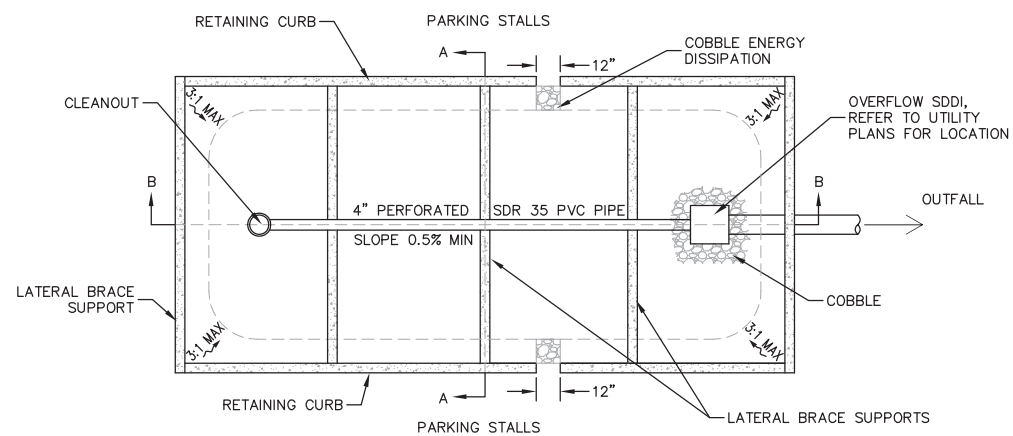
CIVIL DETAILS

ISSUE: PERMIT SET  
- PERMIT SET  
- ENV. HEALTH PERMIT REVISIONS  
- PERMIT SET REV. / BID SET  
- ADDENDUM 3

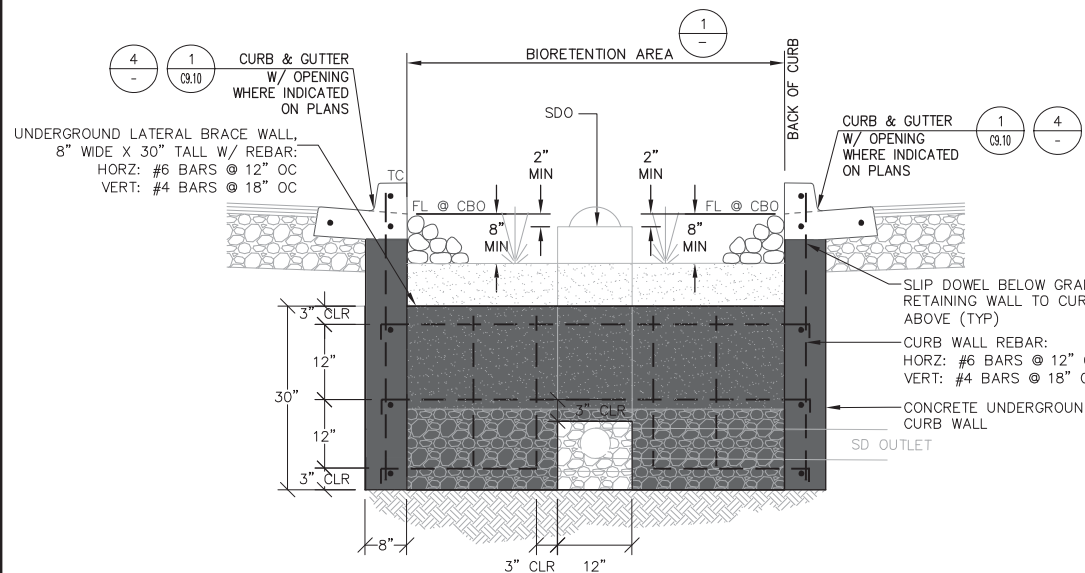
Date: 07/23/18  
Scale: AS NOTED  
Design: SR  
Drawn: AR  
Approved: JL  
Job No: 17-005

Drawing Number:  
**C9.4**





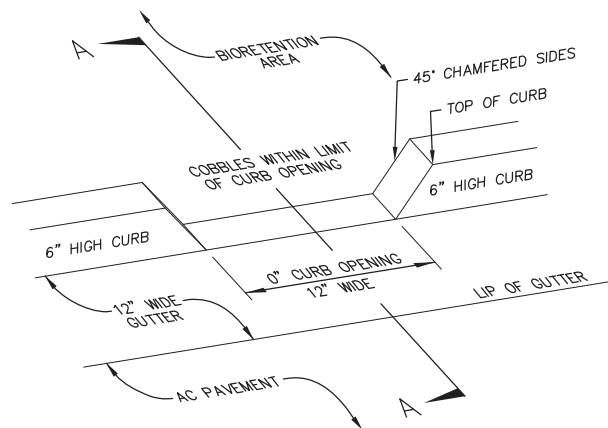
1 BIORETENTION FACILITY BETWEEN PARKING STALLS  
PLAN VIEW  
NOT TO SCALE



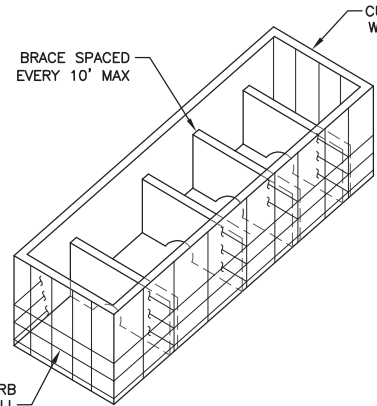
NOTES:

- SPACING OF LATERAL BRACING WALLS SHALL BE INSTALLED AT EVERY 10 FT MAX

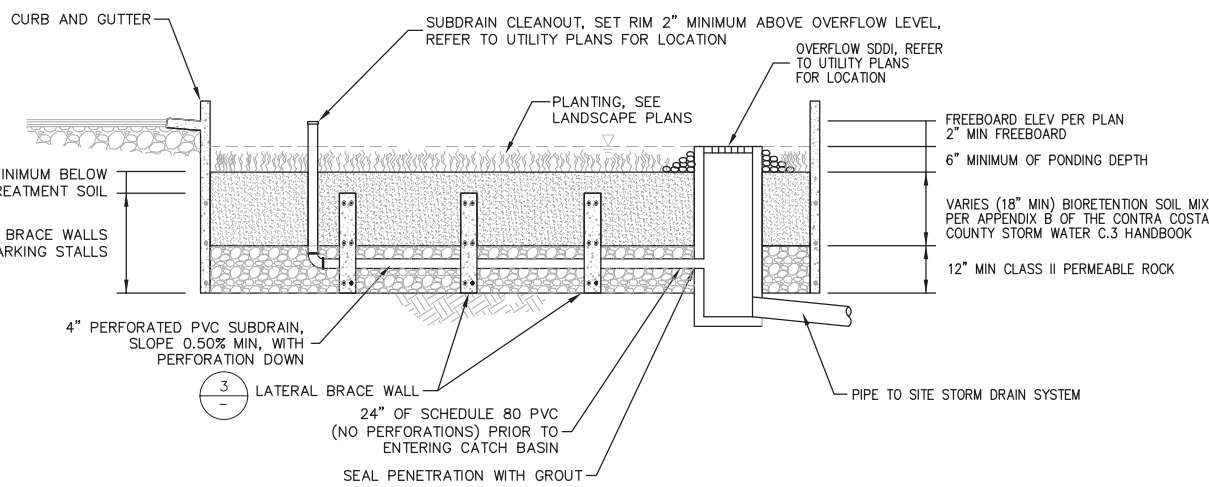
3 BRACED FRAME BIORETENTION AREA  
NOT TO SCALE



4 12 INCH CURB CUT  
ISOMETRIC VIEW  
NOT TO SCALE



LATERAL BRACE WALL  
ISOMETRIC VIEW  
NOT TO SCALE



2 BIORETENTION FACILITY BETWEEN PARKING STALLS  
CROSS SECTION B-B  
NOT TO SCALE

### 320-5000 GALLON GREASE INTERCEPTORS

NORTHERN CALIFORNIA

MODEL NUMBER	LIQUID CAPACITY (GALLONS)	DIM A	DIM B	DIM C	DIM D	DIM E	MINIMUM EXCAVATION WIDTH	MINIMUM EXCAVATION LENGTH	DEPTH OF BURY
JP320EE-G	320	3'-0"	7'-0"	4'-6"	3'-7"	3'-4"	4'-0"	8'-0"	1' TO 8"
JP500EE-G	500	4'-0"	6'-0"	5'-10"	4'-10"	4'-7"	5'-0"	7'-0"	1' TO 6"
JP750EE-G	750	4'-0"	8'-1"	6'-3"	5'-0"	4'-9"	5'-3"	9'-1"	1' TO 6"
JP1000EE-G	1000	5'-1"	8'-2"	6'-3"	5'-0"	4'-9"	6'-4"	9'-2"	1' TO 6"
JP1200EE-G	1200	5'-9"	8'-6"	6'-6"	5'-0"	4'-9"	7'-0"	9'-6"	1' TO 6"
JP1500EE-G	1500	5'-7"	10'-8"	6'-3"	5'-0"	4'-9"	6'-10"	11'-8"	1' TO 6"
JP2000EE-G	2000	4'-11"	15'-11"	6'-0"	5'-0"	4'-9"	5'-11"	16'-11"	1' TO 6"
JZ2500EE-G	2500	5'-9"	16'-10"	6'-0"	5'-0"	4'-9"	6'-9"	17'-10"	1' TO 5"
JZ3000EE-G	3000	5'-9"	16'-10"	6'-9"	5'-9"	5'-6"	6'-9"	17'-10"	1' TO 5"
JZ4000EE-G	4000	7'-8"	16'-7"	6'-9"	5'-6"	5'-3"	8'-8"	17'-7"	1' TO 5"
JZ5000EE-G	5000	7'-8"	16'-7"	7'-11"	6'-9"	6'-6"	8'-8"	17'-7"	1' TO 4"

DESIGN LOAD: H-20 TRAFFIC WITH DRY SOIL CONDITIONS (WATER LEVEL BELOW TANK).  
BEDDING NOTE: SUITABLE SUB-BASE BEDDED WITH GRANULAR MATERIAL SHALL BE PREPARED TO HANDLE ANTICIPATED LOADS.  
FOR COMPLETE DESIGN AND PRODUCT INFORMATION CONTACT JENSEN PRECAST.

**JENSEN PRECAST**

5 JENSEN PRECAST GREASE INTERCEPTOR  
NOT TO SCALE

### SAMPLE BOX WITH PIPE CONNECTORS

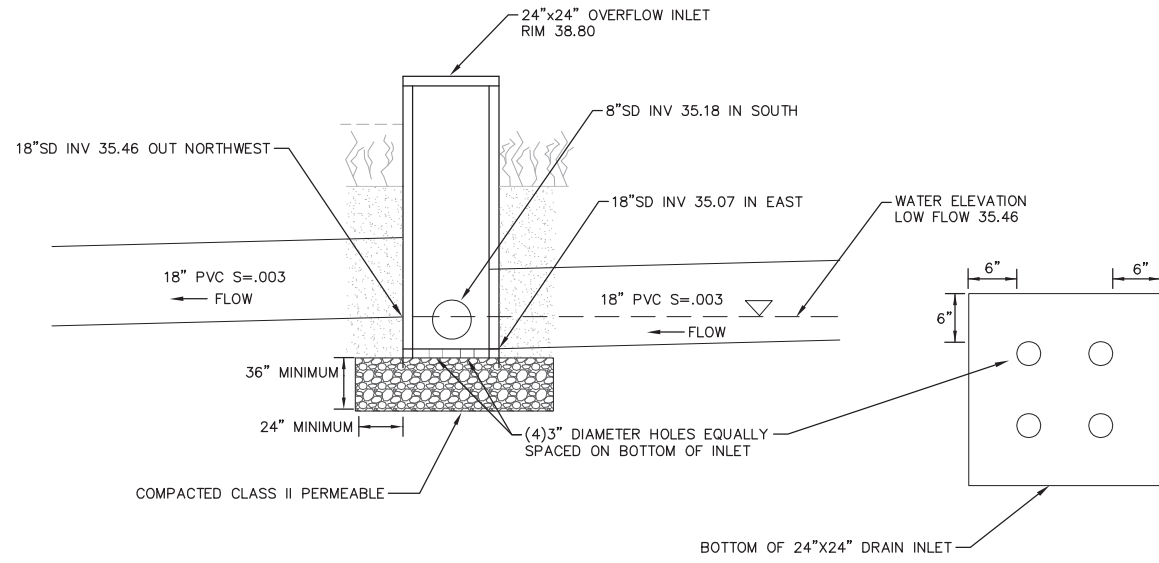
MODEL 2432-Z

BOX WEIGHT: 1250 LBS.  
BOX DESIGN LOAD: H-20 TRAFFIC

SAMPLE BOX MUST BE PLACED ON SUITABLE BASE OF COMPACTED SOIL OR UNDISTURBED EARTH IN TRAFFIC CONDITION. FOR COMPLETE DESIGN AND PRODUCT INFORMATION, CONTACT JENSEN PRECAST.

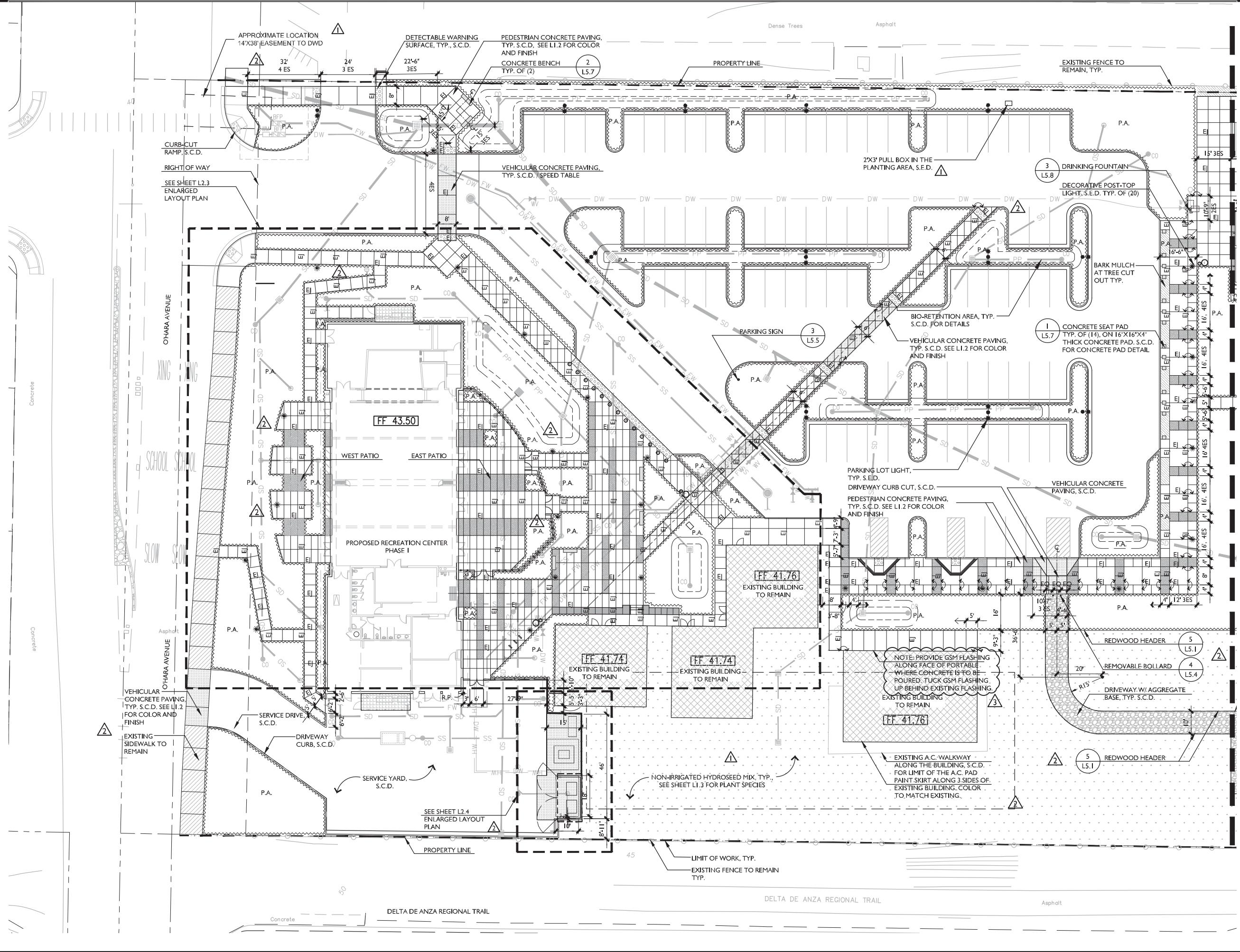
**JENSEN PRECAST**

6 JENSEN PRECAST SAMPLE BOX  
NOT TO SCALE

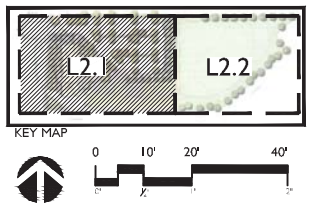


1 DRAIN INLET WITH HYDRAULIC JUMP  
NOT TO SCALE

Date: 07/23/18	Issue
Scale: AS NOTED	PERMIT SET
Design: SR	ENV. HEALTH PERMIT REVISIONS
Drawn: AR	PERMIT SET REV. / BID SET
Approved: JL	ADDENDUM 3
Job No: 17-005	



MATCH LINE, SEE SHEET L2.2



**GATES + ASSOCIATES**  
 LANDSCAPE ARCHITECTURE  
 LAND PLANNING • URBAN DESIGN  
 15257 25TH AVE., SUITE 100, REDWOOD CITY, CA 94061  
 TEL: 650.962.2277 FAX: 650.962.2278

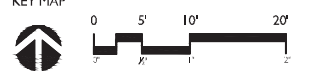
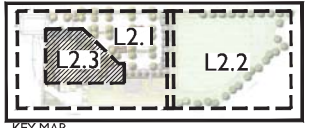
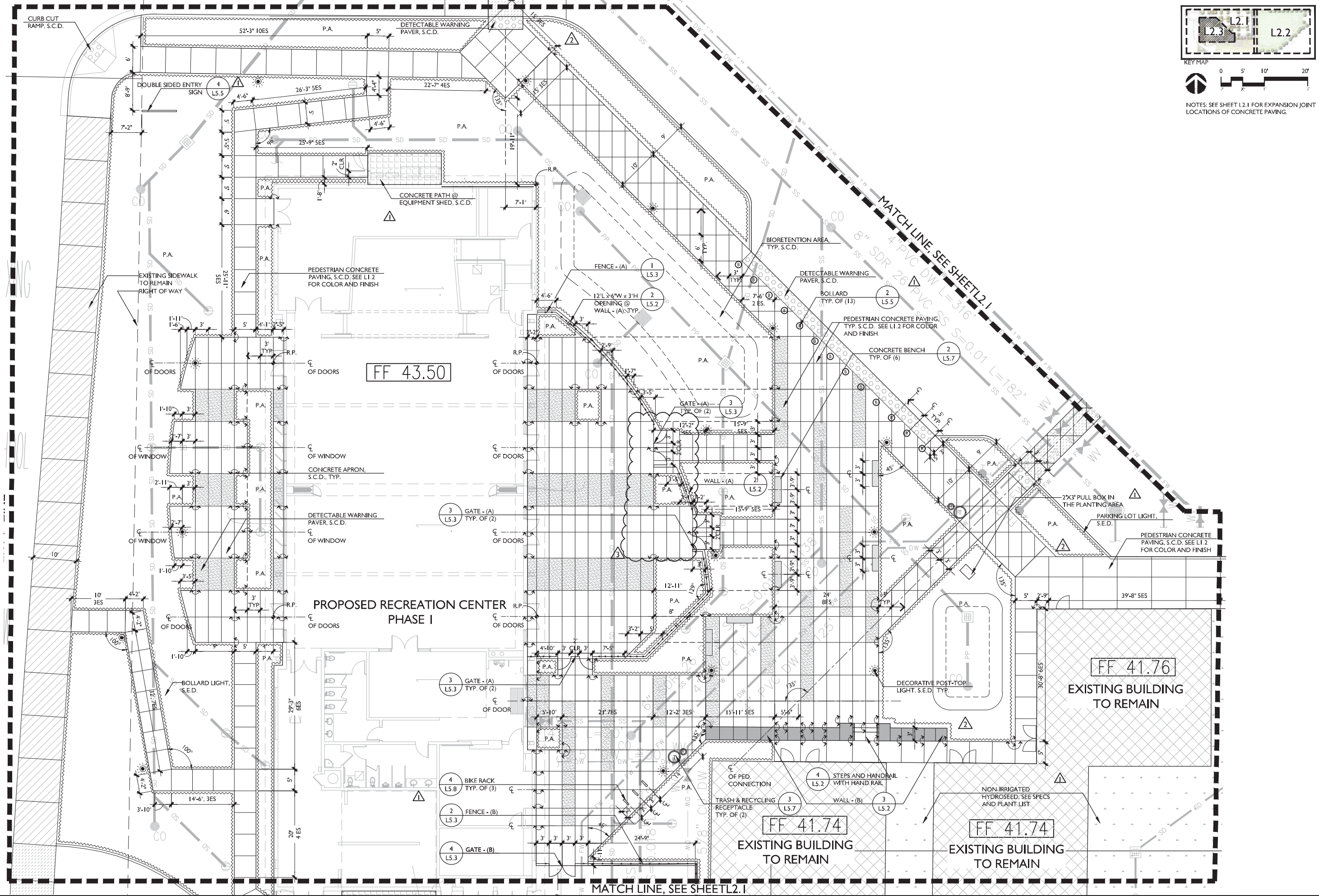
**OAKLEY CALIFORNIA**

**CIP 194 - OAKLEY RECREATION CENTER**  
 CONTRA COSTA COUNTY CALIFORNIA  
 OAKLEY

**LAYOUT PLAN**

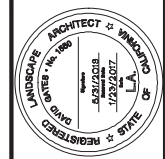
Date: 07/23/2018	Revisions
Scale: AS NOTED	PERMIT SET REV. / BID SET
Design: KC	ADDENDUM 2
Drawn: JS, JS	ADDENDUM 3
Approve:	
Job No: P5003	

Drawing Number:  
**L2.1**



NOTES: SEE SHEET L2.1 FOR EXPANSION JOINT LOCATIONS OF CONCRETE PAVING.

**GATES + ASSOCIATES**  
 LANDSCAPE ARCHITECTURE  
 LAND PLANNING + URBAN DESIGN  
 11257 25TH AVE. #100  
 SAN DIEGO, CA 92121



**OAKLEY**  
 CALIFORNIA

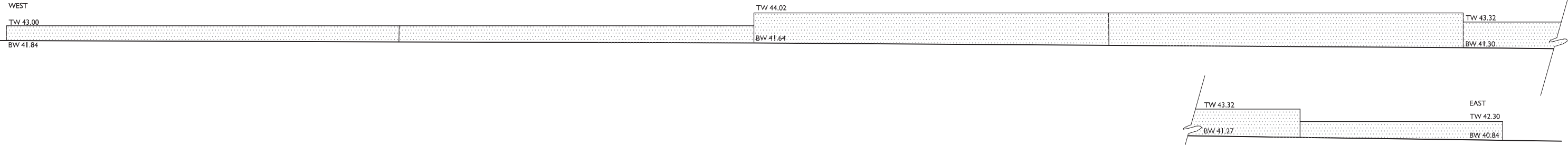
**CIP 194 - OAKLEY RECREATION CENTER**  
 OAKLEY CONTRA COSTA COUNTY CALIFORNIA

No.	Revisions	PERMIT SET REV. / BID SET
1	AS NOTED	ADDENDUM 2
2	DESIGN: KC	ADDENDUM 3
3	DRAWN: JS, JS	
4	APPROVED:	

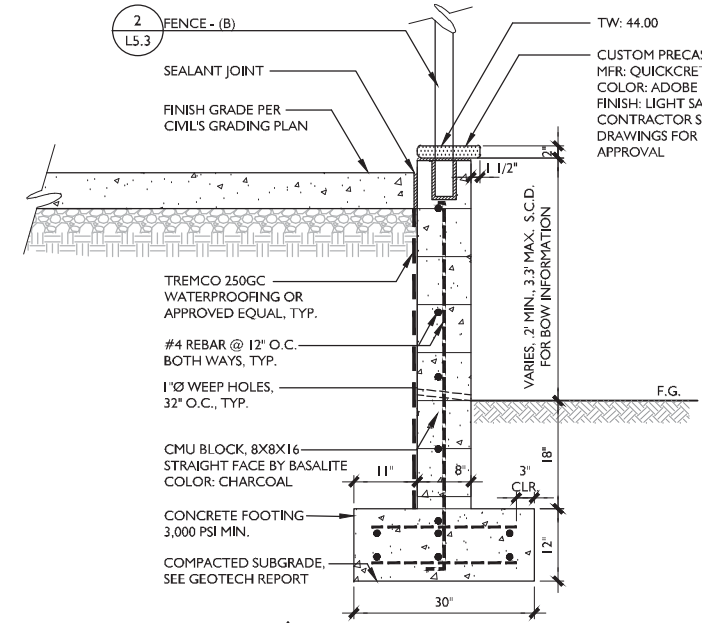
Date: 07/23/2018  
 Scale: AS NOTED  
 Design: KC  
 Drawn: JS, JS  
 Approved:  
 Job No: P5003

Drawing Number:  
**L2.3**

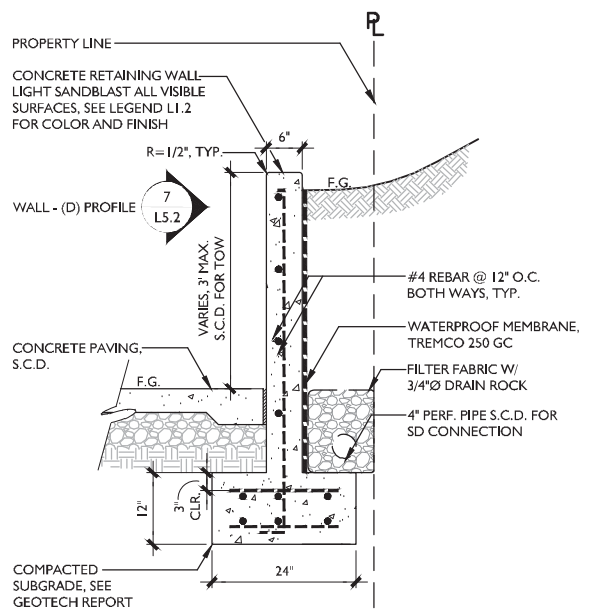
**ENLARGED LAYOUT PLAN**



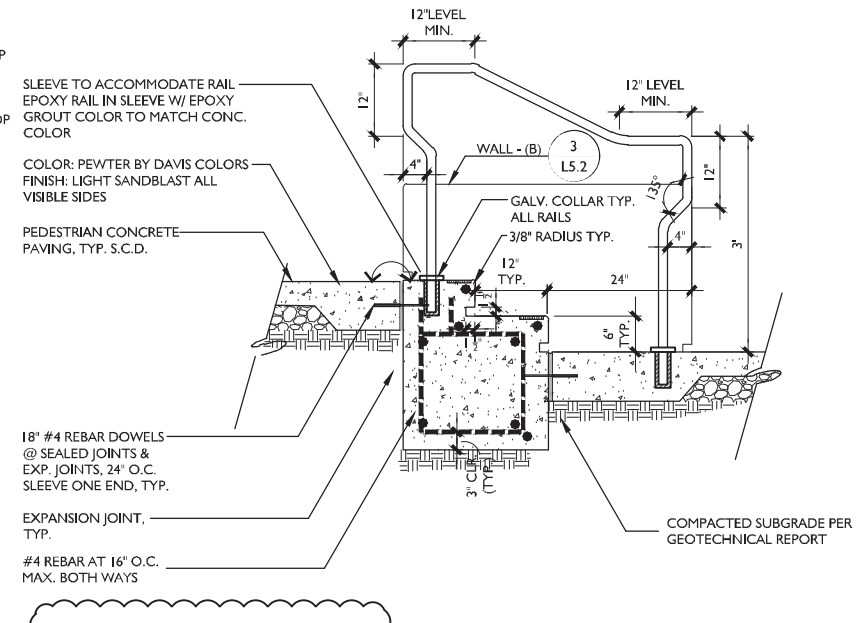
**7 WALL - (D) PROFILE**  
1/4" = 1'-0"



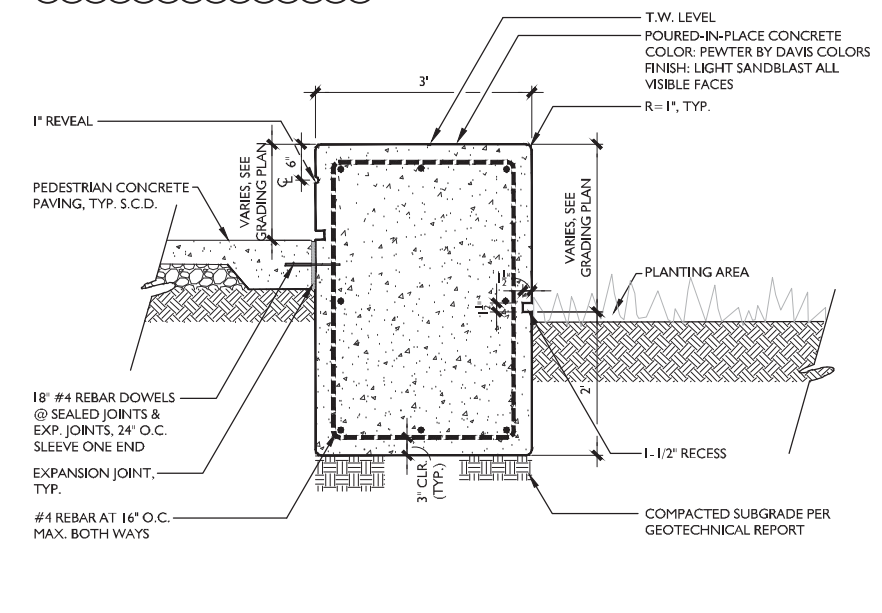
**6 WALL - (E)**  
3/4" = 1'-0"



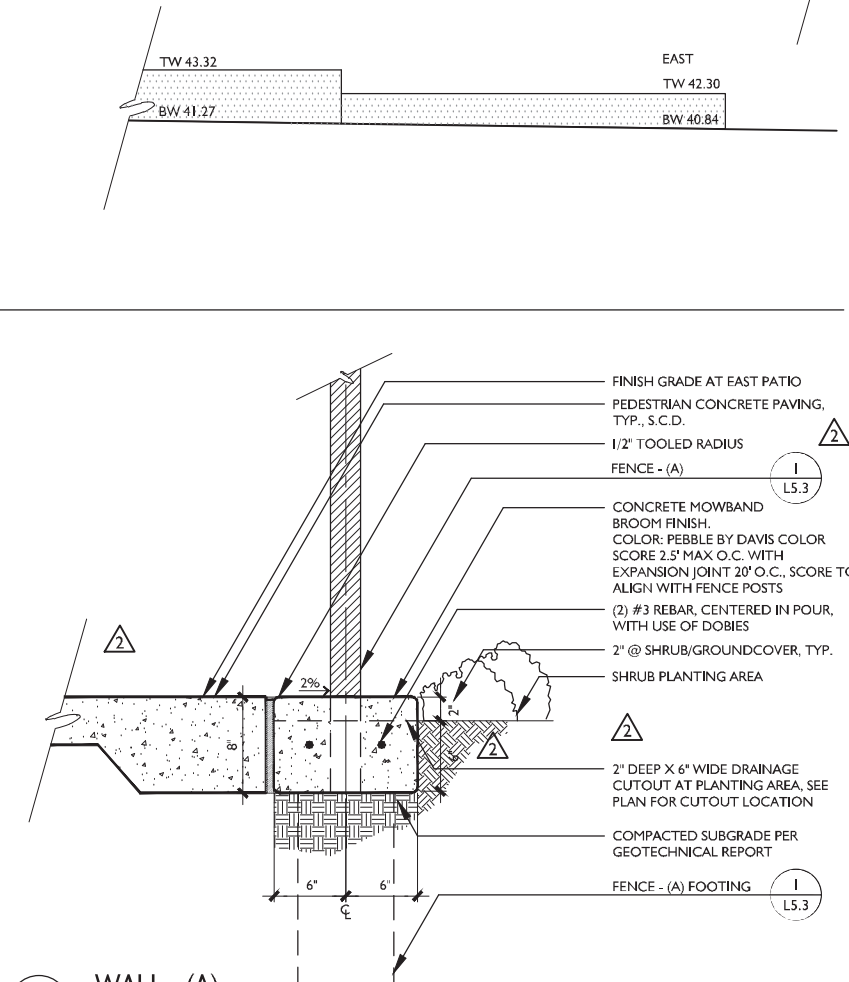
**5 WALL - (D)**  
3/4" = 1'-0"



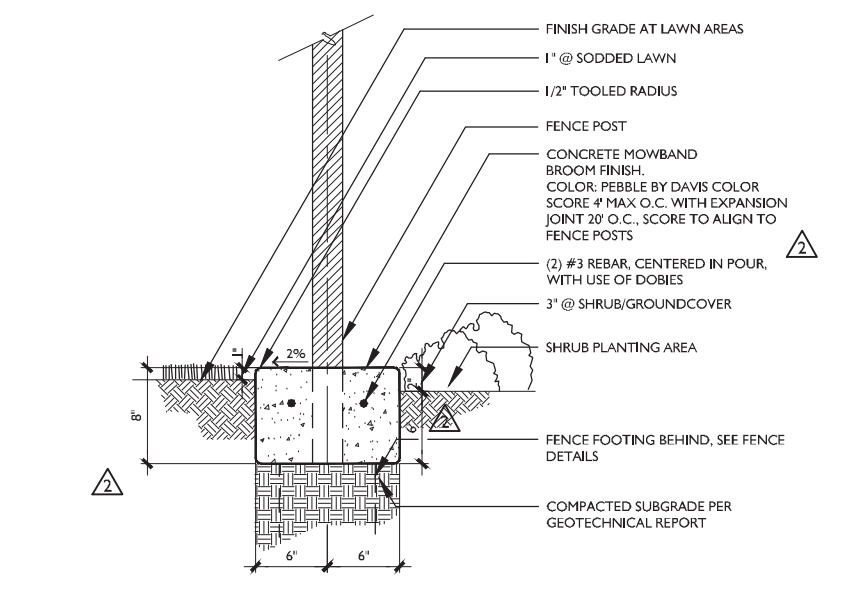
**4 STAIRS AND HANDRAIL**  
3/4" = 1'-0"



**3 WALL - (B)**  
3/4" = 1'-0"

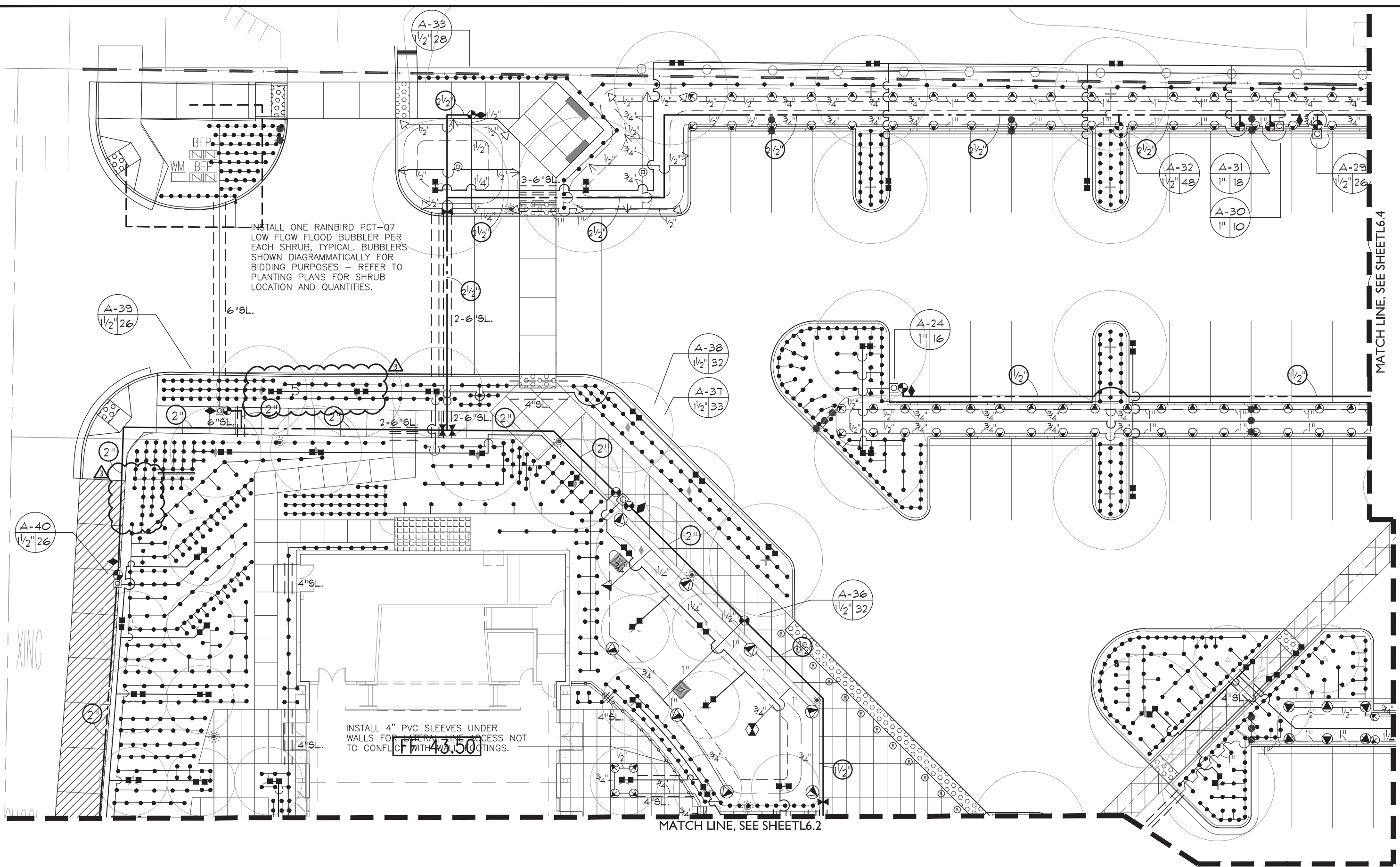


**2 WALL - (A)**  
1 1/2" = 1'-0"



**1 12-INCH CONCRETE MOWBAND**  
1 1/2" = 1'-0"

Date: 07/23/2018	Scale: AS NOTED	Design: KC	Drawn: JS, JS	Approved:	Job No: P5003
Revisions	PERMIT SET REV. / BID SET	ADDENDUM 2	ADDENDUM 3		
No.					



INSTALL ONE RAINBIRD PCT-07 LOW FLOW FLOOD BUBBLER PER EACH SHRUB, TYPICAL. BUBBLERS SHOWN DIAGRAMMATICALLY FOR BIDDING PURPOSES - REFER TO PLANTING PLANS FOR SHRUB LOCATION AND QUANTITIES.

INSTALL 4" PVC SLEEVES UNDER WALLS FOR LATERAL LINE ACCESS NOT TO CONFLICT WITH WALL SETTINGS.

MATCH LINE, SEE SHEET L6.4

MATCH LINE, SEE SHEET L6.2

A-39  
1/2" 26

A-33  
1/2" 28

A-32  
1/2" 48

A-31  
1" 18

A-30  
1" 10

A-29  
1/2" 26

A-38  
1/2" 32

A-37  
1/2" 33

A-24  
1" 16

A-40  
1/2" 26

A-36  
1/2" 32



**GATES + ASSOCIATES**  
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**OAKLEY CALIFORNIA**

**CIP 194 - OAKLEY RECREATION CENTER**  
OAKLEY CONTRA COSTA COUNTY CALIFORNIA

**IRRIGATION PLAN**

Date: 07/23/2018	Revisions
Scale: AS NOTED	PERMIT SET REV. / BID SET
Design: KC	ADDENDUM 2
Drawn: JS, JS	ADDENDUM 3
Approved:	
Job No: P5003	

Drawing Number: **L6.1**

IRRIGATION NOTES

- THE CONTRACTOR SHALL REVIEW RELATED DRAWINGS AND SHALL ENSURE COORDINATION WITH ALL APPLICABLE TRADES PRIOR TO SUBMITTING BID.
- THE IRRIGATION SYSTEM SHALL BE INSTALLED IN CONFORMANCE WITH ALL APPLICABLE STATE AND LOCAL CODES AND ORDINANCES BY LICENSED CONTRACTORS AND EXPERIENCED WORKMEN. CONTRACTOR SHALL OBTAIN AND PAY FOR ALL REQUIRED PERMITS AND FEES RELATING TO HIS WORK.
- THIS DESIGN IS DIAGRAMMATIC. ALL PIPING, VALVES, ETC. SHOWN WITHIN PAVED AREAS IS FOR DESIGN CLARIFICATION ONLY AND SHALL BE INSTALLED IN PLANTING AREAS WHERE POSSIBLE. AVOID ANY CONFLICTS BETWEEN THE SPRINKLER SYSTEM, PLANTING AND ARCHITECTURAL FEATURES. PARALLEL PIPES MAY BE INSTALLED IN COMMON TRENCH. PIPES ARE NOT TO BE INSTALLED DIRECTLY ABOVE ONE ANOTHER.
- DO NOT WILLFULLY INSTALL THE SPRINKLER SYSTEM AS SHOWN ON THE DRAWINGS WHEN IT IS OBVIOUS IN THE FIELD THAT OBSTRUCTIONS, GRADE DIFFERENCES OR DIFFERENCES IN THE AREA DIMENSIONS EXIST THAT MIGHT NOT HAVE BEEN CONSIDERED IN THE ENGINEERING. SUCH OBSTRUCTIONS OR DIFFERENCES SHOULD BE BROUGHT TO THE ATTENTION OF THE OWNER'S AUTHORIZED REPRESENTATIVE. IN THE EVENT THAT THIS NOTIFICATION IS NOT PERFORMED, THE IRRIGATION CONTRACTOR SHALL ASSUME FULL RESPONSIBILITY FOR ANY REVISIONS NECESSARY.
- IT IS THE RESPONSIBILITY OF THE IRRIGATION CONTRACTOR TO FAMILIARIZE HIMSELF WITH ALL GRADE DIFFERENCES, LOCATION OF WALLS, RETAINING WALLS, ETC. HE SHALL COORDINATE HIS WORK WITH THE GENERAL CONTRACTOR AND OTHER SUBCONTRACTORS FOR THE LOCATION AND THE INSTALLATION OF PIPE SLEEVES THROUGH WALLS, UNDER ROADWAYS, PAVING, STRUCTURES, ETC. CONTRACTOR TO VERIFY THE LOCATION OF EXISTING UNDERGROUND UTILITIES AND STRUCTURES PRIOR TO THE EXCAVATION OF TRENCHES. CONTRACTOR IS TO REPAIR ANY DAMAGE CAUSED BY HIS WORK AT NO ADDITIONAL COST TO THE OWNER.
- DUE TO THE SCALE OF THE DRAWINGS, IT IS NOT POSSIBLE TO INDICATE ALL OFFSETS, FITTINGS, SLEEVES, ETC., WHICH MAY BE REQUIRED. THE CONTRACTOR SHALL CAREFULLY INVESTIGATE THE STRUCTURAL AND FINISHED CONDITIONS AFFECTING ALL OF HIS WORK AND PLAN HIS WORK ACCORDINGLY, FURNISHING SUCH FITTINGS, ETC., AS MAY BE REQUIRED TO MEET SUCH CONDITIONS. DRAWINGS ARE GENERALLY DIAGRAMMATIC AND INDICATIVE OF THE WORK TO BE INSTALLED. THE WORK SHALL BE INSTALLED IN SUCH A MANNER AS TO AVOID CONFLICTS BETWEEN IRRIGATION SYSTEMS, PLANTING, AND ARCHITECTURAL FEATURES.
- ELECTRICAL CONTRACTOR TO SUPPLY 120 VAC (2.5 AMP) SERVICE TO CONTROLLER LOCATION. IRRIGATION CONTRACTOR TO MAKE FINAL CONNECTION FROM ELECTRICAL STUB-OUT TO CONTROLLER. IRRIGATION CONTROL WIRE SHALL BE #14, U.L. APPROVED FOR DIRECT BURIAL. COMMON WIRE SHALL BE #12 U.L. APPROVED AND SHALL BE WHITE IN COLOR. WIRING TO INDIVIDUAL REMOTE CONTROL VALVES SHALL BE COLOR OTHER THAN WHITE.
- EACH CONTROLLER SHALL HAVE ITS OWN INDEPENDENT GROUND WIRE.
- REMOTE CONTROL VALVES SHALL BE WIRED TO CONTROLLER IN SEQUENCE AS SHOWN ON PLANS. RUN WIRE FROM EACH RCV TO THE CONTROLLER. SPLICING WIRES TOGETHER OUTSIDE OF VALVE BOXES WILL NOT BE PERMITTED.
- SPLICING OF 24-VOLT WIRES WILL NOT BE PERMITTED EXCEPT IN VALVE BOXES. LEAVE A 36" COIL OF EXCESS WIRE AT EACH SPLICE AND 100 FEET ON CENTER ALONG WIRE RUN. TAPE WIRE IN BUNDLES 10 FEET ON CENTER. NO TAPING PERMITTED INSIDE SLEEVES.
- CONTROL WIRES SHALL BE UL APPROVED COPPER SINGLE STRAND TYPE UF DIRECT BURIAL 14 GAUGE RED IN COLOR. COMMON WIRES SHALL BE UL APPROVED COPPER SINGLE STRAND TYPE UF DIRECT BURIAL 12 GAUGE WHITE IN COLOR. SPARE CONTROL WIRES SHALL BE UL APPROVED COPPER SINGLE STRAND TYPE UF DIRECT BURIAL 14 GAUGE BLUE IN COLOR.
- INSTALL FOUR (4) SPARE CONTROL WIRES ALONG THE ENTIRE MAIN LINE. SPARE WIRES SHALL BE THE SAME COLOR (ONE WITH A WHITE STRIPE) AND OF A DIFFERENT COLOR THAN OTHER CONTROL WIRES. LOOP 36" EXCESS WIRE INTO EACH SINGLE VALVE BOX AND INTO ONE VALVE BOX IN EACH GROUP OF VALVES.
- VALVE LOCATIONS SHOWN ARE DIAGRAMMATIC. INSTALL IN GROUND COVER/SHRUB AREAS WHERE POSSIBLE (NOT IN LAWN AREA.)
- INSTALL VALVE BOXES MINIMUM 12" FROM AND PERPENDICULAR TO WALK, CURB, LAWN, BUILDING OR LANDSCAPE FEATURE. AT MULTIPLE VALVE BOX GROUPS, EACH BOX SHALL BE AN EQUAL DISTANCE FROM THE WALK, CURB, LAWN, ETC. AND EACH BOX SHALL BE MINIMUM 12" APART. SHORT SIDE OF VALVE BOXES SHALL BE PARALLEL TO WALK, CURB, LAWN, ETC. VALVE BOXES LOCATED WITHIN TURF SHALL BE GREEN WITH GREEN BOLT DOWN LIDS, ALL OTHER VALVE BOXES SHALL BE BLACK WITH BLACK BOLT DOWN LIDS.
- LOCATE QUICK COUPLING VALVE 12" FROM HARDSCAPE AREA.
- ALL SPRINKLER HEADS SHALL BE SET PERPENDICULAR TO FINISH GRADE OF THE AREA TO BE IRRIGATED UNLESS OTHERWISE DESIGNATED ON THE PLANS.
- IN LOCATIONS WHERE LOW HEAD DRAINAGE WILL CAUSE EROSION AND EXCESS WATER, USE POP-UP SPRINKLER MODELS WITH INTEGRAL CHECK VALVE. FOR DRIP OR BUBBLER CIRCUITS, INSTALL KING BROS. CV SERIES CHECK VALVES IN LATERAL LINES FOR EVERY 10' OF ELEVATION CHANGE.
- THE IRRIGATION CONTRACTOR SHALL FLUSH AND ADJUST ALL SPRINKLER HEADS FOR OPTIMUM PERFORMANCE AND TO PREVENT OVERSPRAY ONTO WALKS, ROADWAYS AND/OR BUILDINGS AS MUCH AS POSSIBLE. THIS SHALL INCLUDE SELECTING THE BEST DEGREE OF FIXED ARC (OR AN ADJUSTABLE ARC IF FIXED ARC DOES NOT MATCH THE ARC TO BE IRRIGATED) TO FIT THE SITE CONDITIONS AND TO THROTTLE THE FLOW CONTROL AND / OR ADJUST PRESSURE REGULATION MODULE AT EACH VALVE TO OBTAIN THE OPTIMUM OPERATING PRESSURE FOR EACH SYSTEM. ALL MAIN LINES SHALL BE FLUSHED PRIOR TO THE INSTALLATION OF IRRIGATION HEADS. AT 30 DAYS AFTER INSTALLATION EACH SYSTEM SHALL BE FLUSHED TO ELIMINATE GLUE AND DIRT PARTICLES FROM THE LINES.
- WHEN VERTICAL OBSTRUCTIONS (STREET LIGHTS, TREES, FIRE HYDRANTS, ETC.) INTERFERE WITH THE SPRAY PATTERN OF THE HEADS SO AS TO PREVENT PROPER COVERAGE, THE IRRIGATION CONTRACTOR SHALL FIELD ADJUST THE SPRINKLER SYSTEM BY INSTALLING A QUARTER, THIRD OR HALF CIRCLE HEAD AT THE SIDES OF THE OBSTRUCTION SO AS TO PROVIDE PROPER COVERAGE. ALL ADJUSTMENTS SHALL BE MADE AT NO ADDITIONAL COST TO THE OWNER.
- NOTIFY ARCHITECT OF ANY ASPECTS OF LAYOUT THAT WILL PROVIDE INCOMPLETE OR INSUFFICIENT WATER COVERAGE OF PLANT MATERIAL AND DO NOT PROCEED UNTIL HIS INSTRUCTIONS ARE OBTAINED.
- LOCATE BUBBLERS ON UPHILL SIDE OF TREES. TREE BUBBLERS ARE FOR ESTABLISHMENT AND DROUGHT CONDITIONS. THEY ARE TO BE TURNED OFF AFTER TREES ARE ESTABLISHED AND TURNED ON DURING DROUGHT CONDITIONS.
- IN ADDITION TO THE SLEEVES AND CONDUITS SHOWN ON THE DRAWINGS, THE IRRIGATION CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE INSTALLATION OF SLEEVES AND CONDUITS OF SUFFICIENT SIZE UNDER ALL PAVED AREAS.
- ALL EXCAVATIONS ARE TO BE FILLED WITH COMPACTED BACKFILL. CONTRACTOR TO REPAIR ALL SETTLED TRENCHES PROMPTLY, FOR A PERIOD OF 1 YEAR AFTER COMPLETION OF WORK. ADDITIONALLY, CONTRACTOR SHALL WARRANT THAT THE IRRIGATION SYSTEM WILL BE FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP FOR A PERIOD OF 1 YEAR AFTER FINAL ACCEPTANCE OF WORK.
- WHERE IT IS NECESSARY TO EXCAVATE ADJACENT TO EXISTING TREES, THE CONTRACTOR SHALL USE ALL POSSIBLE CARE TO AVOID INJURY TO TREES, AND TREE ROOTS. EXCAVATION IN AREAS WHERE 2 INCH AND LARGER ROOTS OCCUR SHALL BE DONE BY HAND. ROOTS 2 INCHES AND LARGER IN DIAMETER SHALL BE WRAPPED IN A PLASTIC BAG AND SECURED WITH A RUBBER BAND. TRENCHES ADJACENT TO TREE SHOULD BE CLOSED WITHIN 24 HOURS; WHERE THIS IS NOT POSSIBLE, THE SIDE OF THE TRENCH ADJACENT TO THE TREE SHALL BE KEPT SHADED WITH BURLAP OR CANVAS.
- THE SPRINKLER SYSTEM DESIGN IS BASED ON THE MINIMUM OPERATING PRESSURE SHOWN ON THE IRRIGATION DRAWINGS. THE IRRIGATION CONTRACTOR SHALL VERIFY WATER PRESSURE PRIOR TO CONSTRUCTION. REPORT ANY DIFFERENCE BETWEEN THE WATER PRESSURE INDICATED ON THE DRAWINGS AND THE ACTUAL PRESSURE READING AT THE IRRIGATION POINT OF CONNECTION TO THE OWNER'S AUTHORIZED REPRESENTATIVE.
- OPERATE IRRIGATION CONTROLLER(S) BETWEEN THE HOURS OF 10:00 PM AND 7:00 AM. CONTRACTOR SHALL INPUT ALL REQUIRED DATA INTO CONTROLLERS TO ALLOW SELF SCHEDULING INCLUSIVE OF PLANT SPECIES, PLANT WATER REQUIREMENTS, EXPOSURE, SOIL TYPE, SLOPE, IRRIGATION TYPE AND IRRIGATION EFFICIENCY.
- IRRIGATION POINT OF CONNECTION TO WELL AND PUMP DESIGNED AND INSTALLATION BY WELL AND PUMP CONTRACTOR. WELL AND PUMP SHALL PROVIDE MINIMUM FLOW OF 60 GPM AND MINIMUM DISCHARGE PRESSURE OF 70 PSI AT POINT OF CONNECTION.
- THE CONTRACTOR SHALL NOTIFY UNDERGROUND SERVICE ALERT AT 811 AT LEAST 48 HOURS PRIOR TO ANY EXCAVATION.

IRRIGATION LEGEND

SYMBOL	MODEL NUMBER	DESCRIPTION	PSI	GPM	RADIUS
	F4-FC-SAM-10	RAIN BIRD 5" TURF ROTOR WITH RUBBER COVER AND STANDARD CHECK VALVE. 360° SETTING.	50	8.0	45'-50'
	F4-PC-SAM-10	RAIN BIRD 5" TURF ROTOR WITH RUBBER COVER AND STANDARD CHECK VALVE. 360° SETTING.	50	8.0	45'-50'
	F4-FC-SAM-4	RAIN BIRD 5" TURF ROTOR WITH RUBBER COVER AND STANDARD CHECK VALVE. 360° SETTING.	50	4.0	35'-40'
	1812-SAM-R13-18F	RAIN BIRD 12" POP UP SHRUB SPRAY HEAD WITH CHECK VALVE AND RAINBIRD ADJUSTABLE STREAM SPRAY NOZZLE (DO NOT INCLUDE PRS OPTION)	50	2.0	13'-18'
	1812-SAM-VAN1724	RAIN BIRD 12" POP UP SHRUB SPRAY HEAD WITH CHECK VALVE AND RAINBIRD ADJUSTABLE STREAM SPRAY NOZZLE (DO NOT INCLUDE PRS OPTION)	50	2.0	18'-24'
	1812-SAM-R1318H	RAIN BIRD 12" POP UP SHRUB SPRAY HEAD WITH CHECK VALVE AND RAINBIRD ADJUSTABLE STREAM SPRAY NOZZLE (DO NOT INCLUDE PRS OPTION)	50	1.0	13'-18'
	1812-PRS-COM-15 H, Q	RAIN BIRD 12" POP-UP SPRAY HEAD WITH INTERNAL PRESSURE REGULATOR, CHECK VALVE, AND RAINBIRD MPR NOZZLES	30	1.3 0.65	12'
	1812-PRS-COM-12 F, H, Q	RAIN BIRD 12" POP-UP SPRAY HEAD WITH INTERNAL PRESSURE REGULATOR, CHECK VALVE, AND RAINBIRD MPR NOZZLES	30	1.3 0.65	12'
	1812-PRS-COM-10 H, Q	RAIN BIRD 12" POP-UP SPRAY HEAD WITH INTERNAL PRESSURE REGULATOR, CHECK VALVE, AND RAINBIRD MPR NOZZLES	30	0.80 0.40	10'
	1812-PRS-COM-8 H, Q	RAIN BIRD 12" POP-UP SPRAY HEAD WITH INTERNAL PRESSURE REGULATOR, CHECK VALVE, AND RAINBIRD MPR NOZZLES	30	0.20 0.10	8'
	1402	RAINBIRD 1400 SERIES BUBBLER ON FLEX RISER - TWO PER TREE	30	0.50	FLOOD
	PCT-07	RAIN BIRD LOW FLOW FLOOD BUBBLER INSTALLED ON SALCO FLEX RISER - ONE PER SHRUB	30	0.12 (7 GPH)	FLOOD
	LCRBY150S	RAINBIRD 1.5" LARGE CAPACITY FILTER WITH STAINLESS STEEL 120 MESH SCREEN			
	PESB-SERIES PRS-DIAL	RAINBIRD REMOTE CONTROL VALVE WITH NYLON SCRUBBER. INCLUDE RAINBIRD PRS DIAL PRESSURE REGULATION MODULE FOR ALL SPRAY AND BUBBLER ZONE VALVES - NOT REQUIRED FOR TURF ROTOR SPRAY VALVES.			
	619-RW-SON (3" AND LARGER)	NIBCO THREADED GATE VALVE (LINE SIZE) WITH 2" SQUARE NUT ON TOP INSIDE 10" ROUND LOCKING BOX			
	T113-K (2.5" AND SMALLER)	NIBCO THREADED GATE VALVE (LINE SIZE) INSIDE 10" ROUND LOCKING BOX			
	44 NP	RAIN BIRD QUICK COUPLING VALVE WITH LOCKING COVER INSIDE 10" ROUND LOCKING BOX			
	FSAV-150-200	RAINMASTER 1.5" FLOW SENSOR WITH 2" SUPERIOR MASTER VALVE N/O			
	SA6-RM4-48/FAN-16/PMR-CAC/RSE-DX/RHG/RDM/GRP-K/EV-CAB-SEN/EV-CAB-COM/FSAV-150-200	RAINMASTER 48 STATION DX2 CONTROLLER ASSEMBLY BY SITEONE GREEN TECH INSIDE STAINLESS STEEL 16" SLANT TOP ENCLOSURE. INCLUDE ENCLOSURE FAN, PMR-CAC RAINMASTER REMOTE TRANSMITTER AND RECEIVER, ENCLOSURE MOUNT RAIN SENSOR, RADIO AND HIGH GAIN ANTENNA ASSEMBLY, FLOW BOARD AND FLOW SENSOR, SUPERIOR 2" MASTER VALVE N/O. CONTRACTOR SHALL VERIFY 120VAC POWER AVAILABILITY AND INSTALL UNIT ON CONCRETE PAD PER MANUFACTURERS SPECIFICATIONS AND CITY STANDARD DETAILS			
	A-1	STATION NUMBER			
	1" 15	GALLONS PER MINUTE VALVE SIZE			
		MAINLINE: 2" AND LARGER: 1120-CLASS 315 PVC. 1.5" AND SMALLER: 1120-SCHEDULE 40 PVC PLASTIC PIPE. FITTINGS SHALL BE SCHEDULE 80 PVC SOLVENT WELD. 24" COVER.			
		LATERAL LINE: 1120-SCHEDULE 40 PVC PLASTIC PIPE WITH SCHEDULE 40 SOLVENT WELD FITTINGS. 18" COVER			
		SLEEVE: 1120-SCHEDULE 40 PVC PLASTIC PIPE WITH SCHEDULE 40 PVC PLASTIC FITTINGS. 24" COVER			

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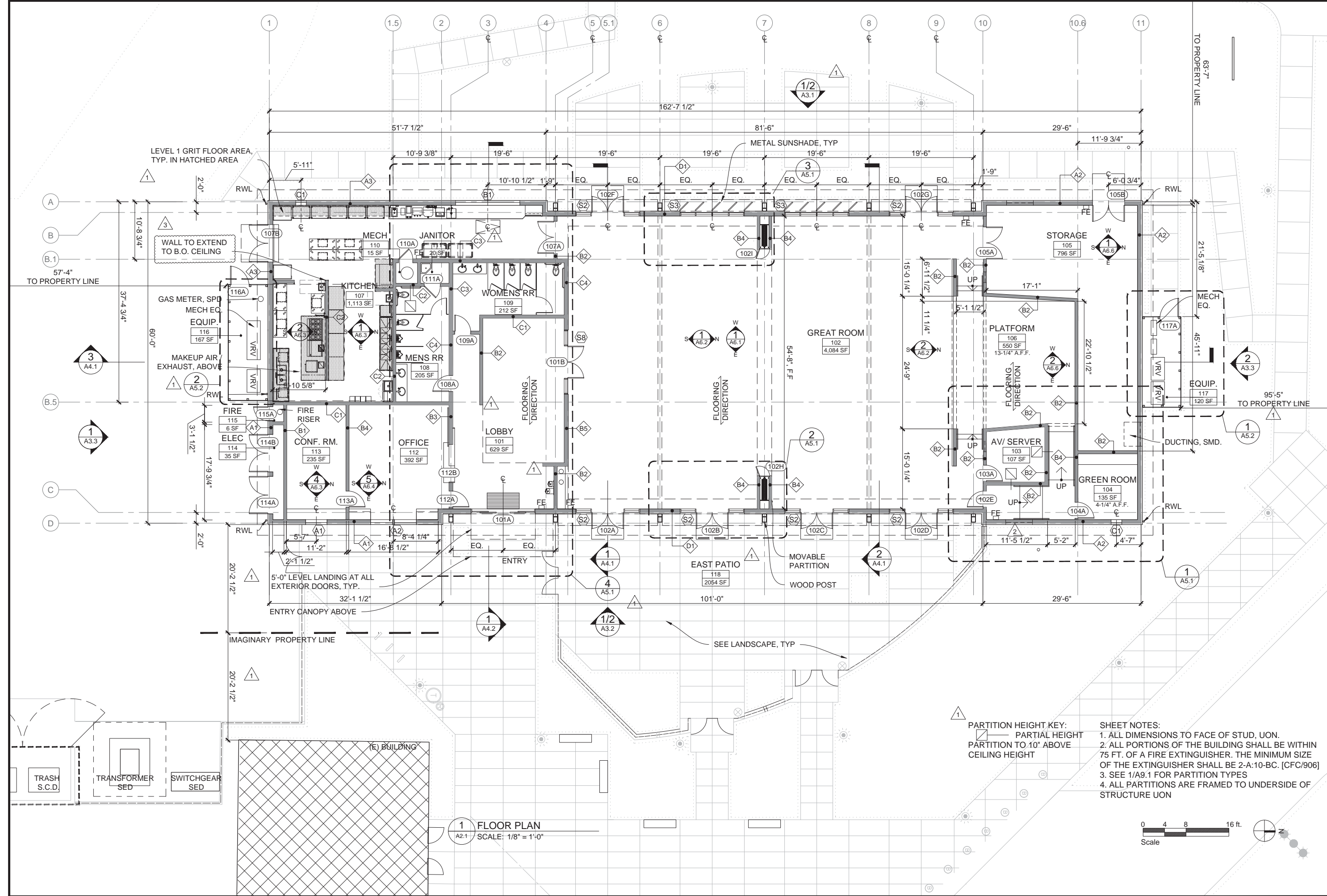
**OAKLEY CALIFORNIA**

**CIP 194 - OAKLEY RECREATION CENTER**  
OAKLEY CONTRA COSTA COUNTY CALIFORNIA

Revisions	PERMIT SET REV. / BID SET
No.	ADDENDUM 2
	ADDENDUM 3

Date: 07/23/2018  
Scale: AS NOTED  
Design: KC  
Drawn: JS, JS  
Approved:  
Job No: P5003

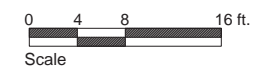
Drawing Number:  
**L6.6**



**1 FLOOR PLAN**  
SCALE: 1/8" = 1'-0"

**PARTITION HEIGHT KEY:**  
 PARTIAL HEIGHT  
 PARTITION TO 10' ABOVE  
 CEILING HEIGHT

- SHEET NOTES:**
1. ALL DIMENSIONS TO FACE OF STUD, UON.
  2. ALL PORTIONS OF THE BUILDING SHALL BE WITHIN 75 FT. OF A FIRE EXTINGUISHER. THE MINIMUM SIZE OF THE EXTINGUISHER SHALL BE 2-A:10-BC. [CFC/906]
  3. SEE 1/A9.1 FOR PARTITION TYPES
  4. ALL PARTITIONS ARE FRAMED TO UNDERSIDE OF STRUCTURE UON



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**OAKLEY ARCHITECT**  
 STATE OF CALIFORNIA  
 ARCHITECT NO. C 22805  
 11-30-19

**OAKLEY CALIFORNIA**

OAKLEY RECREATION CENTER  
 CONTRA COSTA COUNTY CALIFORNIA

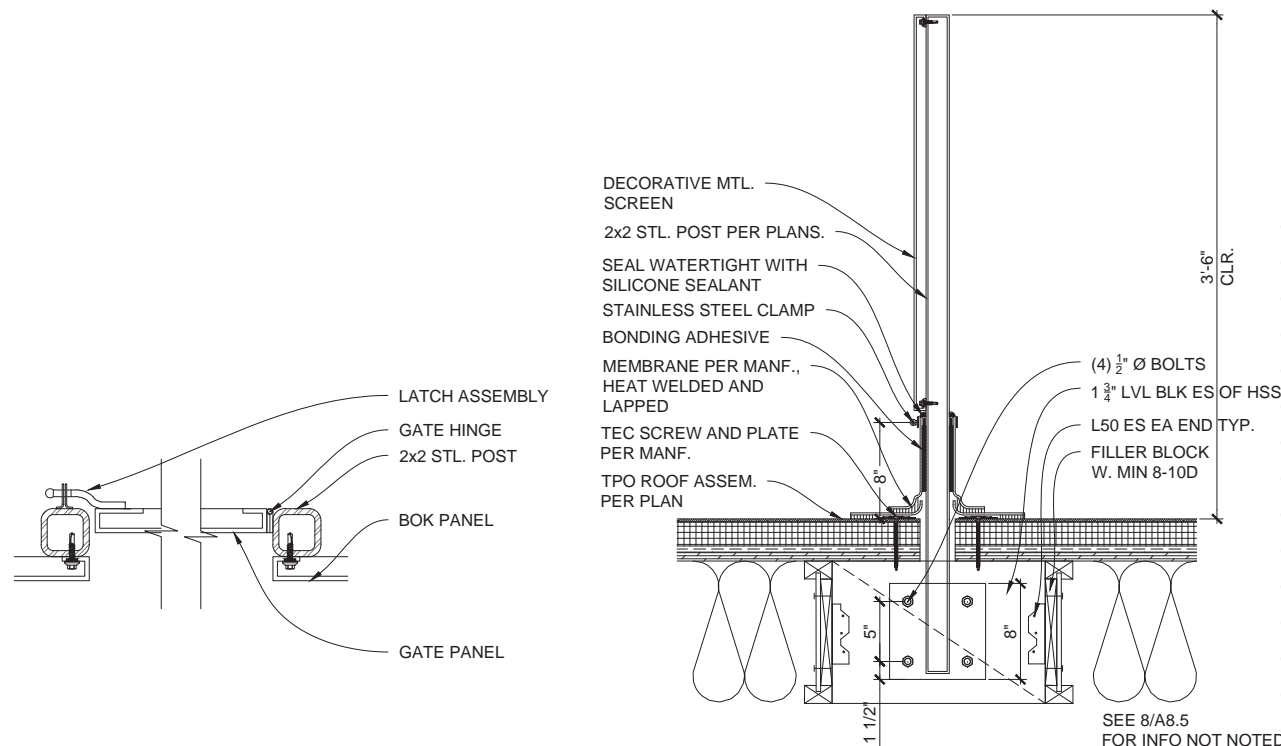
OAKLEY FLOOR PLAN

Date: 1/23/18  
 Scale: AS NOTED  
 Design: SM  
 Drawn: SCD  
 Approver: MH  
 Job No: 17-005

APPENDIX 3

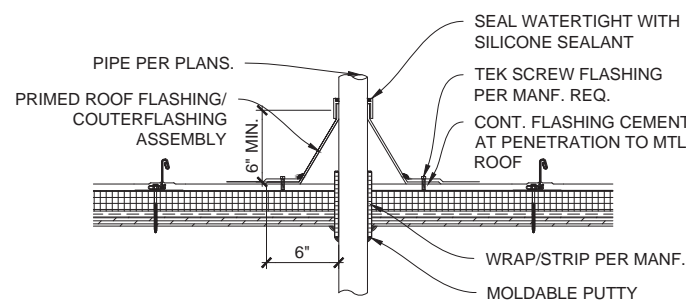
Drawing Number:  
**A2.1**



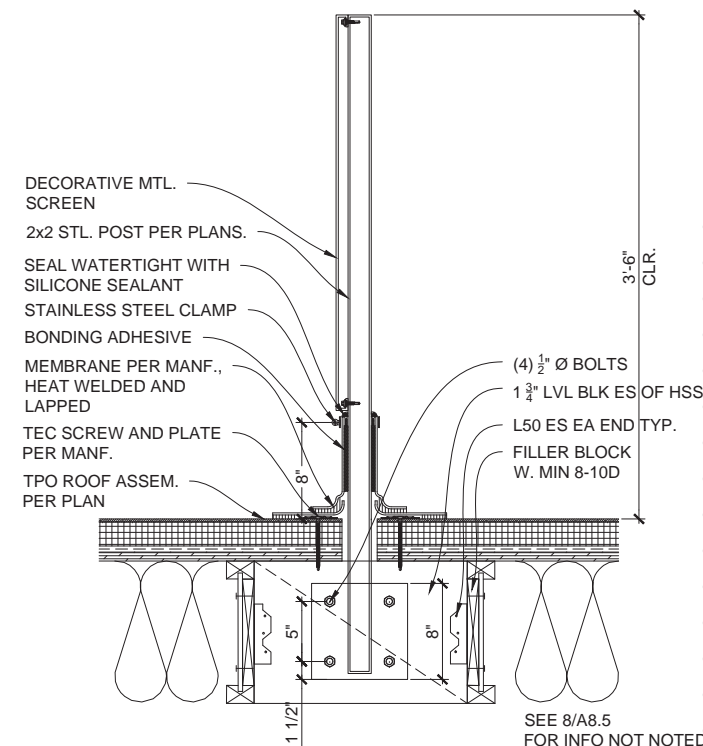


**11** GUARD RAIL LATCH DETAIL  
A8.5 SCALE: 1-1/2" = 1'-0"

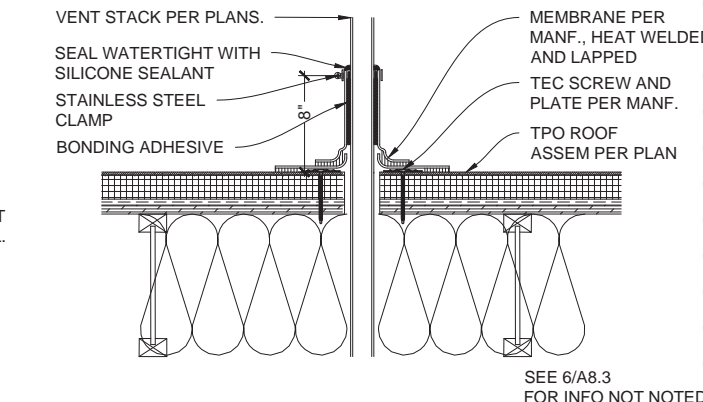
FOR VENT PIPES: TERMINATE 10'-0" FROM ANY OUTSIDE AIR INTAKE OR OPENABLE WINDOW. 2'-0" MIN FROM ANY WALL OR STRUCTURE AND PROVIDE WITH VANDALPROOF CAP



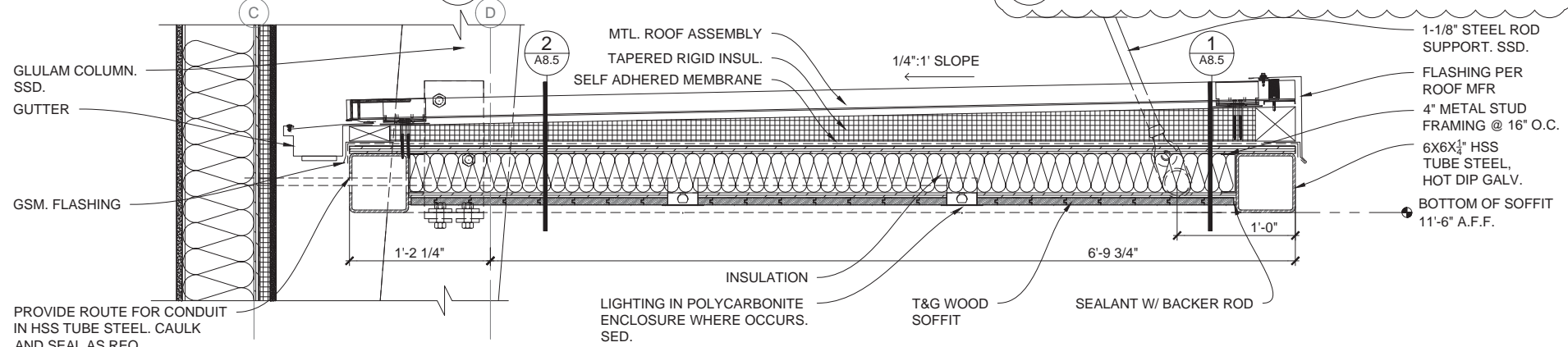
**9** TYP. VENT PIPE PENETRATION AT MTL. ROOF  
A8.5 SCALE: 1-1/2" = 1'-0"



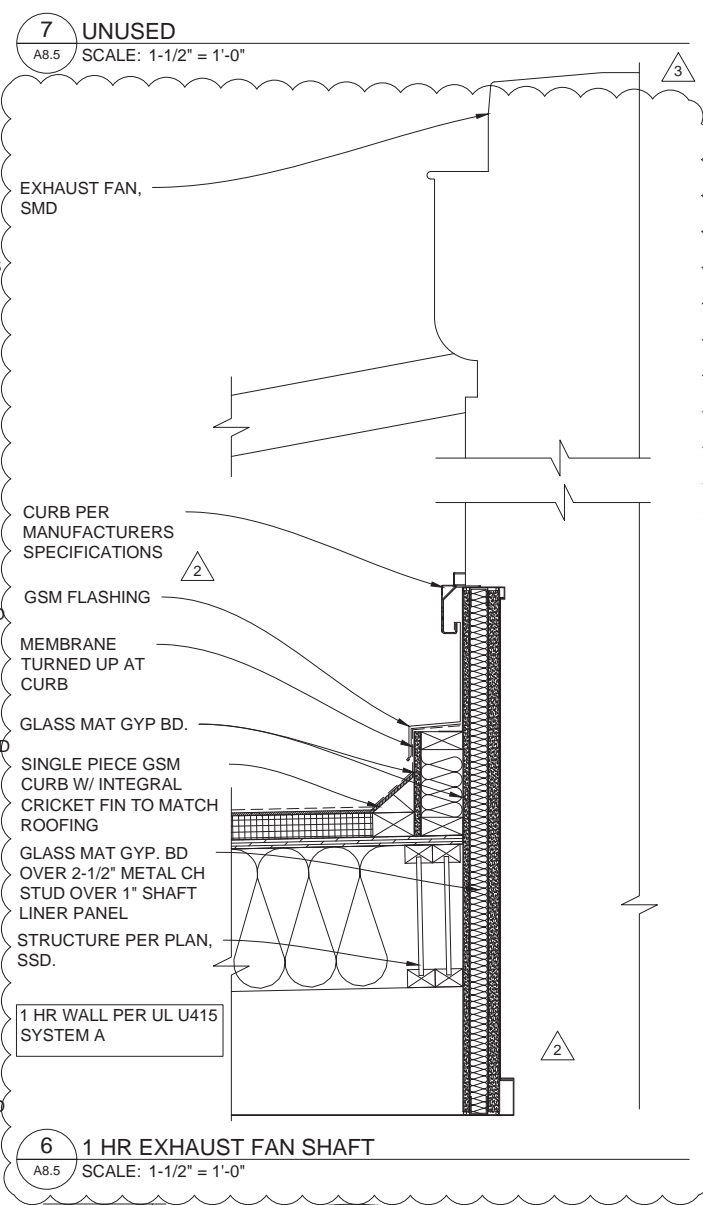
**10** TYP. GUARD RAIL PENETRATION AT TPO ROOF  
A8.5 SCALE: 1-1/2" = 1'-0"



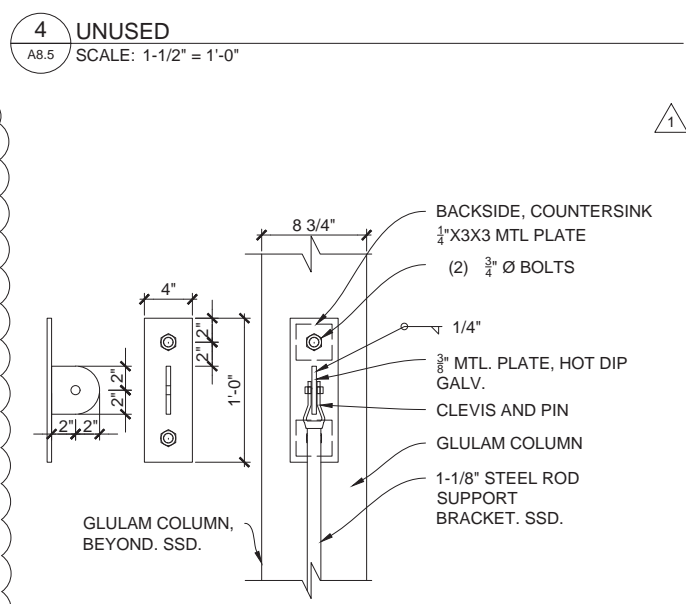
**8** TYP. VENT PIPE PENETRATION AT TPO ROOF  
A8.5 SCALE: 1-1/2" = 1'-0"



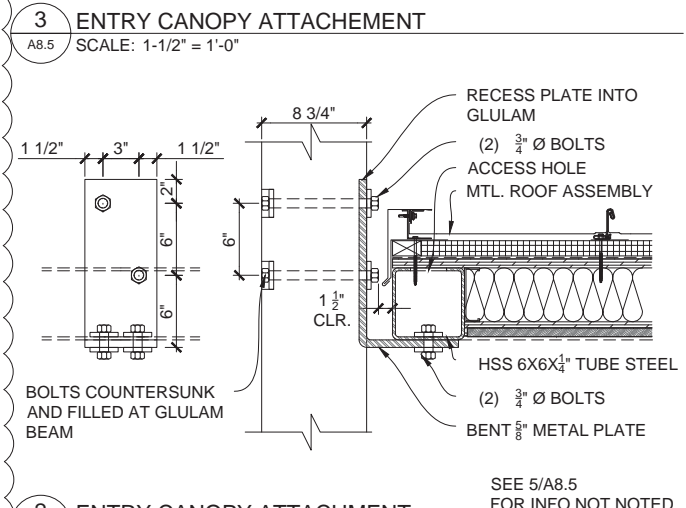
**5** ENTRY CANOPY SECTION  
A8.5 SCALE: 1-1/2" = 1'-0"



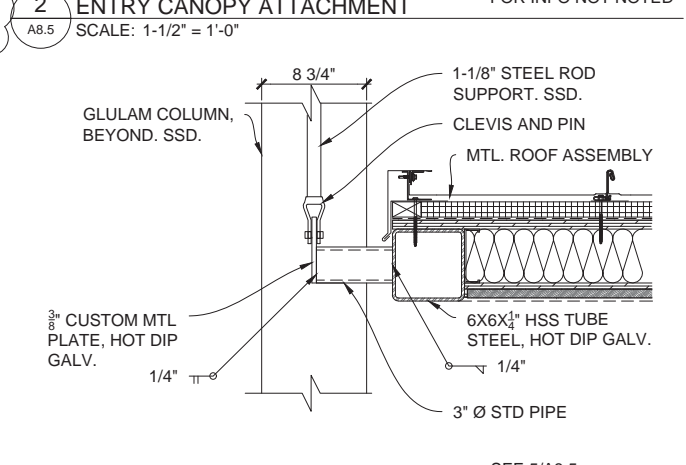
**6** 1 HR EXHAUST FAN SHAFT  
A8.5 SCALE: 1-1/2" = 1'-0"



**4** UNUSED  
A8.5 SCALE: 1-1/2" = 1'-0"

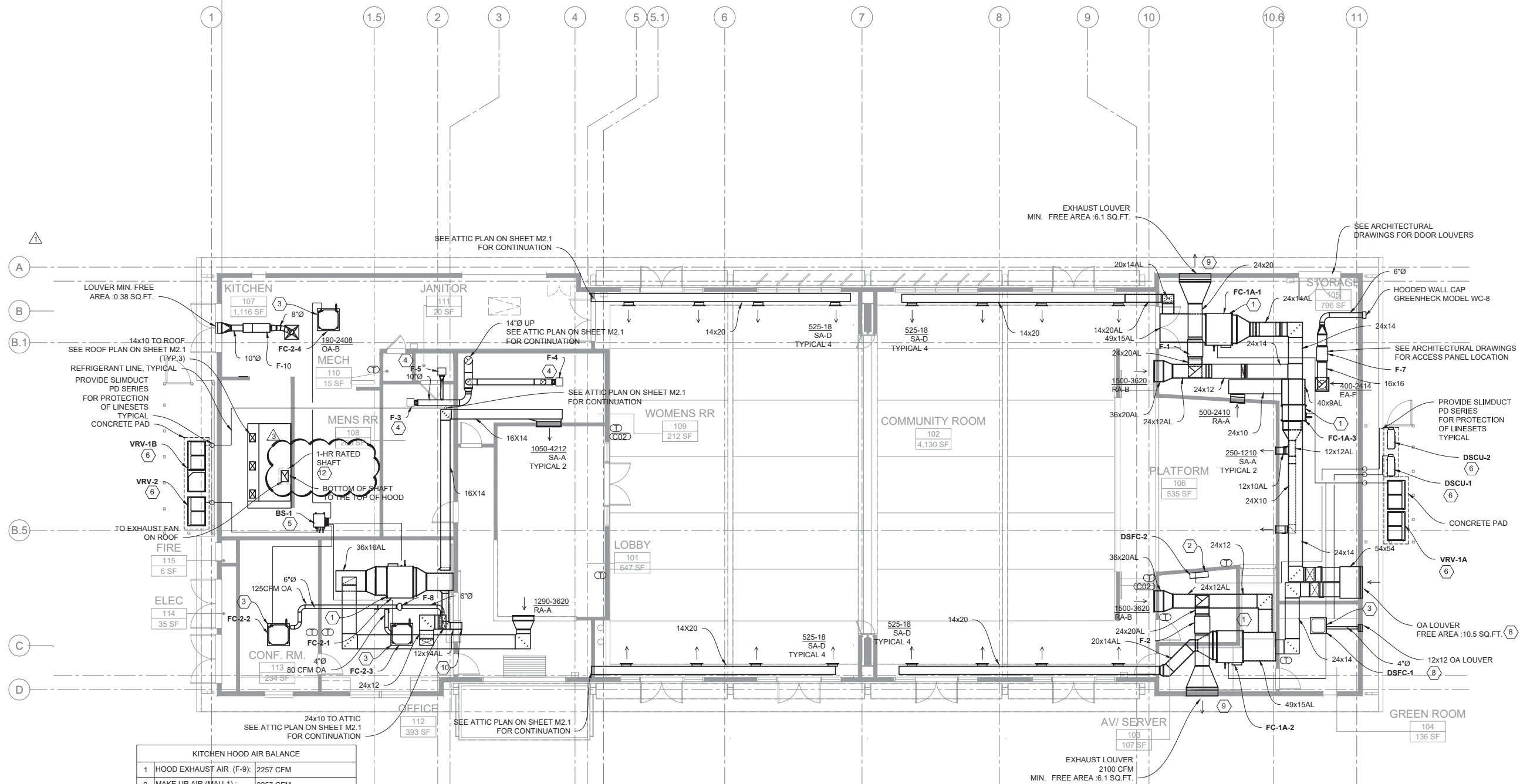


**3** ENTRY CANOPY ATTACHEMENT  
A8.5 SCALE: 1-1/2" = 1'-0"



**2** ENTRY CANOPY ATTACHEMENT  
A8.5 SCALE: 1-1/2" = 1'-0"

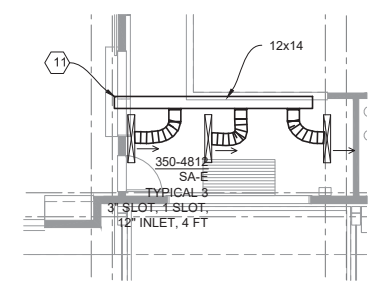
**1** ENTRY CANOPY SECTION  
A8.5 SCALE: 1-1/2" = 1'-0"



**KITCHEN HOOD AIR BALANCE**

1 HOOD EXHAUST AIR (F-9):	2257 CFM
2 MAKE UP AIR (MAU-1):	2257 CFM

**1 MECHANICAL FLOOR PLAN**  
SCALE: 1/8"=1'-0"



**2 LOBBY LOWER CEILING PLAN**  
SCALE: 1/8"=1'-0"

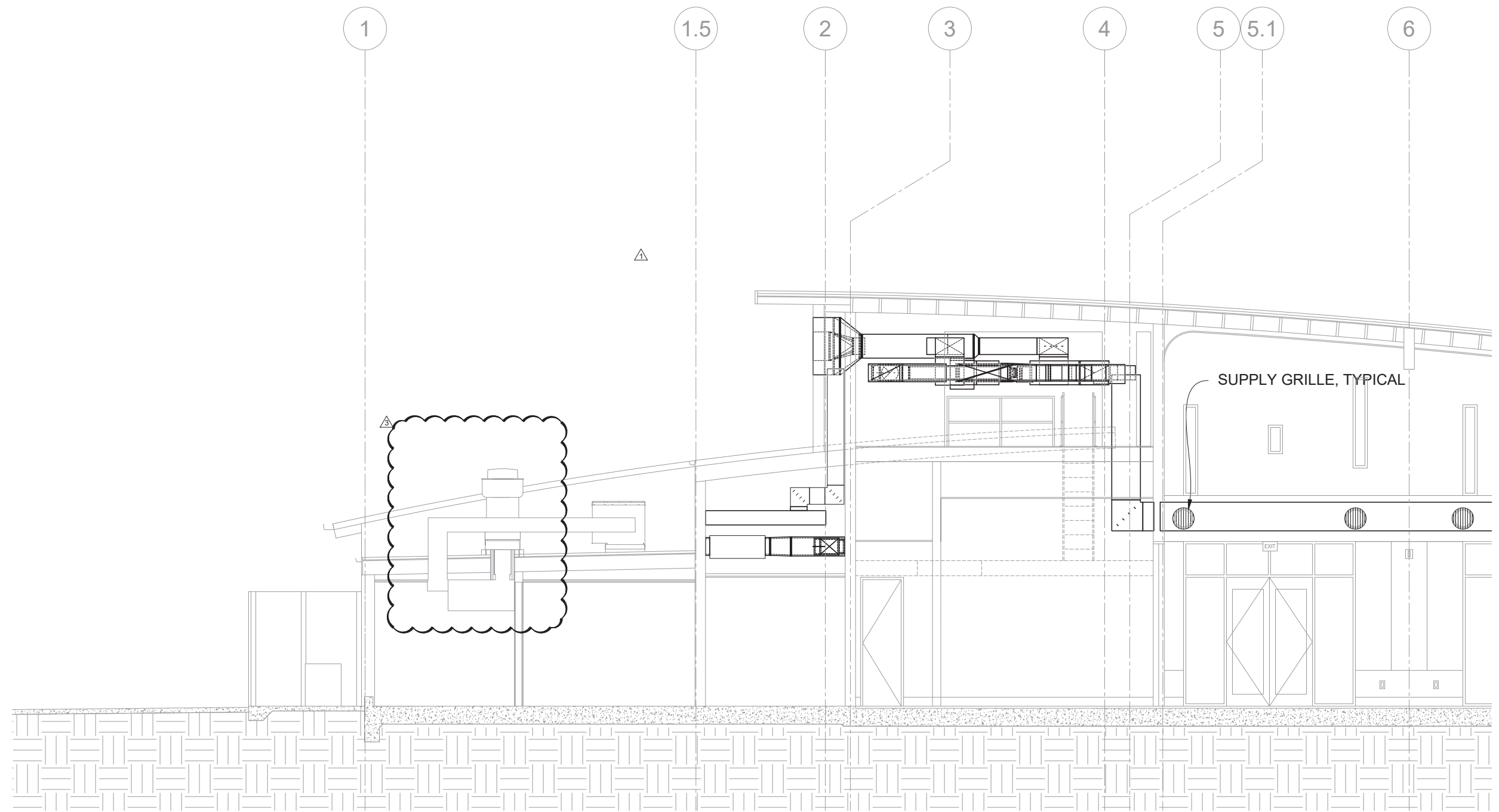
**SHEET NOTES**

- SEE DUCTED FAN COIL SUPPORT DETAIL 2/M.0.3 AND 5/M.0.3
- SEE WALL MOUNTED FAN COIL SUPPORT DETAIL 7/M.0.3
- SEE CEILING CASSETTE FAN COIL SUPPORT DETAIL 4/M.0.3
- SEE CEILING FAN ATTACHMENT DETAIL 1/M.0.3
- SEE FLOW SELECTOR MOUNTING DETAIL 8/M.0.3
- SEE CONDENSING UNIT MOUNTING DETAIL 10/M.0.3
- SEE SECTION DRAWING ON SHEET M3.0 FOR LOUVER LOCATION SEE ARCHITECTURAL DRAWINGS FOR LOUVER LOCATION, INSTALLATION AND DETAILS.
- SEE SECTION DRAWING ON SHEET M3.1 FOR LOUVER LOCATION SEE ARCHITECTURAL DRAWINGS FOR LOUVER LOCATION, INSTALLATION AND DETAILS.
- SEE ARCHITECTURAL DRAWINGS FOR LOUVER LOCATION, INSTALLATION AND DETAILS.
- SEE LOBBY LOWER CEILING PLAN ON THIS SHEET FOR SUPPLY REGISTERS ON LOBBY LOW HEIGHT CEILING PORTION
- SEE FLOOR PLAN ON THIS SHEET FOR DUCT CONTINUATION
- SEE ARCHITECTURAL DRAWINGS -1HR EXHAUST FAN SHAFT DETAIL ON SHEET A8.5. SEE LONGITUDINAL SECTION DETAIL 3 ON SHEET A4.1 FOR EXTENT OF SHAFT.

No.	Revisions
1	PERMIT SET
2	ENV. HEALTH PERMIT REVISIONS
3	PERMIT SET REV. / BID SET
4	ADDENDUM 2
5	ADDENDUM 3

Date: 1/23/2018  
Scale: SEE DRAWING  
Design:  
Drawn:  
Approved:  
Job No: 17-005

Drawing Number:  
**M2.0**



1 MECHANICAL SECTION  
SCALE: 1/4"=1'-0"

Date:	No.	Revisions
1/23/2018	-	PERMIT SET
Scale: SEE DRAWING	1	ENV. HEALTH PERMIT REVISIONS
Design:	1	PERMIT SET REV. / BID SET
Drawn:	2	ADDENDUM 2
Approved:	3	ADDENDUM 3
Job No: 17-005		

### GENERAL NOTES

- BEFORE COMMENCEMENT OF WORK, THE CONTRACTOR SHALL VERIFY THE EXACT LOCATIONS, ELEVATIONS AND CHARACTERISTICS OF ALL UTILITIES AND PIPING, AND SHALL IMMEDIATELY NOTIFY THE ARCHITECT OF ANY DISCREPANCIES.
- EXACT LOCATIONS AND MOUNTING HEIGHTS OF PLUMBING FIXTURES SHALL BE OBTAINED FROM THE ARCHITECTURAL DRAWINGS. SEE ARCHITECTURAL DRAWINGS FOR ADA FIXTURE LOCATIONS AND MOUNTING HEIGHTS. (INSULATE ALL EXPOSED HOT AND COLD WATER AND DRAIN PIPING BELOW ADA LAVATORIES AND SINKS AND OFFSET P-TRAP AGAINST WALL. ALSO, ALL FLUSH VALVES SHALL BE TO WIDE SIDE OF STALL.)
- TRAPS FOR ALL LAVATORIES AND SINKS SHALL TRAP STRAIGHT BACK TO WALL WITH ALL REQUIRED OFFSETS HAPPENING WITHIN THE WALL. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS WITH UTILITY COMPANIES FOR SERVICE IN THE NAME OF THE OWNER AND SHALL PAY ALL MATERIAL AND LABOR COSTS INCIDENTAL TO AN OPERABLE UTILITY SERVICE AS REQUIRED BY THE DESIGNATED GOVERNING AUTHORITIES OF THE CITY.
- ALL PLUMBING WORK SHALL BE INSTALLED SO AS TO AVOID INTERFERENCE WITH ELECTRICAL AND MECHANICAL EQUIPMENT AND STRUCTURAL FRAMING.
- THE CONTRACTOR SHALL COORDINATE THE LOCATION OF ALL CEILING ACCESS PANELS WITH THE ARCHITECTURAL REFLECTED CEILING PLANS AND THE ELEC. LIGHTING LAYOUT.
- THE PLUMBING CONTRACTOR SHALL PROVIDE THE WATER, SEWER AND STORM DRAIN SYSTEMS TO A POINT OF CONNECTION SHOWN ON FLOOR PLANS AND SHALL MEET THE INVERT ELEVATION AS FIELD VERIFIED WHILE MAINTAINING REQUIRED PIPE GRADE.
- ANY ALTERATIONS TO A STRUCTURAL MEMBER, SUCH AS CUTTING, BORING, BRAZING, DRILLING, WELDING, ETC. SHALL HAVE PRIOR WRITTEN APPROVAL OF ARCHITECT AND STRUCTURAL ENGINEER.
- ALL CLEANOUTS SHALL BE INSTALLED WHERE READILY ACCESSIBLE. THE CONTRACTOR SHALL COORDINATE ALL CLEANOUT LOCATIONS WITH EQUIPMENT, CABINETS, ETC., AND THE ARCHITECT PRIOR TO ANY INSTALLATION.
- CONTRACTOR TO PROVIDE WATER HAMMER ARRESTORS AS MANUFACTURED BY JAY R. SMITH. WATER HAMMER ARRESTORS SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS ON ALL DOMESTIC WATER BRANCH LINES SERVING FIXTURES.
- ALL PLUMBING FIXTURE VENTS TO TERMINATE A MIN. OF 12 INCHES FROM ANY VERTICAL SURFACE AND 10 FEET FROM ANY OUTSIDE AIR INTAKES.
- ALL VALVES, UNIONS, ETC. TO BE SAME SIZE AS PIPE UNLESS OTHERWISE INDICATED ON DRAWINGS.
- CONTRACTOR SHALL COORDINATE LAYOUT OF ALL BELOW GRADE PIPING AND COMPONENTS WITH GENERAL CONTRACTOR PRIOR TO BID TO DETERMINE EXTENT OF REQUIRED SAW CUTTING, EXCAVATION, AND SUBSEQUENT REPAIR/RESTORATION OF ALL AFFECTED HARDSCAPE AND SOFTSCAPE SURFACES. ALL SUCH ITEMS SHALL BE INCLUDED IN BID.
- BEFORE FABRICATION OR INSTALLATION THE CONTRACTOR SHALL VERIFY EXACT LOCATIONS OF ALL MECHANICAL EQUIPMENT AND EQUIPMENT PROVIDED UNDER ANOTHER SECTION OF SPECIFICATIONS. EXACT ROUGH-IN LOCATIONS AND REQUIREMENTS SHALL BE COORDINATED IN FIELD.
- ALL POINTS OF CONNECTION SHALL BE COORDINATED WITH THE GENERAL CONTRACTOR PRIOR TO BID.
- ALL WASTE AND VENT PIPING SHALL SLOPE AT 2% UNLESS OTHERWISE INDICATED.
- ALL VALVES, WATER HAMMER ARRESTORS OR OTHER EQUIPMENT SHOWN IN WALLS OR ABOVE NON-ACCESSIBLE CEILINGS SHALL BE INSTALLED BEHIND AN ACCESS PANEL.
- THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH AND BE CONSIDERED TO BE A PART OF SEPARATE AND COMPLETE MECHANICAL SPECIFICATIONS.
- CONNECTION BETWEEN INCOMPATIBLE MATERIALS ABOVE GRADE AND INSIDE BUILDING SHALL BE MADE WITH TWO (2) DIELECTRIC UNIONS SEPARATED BY A SIX INCH (6") SECTION OF RED BRASS PIPE.
- ALL EXTERIOR GAS COCKS, WATER SHUT OFF VALVES AND/OR SEWER CLEANOUTS BELOW GROUND SHALL BE INSTALLED IN YARD BOXES WITH THE COVERS CONSPICUOUSLY MARKED "GAS", "WATER", AND "SEWER" RESPECTIVELY.
- THE CONTRACTOR SHALL VERIFY THE EXACT ELEVATIONS AND LOCATION OF EXISTING DRAINAGE SYSTEM PIPING PRIOR TO CONNECTION OF ANY PIPING.
- ALL HORIZONTAL PIPING LINES EXTENDED AND CONNECTED TO EQUIPMENT SHALL BE RUN AT THE HIGHEST POSSIBLE ELEVATIONS AND NOT LESS THAN 6" ABOVE THE FLOOR TO PROVIDE CLEARANCE FOR CLEANING. AT WALL OR COLUMN LOCATIONS, PIPING ROUGH-IN SHALL BE STUBBED IN WALLS WHENEVER POSSIBLE.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR PATCHING AND REPAIRING ALL AREAS WHICH ARE DAMAGED BY HIS OPERATIONS. IN ADDITION, THE CONTRACTOR SHALL RESTORE TO THEIR ORIGINAL CONDITION ALL EXISTING TO REMAIN STRUCTURE AND NEW CONSTRUCTION DAMAGED BY HIS OPERATIONS.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR PATCHING AND REPAIRING ALL PAVED AREAS WHICH ARE EXCAVATED AND/OR DAMAGED BY HIS OPERATIONS. IN ADDITION, THE CONTRACTOR SHALL RESTORE TO THEIR ORIGINAL CONDITION ALL PLANTED AREAS DAMAGED BY HIS OPERATIONS.
- ALL PATCHING AND REPAIRING OF CONCRETE PAVING AND/OR WALKS SHALL BE UNDER ANOTHER SECTION OF THE SPECIFICATIONS.
- ALL EXISTING PIPING DAMAGED DURING EXCAVATION SHALL BE REPAIRED WITH MATERIALS TO MATCH EXISTING BY THE CONTRACTOR AT NO COST TO THE OWNER.
- ALL CUTTING OF EXISTING PAVING, WALKS AND/OR FLOORS SHALL BE BY MACHINE SAW CUTTING. HOLES FOR PIPES IN CONCRETE WALLS OR FLOORS SHALL BE DONE BY CORE DRILLING EQUIPMENT.
- ALL PIPING, EXCEPT PIPING OF NONFERROUS MATERIAL, INSTALLED WITHIN THE GROUND SHALL BE PROTECTED AGAINST CORROSION BY A PROTECTIVE COVERING SUITABLE FOR THE PURPOSE AND SUBJECT TO THE APPROVAL OF THE BUILDING OFFICIAL. ANY PIPING SUBJECT TO UNDUE CORROSIVE ACTION SHALL BE PROTECTED IN A MATTER SUITABLE FOR THE PURPOSE AND SUBJECT TO THE APPROVAL OF THE BUILDING OFFICIAL.
- ALL PENETRATIONS AND OPENINGS IN PARTY WALLS AND ROOF/FLOOR/CEILING ASSEMBLIES DUE TO PLUMBING WORK SHALL BE SEALED LINED, INSULATED OR OTHERWISE TREATED TO MAINTAIN THE REQUIRED FIRE AND SOUND RATING.

### M/E/P COMPONENT ANCHORAGE NOTES

ALL MECHANICAL, PLUMBING, AND ELECTRICAL COMPONENTS SHALL BE ANCHORED OR INSTALLED PER THE DETAILS ON THE DSA APPROVED CONSTRUCTION DOCUMENTS. WHERE NO DETAIL IS INDICATED, THE FOLLOWING COMPONENTS SHALL BE ANCHORED OR BRACED TO MEET THE FORCED AND DISPLACEMENT REQUIREMENTS PRESCRIBED IN THE 2016 CBC, SECTIONS 1616A.1.23 THROUGH 1616A.1.26 AND ASCE 7-10 CHAPTER 26 AND 13.

- ALL PERMANENT EQUIPMENT AND COMPONENTS.
- TEMPORARY OR MOVABLE EQUIPMENT THAT IS PERMANENTLY ATTACHED (E.G. HARD WIRED) TO THE BUILDING UTILITY SERVICES SUCH AS ELECTRICITY, GAS OR WATER.
- MOVABLE EQUIPMENT WHICH IS STATIONED IN ONE PLACE FOR MORE THAN 8 HOURS AND HEAVIER THAN 400 POUNDS ARE REQUIRED TO BE ANCHORED WITH TEMPORARY ATTACHMENTS.

THE ATTACHMENT OF THE FOLLOWING MECHANICAL AND ELECTRICAL COMPONENTS SHALL BE POSITIVELY ATTACHED TO THE STRUCTURE, BUT NEED NOT BE DETAILED ON THE PLANS. THESE COMPONENTS SHALL HAVE FLEXIBLE CONNECTIONS PROVIDED BETWEEN THE COMPONENT AND ASSOCIATED DUCTWORK, PIPING AND CONDUIT.

A. COMPONENTS WEIGHING LESS THAN 400 POUNDS AND HAVE A CENTER OF MASS LOCATED 4 FEET OR LESS ABOVE THE ADJACENT FLOOR OR ROOF LEVEL THAT DIRECTLY SUPPORT THE COMPONENT.

B. COMPONENTS WEIGHING LESS THAN 20 POUNDS, OR IN THE CASE OF DISTRIBUTED SYSTEMS, LESS THAN 5 POUNDS PER FOOT, WHICH ARE SUSPENDED FROM A ROOF OR FLOOR OR HUNG FROM A WALL.

FOR THOSE ELEMENTS THAT DO NOT REQUIRE DETAILS ON THE APPROVED DRAWINGS, THE INSTALLATION SHALL BE SUBJECT TO THE APPROVAL OF THE STRUCTURAL ENGINEER OF RECORD AND THE DSA DISTRICT STRUCTURAL ENGINEER. THE PROJECT INSPECTOR WILL VERIFY THAT ALL COMPONENTS AND EQUIPMENT HAVE BEEN ANCHORED IN ACCORDANCE WITH ABOVE REQUIREMENTS.

### PIPING DISTRIBUTION BRACING NOTES

PIPING, DUCTWORK, AND ELECTRICAL DISTRIBUTION SYSTEMS SHALL BE BRACED TO COMPLY WITH THE FORCES AND DISPLACEMENTS PRESCRIBED IN ASCE 7-10 SECTION 13.3 AS DEFINED IN ASCE 7-10 SECTION 13.6.8, 13.6.7 AND 13.6.5.6 AND 2016 CBC SECTION 1616A.1.23, 1616A.1.24, 1616A.1.25 AND 1616A.1.26.

THE BRACING AND ATTACHMENTS TO THE STRUCTURE SHALL BE DETAILED ON THE APPROVED DRAWINGS OR THEY SHALL COMPLY WITH ONE OF THE OSHPD PRE-APPROVAL OF MANUFACTURER'S CERTIFICATIONS (OPM) AS MODIFIED TO SATISFY ANCHORAGE REQUIREMENTS OF ACI 318-11, APPENDIX D.

COPIES OF THE OPM MANUAL(S) SHALL BE AVAILABLE ON THE JOB SITE PRIOR TO THE START OF HANGING AND BRACING OF THE PIPE, DUCTWORK, AND ELECTRICAL DISTRIBUTION SYSTEMS.

THE STRUCTURAL ENGINEER OF RECORD SHALL VERIFY THE ADEQUACY OF THE STRUCTURE TO SUPPORT THE HANGER AND BRACE LOADS.

### PLUMBING LEGEND

SYMBOL	ABBREVIATION	DESCRIPTION
— W —	W	SANITARY WASTE/SEWER PIPING
— GW —	GW	GREASE WASTE PIPING
— SD —	SD	STORM DRAIN PIPING
— OFD —	OFD	OVERFLOW DRAIN PIPING
— V —	V	WASTE/SANITARY VENT PIPING
— GV —	GV	GREASE VENT PIPING
		DEMO PIPING
— (E)W —	(E)W	EXISTING SANITARY SEWER PIPING
— (E)V —	(E)V	EXISTING SANITARY VENT PIPING
— CW —	CW	DOMESTIC COLD WATER PIPING
— HW —	HW	DOMESTIC HOT WATER PIPING
— (E)CW —	(E)CW	EXISTING COLD WATER PIPING
— (E)HW —	(E)HW	EXISTING HOT WATER PIPING
— (E)HWR —	(E)HWR	EXISTING HOT WATER RETURN PIPING
— G —	G	NATURAL GAS PIPING
— MPG —	MPG	MEDIUM PRESSURE NATURAL GAS PIPING
— (E)G —	(E)G	EXISTING NATURAL GAS PIPING
— (E)MPG —	(E)MPG	EXISTING MEDIUM PRESSURE NATURAL GAS PIPING
— CD —	CD	CONDENSATE DRAIN PIPING
c		PIPE GOING DOWN
o		PIPE GOING UP
∩		TEE
Φ ●	FCO	FLOOR CLEANOUT/CLEANOUT TO GRADE
∩ ∩		P-TRAP
⊙	POC	POINT OF CONNECTION
⊥	WCO	WALL CLEANOUT
⊥		PIPE CAP
⊥	HB	HOSE BIBB
⊥	SOV	SHUT-OFF VALVE
⊥	SOVAP	SHUT-OFF VALVE IN ACCESS PANEL
⊥	SOVYB	SHUT-OFF VALVE IN YARD BOX
⊥		PLUG VALVE
⊥		GAS COCK VALVE
⊥		CHECK VALVE
⊥	FD	FLOOR DRAIN
⊥	FS	FLOOR SINK
XX-X		EQUIPMENT OR FIXTURE
	CONT.	CONTINUED/CONTINUATION
	DFM	DISTANCE FROM METER
	FR.	FROM
	BEL.	BELOW
	DN.	DOWN
	VTR	VENT THROUGH ROOF
	AP	ACCESS DOOR
	NIC	NOT IN CONTRACT
	REF.	REFERENCE
	S.A.D.	SEE ARCHITECTURAL DRAWINGS
	S.M.D.	SEE MECHANICAL DRAWINGS
	S.C.D.	SEE CIVIL DRAWINGS
	S.S.D.	SEE STRUCTURAL DRAWINGS
	SF	SQUARE FEET

### PLUMBING FIXTURE SCHEDULE

FIXTURE	MARK	ROUGH IN CONNECTIONS				DESCRIPTION
		HW	CW	WASTE	VENT	
WATER CLOSET	<b>WC-1</b>	--	1"	4"	2"	AMERICAN STANDARD MADERA FLOWISE 3451.001 FLOOR MOUNTED WATER CLOSET WITH EVERCLEAN, ELONGATED BOWL, VITREOUS CHINA, 1-1/2" TOP SPUD, POWERFUL DIRECT-FED SIPHON JET ACTION. FLUSH VALVE: SLOAN CROWN 111-1.28 PISTON OPERATED, CHROME PLATED, HIGH EFFICIENCY 1.28 GPF. TOILET SEAT: BEMIS 1955CT OPEN FRONT LESS COVER, ELONGATED, HEAVY DUTY, INJECTION MOLDED SOLID PLASTIC. CARRIER: SEE SECTION 22 00 00.
WATER CLOSET (ADA)	<b>WC-2</b>	--	1"	4"	2"	AMERICAN STANDARD MADERA FLOWISE 3461.001 FLOOR MOUNTED WATER CLOSET WITH EVERCLEAN, ELONGATED BOWL, VITREOUS CHINA, 1-1/2" TOP SPUD, POWERFUL DIRECT-FED SIPHON JET ACTION. FLUSH VALVE: SLOAN CROWN 111-1.28 PISTON OPERATED, CHROME PLATED, HIGH EFFICIENCY 1.28 GPF. TOILET SEAT: BEMIS 1955CT OPEN FRONT LESS COVER, ELONGATED, HEAVY DUTY, INJECTION MOLDED SOLID PLASTIC. CARRIER: SEE SECTION 22 00 00.
URINAL	<b>UR-1</b>	--	3/4"	2"	2"	AMERICAN STANDARD 6590.001 WASHBROOK WALL MOUNTED, VITREOUS CHINA, WASHOUT FLUSH ACTION, 3/4" TOP SPUD. FLUSH VALVE: AMERICAN STANDARD 6047.111.002 EXPOSED FLUSHOMETER 0.125 GPF, DURABLE CHROME-PLATED CAST BRASS CONSTRUCTION, 3/4" TOP SPUD, MANUAL PISTON. CARRIER: SEE SECTION 22 00 00.
URINAL (ADA)	<b>UR-2</b>	--	3/4"	2"	2"	AMERICAN STANDARD 6590.001 WASHBROOK WALL MOUNTED, VITREOUS CHINA, WASHOUT FLUSH ACTION, 3/4" TOP SPUD. FLUSH VALVE: AMERICAN STANDARD 6047.111.002 EXPOSED FLUSHOMETER 0.125 GPF, DURABLE CHROME-PLATED CAST BRASS CONSTRUCTION, 3/4" TOP SPUD, MANUAL PISTON. CARRIER: SEE SECTION 22 00 00.
LAVATORY	<b>L-1</b>	1/2"	1/2"	2"	2"	AMERICAN STANDARD OVALYN 9482.000 UNDERCOUNTER MOUNTED 19-1/4" X 15-3/4" LAVATORY, VITREOUS CHINA, WITH REAR OVERFLOW. FAUCET: AMERICAN STANDARD 6056.204 ELECTRONIC FAUCET, SOLID BRASS CONSTRUCTION, AC PERMANENT POWER, 0.35 GPM PRESSURE COMPENSATING VANDAL RESISTANT NON-AERATING SPRAY. STRAINER/ANGLE STOPS/PIP/PIPE WRAP: SEE SECTION 22 00 00.
THERMOSTATIC MIXING VALVE	<b>TMV-1</b>	3/4"	3/4"	--	--	CHICAGO FAUCET 131-ABNF 3/8" COMPRESSION INLETS AND OULETS, BRASS BODY CONSTRUCTION.
BACKWATER VALVE	<b>BV-1</b>	--	--	4"	--	MIFAB BV1204-R-1 CAST IRON BACKWATER VALVE, NO HUB INLET/OUTLET, GASKETED BOLTED COVER, AUTOMATIC PVC FLAPPER, NICKEL BRONZE ACCESS COVER.
DRINKING FOUNTAIN	<b>DF-1</b>	--	1/2"	2"	2"	ELKAY E2H20 LZWS-EDFP217K BOTTLE FILLER WITH INTEGRAL SOFT SIDES FOUNTAIN, STAINLESS STEEL, ELECTRONIC BOTTLE FILLER SENSOR, FRONT BUBBLER ACTIVATION, 115V/60Hz, 1.0 AMPS. MOUNTING FRAME: ELKAY MFW5200
MOP SINK	<b>MS-1</b>	3/4"	3/4"	3"	2"	FLORESTONE MODEL 85 24"x24"x12" MOP SINK, MOLDED TERRAZZO. FAUCET: AMERICAN STANDARD 8350.243 WALL MOUNTED, CAST BRASS BODY, METAL LEVER HANDLES WITH HOT AND COLD INDICATORS, VANDAL-RESISTANT SCREWS, VACUUM BREAKER, SPOUT WITH BUCKET HOOK AND THREADED HOSE.
FLOOR SINK	<b>FS-1</b>	-	-	SEE PLANS	SEE PLANS	ZURN #Z1910 FLOOR SINK DURA-COATED CAST IRON BODY WITH BOTTOM OUTLET, COMBINATION INVERTIBLE MEMBRANE CLAMP AND ADJUSTABLE COLLAR AND MEDIUM DUTY GRATE.
FLOOR DRAIN	<b>FD-1</b>	-	-	SEE PLANS	SEE PLANS	ZURN #Z415B FLOOR DRAIN DURA-COATED CAST IRON BODY WITH BOTTOM OUTLET, COMBINATION INVERTIBLE MEMBRANE CLAMP AND ADJUSTABLE COLLAR WITH SEEPAGE SLOTS AND "TYPE B" POLISHED NICKEL BRONZE, LIGHT DUTY STRAINER.
HOSE BIBB	<b>HB-1</b>	-	3/4"	-	-	ACORN #8121 3/4" HOSE BIBB FLUSH MOUNT, COMPLETE WITH VACUUM BREAKER.
HOSE BIBB	<b>HB-2</b>	-	3/4"	-	-	ACORN #8104 3/4" HOSE BOX RECESSED WITH CAM LOCK, REMOVABLE LOOSE KEY WHEEL HANDLE, COMPLETE WITH VACUUM BREAKER.
TRAP PRIMER	<b>TP-1</b>	-	1/2"	-	-	PRECISION PLUMBING PRODUCTS P2-500 TRAP PRIMER, CORROSION RESISTANT BRASS, PISTON OPERATED.

NOTES:  
 1. ITEM DESCRIPTIONS INCLUDED IN THIS SCHEDULE ARE INTENDED TO DESCRIBE GENERAL FIXTURE CONFIGURATIONS, AND DO NOT INCLUDE ALL REQUIREMENTS. REFER TO SPECIFICATION SECTION 22 00 00 FOR ADDITIONAL REQUIREMENTS.  
 2. REFER TO ARCHITECTURAL DRAWINGS FOR MOUNTING HEIGHTS AND REQUIRED CLEARANCES OF ALL FIXTURES.  
 3. ALL FIXTURES, TRIM, AND VALVING SHALL COMPLY WITH CALIFORNIA'S LEAD FREE PLUMBING LAW, HEALTH AND SAFETY CODE AND CA ASSEMBLY BILL 1953.

### GAS WATER HEATER SCHEDULE

ITEM	MANUFACTURER	MODEL NO.	SERVICE	STORAGE (GAL.)	MBH	VOLT	PHASE	RECOVERY @ 90°F (GAL)	INLET TEMP (°F)	OUTLET TEMP (°F)	OPERATING WEIGHT (LBS)
<b>GWH-1</b>	AO SMITH	BTL-154	DOMESTIC WATER	81	154	120	1	164	60	140	1548

### CIRCULATION PUMP SCHEDULE

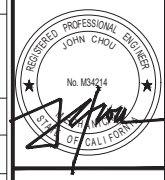
ITEM	LOCATION	MANUFACTURER	MODEL NO.	SERVICE	TYPE	ACCESSORIES	CAPACITY		MOTOR			
							GPM	HEAD	HORSE POWER	VOLT	PHASE	AMPS
<b>CP-1</b>	<b>GWH-1</b>	TACO PUMPS	IL-003	HOT WATER RETURN	CARTRIDGE	N/A	1	1	1/40	115	1	0.43

### LIST OF APPLICABLE CODES

- LIST OF CODES AND STANDARDS MODEL CODE EDITIONS EFFECTIVE JANUARY 1, 2016
- 2016 CA BUILDING CODE TITLE 24 PART 2 VOLUME #1 AND #2
  - 2016 CA ELECTRICAL CODE TITLE 24 PART 3
  - 2016 CA MECHANICAL CODE TITLE 24 PART 4
  - 2016 CA PLUMBING CODE TITLE 24 PART 5
  - 2016 CA FIRE CODE TITLE 24 PART 9
  - 2016 CA BUILDING STANDARDS TITLE 24 PART 9

### SHEET INDEX

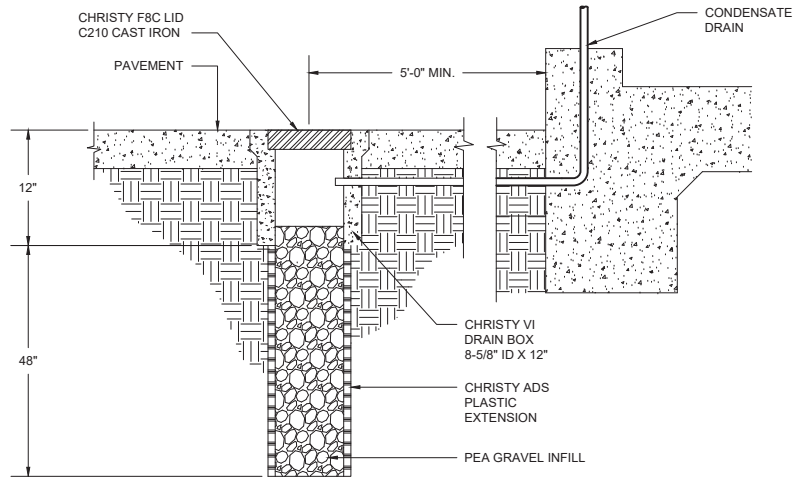
P0.1	GENERAL NOTES, LEGEND & SCHEDULES
P0.2	DETAILS
P0.3	DETAILS
P0.4	CALCS & GAS DIAGRAM
P2.0	PLUMBING UNDERFLOOR PLAN
P2.1	PLUMBING FIRST FLOOR PLAN
P2.2	PLUMBING ROOF PLAN
P3.1	PLUMBING PARTIAL FLOOR PLAN



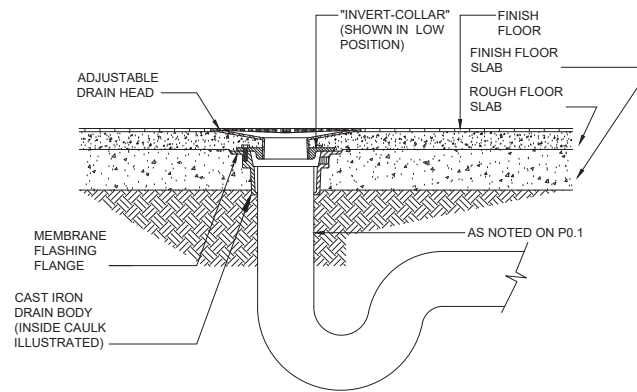
OAKLEY RECREATION CENTER  
 OAKLEY CONTRA COSTA COUNTY CALIFORNIA  
 PLUMBING GENERAL NOTES, LEGEND AND SCHEDULES

No.	Revisions
1	PERMIT SET
1	ENV. HEALTH PERMIT REVISIONS
1	PERMIT SET REV. / BID SET
2	APPENDIX 2
3	APPENDIX 3

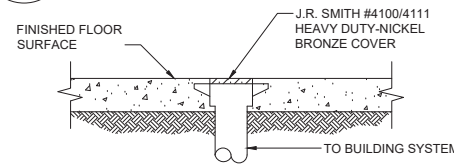
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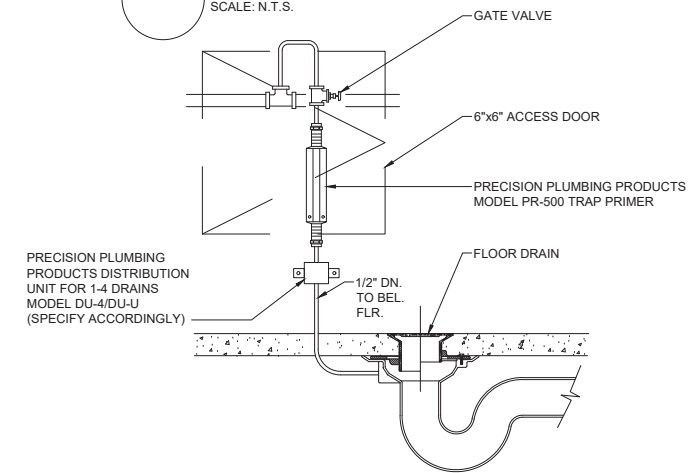
**8 DRYWELL DRAIN DETAIL**  
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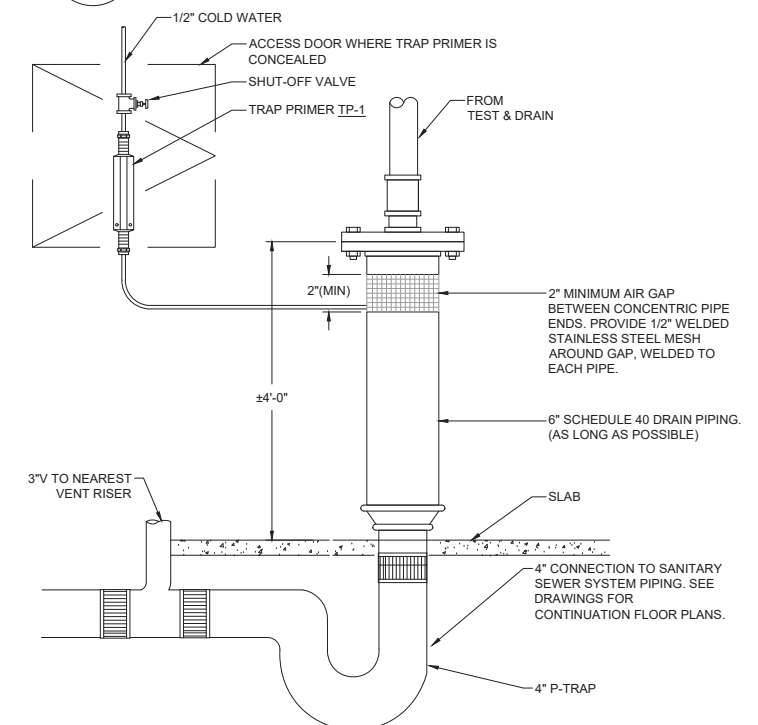
**6 FLOOR DRAIN DETAIL**  
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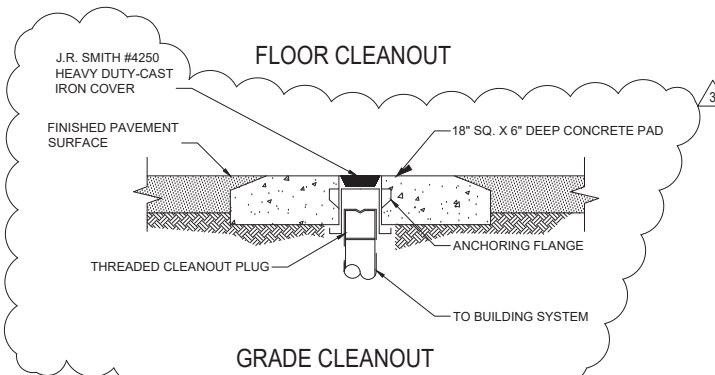
**3 FLOOR SINK DETAIL**  
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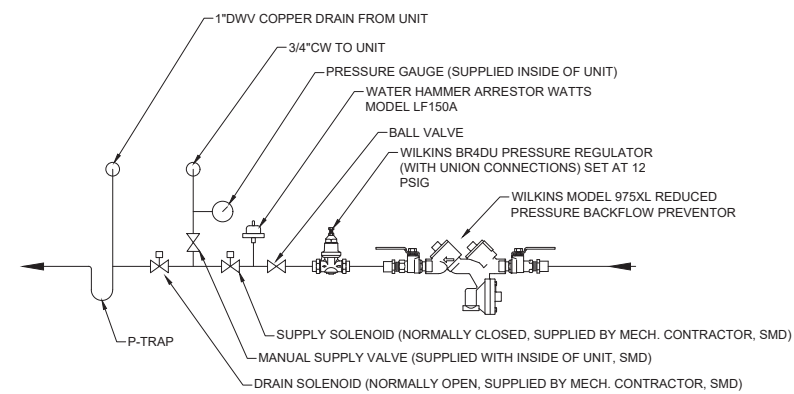
**2 TRAP PRIMER DETAIL**  
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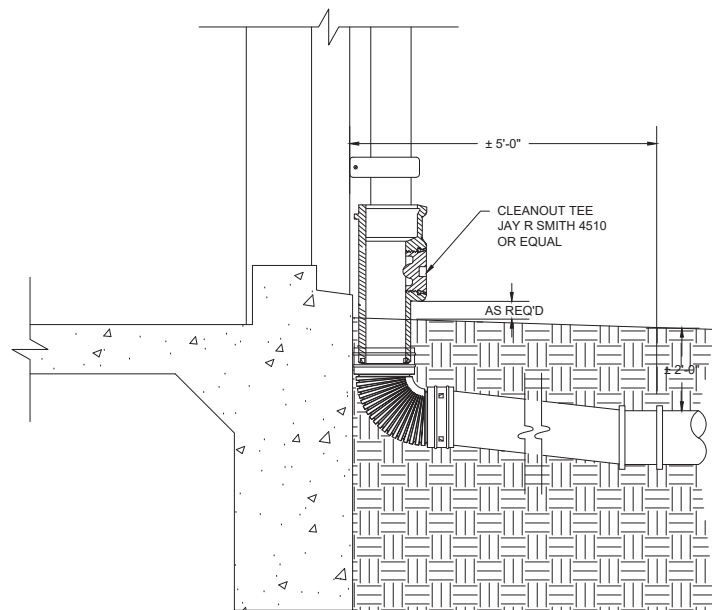
**1 STANDPIPE DRAIN DETAIL**  
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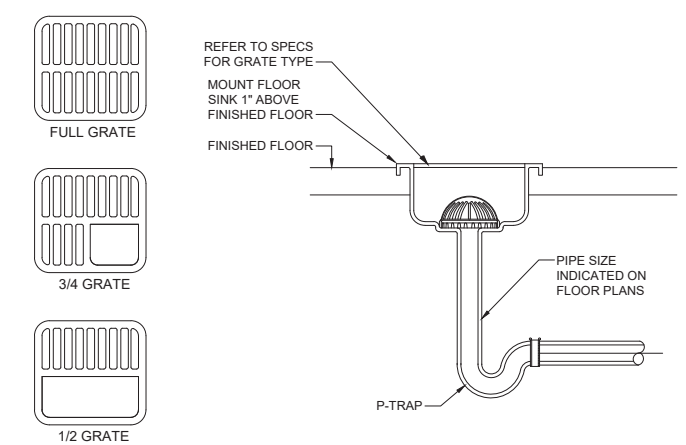
**5 FLOOR CLEANOUT DETAIL**  
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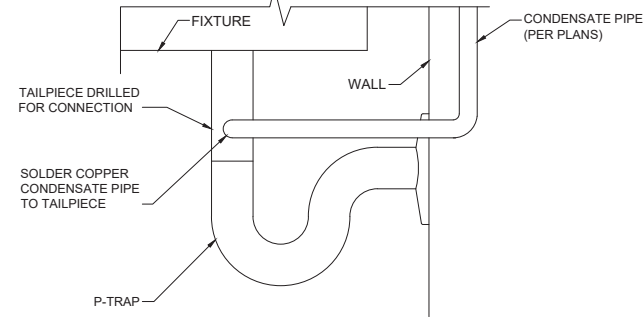
**4 MAKE-UP WATER CONNECTION DETAIL**  
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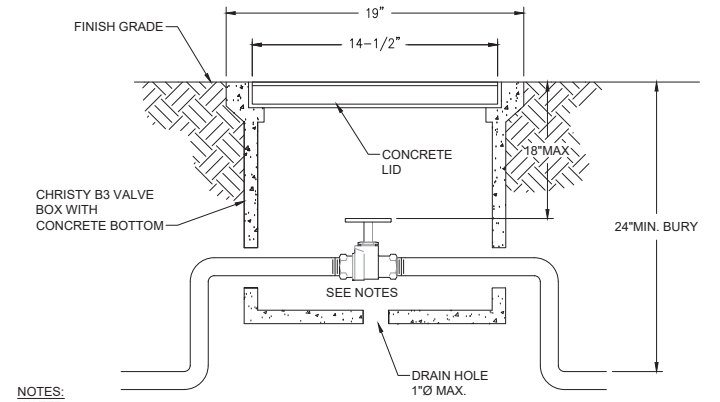
**7 RAINWATER LEADER DETAIL**  
SCALE: N.T.S.



No.	Revisions
1	PERMIT SET
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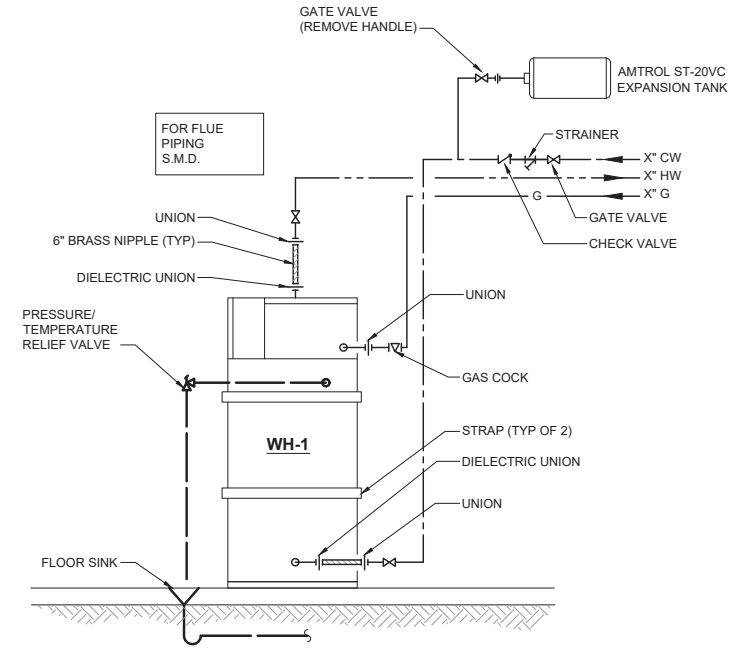
**7 CONDENSATE TO TAILPIECE DETAIL**  
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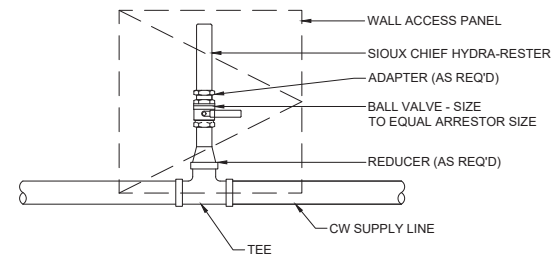
**4 SHUT-OFF VALVE IN YARD BOX**  
SCALE: N.T.S.

NOTES:  
WATER  
UP TO 2": BALL VALVE WITH EXTENDED ROUND HANDLE, NIBCO S-585-80-LF FIELD RETROFITTED WITH CS EXTENDED LEVER HANDLE OR EQUAL 2-1/2" AND ABOVE: USE BALL VALVE

GAS  
GAS COCK



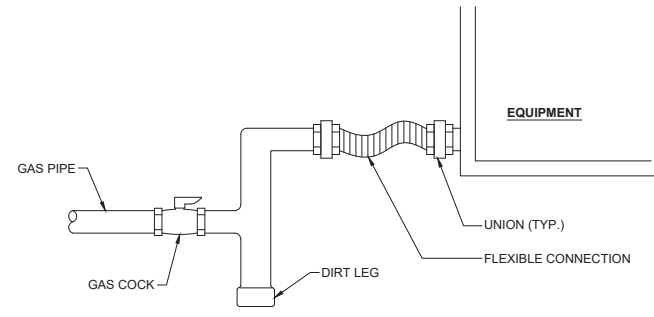
**2 WATER HEATER PIPING DIAGRAM**  
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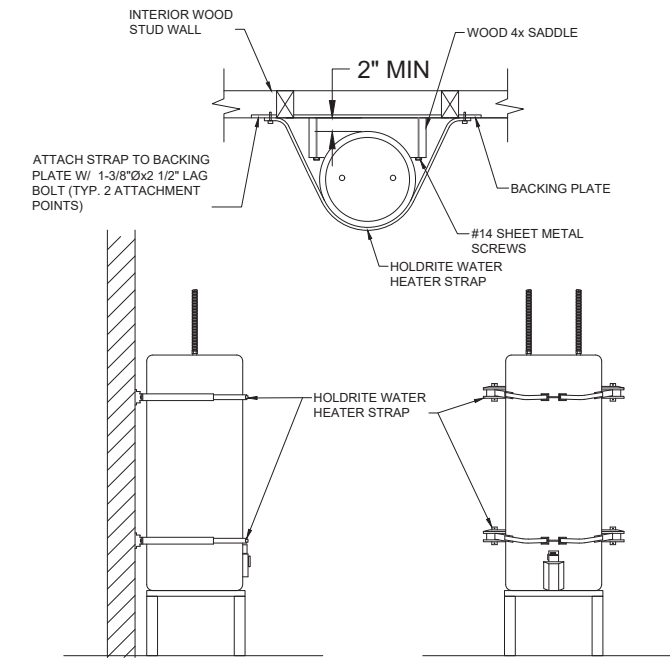
NOTE:  
PROVIDE, SIZE, AND LOCATE WATER HAMMER ARRESTORS PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE LOCATIONS OF ACCESS PANELS WITH ARCHITECT PRIOR TO INSTALLATION OF ARRESTOR AND APPURTENANCES.

WATER HAMMER ARRESTOR				
SIZE	HEIGHT	CHAMBER WIDTH	VOLUME (CU. IN.)	FIXTURE UNITS
1/2"	8 1/4"	1 3/8"	5	1-11
3/4"	10"	1 3/8"	7	12-32
1"	12 1/2"	1 3/8"	11	33-60
1"	11"	2 1/8"	20	61-113
1"	13 1/2"	2 1/8"	29	114-154
1"	16"	2 1/8"	36	155-330

**5 WATER HAMMER ARRESTOR DETAIL**  
SCALE: N.T.S.



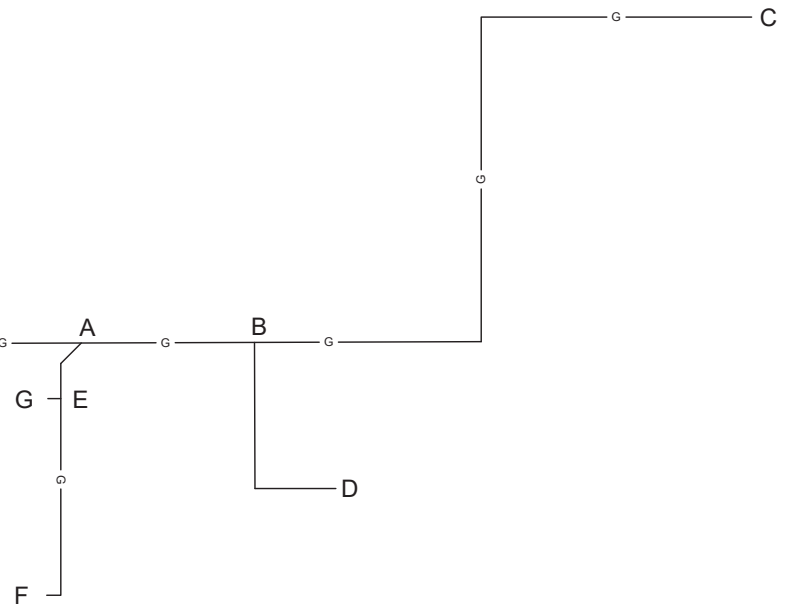
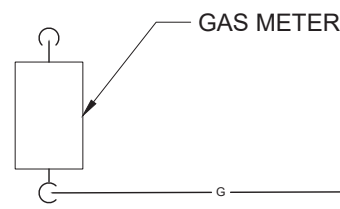
**3 GAS CONNECTION TO EQUIPMENT DETAIL**  
SCALE: N.T.S.



**1 WATER HEATER WALL MOUNTING DETAIL**  
SCALE: N.T.S.

No.	Revisions
1	PERMIT SET
2	ENV. HEALTH PERMIT REVISIONS
3	PERMIT SET REV. / BID SET
4	ADDENDUM 2
5	ADDENDUM 3

Date: 1/23/2018  
Scale: NONE  
Design: SCW  
Drawn:  
Approved:JC  
Job No: 17-005



Natural Gas Piping Equivalent Length		Natural Gas Loads			
Vertical Distance FT =	14	Qty	Equipment	Each	Total
Horizontal Distance FT from meter to last use point =	32	1	Water Heater	154 CFH	154 CFH
Developed Length =	46	1	Range	328 CFH	328 CFH
		1	Make-up Air	150 CFH	150 CFH
		1	Range	86 CFH	86 CFH
% for fittings and valves 25% =	58 Equivalent length				718 Total CFH

NATURAL GAS PIPE SIZING SCHEDULE per CPC 2016					
Maximum Delivery Capacity of Cubic Feet of Gas per Hour of IPS Pipe Carrying Natural Gas of 0.60 Specific Gravity					
Pressure Drop (Inch Water Column) of 0.50 inch W.C.					
Project Name: Oakley Recreation Center					
Pipe Section:		Pipe Section Size			
From	To	Gas Flow Rate (CFH)	Measured distance from gas meter to furthest outlet (Feet)	Equivalent Pipe Length (Feet)	Minimum Pipe Size per CPC Equation 1216.3
C	B	154	46	58	1
B	A	304	46	58	1 1/4
A	METER	718	46	58	1 1/2
D	B	150	32	40	3/4
E	A	414	20	25	1
E	F	86	20	25	1/2
G	E	328	17	21	1

FIXTURE CALCULATION SHEET								
Quantity	Fixture Description	Symbol	Hot water		Cold water		Waste	
			Units*	Total	Units*	Total	Units	Total
7	Water Closet (FV)	WC			5	35	4	28
1	Urinal	UR			4	4	2	2
4	Lavatories	L	0.75	3	1	4	1	4
5	Sink, Kitchen		1.125	5.625	1.5	7.5	2	10
2	Sink, Service or Mop Basin	MS	2.25	4.5	3	6	3	6
2	Sink, Wash-up		1.5	3	2	4	2	4
1	Drinking Fountain	DF			0.5	0.5	0.5	0.5
2	Bottle Filler				0.5	1	0.5	1
1	Hose Bibb	HB			2.5	2.5	-	-
3	Hose Bibb, additional	HB			1	3	-	-
1	Ice Maker	CLW			1	1	3	3
2	Coffee Maker	CLW			1	2	3	6
1	Tea Maker	CLW			1	1	3	3
1	Dishwasher, Domestic	DW	1.125	1.125	1.5	1.5	3	3
4	Floor drain, 2"	FD					4	16
1	Floor drain, 4"	FD					8	8
5	Floor Sink, 2"	FS					4	20
1	Floor Sink, 3"	FS					6	6
Total			17.25		73		120.5	
GPM			14		60		60.25	
Size			1 1/4"		2 1/2"		4"	
							Size 1"	4"

COLD WATER DESIGN CRITERIA			
PRESSURE @ STREET MAIN			33 psi
PRESSURE LOSS THRU METER			0 psi
PRESSURE LOSS THRU OTHER DEVICES (i.e. BFP)			0 psi
PRESSURE AVAILABLE @ 5' OUTSIDE BLDG.			33 psi
PRESSURE LOSS THRU "PRV" SET @	0	PSI	0 psi
PRESSURE LOSS DUE TO HEIGHT	20	X	0.43
MISC. LOSS			0 psi
PRESSURE REQUIRED @ REMOTE FIXTURE			30 psi
PRESSURE AVAILABLE FOR FRICTION LOSS			-6 psi
TOTAL EQUIVALENT LENGTH OF RUN			100 ft
TOTAL DEVELOPED LENGTH OF RUN	(EQUIVALENT LENGTH + 30%)		130 ft
FRICTION LOSS RATE AVAILABLE	-6	X	100 ft = -4 psi/100ft

PIPE SIZING SUMMARY @4psi/100' Friction loss							
PIPE SIZE	COLD WATER				HOT WATER		
	MAX FLOW (GPM)	WSFU (FT)	WSFU (FV)	MAX VELOCITY (FPS)	MAX FLOW (GPM)	WSFU	MAX VELOCITY (FPS)
1/2"	1.8	1		2.8	1.8	1	2.8
3/4"	6	7		3.8	6	7	3.8
1"	12	16		4.5	12	16	4.5
1-1/4"	21	31		5.3	19	27	5
1-1/2"	32	57	15	6	28	47	5
2"	58	161	67	6	49	120	5
2-1/2"	89	316	187	6	85	276	5

CA GREEN CODE WATER CONSERVATION CALCS						
BASELINE WATER USE CALCULATION TABLE						
FIXTURE TYPE	FLOWRATE (GPM)	DURATION (MIN. OR FLUSH)	DAILY USES	OCCUPANTS ****	GALLONS PER DAY	
SHOWER HEADS	2.0	x 5	x 1	x 0	=	0
LAVATORY FAUCETS, NON	0.5	x 0.25	x 1	x 336	=	42
KITCHEN FAUCETS	1.8	x 4	x 1	x 336	=	2418
METERING FAUCETS	0.25	x 1	x 3	x 0	=	0
WATER CLOSET-MALE	1.28	x 1	x 1	x 168	=	215
WATER CLOSET-FEMALE	1.28	x 1	x 3	x 168	=	645
URINALS	0.125	x 1	x 2	x 168	=	42
TOTAL DAILY BASELINE WATER USE (BWU) =					3361	
3361 (BWU) x 0.80 =					2689	ALLOWABLE WATER USE
WATER USE REDUCTION CALCULATION TABLE						
FIXTURE TYPE	FLOWRATE (GPM)	DURATION (MIN. OR FLUSH)	DAILY USES	OCCUPANTS	GALLONS PER DAY	
SHOWER HEADS	1.5	x 5	x 1	x 0	=	0
LAVATORY FAUCETS, NON	0.4	x 0.25	x 1	x 336	=	29
KITCHEN FAUCETS	1.5	x 4	x 1	x 336	=	2015
METERING FAUCETS	0.2	x 1	x 3	x 0	=	0
WATER CLOSET-MALE	1.28	x 1	x 1	x 168	=	215
WATER CLOSET-FEMALE	1.28	x 1	x 3	x 168	=	645
URINALS	0.125	x 1	x 2	x 168	=	42
PROPOSED WATER USE =					2946	
GALLONS SAVED =					416	
PERCENTAGE SAVED =					12	
NOTES:						
* BASELINE IS 0.25 GAL PER MIN CYCLE. 0.25 GAL/CYCLE x CYCLE/0.25 MIN. = 1.0 GPM						
**0.2 GAL/CYCLE REQUIRED. 0.5 GPM x 0.25MIN = 0.13 GAL/CYCLE						
***OCCUPANCY LOAD FACTORS (CBC Sec 303 & 304, CPC Sec 4 Table A)						
Area A	10,073	30	336			
			336			

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OAKLEY RECREATION CENTER  
 CONTRA COSTA COUNTY CALIFORNIA

OAKLEY

PLUMBING CALCS & GAS DIAGRAM

Revisions

No.	Permit Set
1	ENV. HEALTH PERMIT REVISIONS
2	PERMIT SET REV. / BID SET
3	ADDENDUM 2
3	ADDENDUM 3

Date: 1/23/2018

Scale: NONE

Design: SCW

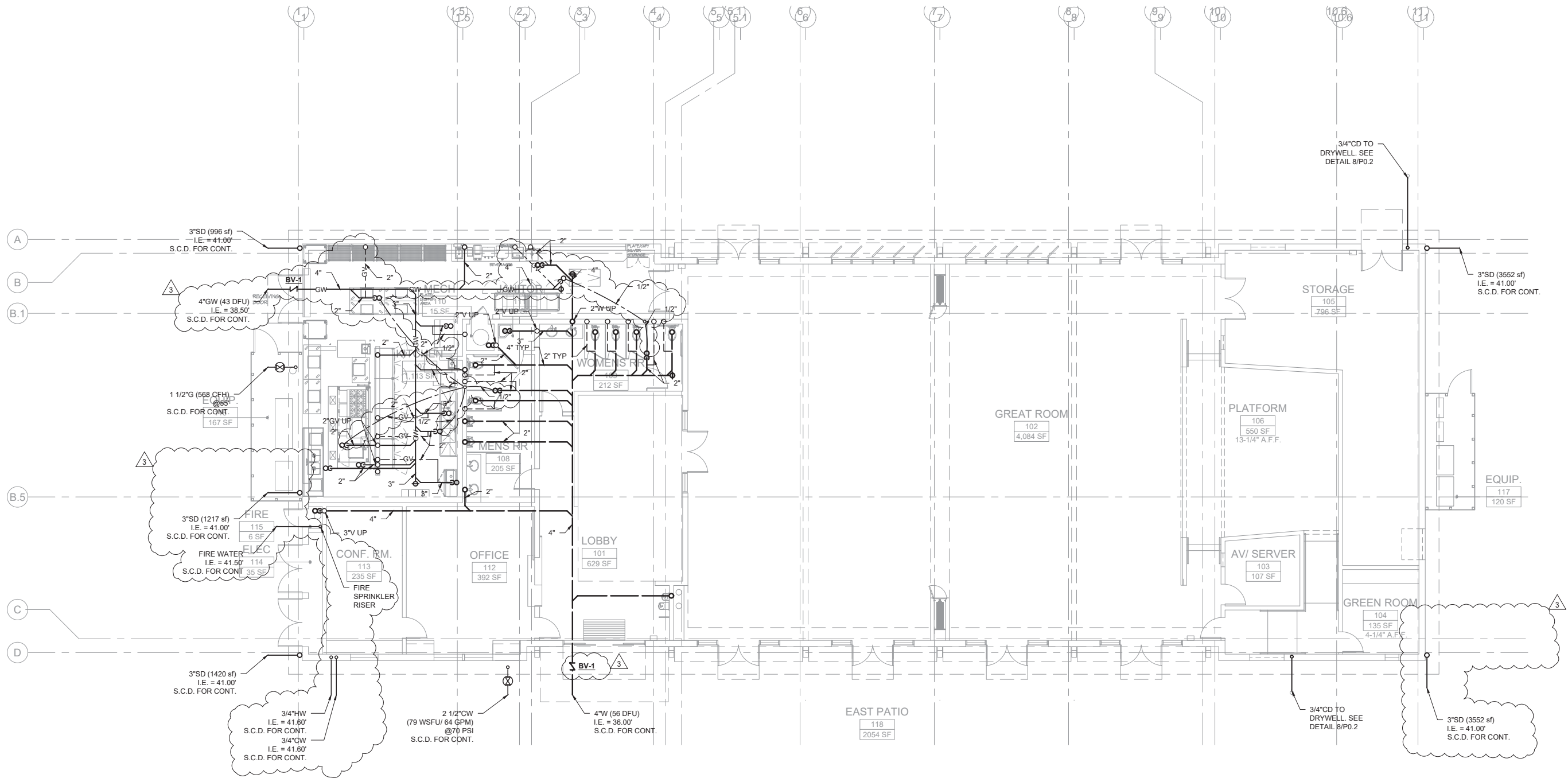
Drawn:

Approved: JC

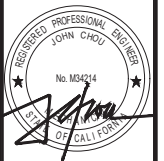
Job No: 17-005

Drawing Number

P0.4

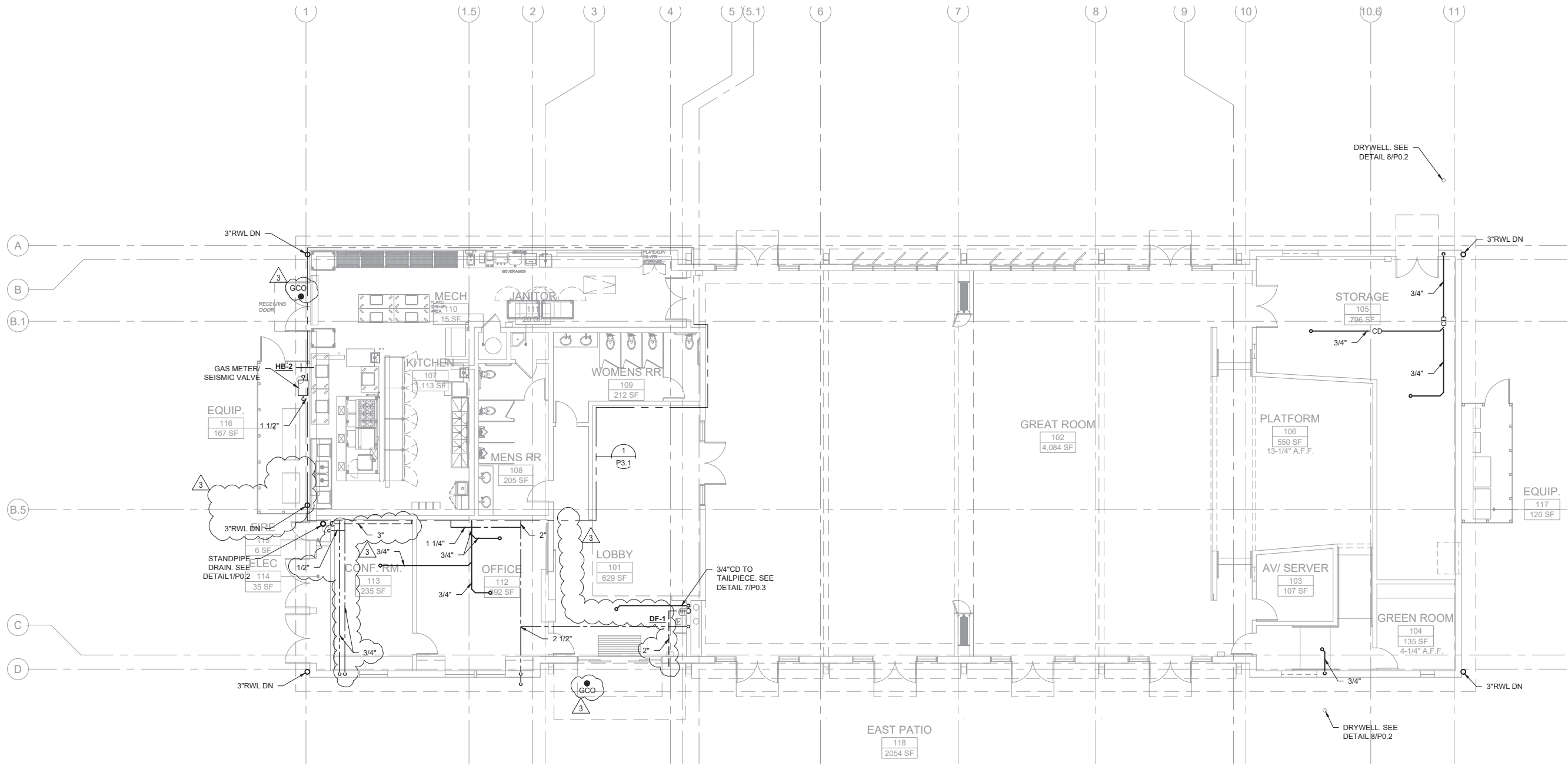


**1 PLUMBING UNDERFLOOR PLAN**  
 P2.0 SCALE: 1/8" = 1'-0"

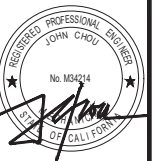


Revisions	
No.	Description
1	PERMIT SET
2	ENV. HEALTH PERMIT REVISIONS
3	PERMIT SET REV. / BID SET
4	ADDENDUM 2
5	ADDENDUM 3





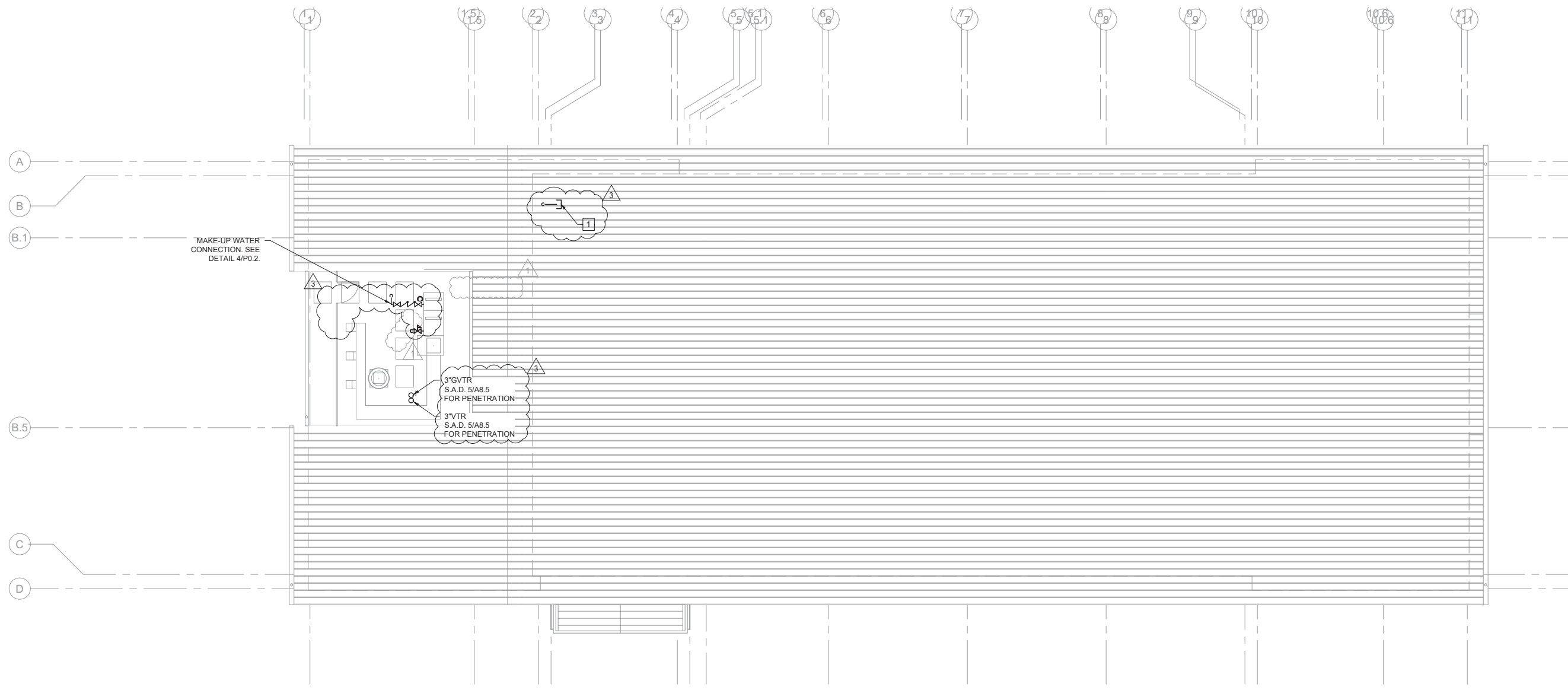
**1 PLUMBING FLOOR PLAN**  
 P2.1 SCALE: 1/8" = 1'-0"



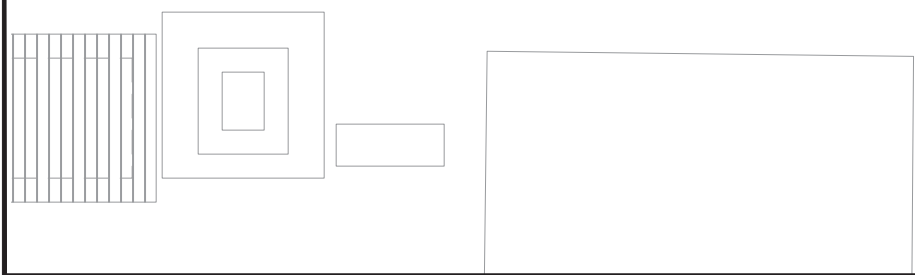
Revisions	
No.	Description
-	PERMIT SET
1	ENV. HEALTH PERMIT REVISIONS
1	PERMIT SET REV. / BID SET
2	ADDENDUM 2
3	ADDENDUM 3

**SHEET NOTES:**

1 POTENTIAL ROUTING OF 1 1/4" COPPER PIPE FOR CONNECTION TO SOLAR HOT WATER.



1 PLUMBING ROOF PLAN  
P2.2 SCALE: 1/8" = 1'-0"



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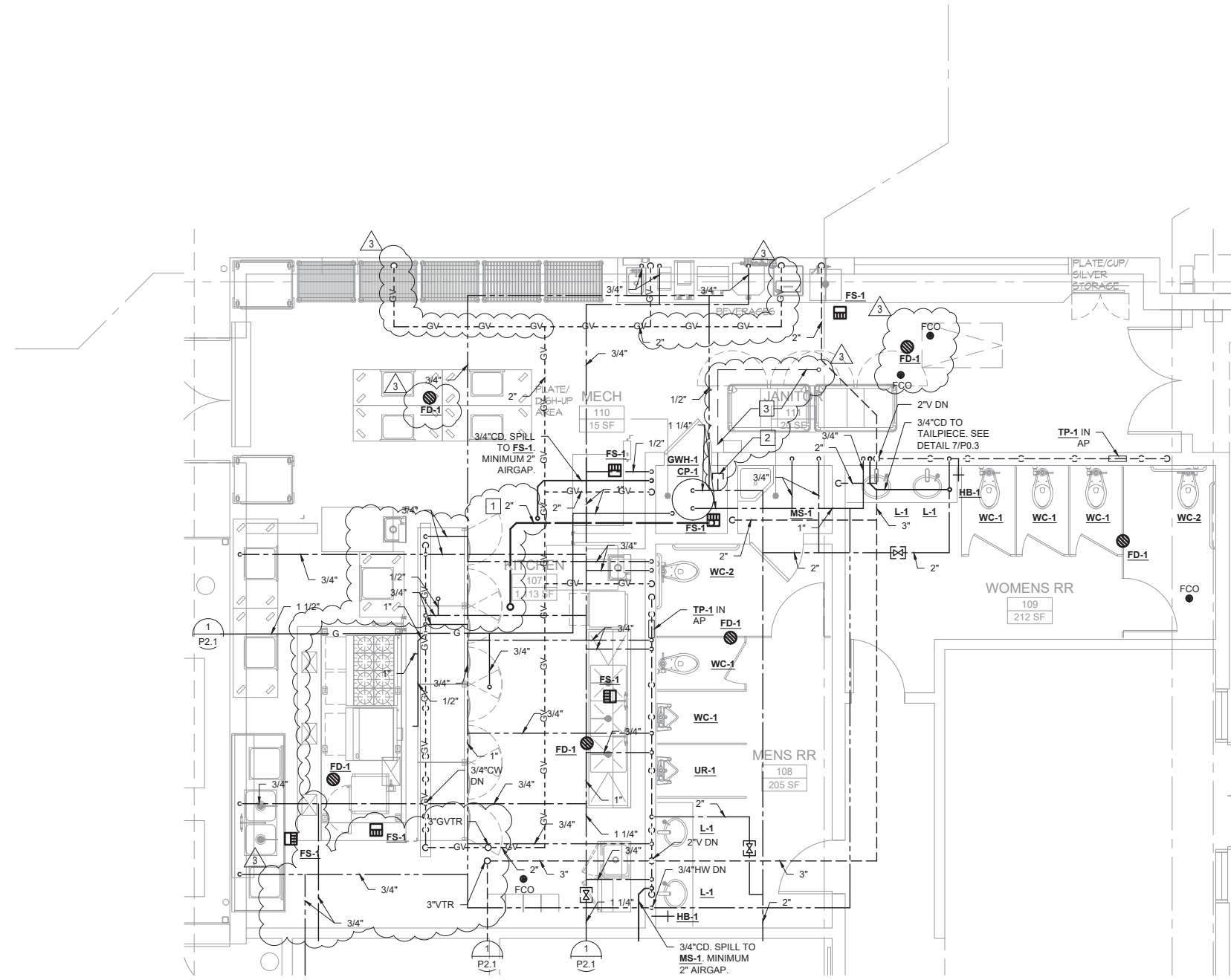
OAKLEY RECREATION CENTER  
OAKLEY CONTRA COSTA COUNTY CALIFORNIA  
PLUMBING ROOF PLAN

Date:	No.	Revisions
1/23/2018	-	PERMIT SET
Scale: 1/8"=1'-0"	1	ENV. HEALTH PERMIT REVISIONS
Design: SCW	1	PERMIT SET REV. / BID SET
Drawn:	2	ADDENDUM 2
Approved:JC	3	ADDENDUM 3
Job No: 17-005		

Drawing Number:  
**P2.2**

**SHEET NOTES:**

- 1 DRAIN FROM MAU-1 ABOVE.
- 2 1 1/4" COPPER PIPE FOR FUTURE CONNECTION TO SOLAR HOT WATER.
- 3 POTENTIAL ROUTING OF 1 1/4" COPPER PIPE FOR CONNECTION TO SOLAR HOT WATER.



**1 PLUMBING PARTIAL FLOOR PLAN**  
 P3.1 SCALE: 1/4" = 1'-0"

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 Oakland, CA 94621  
 510-565-2000



**OAKLEY**  
 CALIFORNIA

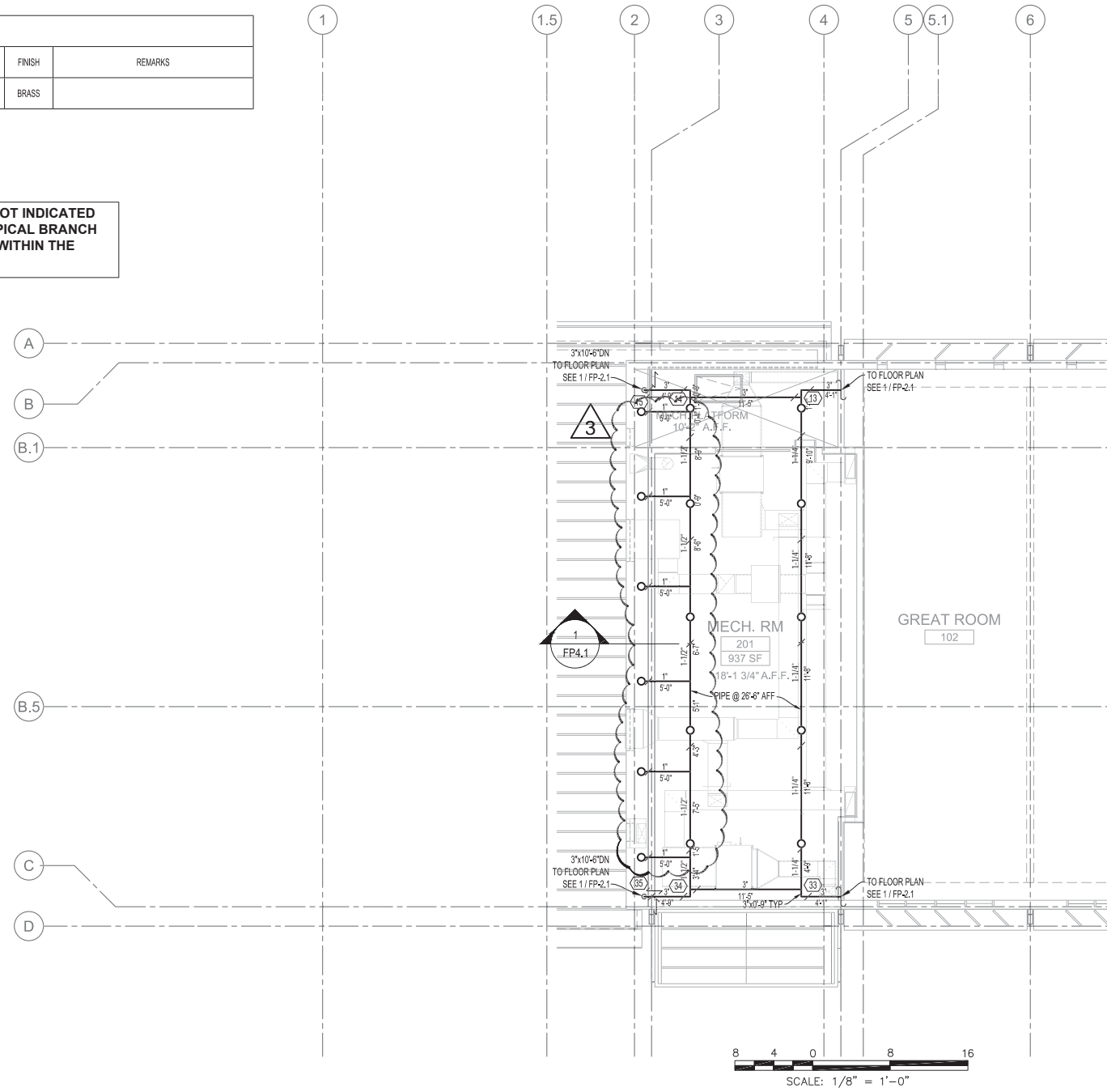
OAKLEY RECREATION CENTER  
 OAKLEY CONTRA COSTA COUNTY CALIFORNIA  
 PLUMBING PARTIAL FLOOR PLAN

Revisions	
No.	Description
-	PERMIT SET
1	ENV. HEALTH PERMIT REVISIONS
1	PERMIT SET REV. / BID SET
2	ADDENDUM 2
3	ADDENDUM 3

Date: 1/23/2018  
 Scale: 1/4" = 1'-0"  
 Design: SCW  
 Drawn:  
 Approved:JC  
 Job No: 17-005  
 Drawing Number:  
**P3.1**

SPRINKLER LEGEND											
SYMBOL	COUNT	TYPE	RESPONSE	TEMP	K-FACTOR	ORIFICE	MANUFACTURER	MODEL	SIN	FINISH	REMARKS
2	○	UPRIGHT ON SPRIG	QUICK	175°F	5.6	1/2"	VIKING	MICROFAST MODEL M	VK300	BRASS	

ALL BRANCH LINE PIPE SIZES AND LENGTHS NOT INDICATED ON THE FLOOR PLANS ARE BASED ON THE TYPICAL BRANCH LINE PIPE SIZES AND LENGTHS AS INDICATED WITHIN THE SAME FLOOR OR COMPARTMENT.



1 FIRE PROTECTION ATTIC PLAN  
SCALE: 1/8" = 1'-0"

1. PROVIDE SPRINKLER GUARDS IN ALL AREAS OF LOW CEILINGS, OR WHERE SUBJECT TO PHYSICAL EDUCATION ACTIVITIES.
2. DRAWINGS INDICATE GENERAL ARRANGEMENT OF PIPING AND EQUIPMENT, SHOULD IT BE NECESSARY TO DEVIATE FROM ARRANGEMENT OR LOCATION INDICATED IN ORDER TO MEET ARCHITECTURAL CONDITIONS OR SITE CONDITIONS, OR DUE TO INTERFERENCE WITH WORK IN OTHER DIVISIONS, SUCH DEVIATIONS AS OFFSETS, RISES, OR DROPS IN PIPING THAT MAY BE NECESSARY, WHETHER SHOWN OR NOT, SHALL BE MADE AT CONTRACTOR'S EXPENSE.



OAKLEY RECREATION CENTER  
OAKLEY CONTRA COSTA COUNTY CALIFORNIA  
FIRE PROTECTION ATTIC PLAN

Date	No.	Revisions
1/23/2018	-	PERMIT SET
Scale: 1/8" = 1'-0"	1	ENV. HEALTH PERMIT REVISIONS
Design:	1	PERMIT SET REV. / BID SET
Drawn:	2	ADDENDUM 2
Approved:	3	ADDENDUM 3
Job No:	17-005	

Drawing Number:  
FP2.2

**HM**  
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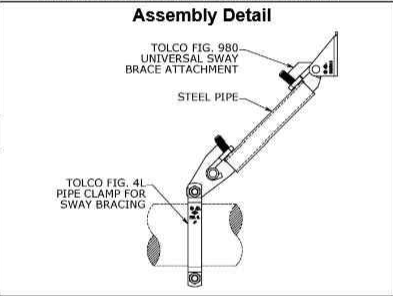
### Tol-Brace Seismic Calculations

**Project Address:** Oakley Recreation Center  
1250 O'hara Avenue  
Oakley, CA 94561  
Job #

**H&M Mechanical Group**  
8517 Earhart RD  
Oakland, CA 94621

**B-Line**  
by **FATON**

Calculations based on 2016 NFPA Pamphlet #13

Brace Information	Tolco Brace Components	
Maximum Spacing: 50' 0" (15.24 m)	<b>Tolco Component Fig. Number</b> <b>Adjusted Load</b>	
Maximum Brace Length: 7' 0" (2.13 m)	Fig. 4L Clamp      1425 lbs (646 kg)	
Bracing Material: 1" Sch. 40	Fig. 980 Universal Swivel      1425 lbs (646 kg)	
Angle from Vertical: 45° Min.	*Calculation Based on CONCENTRIC Loading *Please Note: These calculations are for Tolco components only. Use of any other components voids these calculations and the listing of the assembly.	
Least Rad. of Gyration: 0.42" (11 mm)	<b>Assembly Detail</b>	
L/R Value: 200		
Max Horizontal Load: 1310 lbs (594 kg)	<b>Brace Identification on Plans</b> Longitudinal	
Force Factor (Cp): 0.671	<b>Orientation of Brace</b> Longitudinal	
<b>Fastener Information</b>		
Fastener Orientation: NFPA Type E		
Maximum Load: 400 lbs (181 kg)		
Diameter: 5/8in. (16 mm)		
Length: 3-1/2in. (89 mm)		
Type: Dual Lag Bolts - Fig. 906		
<b>Load Information</b>		
Braced Pipe: 3" Sch. 10 Steel Pipe		
<b>Size and Type of Pipe</b>	<b>Total Length</b>	<b>Total Calculated Load</b>
3" Sch. 10 Steel Pipe (76.2 mm)	50ft (15.2 m)	266 lbs (121 kg)
Percentage added for Fittings and Sprinklers: 15%		
<b>Total Adjusted Load of all pipe within Zone of Influence</b>		306 lbs (139 kg)

(Tol-Brace Verzion 8)

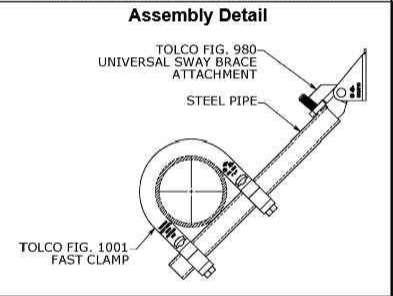
### Tol-Brace Seismic Calculations

**Project Address:** Oakley Recreation Center  
1250 O'hara Avenue  
Oakley, CA 94561  
Job #

**H&M Mechanical Group**  
8517 Earhart RD  
Oakland, CA 94621

**B-Line**  
by **FATON**

Calculations based on 2016 NFPA Pamphlet #13

Brace Information	Tolco Brace Components	
Maximum Spacing: 20' 0" (6.1 m)	<b>Tolco Component Fig. Number</b> <b>Adjusted Load</b>	
Maximum Brace Length: 7' 0" (2.13 m)	Fig. 1001 Clamp      1425 lbs (646 kg)	
Bracing Material: 1" Sch. 40	Fig. 980 Universal Swivel      1425 lbs (646 kg)	
Angle from Vertical: 45° Min.	*Calculation Based on CONCENTRIC Loading *Please Note: These calculations are for Tolco components only. Use of any other components voids these calculations and the listing of the assembly.	
Least Rad. of Gyration: 0.42" (11 mm)	<b>Assembly Detail</b>	
L/R Value: 200		
Max Horizontal Load: 1310 lbs (594 kg)	<b>Brace Identification on Plans</b> Lateral	
Force Factor (Cp): 0.671	<b>Orientation of Brace</b> Lateral	
<b>Fastener Information</b>		
Fastener Orientation: NFPA Type E		
Maximum Load: 400 lbs (181 kg)		
Diameter: 5/8in. (16 mm)		
Length: 3-1/2in. (89 mm)		
Type: Dual Lag Bolts - Fig. 906		
<b>Load Information</b>		
Braced Pipe: 3" Sch. 10 Steel Pipe		
<b>Size and Type of Pipe</b>	<b>Total Length</b>	<b>Total Calculated Load</b>
3" Sch. 10 Steel Pipe (76.2 mm)	20ft (6.1 m)	107 lbs (49 kg)
1.5" Sch. 40 Steel Pipe (38.1 mm)	75ft (22.9 m)	182 lbs (83 kg)
1" Sch. 40 Steel Pipe (25.4 mm)	10ft (3 m)	14 lbs (6 kg)
Percentage added for Fittings and Sprinklers: 15%		
<b>Total Adjusted Load of all pipe within Zone of Influence</b>		347 lbs (157 kg)

(Tol-Brace Verzion 8)

### SEISMIC COEFFICIENT

2010 ASCE 7 STANDARD

OAKLEY RECREATION CENTER  
1250 O'HARA AVE.  
OAKLEY, CA 94561

LATITUDE = 37.9873  
LONGITUDE = -121.7133  
SPECTRAL RESPONSE ACCELERATION S<sub>s</sub> AND S<sub>1</sub>  
S<sub>s</sub> AND S<sub>1</sub> = MAPPED SPECTRAL ACCELERATION VALUES  
SITE CLASS B - F<sub>a</sub> = 1.0, F<sub>v</sub> = 1.0  
DATA ARE BASED ON A 0.01 DEG GRID SPACING

PERIOD (SEC)	S <sub>s</sub> (G)
0.2	1.442 (S <sub>s</sub> , SITE CLASS B)
1.0	0.493 (S <sub>1</sub> , SITE CLASS B)

C<sub>p</sub> VALUE PER NFPA 13 TABLE 9.3.5.9.3

S <sub>s</sub>	C <sub>p</sub>
1.442	0.671

**H&M MECHANICAL GROUP**

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Oakland, CA 94621  
510-569-2000

PROFESSIONAL ENGINEER  
JOHN CHOU  
No. M34214  
STATE OF CALIFORNIA

**OAKLEY CALIFORNIA**

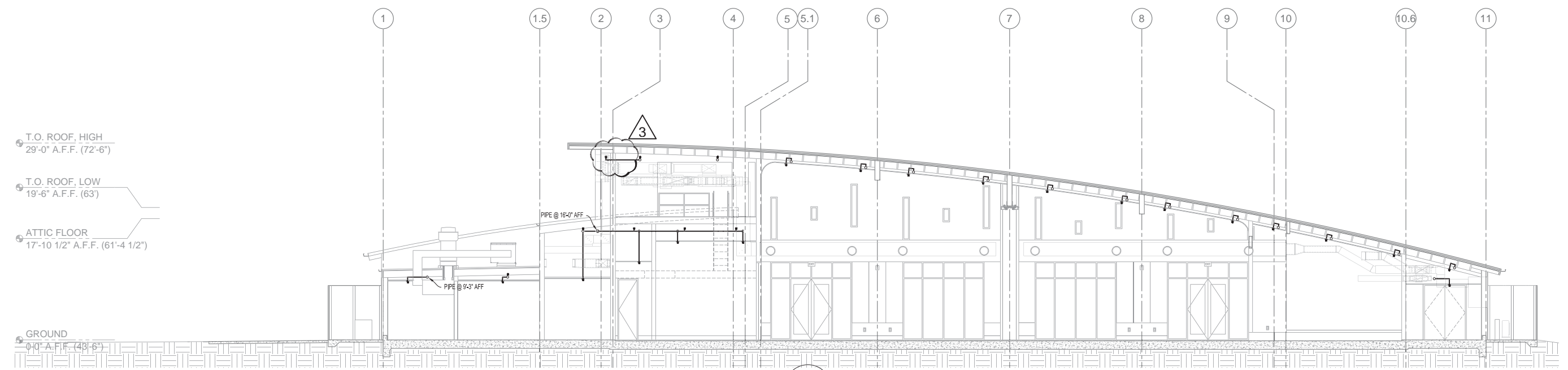
OAKLEY RECREATION CENTER  
CONTRA COSTA COUNTY CALIFORNIA  
OAKLEY  
FIRE PROTECTION SECTION AND  
SEISMIC CALCULATIONS

Date: 1/23/2018	No.	Revisions
Scale: SEE DRAWING	1	PERMIT SET
Design:	1	ENV. HEALTH PERMIT REVISIONS
Drawn:	1	PERMIT SET REV. / BID SET
Approved:	2	ADDENDUM 2
Job No: 17-005	3	ADDENDUM 3

Drawing Number:  
**FP4.1**

LONGITUDINAL

LATERAL



1 FIRE PROTECTION SECTION  
SCALE: 1/8"=1'-0"