



An MBE | SBE | DBE | LSBE Firm

Santa Rosa TMS Restrooms

Budlong Job #19-394.C4

DSA approved CCD 003A

03/06/2026

CCD 003A Cover Page for Bidding Contractors

Note for Bidding contractors regarding CCD 003A: Only Buildings D and E will get restroom upgrades in Summer 2026.

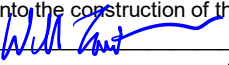
Patrick Fitzsimmons

Project Manager
Budlong

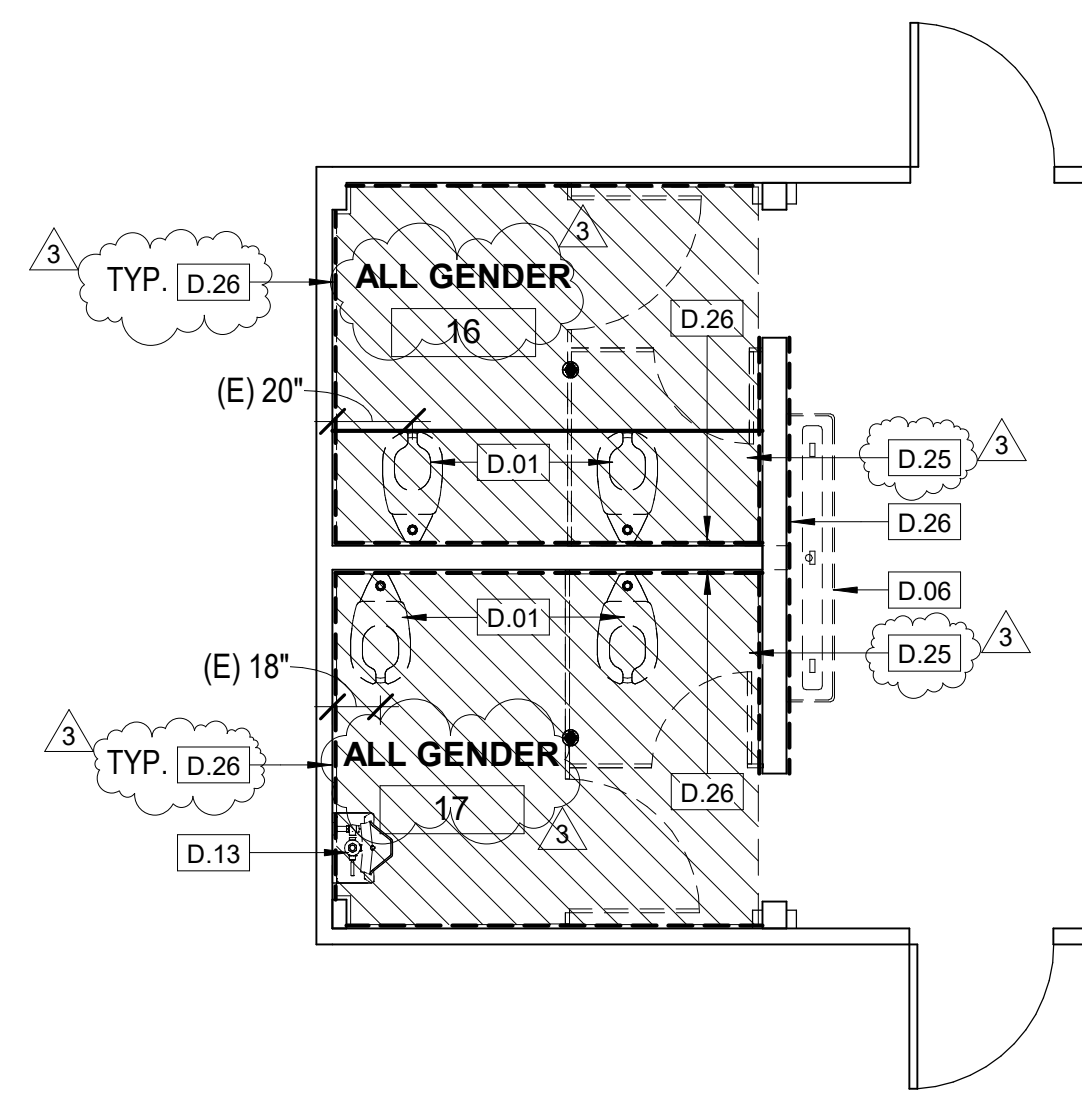
APPLICATION FOR SUBMITTAL OF POST-APPROVAL DOCUMENT

This application is for submittal of documents, after the initial approval of the project (post-approval documents), that require Division of the State Architect (DSA) review and approval. This form shall be completed by the Design Professional in General Responsible Charge of the project, in accordance with California Code of Regulations, Title 24, Part 1, Sections 4-317, 4-323 and 4-338 and in compliance with DSA IR A-6: Construction Change Document Submittal and Approval Process.

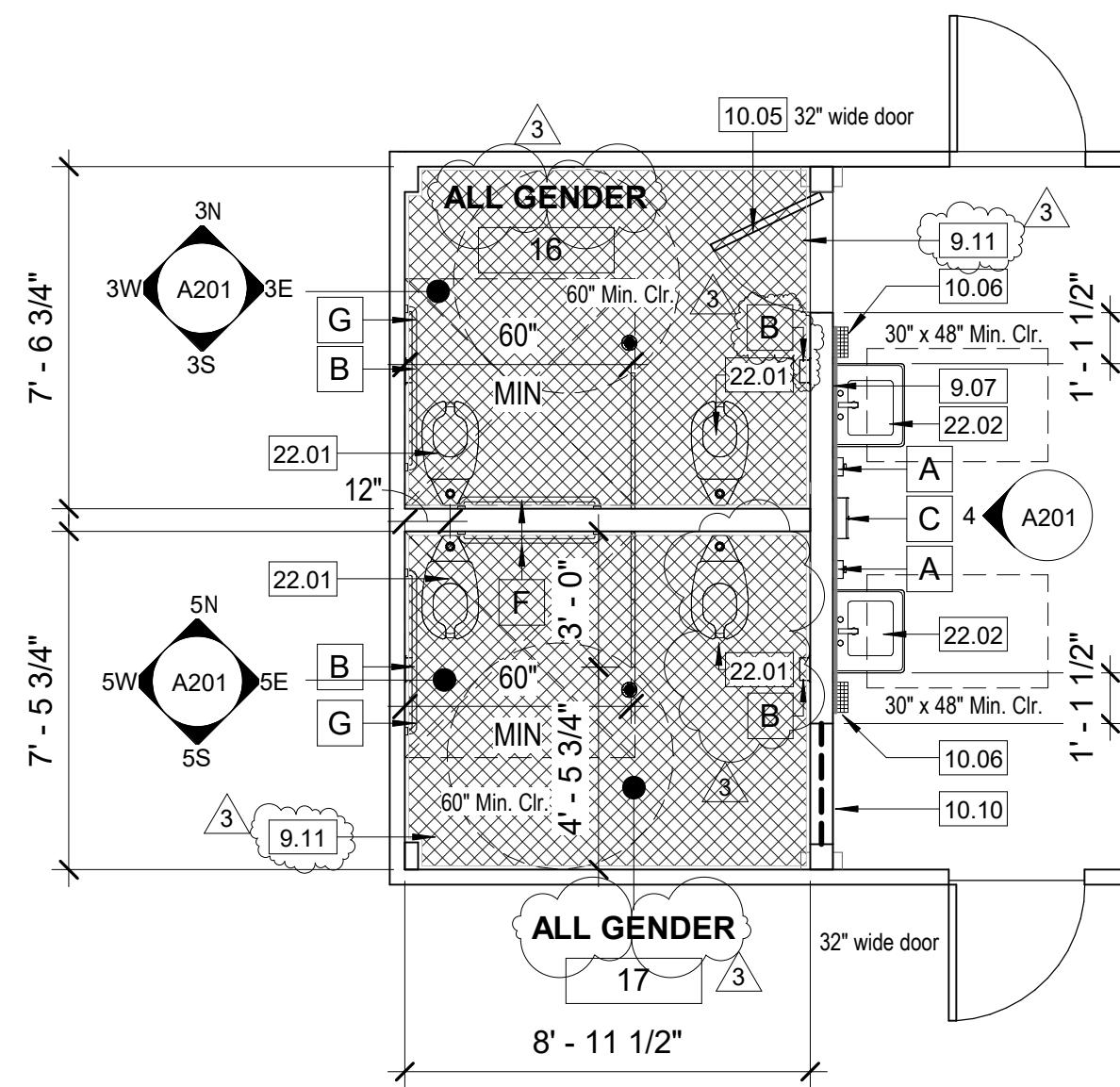
DSA documents referenced within this form are available on the [DSA Forms](#) or [DSA Publications](#) webpages.

1. SUBMITTAL TYPE: (Is this a resubmittal? Yes ☒ No ☐)			
Deferred Submittal ☐	Addendum Number:	Revision Number:	CCD Number: 003 Category A ☒ or B ☐
2. PROJECT INFORMATION:			
School District/Owner: Pleasant Valley School District		DSA File Number: 56 H4	
Project Name/School: Santa Rosa Technology Magnet School		DSA Application Number 03 121466	
3. APPLICANT INFORMATION:			
Date Submitted: 02/04/26		Attached Pages? No ☐ Yes ☒ Number of pages? 281	
Firm Name: Orion Structural Group, Inc.		Contact Name: Will Lambert	
Work Email: Will@OrionStructural.com		Work Phone: (805) 390-9242	
Firm Address: 223 E. Thousand Oaks Blvd., #304		City: Thousand Oaks	State: CA Zip Code: 91360
4. REASON FOR SUBMITTAL: (Check applicable boxes)			
☐ For revision or addendum prior to construction.		☒ For a project currently under construction.	
☒ For a project that has a form DSA 301-N: Notification of Requirement for Certification, DSA 301-P: Posted Notification of Requirement for Certification or a 90-Day Letter issued.			
☐ To obtain DSA approval of an existing uncertified building or buildings.			
☐ For Category B CCD this is: ☐ a voluntary submittal, ☐ a DSA required submittal (attach DSA notice requiring submission).			
5. DESIGN PROFESSIONAL IN GENERAL RESPONSIBLE CHARGE:			
Name of the Design Professional In General Responsible Charge: Will Lambert			
Professional License Number: 5430		Discipline: Structural	
Design Professional in General Responsible Charge Statement: The attached post-approval documents have been examined by me for design intent and appear to meet the appropriate requirements of Title 24, California Code of Regulations and the project specifications. They are acceptable for incorporation into the construction of the project.			
Signature: 			
DESIGN PROFESSIONAL IN GENERAL RESPONSIBLE CHARGE			
6. CONFIRMATION, DESCRIPTION AND LISTING OF DOCUMENTS:			
For addenda, revisions, or CCDs: CHECK THIS BOX ☒ to confirm that <i>all</i> post-approval documents have been stamped and signed by the Responsible Design Professional listed on form DSA 1: Application for Approval of Plans and Specifications for this project. (For Deferred Submittals, refer to IR A-18: Use of Construction Documents Prepared by Other Professionals, and IR A-19: Design Professional's Signature and Seal (Stamp) on Construction Documents, when applicable, for signature and seal requirements.)			
Provide a brief description of construction scope for this post-approval document (attach additional sheets if needed): Providing an upgrade of the Restrooms at Bldgs. B, C, D & E including replacement of all waste, water and plumbing fixtures. Also removing urinals in Student restrooms and installing toilets at those locations, and in some cases lavatories. Replaced Plastic Toilet Compartments with Phenolic-Core Toilet Compartments in specifications. Removed specification sections 23, 26, 31, 32. Since the HVAC, Electrical and Fire Alarm construction scope has already been completed, we modified specifications and drawings so CCD-003A would be for these restroom upgrades only.			
List of DSA-approved drawings affected by this post-approval document: A102, A201, A202, A601, A602, P-101, P-102, P-103, P-300, P-301			

DSA USE ONLY		
SSS RS Date 02/09/26 ☒ Approved ☐ Disapproved ☐ Not Required Comments: _____ FLS SFH Date 01/14/2025 ☒ Approved ☐ Disapproved ☐ Not Required Comments: _____ ACS ST Date 2/6/26 ☒ Approved ☐ Disapproved ☐ Not Required Comments: _____	Returned Date: _____ By: _____	DSA STAMP APPROVED DIV. OF THE STATE ARCHITECT APP: 03-121466 INC: REVIEWED FOR SS ☒ FLS ☒ ACS ☒ DATE: 02/09/2026

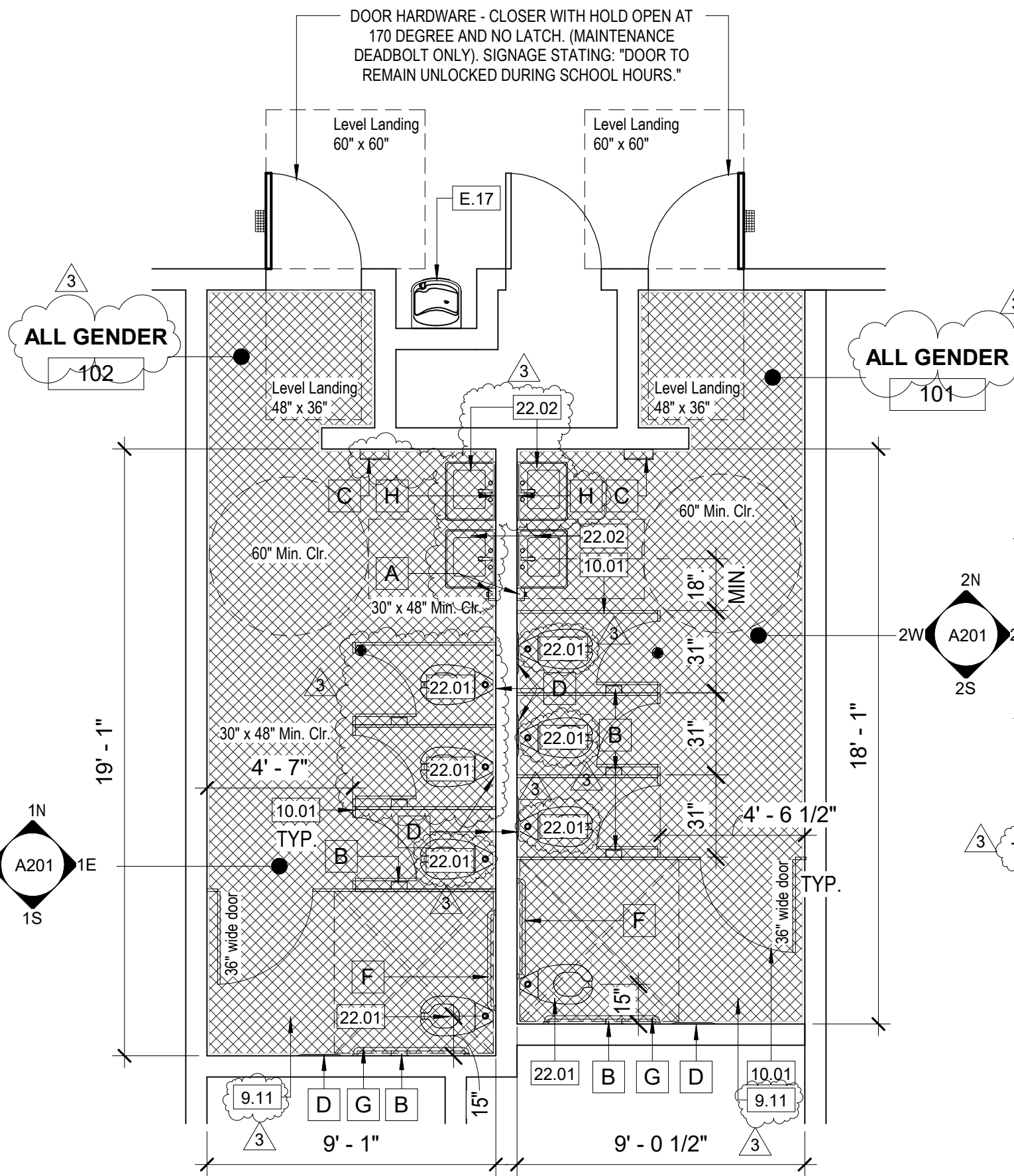


3 EXISTING BLDG B - DEMOLITION PLAN
1/4" = 1'-0"



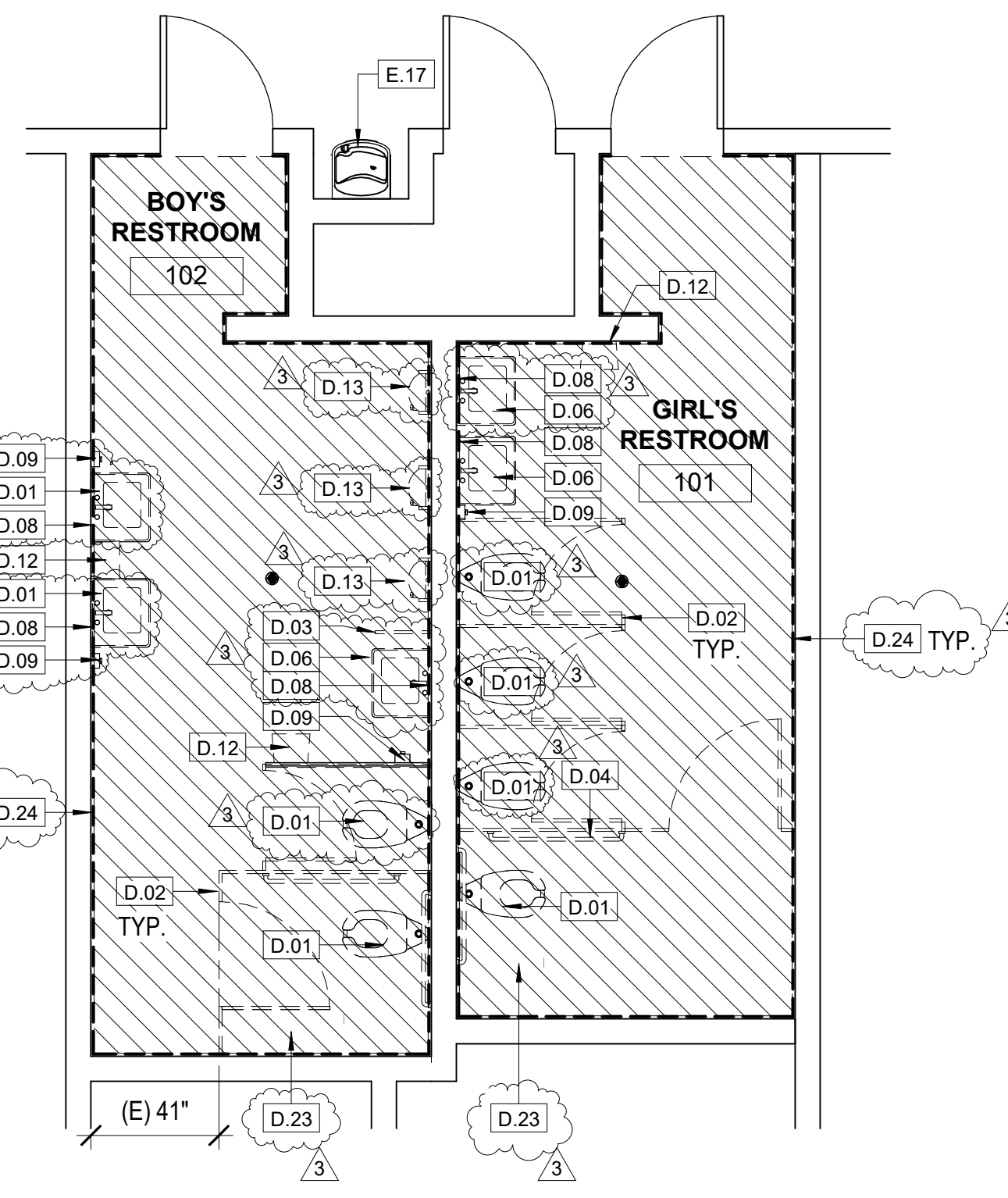
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4 EXISTING BLDG B - NEW PLAN
1/4" = 1'-0"

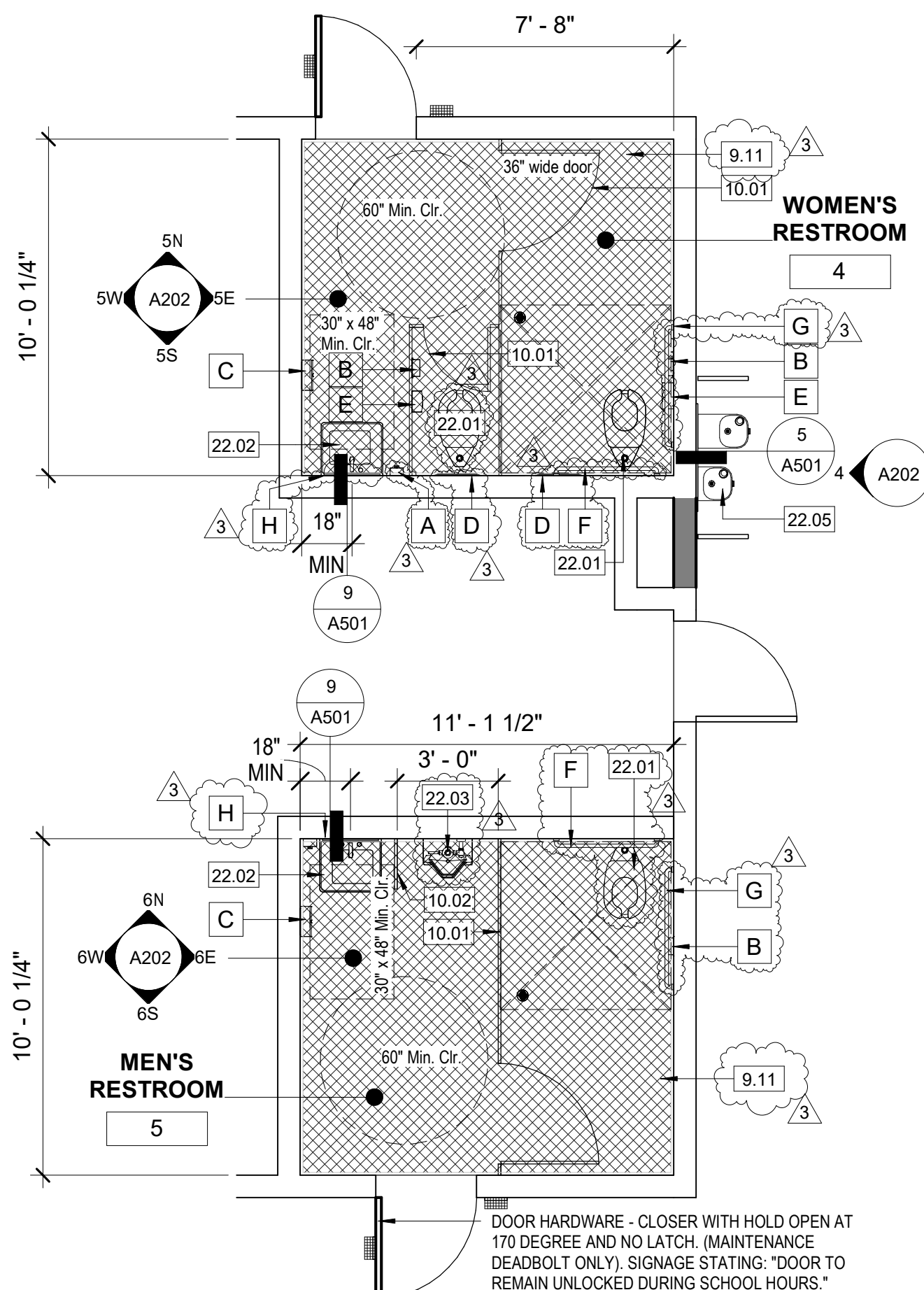


NOTE: USE ELEMENTARY (E) DIMENSIONS FROM A002

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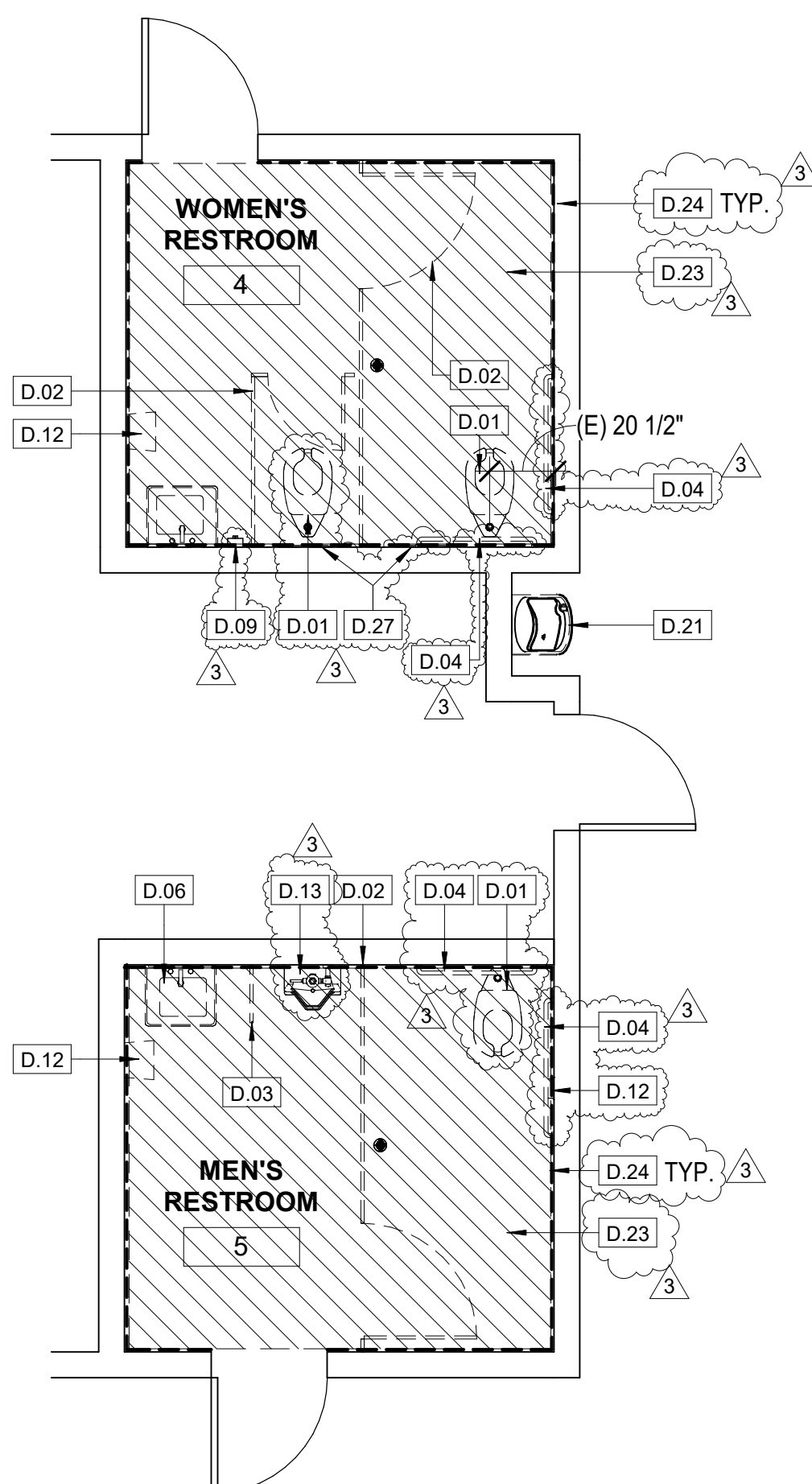


1 EXISTING BLDG C - DEMOLITION PLAN
1/4" = 1'-0"

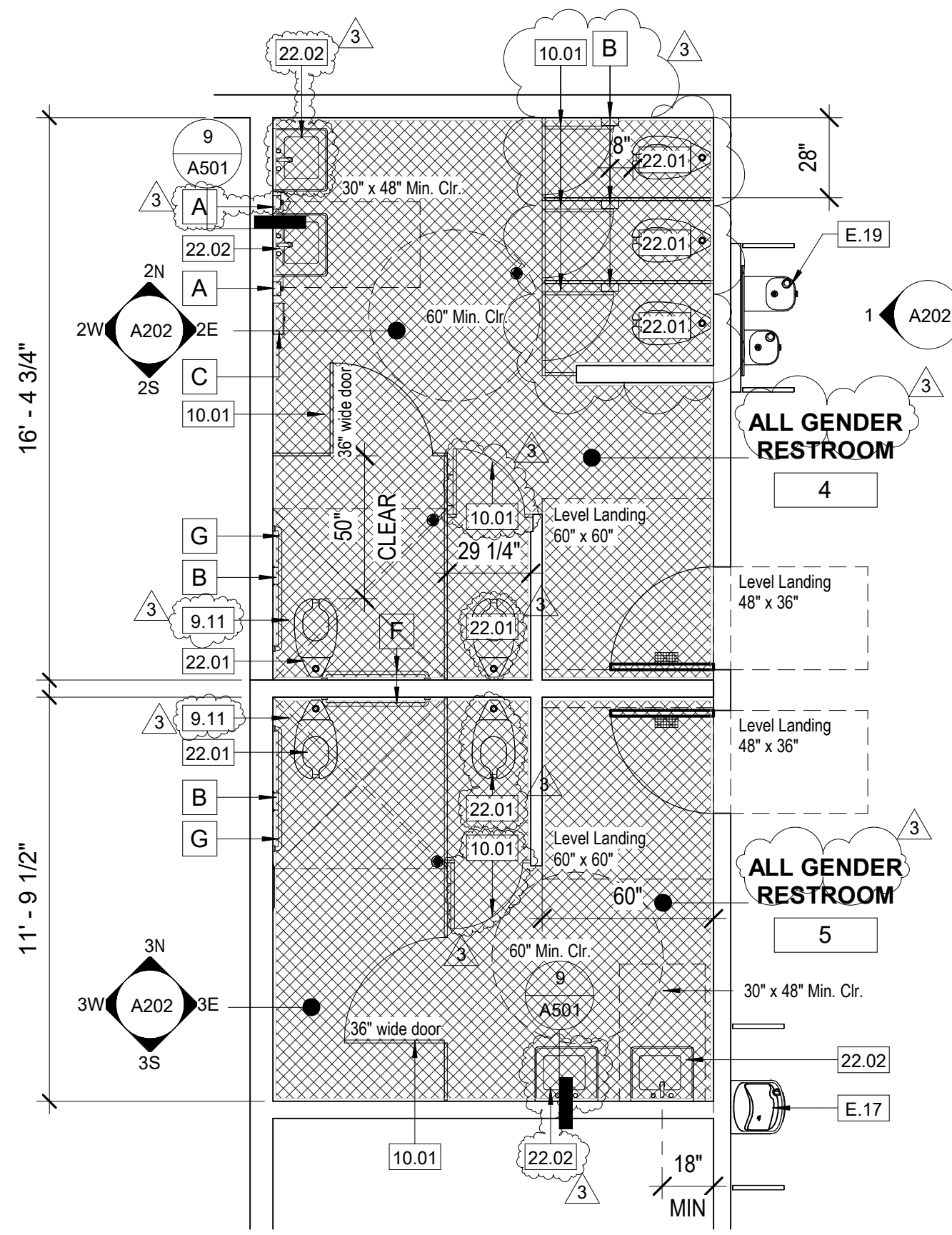


NOTE: USE ADULT (A) DIMENSIONS FROM A002

8 EXISTING BLDG E - NEW PLAN
1/4" = 1'-0"

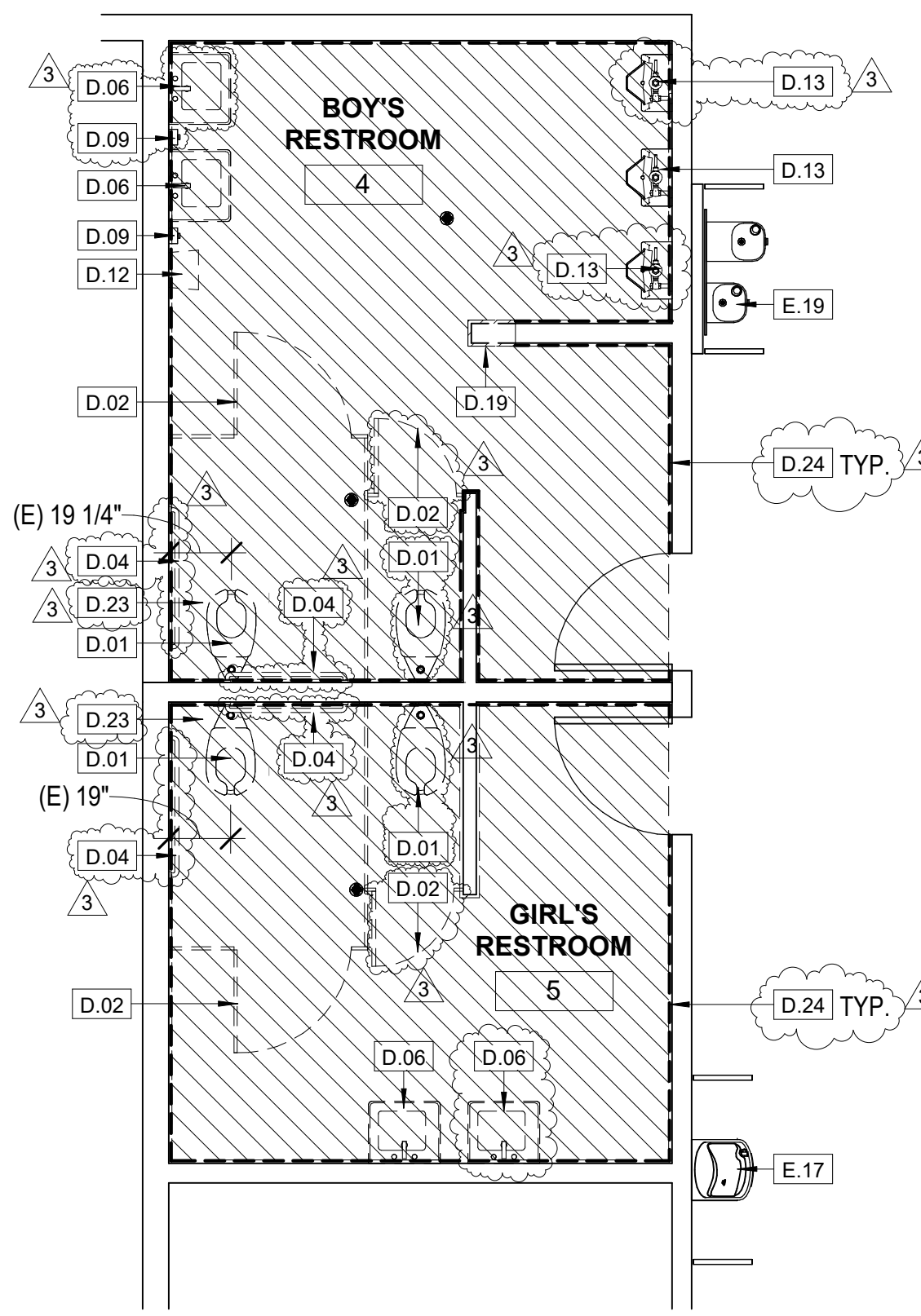


7 EXISTING BLDG E - DEMOLITION PLAN
1/4" = 1'-0"



NOTE: USE ELEMENTARY (E) DIMENSIONS FROM A002

6 EXISTING BLDG D - NEW PLAN
1/4" = 1'-0"



5 EXISTING BLDG D - DEMOLITION PLAN
1/4" = 1'-0"

DEMOLITION KEYNOTES

- D.01 DEMOLISH (E) WATER CLOSET
- D.02 DEMOLISH (E) TOILET PARTITION
- D.03 DEMOLISH (E) URINAL SCREEN
- D.04 DEMOLISH (E) GRAB BAR
- D.06 DEMOLISH (E) LAVATORY
- D.08 DEMOLISH (E) MIRROR
- D.09 DEMOLISH (E) SOAP DISPENSER
- D.12 DEMOLISH (E) PAPER TOWEL DISPENSER
- D.13 DEMOLISH (E) URINAL
- D.19 DEMOLISH (E) WALL
- D.21 DEMOLISH (E) DRINKING FOUNTAIN DIV 1
- D.23 DEMOLISH (E) TILE FLOOR FINISH
- D.24 DEMOLISH (E) TILE WALL FINISH
- D.25 DEMOLISH (E) SHEET VINYL FLOOR FINISH
- D.26 DEMOLISH (E) FIBERGLASS REINFORCED PANELS WALL FINISH AND GYPSUM BOARD SUBSTRATE
- D.27 DEMOLISH (E) SEAT COVER

EXISTING KEYNOTES

- E.17 (E) LOW DRINKING FOUNTAIN
- E.19 (E) HI-LOW DRINKING FOUNTAIN

KEYNOTES

- 9.07 (N) FIBERGLASS REINFORCED PANEL OVER 5/8" GYPSUM BOARD TO MATCH EXISTING
- 9.11 (N) SHEET VINYL FLOORING WITH INTEGRAL 4" COVED BASE, TYP.
- 10.01 (N) TOILET PARTITION
- 10.02 (N) 18" URINAL SCREEN
- 10.05 (N) TOILET PARTITION DOOR
- 10.06 (N) SIGNAGE
- 10.10 (N) CUBICLE CURTAIN AND TRACK, CUBICLE CURTAIN - TUBULAR SPECIALTIES MANUFACTURING OR EQUAL, SURFACE MOUNTED ALUMINUM TRACK AND NYLON CURTAIN WITH 21" MESH AT TOP, COLOR ALMOND.
- 22.01 (N) WATER CLOSET
- 22.02 (N) LAVATORY
- 22.03 (N) URINAL
- 22.05 (N) DRINKING FOUNTAIN

GENERAL NOTES

1. REMOVE WALL AND FLOOR TILE AS INDICATED IN DRAWINGS TO ACCOMMODATE THE SCOPE OF WORK AND REPLACE WITH NEW MATERIALS.
2. TOILET PARTITIONS SHALL HAVE CONTINUOUS BRACKETS AND NO SIGHT-LINE JOINTS

ACCESSORIES SCHEDULE

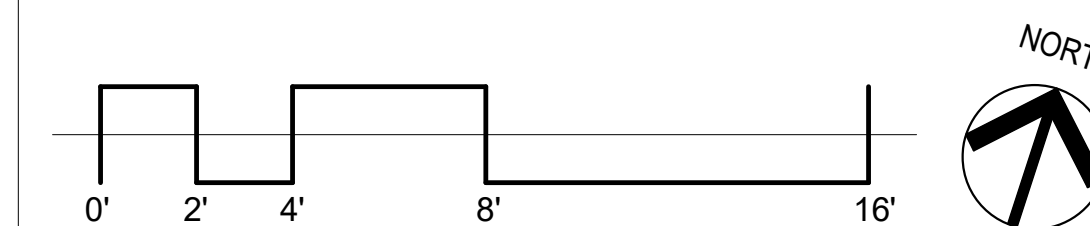
FOR ACCESSORIES MOUNTING HEIGHT SEE SHEET G002

- A LIQUID SOAP DISPENSER
- B TOILET PAPER DISPENSER
- C PAPER TOWEL DISPENSER
- D TOILET SEAT COVER DISPENSER
- E NAPKIN DISPOSAL
- F 36" STAINLESS STEEL GRAB BAR
- G 42" STAINLESS STEEL GRAB BAR
- H 20"x30" MIRROR

RESTROOM LEGEND

- INDICATES 54" x 60" CLEAR SPACE
- INDICATES 60" DIAMETER CLEAR SPACE
- DEMOLISH EXISTING TILES
- DEMOLISH EXISTING WALL
- NEW TILES
- NEW FULL HEIGHT WALL

AS REVISED
CCD-003A
DSA A# 03-121466



APPROVED
DIV. OF THE STATE ARCHITECT
APP: 03-121466 INC:
REVIEWED FOR
SS ☒ FLS ☒ ACS ☒
DATE: 02/09/2026



PLEASANT VALLEY
SCHOOL DISTRICT

600 TEMPLE AVENUE,
CAMARILLO, CA 93010

ENGINEER

BOUDLONG & ASSOCIATES, INC.
SEEP CONSULTING ENGINEERS
JOB NO. 19-36

CAMARILLO OFFICE 1000 CAMARILLO AVENUE, SUITE 100 CAMARILLO, CA 93010
SANTA ROSA OFFICE 13282 SANTA ROSA RD, SUITE 100 SANTA ROSA, CA 95403
GENERAL OFFICE 1000 CAMARILLO AVENUE, SUITE 100 CAMARILLO, CA 93010

ENGINEER'S STAMP

CONSULTANT



CONSULTANT'S STAMP



PROJECT TITLE AND ADDRESS

PLEASANT VALLEY
SCHOOL DISTRICT GYM
HVAC UPGRADES

SANTA ROSA
TECHNOLOGY MAGNET
SCHOOL
13282 SANTA ROSA RD,
CAMARILLO, CA 93012

REVISIONS

3	CCD-003A	01-07-2026

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SHEET TITLE

ENLARGED DEMOLITION AND
NEW PLANS

DATE 01/03/2022

SCALE

PROJECT NO. 19-394

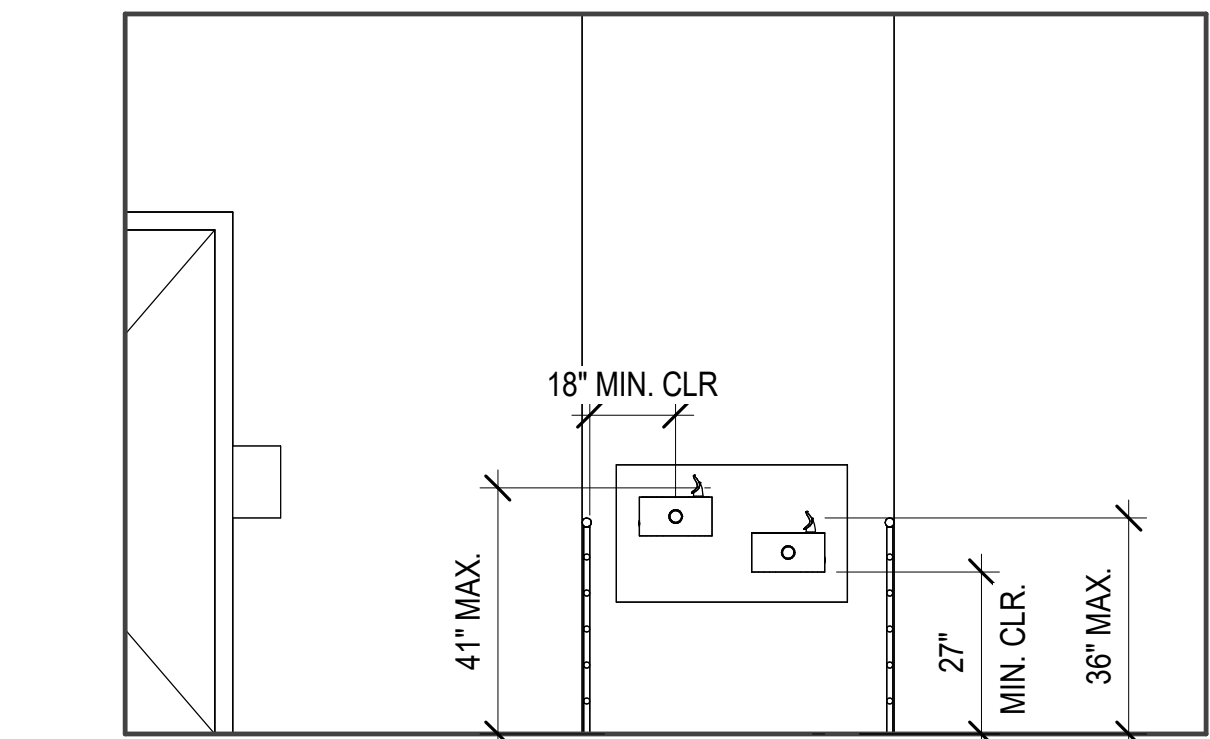
DRAWN BY PVP/ISAN

CHECKED BY WJA

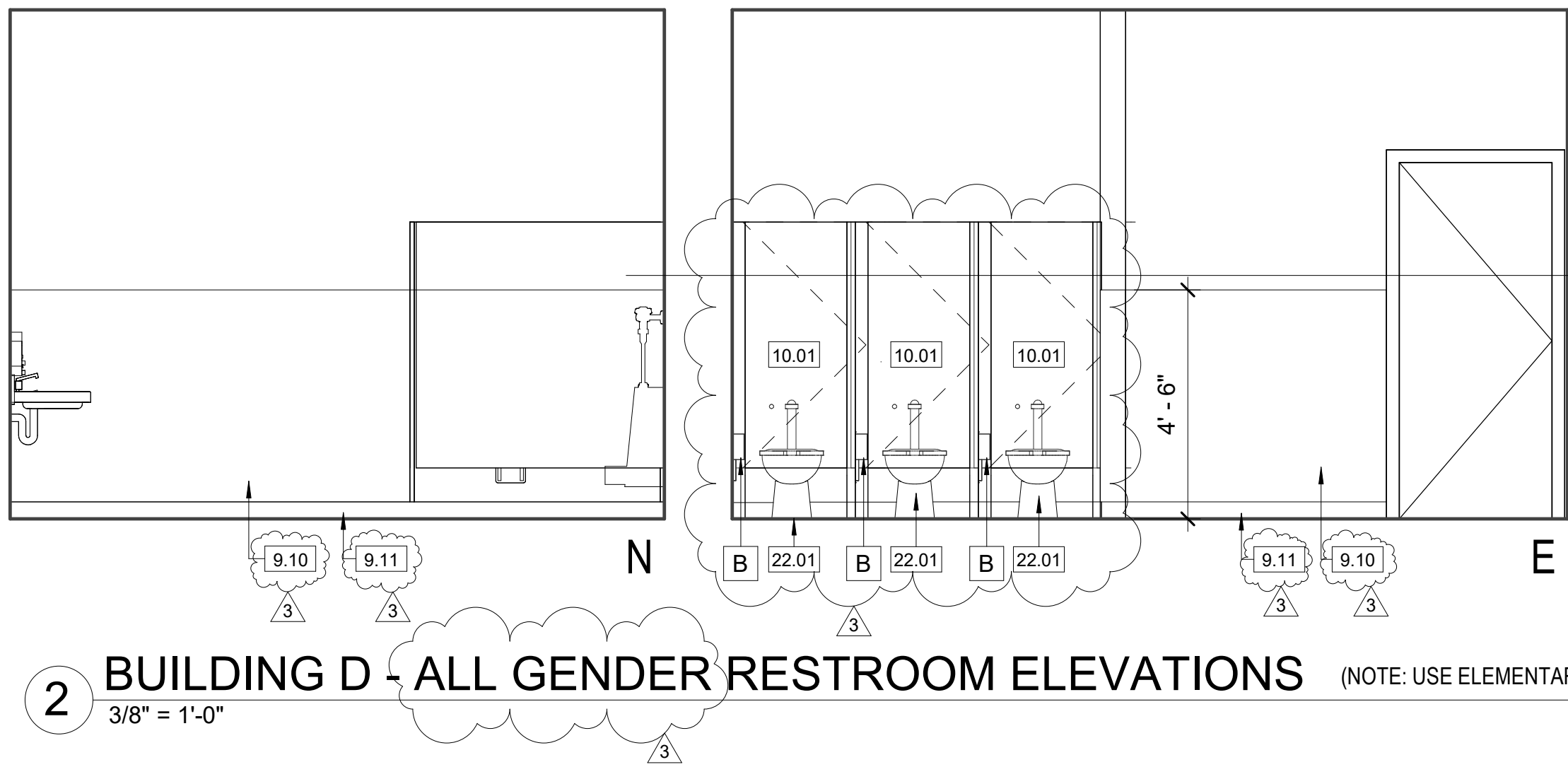
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A102

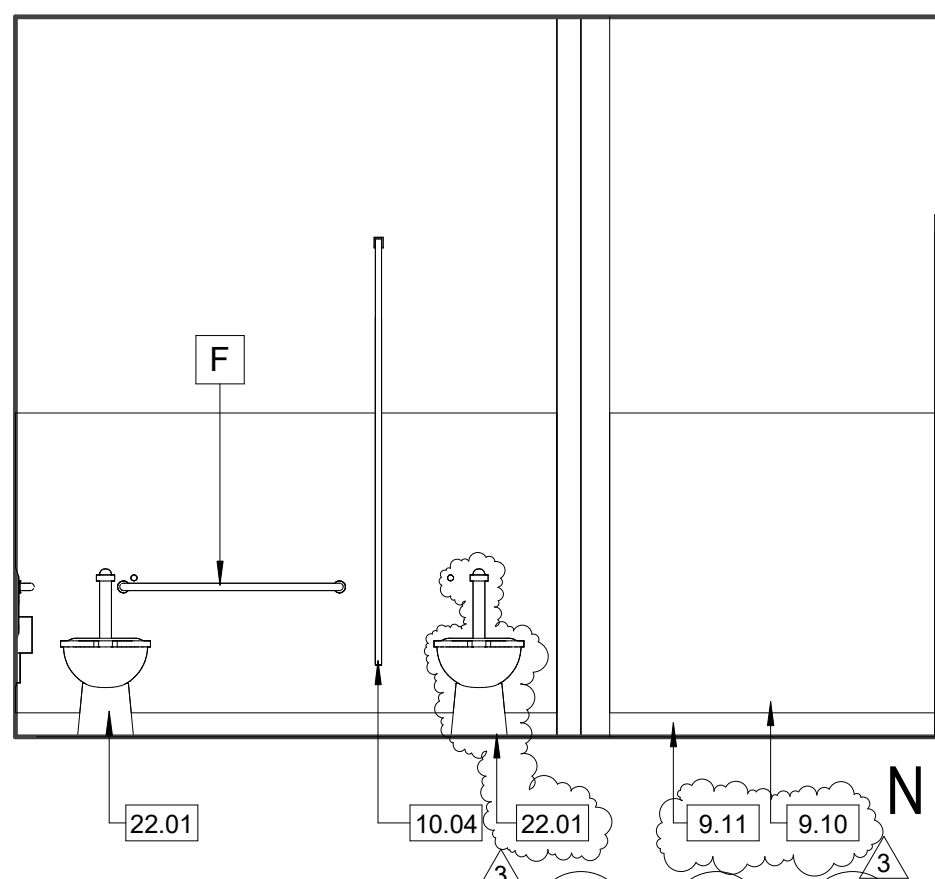
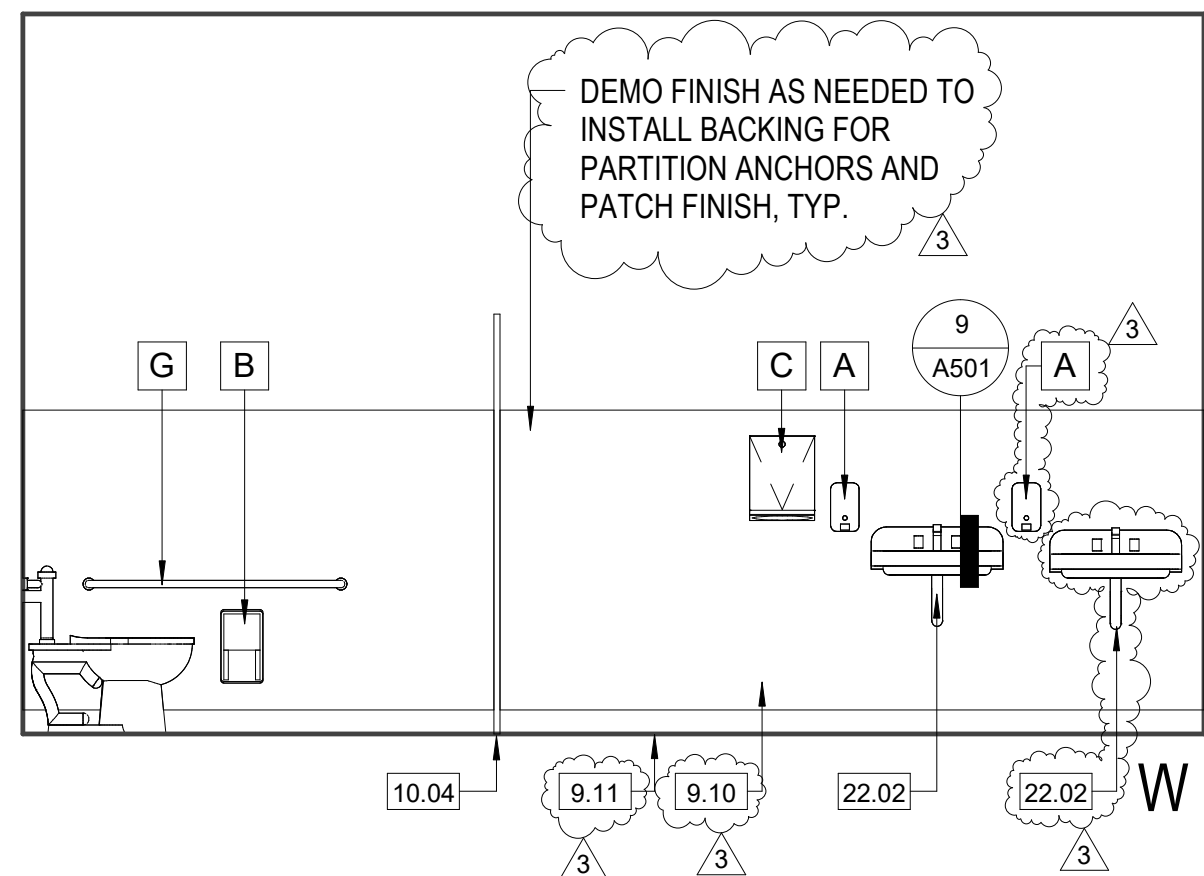
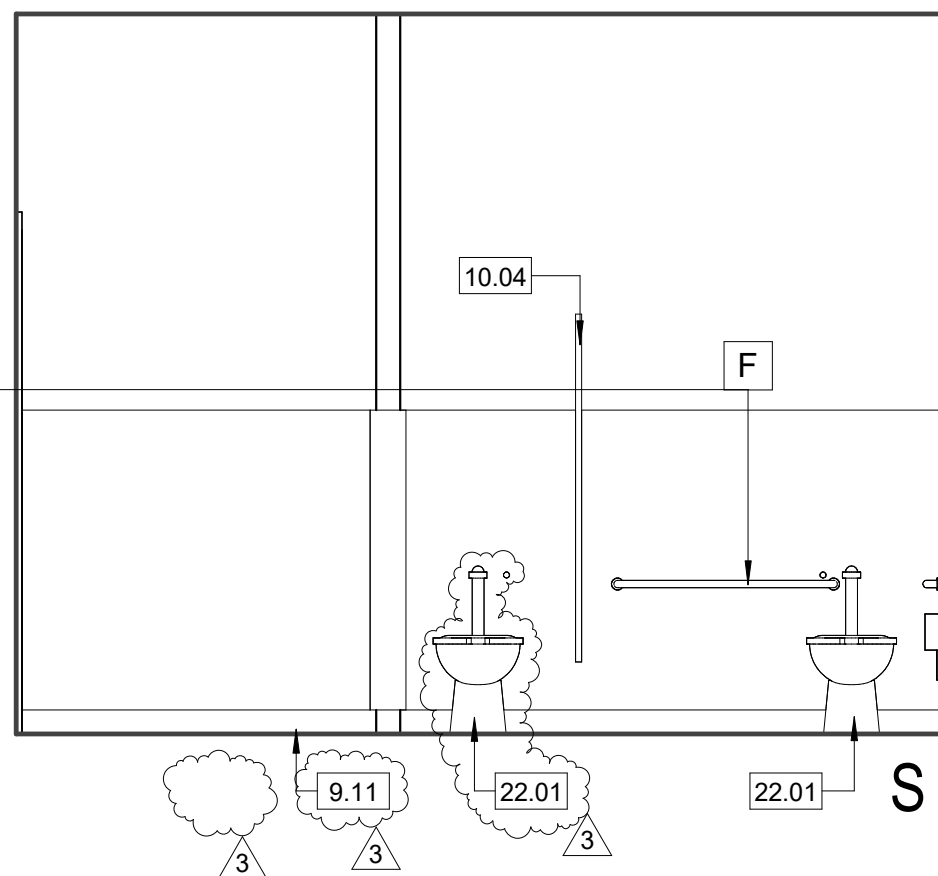




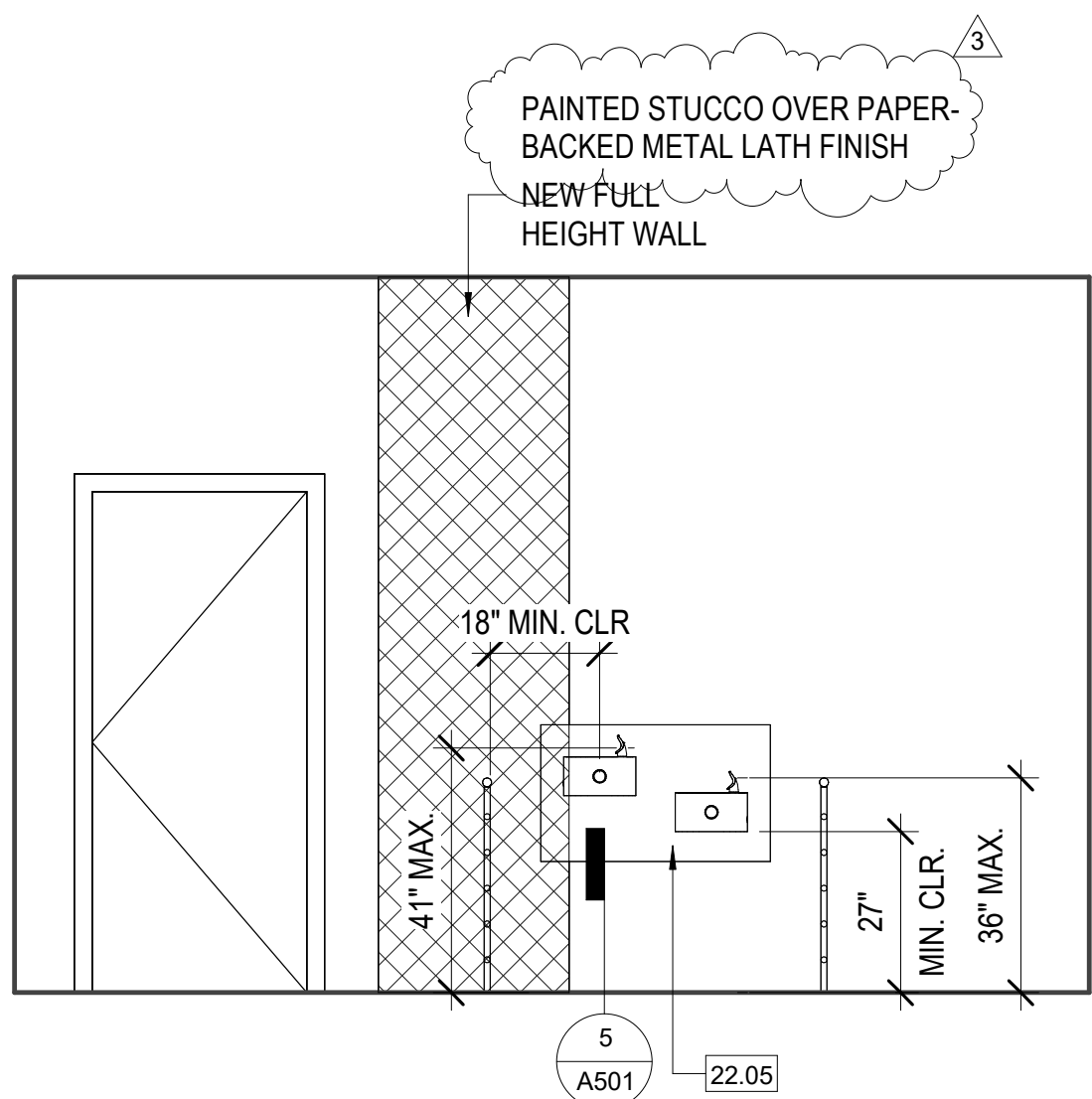
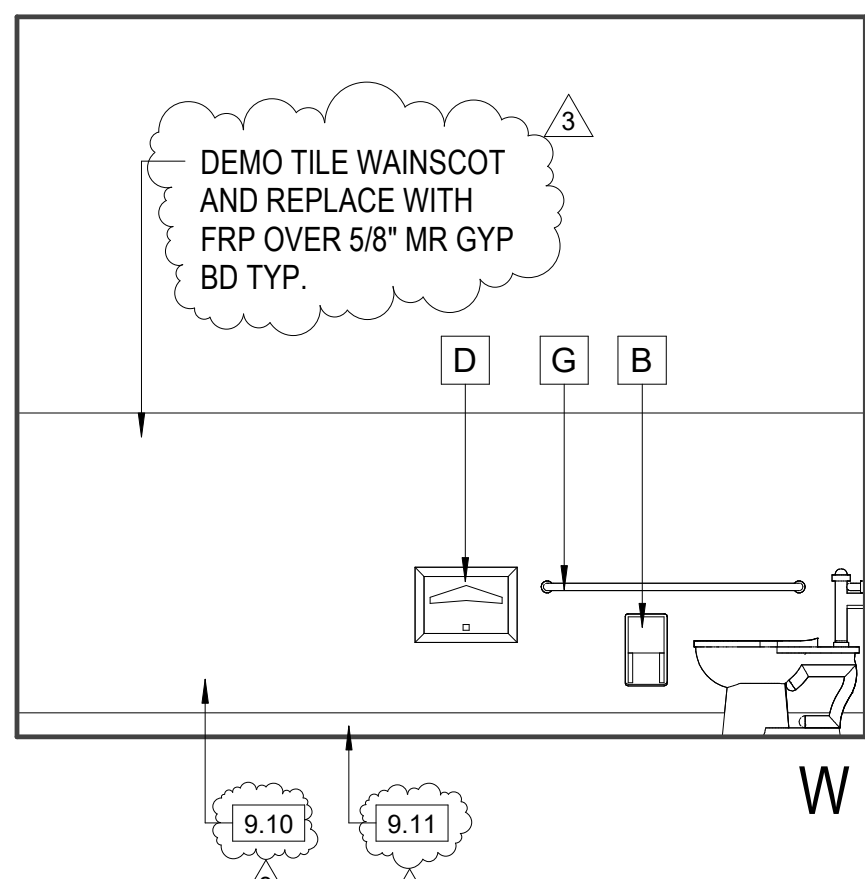
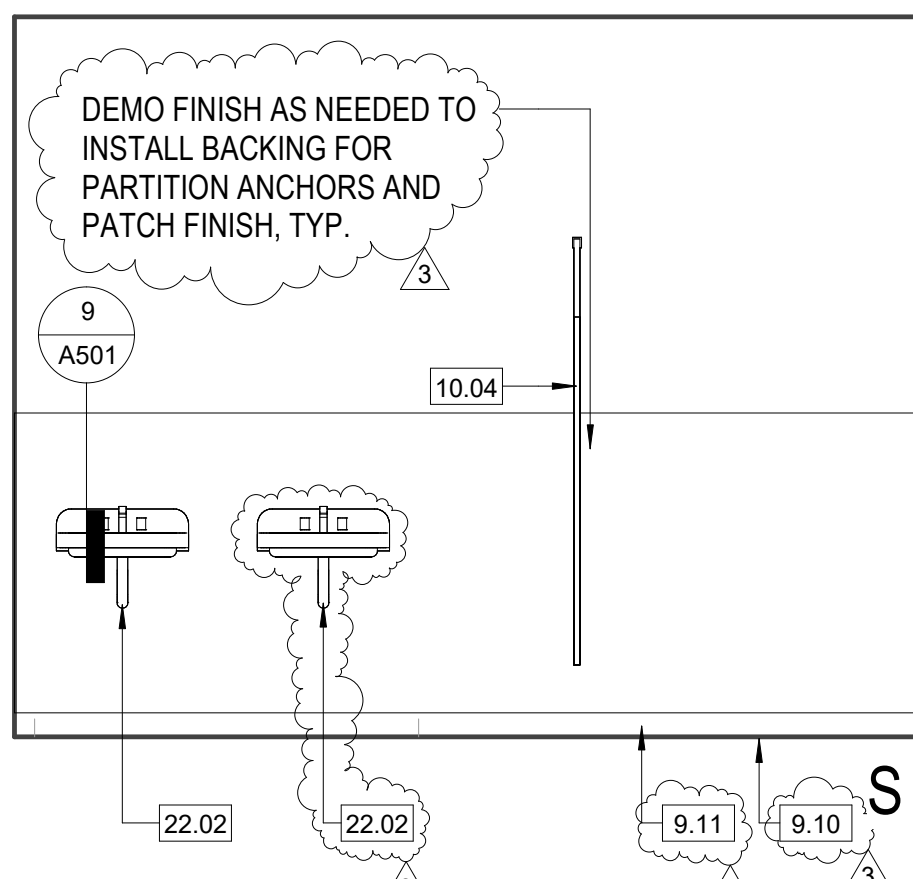
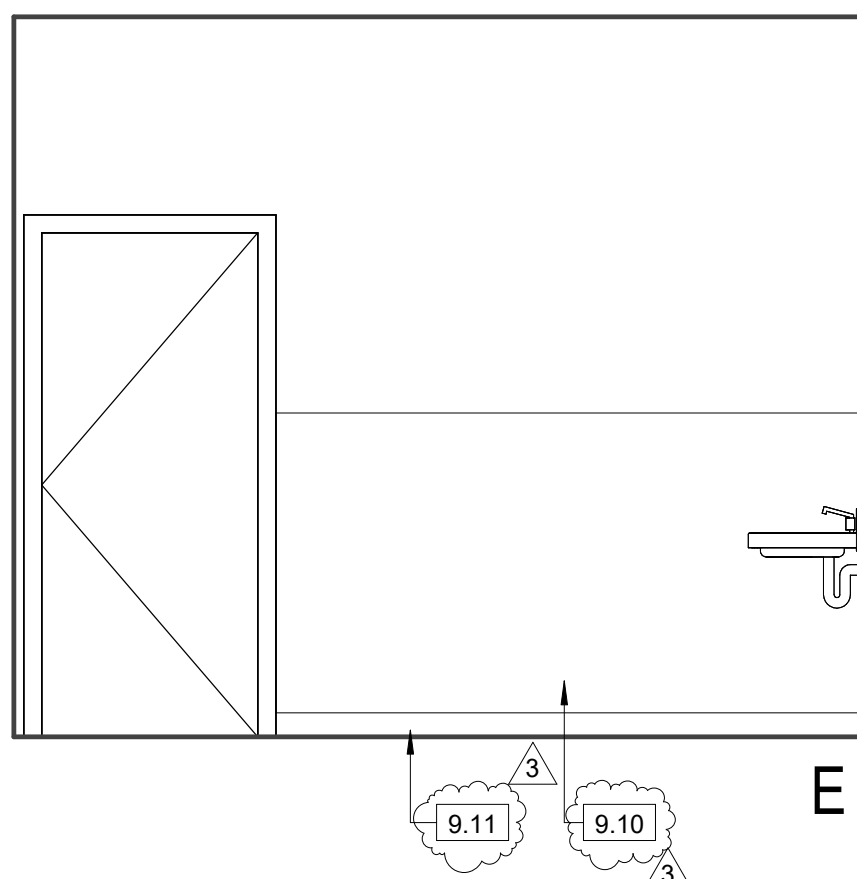
1 BUILDING D - DRINKING FOUNTAIN
3/8" = 1'-0"



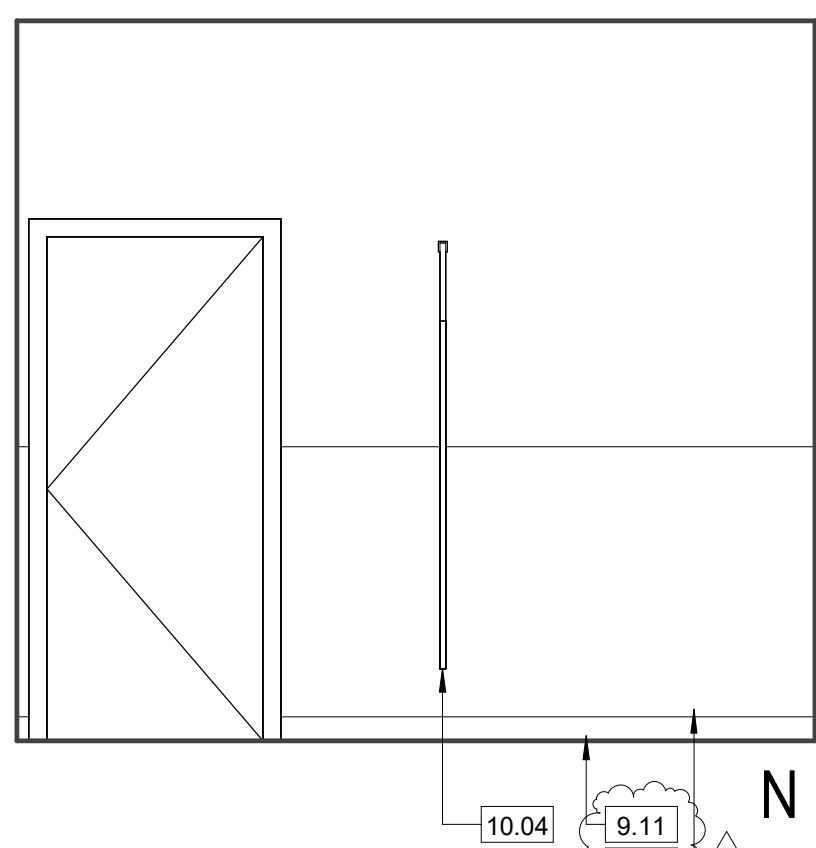
2 BUILDING D - ALL GENDER RESTROOM ELEVATIONS (NOTE: USE ELEMENTARY (E) DIMENSIONS FROM A002)
3/8" = 1'-0"



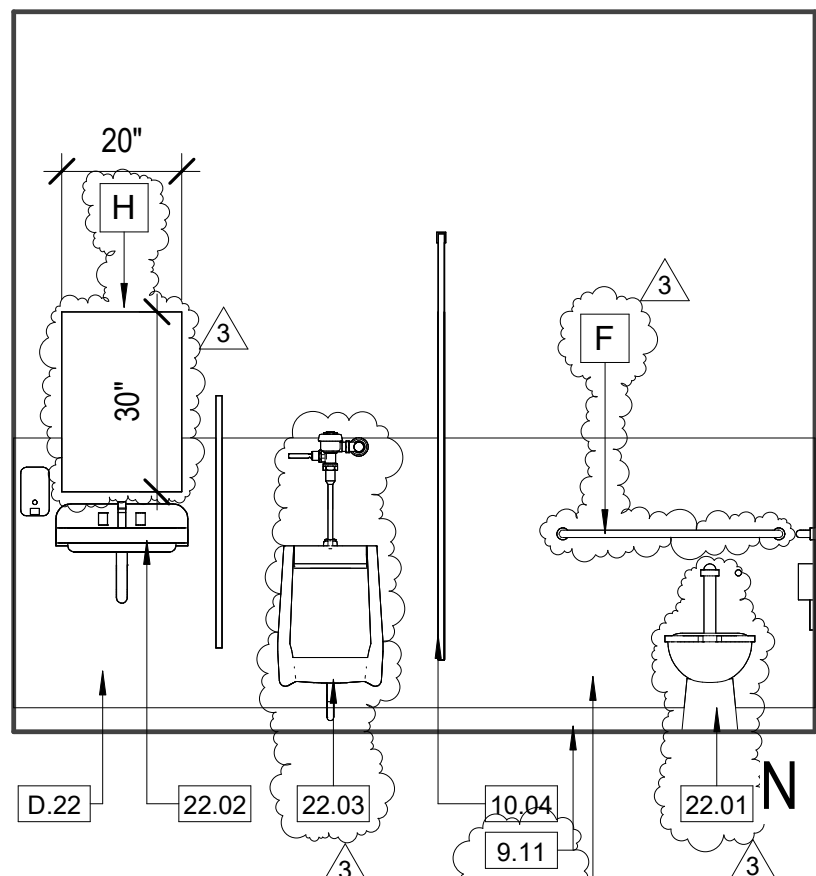
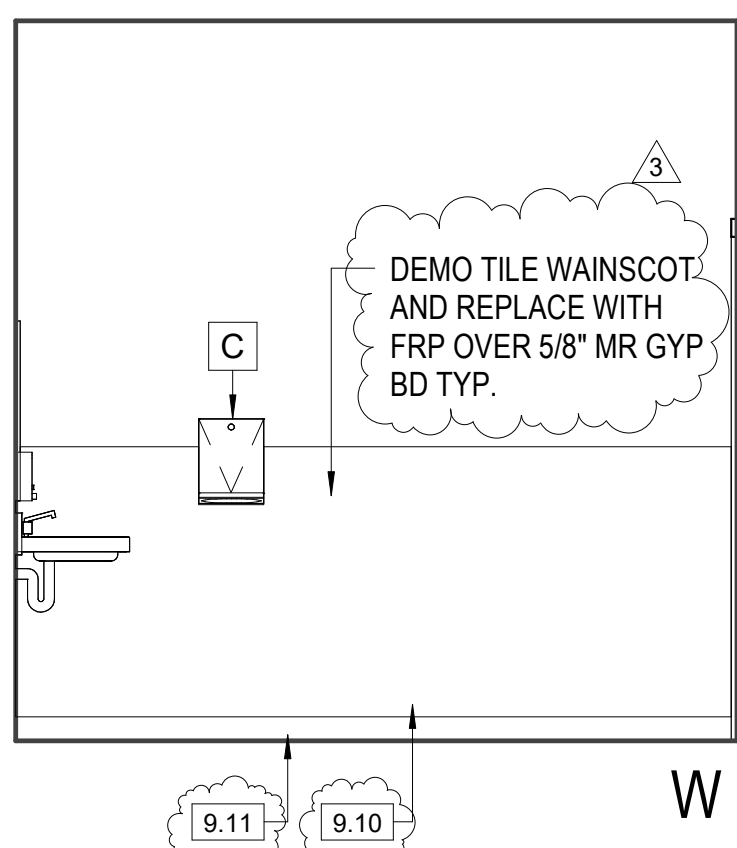
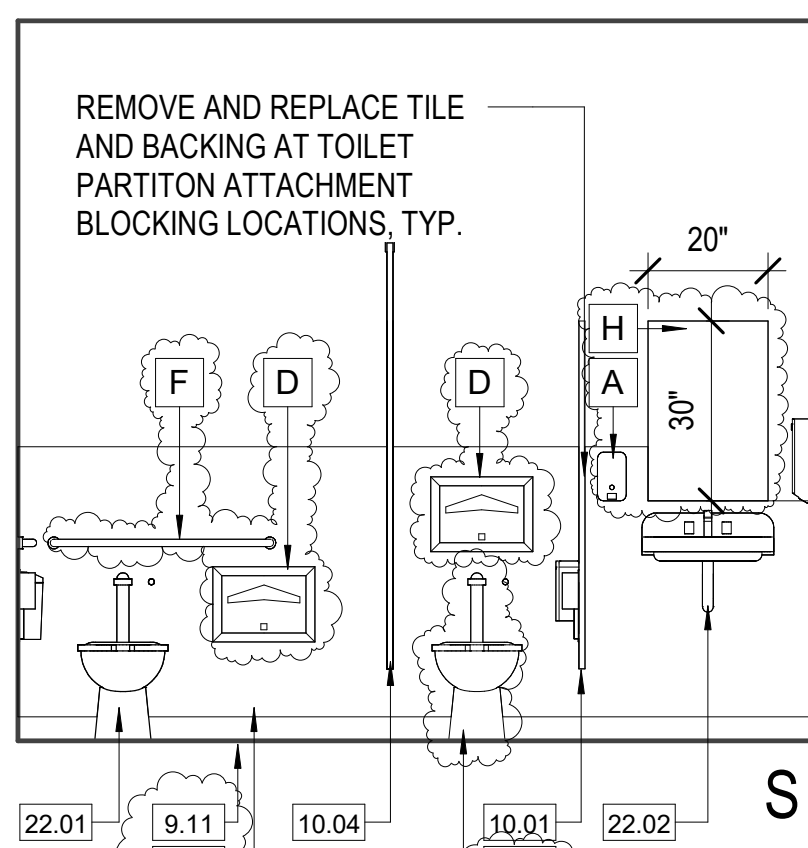
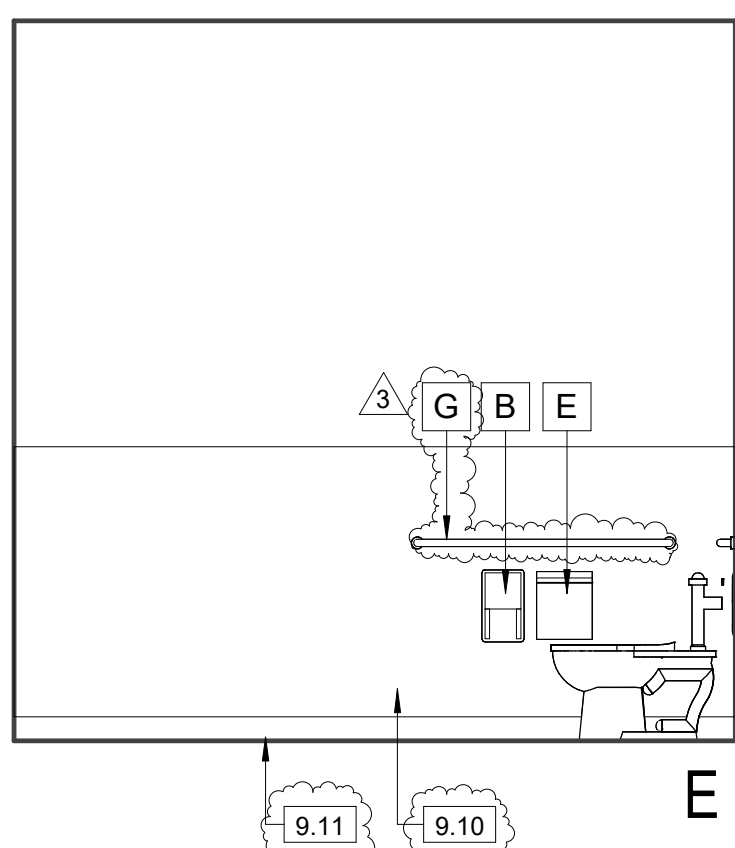
3 BUILDING D - ALL GENDER RESTROOM ELEVATIONS (NOTE: USE ELEMENTARY (E) DIMENSIONS FROM A002)
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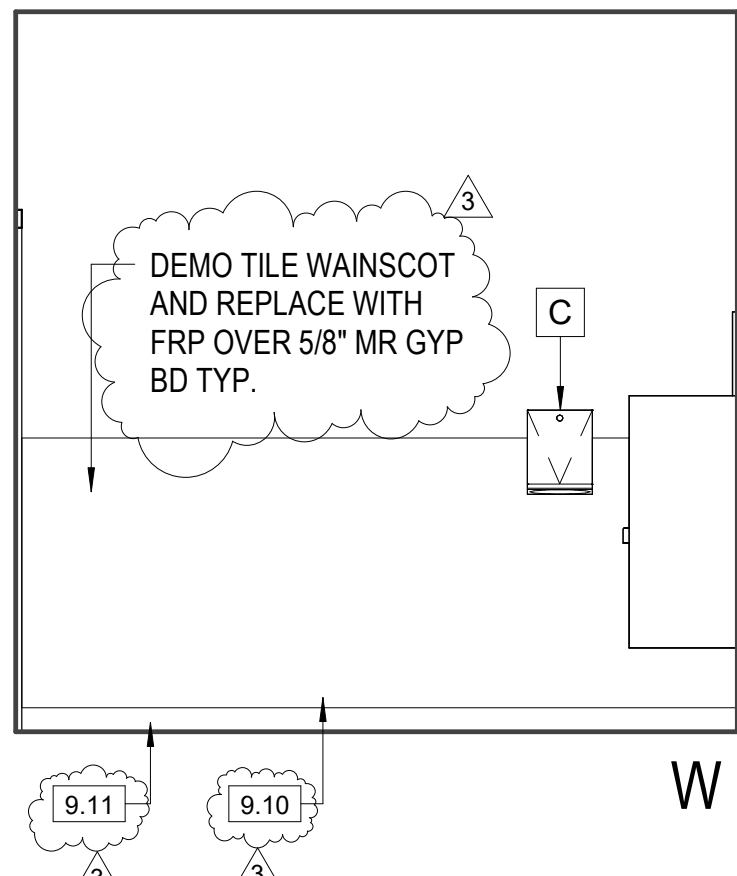
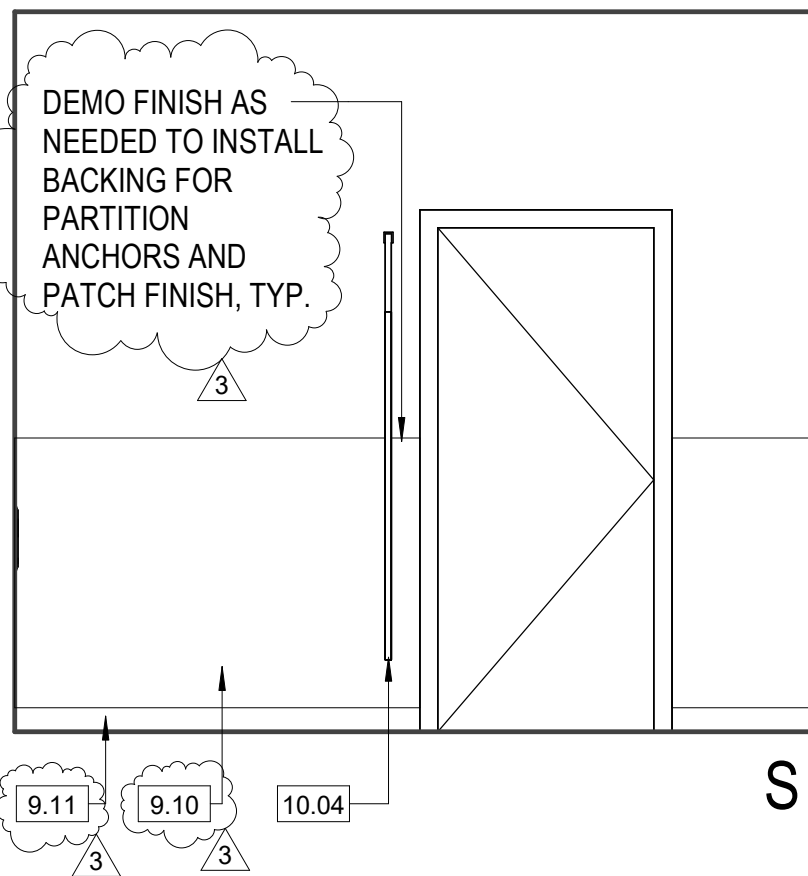
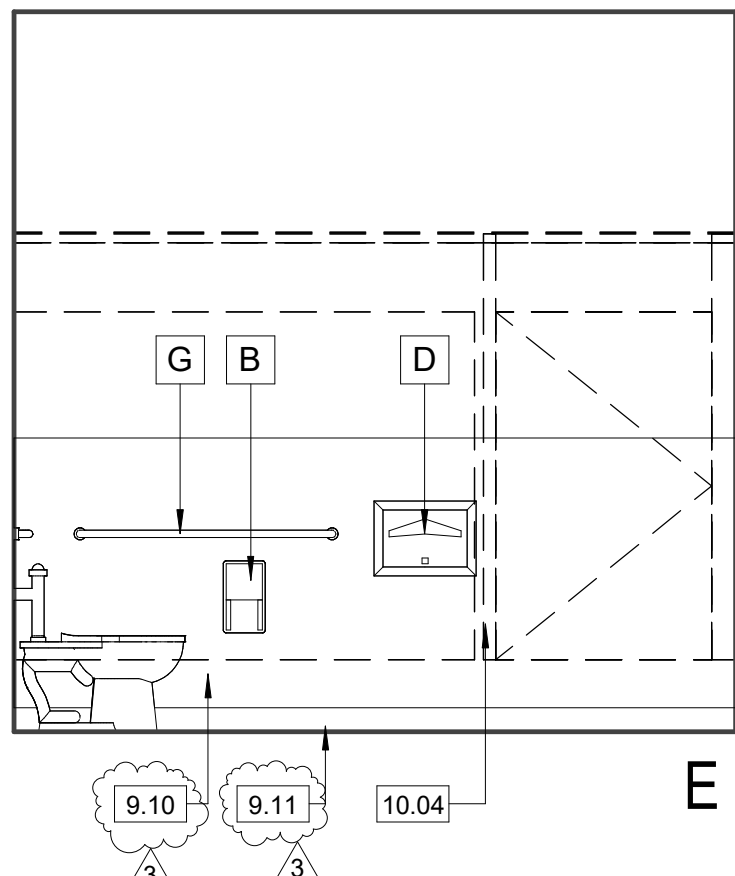
4 BUILDING E - DRINKING FOUNTAIN
3/8" = 1'-0"



5 BUILDING E - WOMEN'S RESTROOM ELEVATIONS (NOTE: USE ADULT (A) DIMENSIONS FROM A002)
3/8" = 1'-0"



6 BUILDING E - MEN'S RESTROOM ELEVATIONS (NOTE: USE ADULT (A) DIMENSIONS FROM A002)
3/8" = 1'-0"



DEMOLITION KEYNOTES

D.22 DEMOLISH AND REPLACE (E) WALL TILE

EXISTING KEYNOTES

KEYNOTES

- 9.10 (N) FIBERGLASS REINFORCED PANEL WAINSCOT OVER 5/8" GYPSUM BOARD TYP. MOISTURE RESISTANT
9.11 (N) SHEET VINYL FLOORING WITH INTEGRAL 4" COVED BASE, TYP.
10.01 (N) TOILET PARTITION
10.04 (N) ACCESSIBLE TOILET PARTITION
22.01 (N) WATER CLOSET
22.02 (N) LAVATORY
22.03 (N) URINAL
22.05 (N) DRINKING FOUNTAIN

GENERAL NOTES

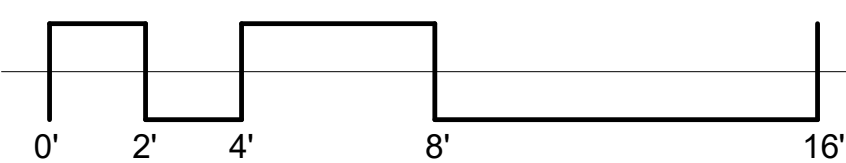
- REMOVE WALL AND FLOOR TILE AS INDICATED IN DRAWINGS TO ACCOMMODATE THE SCOPE OF WORK AND REPLACE WITH NEW MATERIALS.
- TOILET PARTITIONS SHALL HAVE CONTINUOUS BRACKETS AND NO SIGHT-LINE JOINTS

ACCESSORIES SCHEDULE

FOR ACCESSORIES MOUNTING HEIGHT SEE SHEET G002

- A LIQUID SOAP DISPENSER
B TOILET PAPER DISPENSER
C PAPER TOWEL DISPENSER
D TOILET SEAT COVER DISPENSER
E NAPKIN DISPOSAL
F 36" STAINLESS STEEL GRAB BAR
G 42" STAINLESS STEEL GRAB BAR
H 20"x30" MIRROR

AS REVISED
CCD-003A
DSA A# 03-121466



APPROVED
DIV. OF THE STATE ARCHITECT
APP: 03-121466 INC:
REVIEWED FOR
SS ☒ FLS ☒ ACS ☒
DATE: 02/09/2026



PLEASANT VALLEY
SCHOOL DISTRICT

600 TEMPLE AVENUE,
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ENGINEER

BO BUDLONG & ASSOCIATES, INC.
SEEP CONSULTING ENGINEERS
JOB NO. 19-36
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CONVENTINA OFFICE 1000 N. G STREET, SUITE 100 CAMARILLO, CA 93010
GENERAL OFFICE 1000 N. G STREET, SUITE 100 CAMARILLO, CA 93010

ENGINEER'S STAMP

CONSULTANT



CONSULTANT'S STAMP



PROJECT TITLE AND ADDRESS

PLEASANT VALLEY
SCHOOL DISTRICT GYM
HVAC UPGRADES

SANTA ROSA
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SHEET TITLE

BUILDING D AND E
ELEVATIONS

DATE 01/03/2022

SCALE

PROJECT NO. 19-394

DRAWN BY PVP

CHECKED BY WJA

SHEET NUMBER

A202



PLEASANT VALLEY
SCHOOL DISTRICT

600 TEMPLE AVENUE,
CAMARILLO, CA 93010

ENGINEER

ba BUDLONG & ASSOCIATES, INC.
BEEP CONSULTING ENGINEERS
JOB NO. 19-36
☐ CAMARILLO OFFICE ☐ COMPTON/IRVINE OFFICE ☒ GLENDALE OFFICE
1000 W. 10TH ST., SUITE 100 CAMARILLO, CA 93010 1000 W. 10TH ST., SUITE 100 IRVINE, CA 92614 1000 W. 10TH ST., SUITE 100 GLENDALE, CA 91204

ENGINEER'S STAMP

CONSULTANT



CONSULTANT'S STAMP



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SHEET TITLE

SIGNAGE PLAN

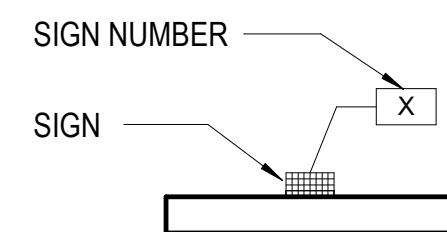
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SCALE
PROJECT NO. 19-394
DRAWN BY PVP
CHECKED BY WJA
SHEET NUMBER

AS REVISED
CCD-003A
DSA A# 03-121466

A601

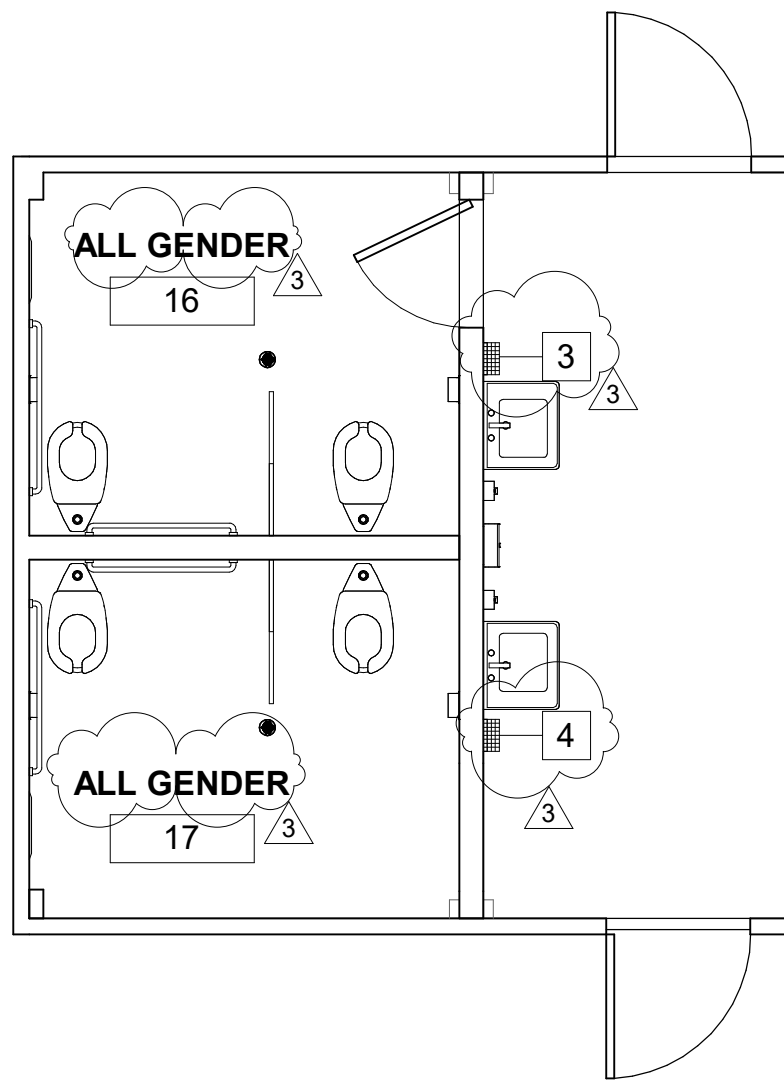
SIGN NO.	SIGN LOCATION	SIGN - TEXT	ROOM NO.	DETAIL
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2	ALL GENDER RESTROOM	(ALL GENDER GRAPHIC)	102	11C6/A602
3	ALL GENDER RESTROOM	(ALL GENDER GRAPHIC)	101	11C6/A602
4	ALL GENDER RESTROOM	(ALL GENDER GRAPHIC)	102	11C6/A602
5	ALL GENDER RESTROOM	(ALL GENDER GRAPHIC)	4	11C6/A602
6	ALL GENDER RESTROOM	(ALL GENDER GRAPHIC)	5	11C6/A602
7	ALL GENDER RESTROOM	(ALL GENDER GRAPHIC)	101	11C3/A602
8	ALL GENDER RESTROOM	(ALL GENDER GRAPHIC)	102	11C3/A602
9	ALL GENDER RESTROOM	(ALL GENDER GRAPHIC)	4	11C3/A602
10	ALL GENDER RESTROOM	(ALL GENDER GRAPHIC)	5	11C3/A602
E11	WOMEN RESTROOM	(EXISTENT WOMEN'S GRAPHIC)	4	11C4/A602
E12	WOMEN RESTROOM	(EXISTENT WOMEN'S GRAPHIC)	4	11C2/A602
E13	MEN RESTROOM	(EXISTENT MEN'S GRAPHIC)	5	11C5/A602
E14	MEN RESTROOM	(EXISTENT MEN'S GRAPHIC)	5	11C1/A602

SIGNAGE LEGEND

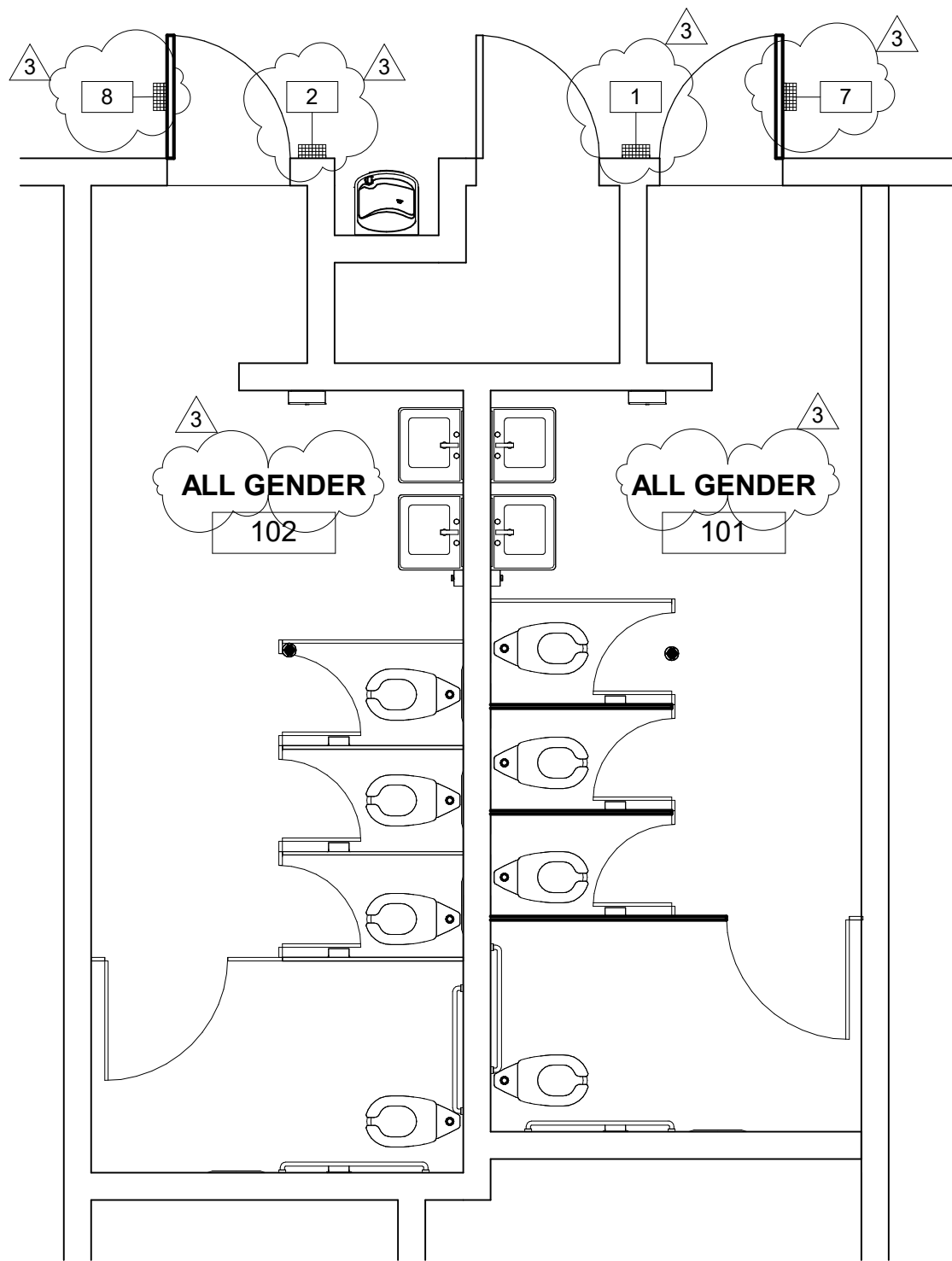


GENERAL SINAGE NOTES

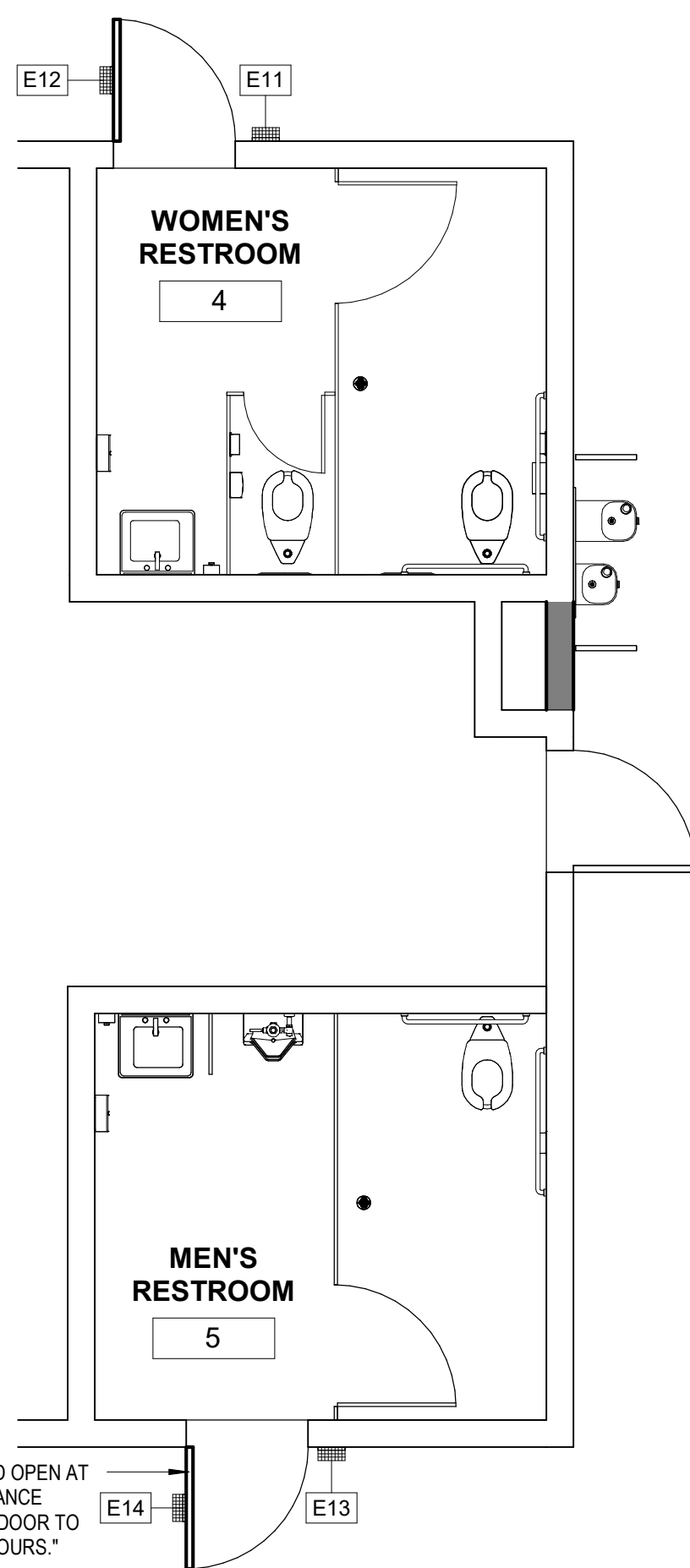
- REFER TO SHEET A602 FOR SIGNAGE DETAILS INCLUDING CHARACTERS & BRAILLE SIGN DETAIL.
- SIGNS SHALL BE LOCATED ADJACENT TO EXIT ACCESS DOORS UNLESS OTHERWISE NOTED.



2 EXISTING BLDG B - NEW PLAN
1/4" = 1'-0"

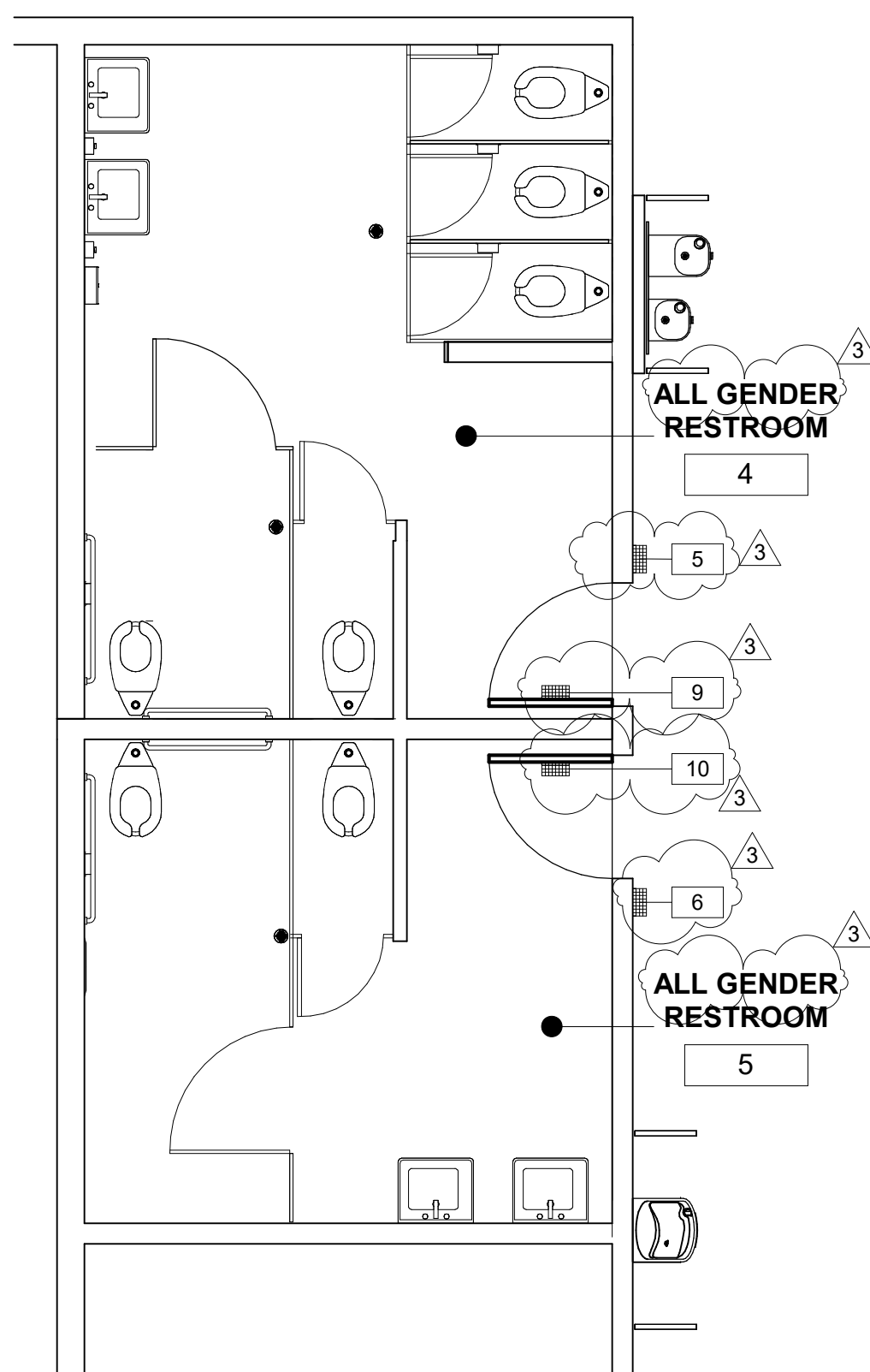


1 EXISTING BLDG C - NEW PLAN
1/4" = 1'-0"

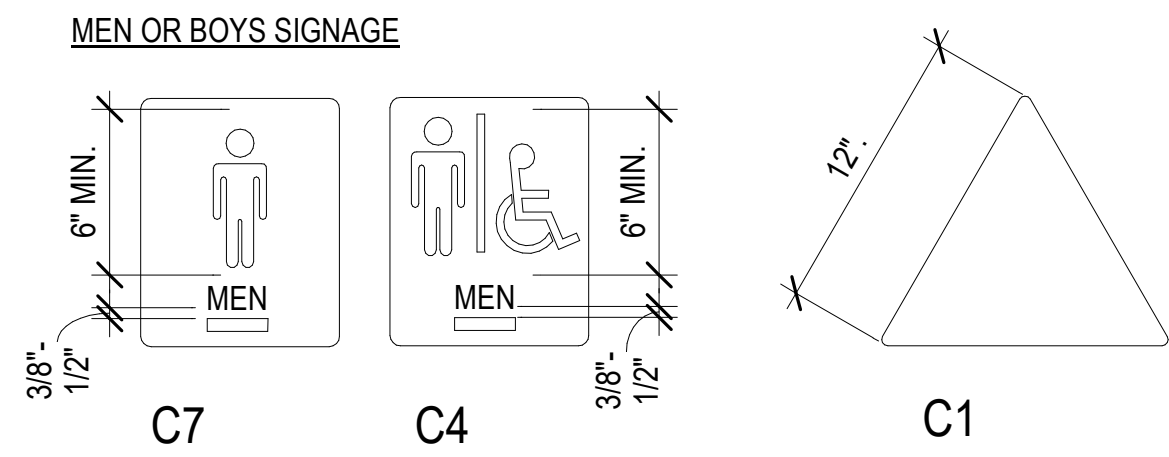


DOOR HARDWARE - CLOSER WITH HOLD OPEN AT 170 DEGREE AND NO LATCH. (MAINTENANCE DEADBOLT ONLY). SIGNAGE STATING "DOOR TO REMAIN UNLOCKED DURING SCHOOL HOURS."

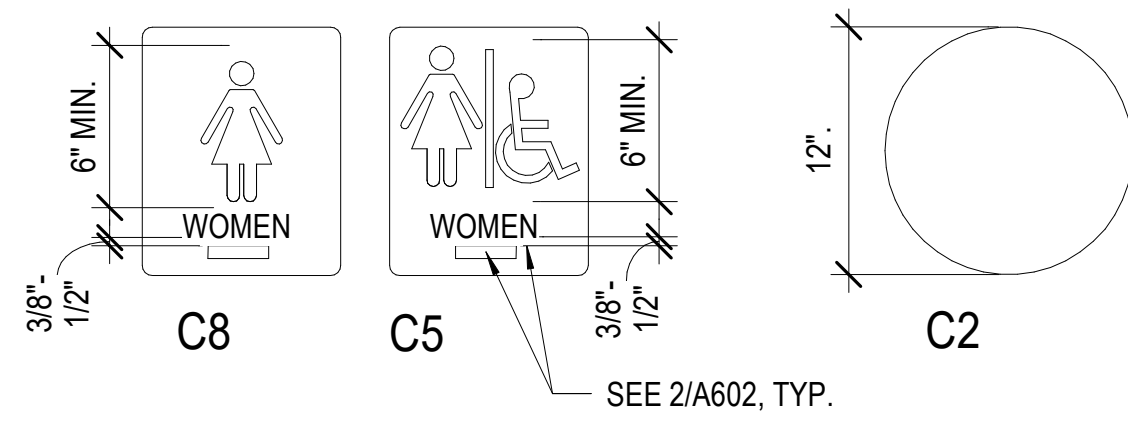
4 EXISTING BLDG E - NEW PLAN
1/4" = 1'-0"



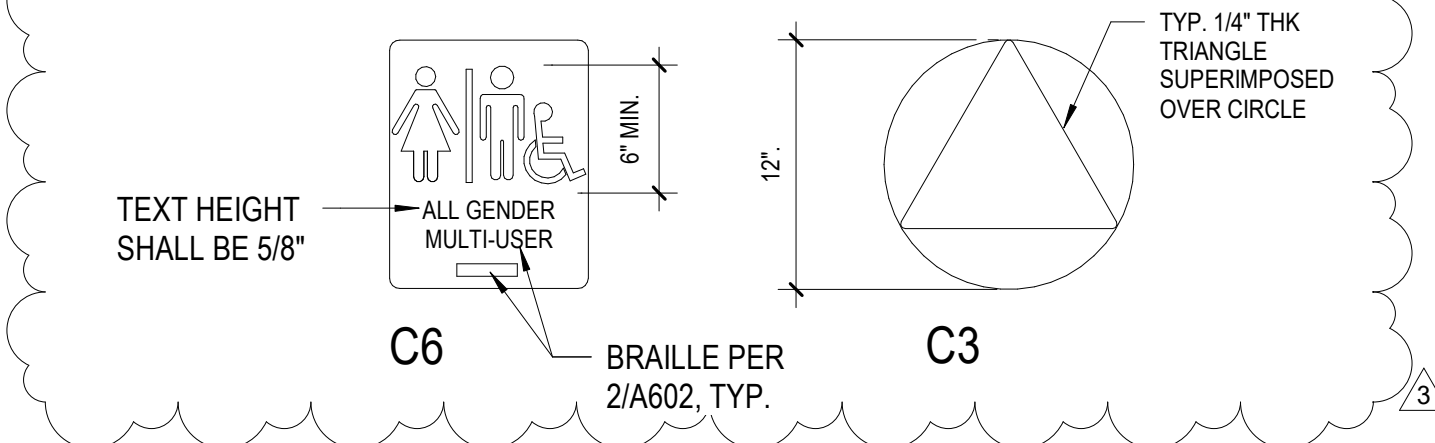
3 EXISTING BLDG D - NEW PLAN
1/4" = 1'-0"



WOMEN OR GIRLS SIGNAGE



ALL GENDER SIGNAGE

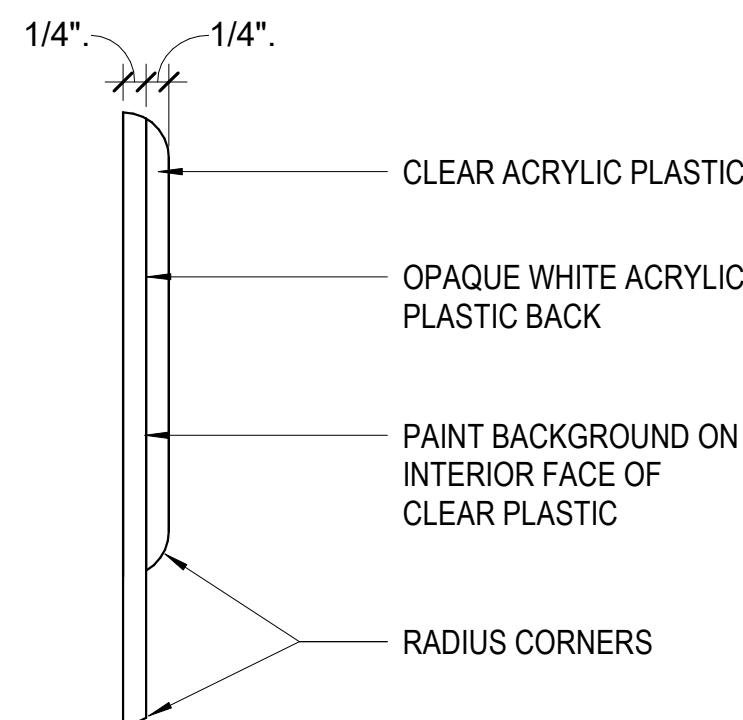


RESTROOM WALL SIGNS

NOTE: RESTROOM WALL SIGNS ARE TO BE MOUNTED ON LATCH SIDE OF DOOR.

RESTROOM DOOR SYMBOLS

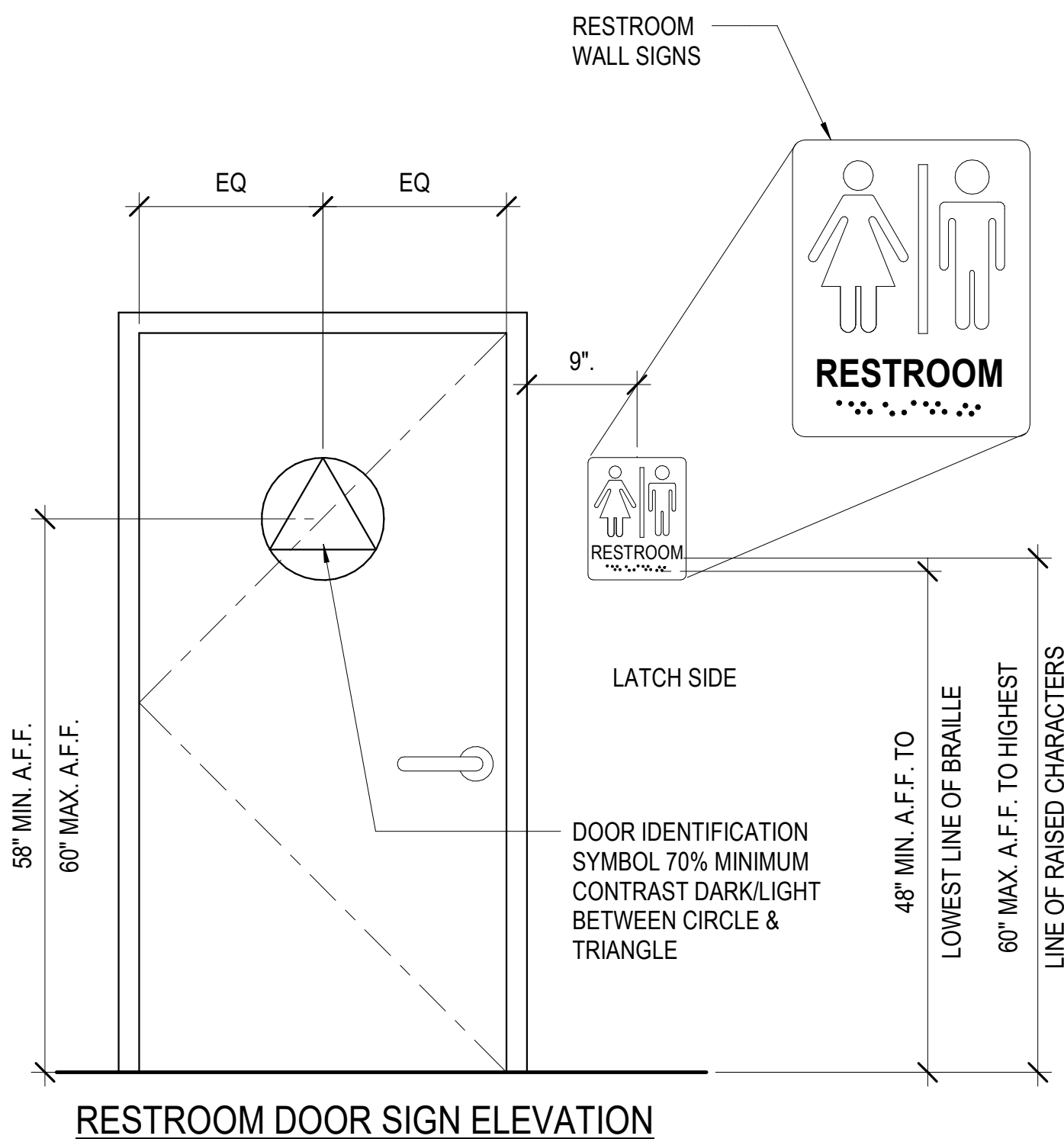
NOTE: RESTROOM DOOR SIGNS ARE TO BE CENTERED ON DOOR.



DOOR SIGN SECTION

NOTES ON RESTROOM SIGNAGE:

- ALL RESTROOM DOOR SIGNS SHALL BE MOUNTED AT 58" MINIMUM AND 60" MAXIMUM ABOVE FINISH FLOOR TO CENTER OF SIGN.
- ATTACH SIGN USING (3) THREE FLATHEAD WOOD SCREWS, COUNTER-SUNK AND ADHESIVE.
- ISA SYMBOL REQUIRED ON DOOR, WALL OR SEPARATE SIGN, NOT REQUIRED TO BE RAISED FROM BACKGROUND.
- GEOMETRIC SYMBOL DOOR SIGNS FOR RESTROOMS MUST CONTRAST WITH DOOR, DARK ON LIGHT OR LIGHT ON DARK. FOR UNISEX DOOR SIGNS, TRIANGLE TO CONTRAST WITH CIRCLE, WHICH MUST CONTRAST WITH THE DOOR. 70% MINIMUM LIGHT/DARK. ENTIRE BACKGROUND COLOR OF GEOMETRIC SYMBOL SIGN MUST CONTRAST WITH DOOR. IT IS NOT ALLOWED TO HAVE A THIN CONTRASTING BORDER AROUND SYMBOL, WITH REMAINDER OF SIGN BACKGROUND IN A NON-CONTRASTING COLOR. ISA, CONTRASTING WITH BACKGROUND, MAY BE ON SIGN.
- EDGES OF SIGNS SHALL BE ROUNDED, CHAMFERED OR EASED. CORNERS OF SIGNS SHALL HAVE A MINIMUM RADIUS OF 1/8 INCH.



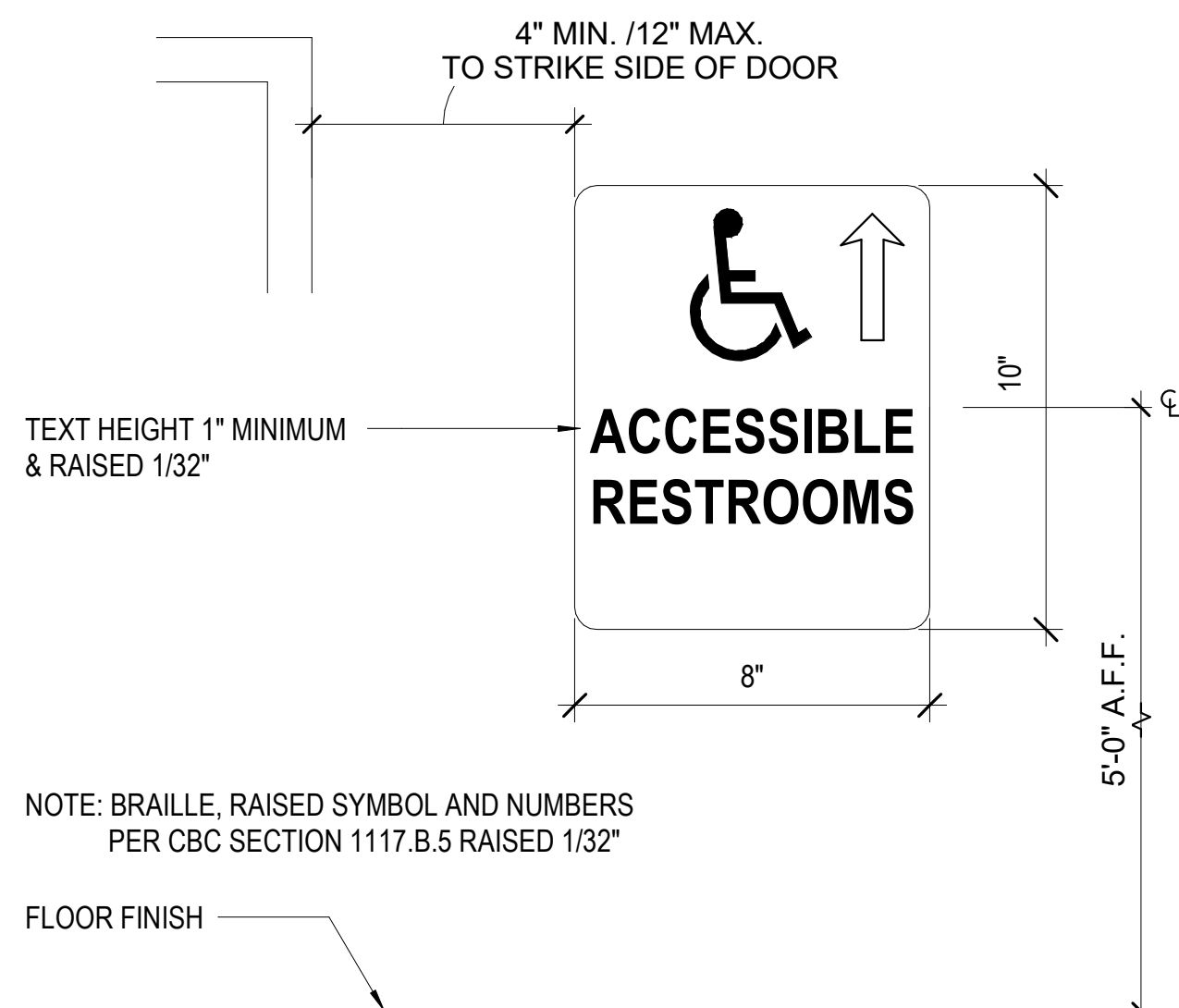
RESTROOM DOOR SIGN ELEVATION

11 RESTROOM SIGNAGE (C1 thru C6)

1" = 1'-0"

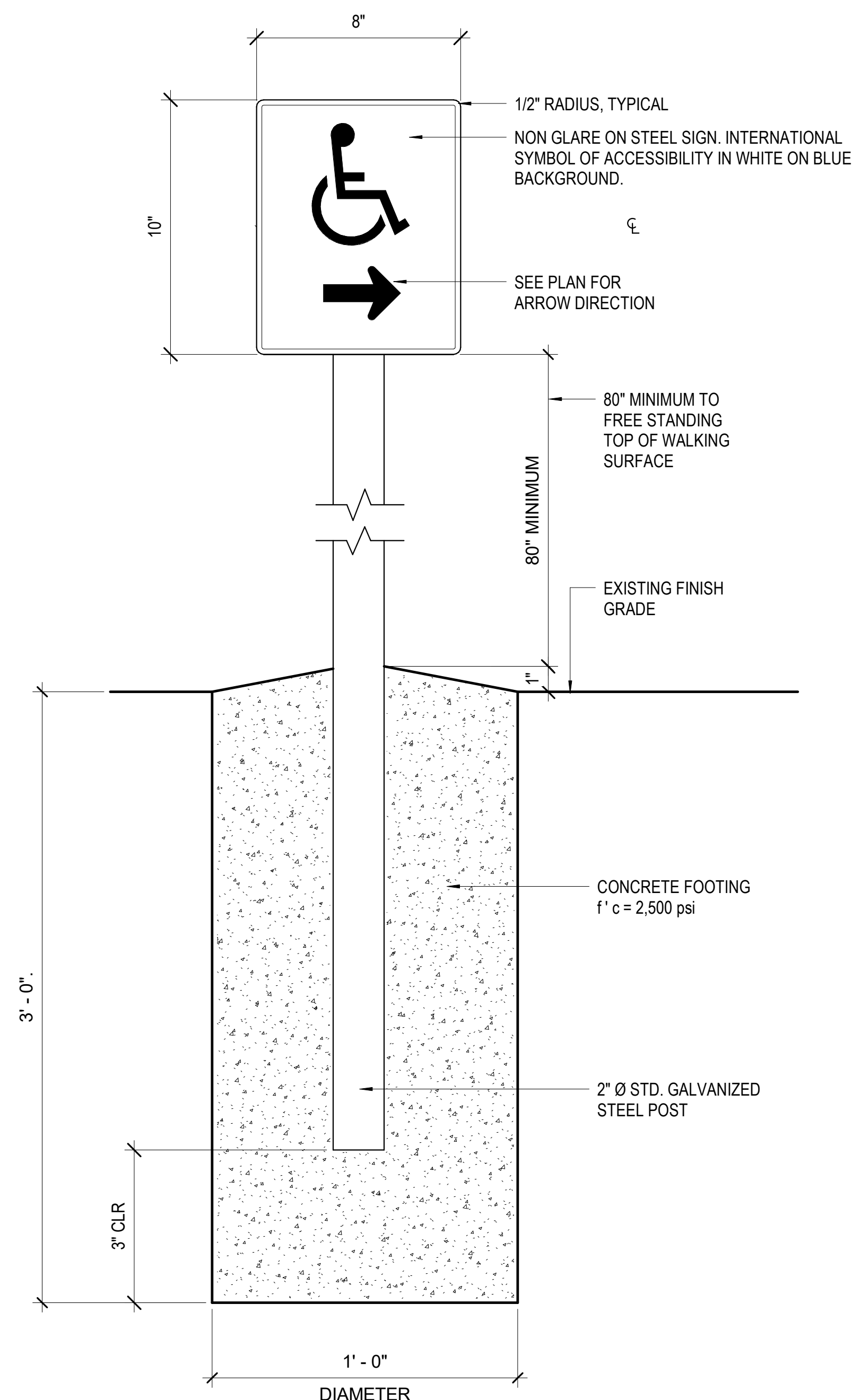
9 ACCESSIBLE DIRECTIONAL SIGN

3" = 1'-0"



4 POST MOUNT DETAIL

3" = 1'-0"

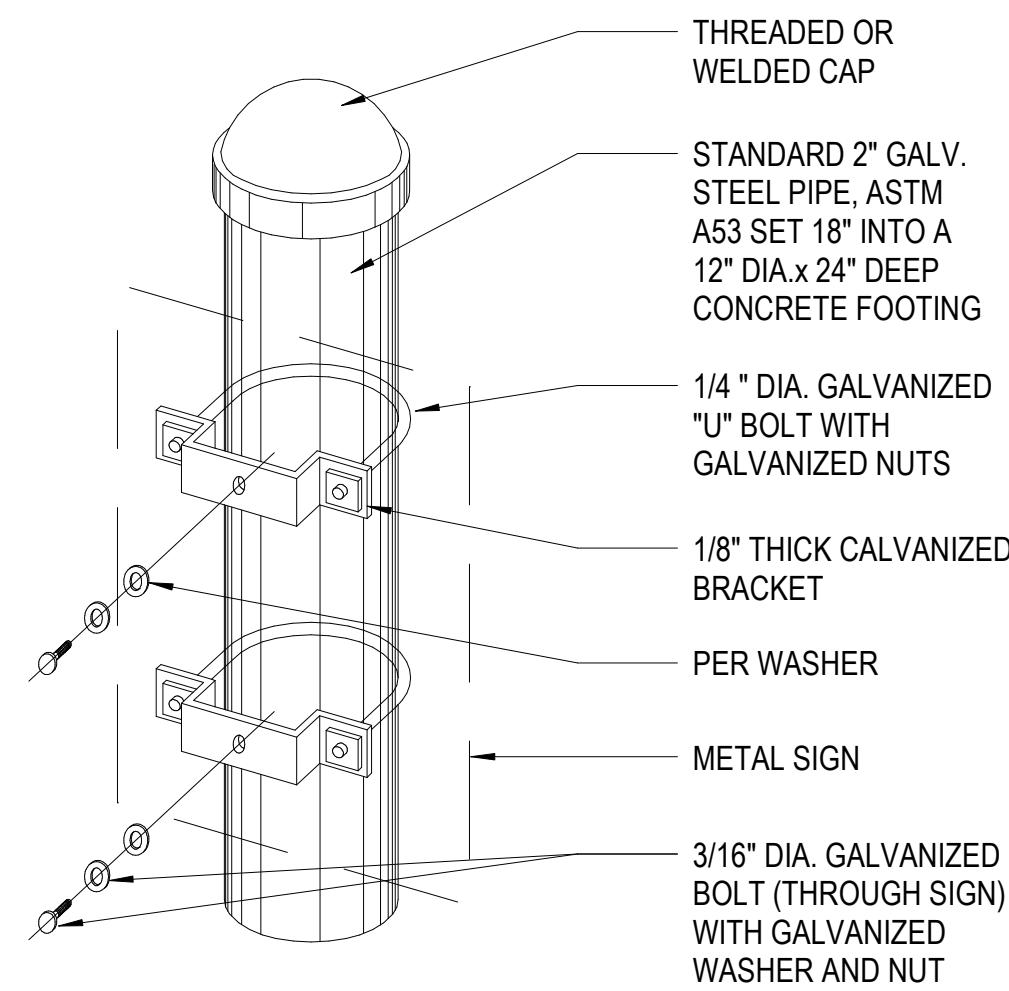


NOTES:

- SIGN TO CONFORM TO ALL CURRENT, FEDERAL, STATE, LOCAL CODES AND / OR REGULATIONS.
- ARROW SHALL POINT IN THE DIRECTION OF THE PATH OF TRAVEL.
- SIGN SHALL BE 72 SQ. IN. MIN. NON-GLARE ON STEEL SIGN BEADED TEXT OR EQUAL WITH INTERNATIONAL SYMBOL OF ACCESSIBILITY IN WHITE OR BLUE BACKGROUND.
- EXCEPT WHEN POLE MOUNTED, PROVIDE 1/2" DIA. HOLES AT EACH CORNER FOR MOUNTING SIGN TO CHAIN-LINK FENCE W/ FENCE CLIPS & SCREWS. WALL MOUNTING USING GALV. WASHERS, EXPANSION SHIELDS & VANDAL-PROOF SCREWS.

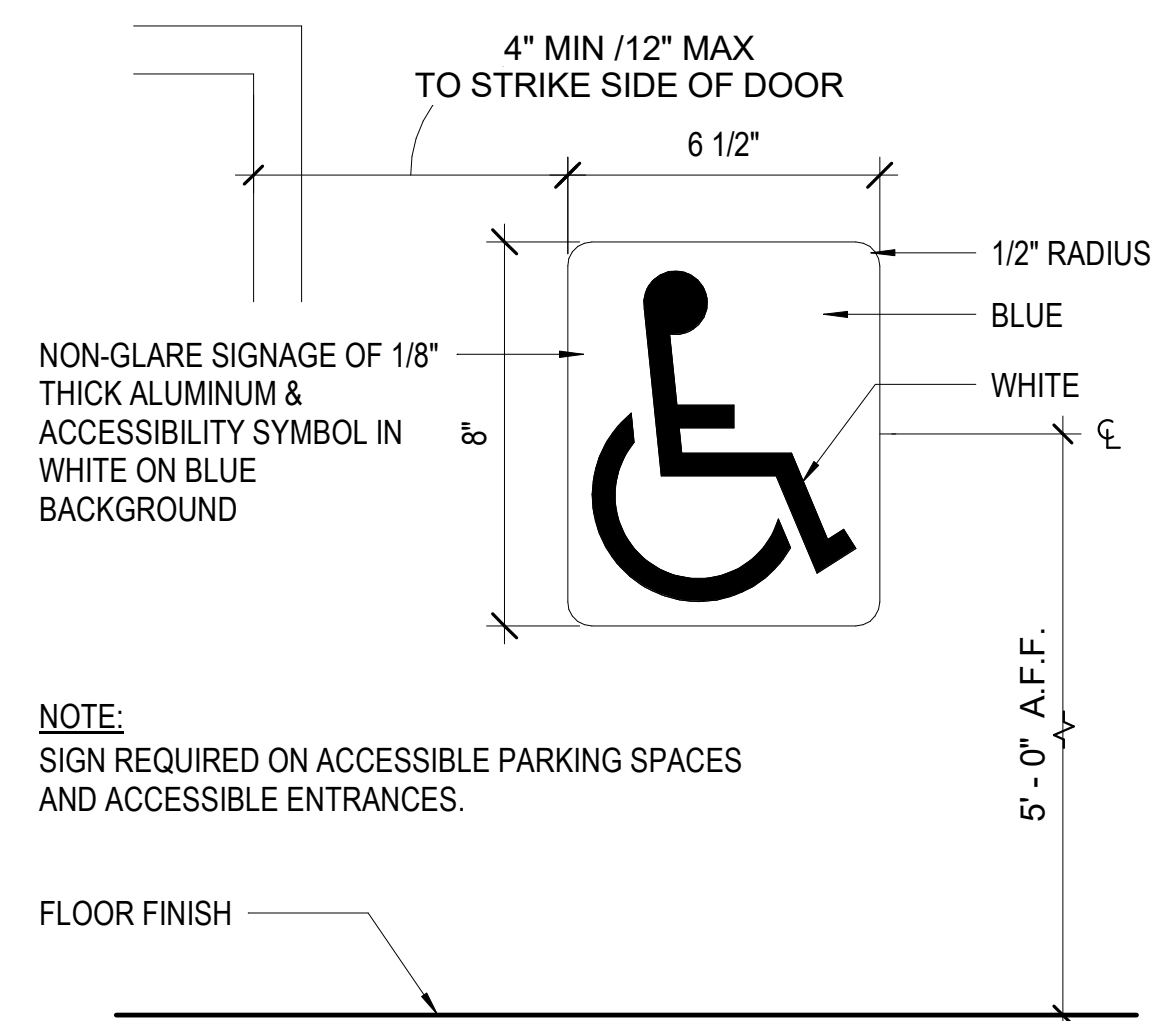
6 DIRECTIONAL PATH OF TRAVEL SIGN

3" = 1'-0"



2 CHARACTERS & BRAILLE SIGN DETAIL

6" = 1'-0"



NOTE:

SIGN REQUIRED ON ACCESSIBLE PARKING SPACES AND ACCESSIBLE ENTRANCES.

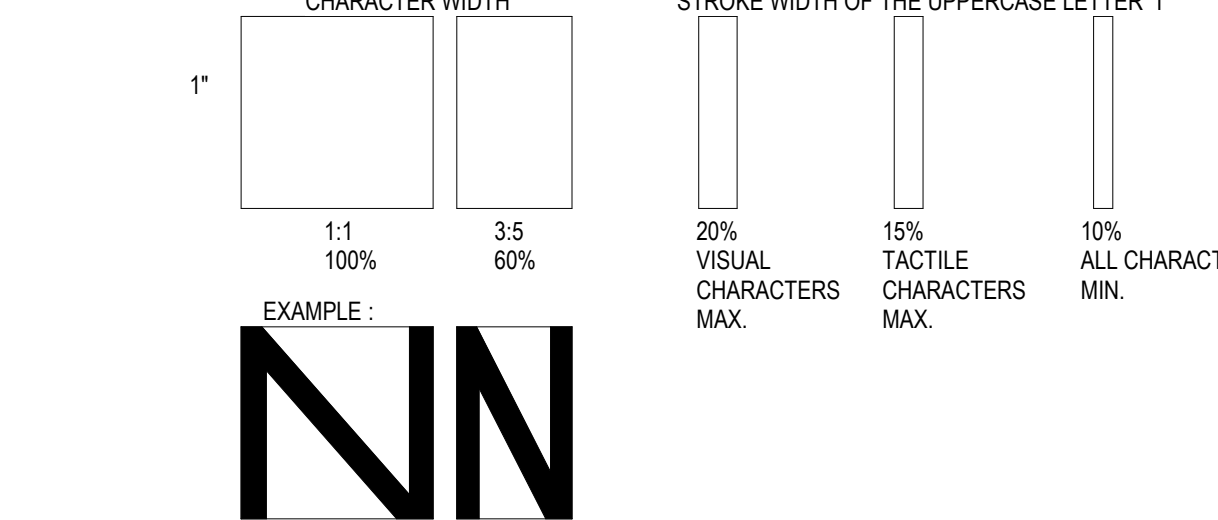
FLOOR FINISH

3 INTERNATIONAL SYMBOL OF ACCESS

3" = 1'-0"

- CHARACTER TYPE: CHARACTERS ON SIGNS SHALL BE RAISED 1/32" (0.794 MM) MINIMUM AND SHALL BE SERIF UPPERCASE CHARACTERS ACCOMPANIED BY GRADE 2 BRAILLE (SEE NOTE E BELOW). CBC 11B-703.2
- CHARACTER SIZE: RAISED CHARACTERS SHALL BE A MINIMUM OF 5/8" (15.9 MM) AND A MAXIMUM OF 2 INCHES (51 MM) HIGH BASED ON THE HEIGHT OF THE UPPERCASE LETTER "T". CBC 11B-703.2.5
- FINISH AND CONTRAST: CONTRAST BETWEEN CHARACTERS, PICTOGRAMS, SYMBOLS AND THEIR BACKGROUND MUST HAVE A NON-GLARE FINISH. CHARACTERS, PICTOGRAMS AND SYMBOLS SHALL CONTRAST WITH THEIR BACKGROUND, EITHER LIGHT ON A DARK BACKGROUND OR DARK ON A LIGHT BACKGROUND. CBC 11B-703.5.1, 11B-703.6.2, 11B-703.7.1
- PROPORTIONS: CHARACTERS ON SIGNS SHALL BE SELECTED FROM FONTS WHERE THE WIDTH OF THE UPPERCASE LETTER "O" IS 60 % MINIMUM AND 110% MAXIMUM OF THE HEIGHT OF THE UPPERCASE LETTER "I". CBC 11B-703.2.4, 11B-703.5.4. STROKE THICKNESS OF THE UPPERCASE LETTER "I" SHALL BE 15% MAXIMUM OF THE HEIGHT OF THE CHARACTER FOR RAISED CHARACTERS AND 10% MINIMUM AND 20% MAXIMUM OF THE HEIGHT OF THE CHARACTER FOR VISUAL CHARACTERS. CBC 11B-703.2.6, 11B-703.5.7

AFTER CHOOSING A TYPESTYLE TO TEST, BEGIN BY PRINTING THE LETTERS "I" AND "O" AT 1 INCH HIGH. PLACE THE TEMPLATES 1:1 SQUARE OVER THE "O". IF THE CHARACTER IS NOT WIDER THAN 1 INCH, NOR NARROWER THAN THE 3:5 RECTANGLE, THE PROPORTIONS ARE CORRECT. USE THE 15% OR 10% RECTANGLE TO DETERMINE IF THE STROKE OF THE "I" IS TOO BROAD, AND THE 10% RECTANGLE TO SEE IF IT IS TOO NARROW. IF ALL THE TESTS ARE PASSED, THE TYPESTYLE IS COMPLIANT WITH PROPORTION CODE.



- BRAILLE: CONTRACTED CALIFORNIA GRADE 2 BRAILLE SHALL BE USED WHEREVER BRAILLE IS REQUIRED IN OTHER PORTIONS OF THESE STANDARDS. DOTS SHALL BE 1/10 INCH (2.5 MM) ON CENTERS IN EACH CELL WITH 0.30 INCH (7.6 MM) SPACE BETWEEN CELLS, MEASURED FROM THE SECOND COLUMN OF DOTS IN THE FIRST CELL TO THE FIRST COLUMN OF DOTS IN THE SECOND CELL. DOTS SHALL BE RAISED A MINIMUM OF 1/40 INCH (0.635 MM) ABOVE THE BACKGROUND AND 0.037" MAXIMUM. CBC 11B-703.3

INDIVIDUAL BRAILLE DOTS SHALL EACH BE DISTINCT & SEPARATE. EACH DOT SHALL BE ROUNDED OR DOWED IN LIEU OF SQUARE SIDED & FLAT TOPPED. DOTS WITH STRAIGHT SIDES AND FLAT TOPS ARE NOT READABLE FOR MANY BRAILLE USERS.

APPROVED
DIV. OF THE STATE ARCHITECT
APP: 03-121466 INC:
REVIEWED FOR
SS ☒ FLS ☒ ACS ☒
DATE: 02/09/2026



PLEASANT VALLEY
SCHOOL DISTRICT

600 TEMPLE AVENUE,
CAMARILLO, CA 93010

ENGINEER

BO BUDLONG & ASSOCIATES, INC.
SHEP CONSULTING ENGINEERS
JOB NO. 19-394

CAMARILLO OFFICE: 1000 S. MAIN ST., SUITE 100, CAMARILLO, CA 93010
SANTA ROSA OFFICE: 1000 S. MAIN ST., SUITE 100, SANTA ROSA, CA 95401
GENERAL OFFICE: 1000 S. MAIN ST., SUITE 100, SANTA ROSA, CA 95401

ENGINEER'S STAMP

CONSULTANT



CONSULTANT'S STAMP



PROJECT TITLE AND ADDRESS

PLEASANT VALLEY
SCHOOL DISTRICT GYM
HVAC UPGRADES

SANTA ROSA
TECHNOLOGY MAGNET
SCHOOL
13282 SANTA ROSA RD,
CAMARILLO, CA 93012

REVISIONS

3	CCD-003A	01-07-2026

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SHEET TITLE

SIGNAGE DETAILS

DATE 01/03/2022

SCALE

PROJECT NO. 19-394

DRAWN BY SAN

CHECKED BY WJA

SHEET NUMBER

A602

PLUMBING PIPE AND FITTING SCHEDULE			
TYPE	MATERIAL	FITTINGS	LOCATION
CW	TYPE "L" HARD COPPER	WROUGHT COPPER	ABOVE GRADE
	TYPE CPVC SCH 40	PLASTIC PIPE CEMENT JOINTS	BELOW GRADE
CD, PCD	TYPE "L" HARD COPPER	WROUGHT COPPER	INSIDE BUILDING
	TYPE CPVC SCH 40	PLASTIC PIPE CEMENT JOINTS	EXTERIOR OF BUILDING & BELOW GRADE - EXPOSED PIPING TO BE PAINTED WITH UV RESISTANT WATER BASED PAINT
GAS (LOW PRESSURE)	BLACK STEEL	BLACK STEEL	ABOVE GRADE
MEDIUM PRESSURE GAS	POLYETHYLENE	POLYETHYLENE	BELOW GRADE WITH TRACER WIRE
WASTE	NO-HUB CAST IRON	NO-HUB CAST IRON	ABOVE GRADE
			BELOW GRADE
VENT	NO-HUB CAST IRON	NO-HUB CAST IRON	ABOVE GRADE
			BELOW GRADE

FIXTURE NUMBER	FIXTURE	W	V	TRAP	CW	HW	REMARKS
WC-3	WATER CLOSET STUDENT/ADULT	4"	2"	INT.	1-1/2"	-	AMERICAN STANDARD - MADERA FLOW WISE 3461.001 NEW FLOOR MOUNTED WITH SLOAN 111-1.28 MANUAL FLUSH VALVE AT 1.28 GPF. PROVIDE WITH OLSONITE 10SSCTFR TOILET SEAT. INSTALL WCO ABOVE WATER CLOSET.
WC-4	WATER CLOSET STUDENT/ADULT	4"	2"	INT.	1-1/2"	-	AMERICAN STANDARD - MADERA FLOW WISE 3461.001 NEW FLOOR MOUNTED WITH SLOAN 111-1.28 MANUAL FLUSH VALVE AT 1.28 GPF. PER ACCESSIBLE REQUIREMENTS. PROVIDE WITH OLSONITE 10SSCTFR TOILET SEAT. INSTALL WCO ABOVE WATER CLOSET.
WC-5	WATER CLOSET KINDERGARTEN	4"	2"	INT.	1-1/2"	-	AMERICAN STANDARD 2282.001 FLOOR MOUNTED WATER CLOSET WITH SLOAN 111-1.28 MANUAL FLUSH VALVE. 1.28 GPF. PROVIDE WITH BEMIS BB 955 CT TOILET SEAT. INSTALL WCO ABOVE WATER CLOSET.
L-1	LAVATORY	2"	1-1/2"	1-1/4" X 1-1/2"	1/2"	-	CECO 551 LAVATORY WITH 3 HOLES AT 4-INCH ON CENTER PROVIDED WITH CHICAGO FAUCETS 3400-ABCP SELF-CLOSING METERING DECK MOUNTED FAUCET WITH 4-INCH CENTERS. PROVIDE WITH ZURN Z1231 CONCEALED ARM WALL CARRIER. INSTALL WCO ABOVE FIXTURE.
L-4	LAVATORY ADULT	2"	1-1/2"	1-1/4" X 1-1/2"	1/2"	-	CECO 551 LAVATORY WITH 3 HOLES AT 4-INCH ON CENTER PROVIDED WITH CHICAGO FAUCETS 3400-ABCP SELF-CLOSING METERING DECK MOUNTED FAUCET WITH 4-INCH CENTERS. PROVIDE WITH ZURN Z1231 CONCEALED ARM WALL CARRIER. INSTALL WCO ABOVE FIXTURE.
DF-12A	DRINKING FOUNTAIN	2"	1-1/2"	1-1/4" X 1-1/2"	1/2"	-	ELKAY - VRCLBWSK WITH ELKAY EZH20 VANDAL RESISTANT BOTTLE FILLING STATION & BI-LEVEL COOLER - NEW HI-LOW DRINKING FOUNTAIN WITH METER AND FILTER SYSTEM INSIDE LOCKABLE ACCESS PANEL. . INSTALL WCO ABOVE DRINKING FOUNTAIN.
U-3	URINAL STUDENT/ADULT	2"	1-1/2"	INT.	1"	-	SLOAN SU-1009-STG WALL MOUNTED URINAL WITH SLOAN ROYAL 186-0.125-DBP MANUAL FLUSH VALVE AT 0.125 GPF. INSTALL PER ACCESS COMPLIANT REQUIREMENTS. PROVIDE WITH ZURN Z1222 WALL CARRIER. INSTALL WCO ABOVE FIXTURE.
WHA-1	WATER HAMMER ARRESTOR	-	-	-	-	-	WATTS - LF15M2 - INSTALL NEW WHA BEHIND LOCKABLE ACCESS DOOR. INSTALL PER MANUFACTURER RECOMMENDATIONS.
ATP-1	TRAP PRIMER	-	-	-	1/2"	-	MIFAB MR-500-NPB AUTOMATIC TRAP PRIMER. INSTALL BEHIND LOCKABLE ACCESS DOOR. INSTALL WITH SHUT-OFF VALVE. SEE DETAIL #A/P-0.03 FOR ACCESS PANEL INFORMATION. INSTALL PER MANUFACTURER RECOMMENDATIONS.
FD-1	FLOOR DRAIN	2"	1-1/2"	2"	1/2"	-	JAY R. SMITH 2005Y-A ROUND TOP FLOOR DRAIN. PROVIDE WITH TRAP PRIMER CONNECTION. INSTALL PER MANUFACTURER RECOMMENDATIONS.
HB-8	HOSE BIBB	-	-	-	3/4"	-	ACORN 8151 HOSE BIBB INSIDE RECESSED WALL FLANGE HOSE BOX WITH LOCKABLE DOOR. PROVIDE WITH VACUUM BREAKER. INSTALL PER MANUFACTURER RECOMMENDATIONS.

1.	P-101	PLUMBING FRONT SHEET
2.	P-102	PLUMBING DEMOLITION SITE PLAN
3.	P-103	PLUMBING RECONSTRUCTION SITE PLAN
4.	PA-202D	BUILDING 'A' DEMOLITION PLUMBING ROOF PLAN
5.	PA-202	BUILDING 'A' RECONSTRUCTION PLUMBING ROOF PLAN
6.	PB-202D	BUILDING 'B' DEMOLITION PLUMBING ROOF PLAN
7.	PB-202	BUILDING 'B' RECONSTRUCTION PLUMBING ROOF PLAN
8.	PC-202D	BUILDING 'C' DEMOLITION PLUMBING ROOF PLAN
9.	PC-202	BUILDING 'C' RECONSTRUCTION PLUMBING ROOF PLAN
10.	PD-202D	BUILDING 'D' DEMOLITION PLUMBING ROOF PLAN
11.	PD-202	BUILDING 'D' RECONSTRUCTION PLUMBING ROOF PLAN
12.	PE-202D	BUILDING 'E' DEMOLITION PLUMBING ROOF PLAN
13.	PE-202	BUILDING 'E' RECONSTRUCTION PLUMBING ROOF PLAN
14.	PKJ-202D	KITCHEN & LOCKER ROOM DEMOLITION PLUMBING PLAN
15.	PKJ-202	KITCHEN & LOCKER ROOM RECONSTRUCTION PLUMBING PLAN
16.	P-300	PLUMBING DEMOLITION AND NEW RESTROOM PLANS
17.	P-301	PLUMBING DETAIL SHEET

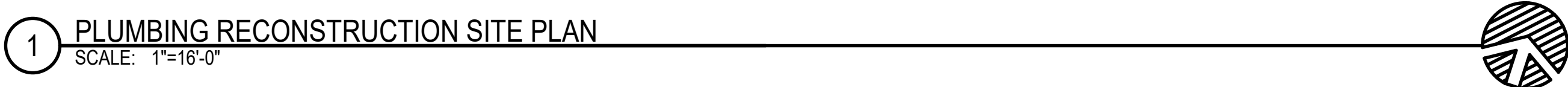
AS REVISED
CCD-003A
DSA A# 03-121466

CHECKED BY _____

P-101

P-102

Figure 1 illustrates the process of reconstructing a building's footprint from a single aerial photograph. The diagrams show the building's footprint being reconstructed from a single aerial photograph, with the final result being a complete reconstruction of the building's footprint.



P-103

A detailed key plan of the building layout, showing the arrangement of rooms and corridors. The plan includes a north arrow in the bottom right corner, indicating the orientation of the building. The layout is complex, with multiple interconnected rooms and corridors, and is presented in a black and white line drawing style.

12" = 305mm
1" = 25.4mm
1'-0" = 3050mm
12" = 305mm
6" = 152mm
3" = 76.2mm
1 1/2" = 38.1mm
1" = 25.4mm
3/4" = 19.0mm
1/2" = 12.7mm
3/8" = 9.5mm
1/4" = 6.3mm
3/16" = 4.8mm
1/8" = 3.2mm
1/16" = 1.6mm
1/32" = 0.8mm
1/64" = 0.4mm
1/128" = 0.2mm
1/256" = 0.1mm
1/512" = 0.05mm
1/1024" = 0.025mm
1/2048" = 0.0125mm
1/4096" = 0.00625mm
1/8192" = 0.003125mm
1/16384" = 0.0015625mm
1/32768" = 0.00078125mm
1/65536" = 0.000390625mm
1/131072" = 0.0001953125mm
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PROJECT MANUAL FOR THE

SANTA ROSA TECHNOLOGY MAGNET SCHOOL HVAC UPGRADE

for the

PLEASANT VALLEY SCHOOL DISTRICT

Prepared by
BUDLONG & ASSOCIATES
1000 Paseo Camarillo, Ste. 140
Camarillo, CA 93010



ARCHITECT
William J Amador, C20348
Amador Whittle Architects, Inc.



STRUCTURAL ENGINEER
Will Lambert, No. 5430
Orion Structural



ELECTRICAL ENGINEER
Manan Christian, E 22864
Budlong & Associates, Inc.



MECHANICAL ENGINEER
Sunil Patel, 29448
Budlong & Associates, Inc.

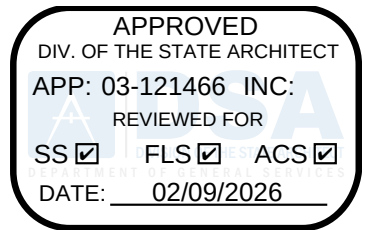


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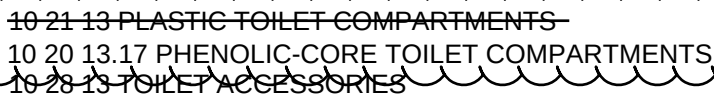
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SECTION 01 1100

SUMMARY OF WORK

PART 1 - GENERAL

- 1.01 SECTION INCLUDES
- A.  The furnishing of all labor, materials, equipment, services, and incidentals necessary for Work of the new HVAC system at Santa Rosa Technology Magnet School located at 13282 Santa Rosa Rd, Camarillo, CA 93012, as set forth in the Construction Documents which include, but are not limited to, the Drawings, Addenda and Specifications.
- Restroom Upgrades

1.02 RELATED REQUIREMENTS:

1. Section 01 1216: Phasing of the Work.

~~2. Section 01 2300: Alternates (Bid Items).~~

~~3. Section 01 3113: Project Coordination.~~

~~4. Section 01 3229: Project Forms.~~

~~5. Section 01 3213: Construction Schedule.~~

~~6. Section 01 4525: Testing, Adjusting, and Balancing for HVAC.~~

~~7. Section 01 5000: Construction Facilities and Temporary Controls.~~

~~8. Section 01 7123: Field Engineering.~~

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PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 USE OF PREMISES

- A. CONTRACTOR shall coordinate Work of all trades, Subcontractors, utility service providers, with OWNER and/or Separate Work Contract. CONTRACTOR shall sequence, coordinate, and perform the Work to impose minimum hardship on the operation and use of the existing facilities and/or Project site. CONTRACTOR shall install all necessary protection for existing improvements, Project site, property, and new Work against dust, dirt, weather, damage, vandalism, and maintain and relocate all protection to accommodate progression of the Work.
- B. CONTRACTOR shall confine entrance and exiting to the Project site and/or facilities to routes designated by the OWNER.
- C. Within existing facilities, OWNER will remove portable equipment, furniture, and supplies from Work areas prior to the start of Work. CONTRACTOR shall cover and protect remaining items in areas of the Work.

- D. CONTRACTOR is advised school may be in session during performance of the Work. CONTRACTOR shall utilize all available means to prevent generation of unnecessary noise and maintain noise levels to a minimum. When required by the OWNER, CONTRACTOR shall immediately discontinue noise-generating activities and/or provide alternative methods to minimize noise generation. CONTRACTOR shall install and maintain air compressors, tractors, cranes, hoists, vehicles, and other internal combustion engine equipment with mufflers, including unloading cycle of compressors. CONTRACTOR shall discontinue operation of equipment producing objectionable noise as required by the OWNER.
- E. CONTRACTOR shall furnish, install, and maintain adequate supports, shoring, and bracing to preserve structural integrity and prevent collapse of existing improvements and/or Work modified and/or altered as part of the Work.
- F. CONTRACTOR shall secure building entrances, exits, and Work areas with locking devices as required by the OWNER.
- G. CONTRACTOR assumes custody and control of OWNER property, both fixed and portable, remaining in existing facilities vacated during the Work.
- H. CONTRACTOR shall cover and protect surfaces of rooms and spaces in existing facilities turned over for the Work, including OWNER property remaining within as required to prevent soiling or damage from dust, dirt, water, and/or fumes. CONTRACTOR shall protect areas adjacent to the Work in a similar manner. Prior to OWNER occupancy, CONTRACTOR shall clean all surfaces including OWNER property.
- I. CONTRACTOR shall not use or allow anyone other than OWNER employees to use facility telephones and/or other equipment, except in an emergency. CONTRACTOR shall reimburse OWNER for telephone toll charges originating from the facility except those arising from emergencies or use by OWNER employees.
- J. CONTRACTOR shall protect all surfaces, coverings, materials, and finished Work from damage. Mobile equipment shall be provided with pneumatic tires.
- K. CONTRACTOR is advised OWNER will award Separate Work Contracts at this Project site.
- L. CONTRACTOR shall not permit the use of portable and/or fixed radio's or other types of sound producing devices including walkmans and similar devices.

3.02 PROPERTY INVENTORY

- A. Property, OWNER intends to remove; will be removed by OWNER before a room or space is vacated for the Work. Before performing Work in each room or space, OWNER and CONTRACTOR shall prepare a detailed initial written inventory of OWNER property remaining within, including equipment and telephone instruments and the condition thereof. OWNER and CONTRACTOR shall retain a signed copy of the inventory dated and signed by both parties. Prior to subsequent OWNER occupancy of each such room or space, OWNER and CONTRACTOR shall perform a final inventory of OWNER property and all discrepancies between the initial inventory and final inventory shall be the responsibility of CONTRACTOR.

3.03 FURNITURE, FIXTURES AND EQUIPMENT (MATERIALS) OWNER FURNISHED CONTRACTOR INSTALLED (OFCl)

- A. Certain materials identified in the Contract Documents as OWNER Furnished CONTRACTOR Installed, OFCl, will be delivered to the Project site by the OWNER.

- B. If designated in the Contract Documents to be OWNER furnished CONTRACTOR installed, (OFCI), CONTRACTOR shall unload, store, uncrate, assemble, install, and connect OWNER supplied materials.
 - C. One-Hundred and Twenty days before the date the CONTRACTOR needs to have the OFCI materials on site, CONTRACTOR shall notify OWNER of the scheduled date for needed OFCI materials. Upon delivery to Project site, CONTRACTOR shall store OFCI materials inside rooms and/or protected spaces and will be responsible for security of OFCI materials until Substantial Completion. OWNER will sign receipt or bill of lading as applicable.
 - D. CONTRACTOR shall, within ten days after delivery, uncrate and/or unpack OFCI materials in presence of OWNER who shall inspect delivered items. OWNER shall prepare an inspection report listing damaged or missing parts and accessories. OWNER shall transmit one copy of the report to CONTRACTOR. OWNER will procure and/or replace missing and or damaged OFCI materials, as indicated in inspection report.
 - E. CONTRACTOR shall install OFCI materials in the locations and orientation as indicated in the Contract Documents. CONTRACTOR shall verify exact locations with OWNER before final installation of OFCI materials.
 - F. If required, OWNER will furnish setting and or placement drawings for OFCI materials.
 - G. CONTRACTOR shall install OFCI materials by proper means and methods to ensure an installation as recommended by the manufacturer. CONTRACTOR shall furnish and install all necessary fasteners and required blocking to properly install OFCI materials.
 - H. CONTRACTOR shall install OFCI materials with manufacturer recommended fasteners for the type of construction to which the OFCI materials are being fastened and/or anchored.
 - I. CONTRACTOR shall provide final connections of any electrical, signal, gas, water, waste, venting and/or similar items to OFCI materials. CONTRACTOR shall, prior to final connection, verify the operating characteristics of OFCI materials are consistent with the designated supply.
- 3.04 FURNITURE, FIXTURES AND EQUIPMENT (Materials) - OWNER furnished, OWNER installed (OFOI)
- A. Certain materials are identified in the Contract Documents as OWNER Furnished, OWNER Installed (OFOI)
 - B. On dates and during times designated by OWNER, CONTRACTOR shall provide clear off-loading, receiving, protected storage, and OWNER'S dumpster space areas for the use of OWNER or OWNER'S third party OFOI installation contractors. At such times, CONTRACTOR shall also make clear routes and access available to all rooms and spaces to receive OFOI materials.
 - C. On dates and during times designated by OWNER, CONTRACTOR shall provide access to the elevators for use of OWNER or OWNER'S third party OFOI installation contractors.
 - D. CONTRACTOR shall cooperate fully with OWNER or OWNER'S third part OFOI installation contractors.

- E. CONTRACTOR may be requested by OWNER to provide supplemental labor and equipment to support OFOI activities. Such requests must be submitted in accordance with the change order clauses of Contract.
- F. Immediately prior to mobilization of OWNER or OWNER'S third party OFOI installation contractors, OWNER shall document the condition of the Work in areas to be utilized for OFOI activities.
- G. CONTRACTOR shall not be responsible for damage caused by OWNER or OWNER'S forces. OWNER shall document the condition of the Work and report to CONTRACTOR any damage in areas utilized for OFOI activities.

END OF SECTION

**SECTION 01 1216
PHASING OF THE WORK**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements for phasing of Work include logistics, phasing, and completion of designated phases prior to commencement of subsequent phases.

1.02 RELATED REQUIREMENTS

- A. Section 01 1100: Summary of Work.



- ~~B. Section 01 1219: Phasing of Work - Appendix A.~~ NIC

- C. Section 01 3300: Submittal Procedures.



- ~~D. Section 01 3113: Project Coordination.~~

- ~~E. Section 01 3213: Construction Schedule.~~

- ~~F. Section 01 5000: Construction Facilities and Temporary Controls.~~

- ~~G. Section 01 7700: Contract Closeout.~~

PART 2 - PRODUCTS (Not used)

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PART 3 - EXECUTION

3.01 SUBMITTALS

- A. CONTRACTOR shall submit a Project site logistics plans in accordance with and as required by this Section.

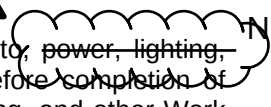
3.02 LOGISTICS

- A. Prior to commencement of Work, CONTRACTOR shall prepare and submit to OWNER, a detailed Project site logistic plan, in same size and scale of Drawings, setting forth CONTRACTOR plan of Work relative to following, but not limited to, items:

1. Hauling route shall be in accordance with local ordinances a truck access route to and from Project site.
2. The identification of any overhead wire restrictions for power, street lighting, signal or cable.
3. Local sidewalk access and street closure requirements.
4. Protection of sidewalk pedestrians and vehicular traffic.

5. Project site fencing and access gate locations.
 6. Construction parking.
 7. Material staging or delivery areas.
 8. Material storage areas.
 9. Temporary trailer locations.
 10. Temporary service location and proposed routing of all temporary utilities.
 11. Location of temporary or accessible fire protection.
 12. Trash removal and location of dumpsters.
 13. Concrete pumping locations.
 14. Crane locations.
 15. Location of portable sanitary facilities.
 16. Mixer truck wash out locations.
 17. Traffic control signage.
 18. Perimeter and site lighting.
 19. Storm Water Pollution Prevention Plan – SWPPP.
 20. Stockpile or lay down areas.
 21. Security lighting
- B. Revised Project site logistic plan may be required by OWNER for separately identified phases of Work as set forth in this Section.
- C. CONTRACTOR is responsible for securing and/or obtaining all approvals and permits from authorities having jurisdiction relative to any activities set forth in Article 3.02.A.

3.03 PHASING OF THE WORK

- A. Project will be constructed in separate Milestone increments, as identified or as described in this Section or Contract Documents. Phasing will also delineate Work to be completed in each designated phase. Unless otherwise approved or directed by OWNER, each phase shall be completed according to approved Baseline Schedule prior to commencement of next subsequent phase. CONTRACTOR shall incorporate and coordinate Work of Separate Work Contracts relative to this Project into the Phasing and Construction Schedule.
- B.  CONTRACTOR shall install all necessary Work for, but not limited to, ~~power, lighting, signal, HVAC, drainage, and plumbing systems~~ in phased Work before completion of designated phase. All valves, pull boxes, stub outs, temporary capping, and other Work
-   NIC

necessary for phased completion and operation of all necessary systems shall be provided whether or not such Work is specifically identified in Contract Documents.

3.04 PHASING OF THE WORK – GENERAL

- A. CONTRACTOR shall prepare Construction Schedule in order to complete Work and related activities in accordance with phasing plan as established in Appendix "A". CONTRACTOR shall include all costs to complete all Work within Milestones or Contract Time.
- B. OWNER will be seriously damaged by not having all Work completed within Milestones or Contract Time. It is mandatory Work be complete within Milestones or Contract Time.

3.05 PHASING OF THE WORK – SPECIFIC

- A. CONTRACTOR shall prepare Construction Schedule, and shall complete following, but not limited to Milestones, as shown in Section 01 1219 – Appendix A and within designated phases in accordance with following:
 - 1. Phase 1 Mobilization – (# of days) calendar days: Milestones 1 & 3.
 - 2. Phase 2 Construction – (#days) calendar days: Milestone 2, 4-28.
 - 3. Phase 3 Administrative Closeout – (# of days) calendar days: Milestone 29.
- B. The Contract Time shall be a total of (# days) calendar days from date of commencement of Contract Time.

END OF SECTION

SECTION 01 3300

SUBMITTAL PROCEDURES

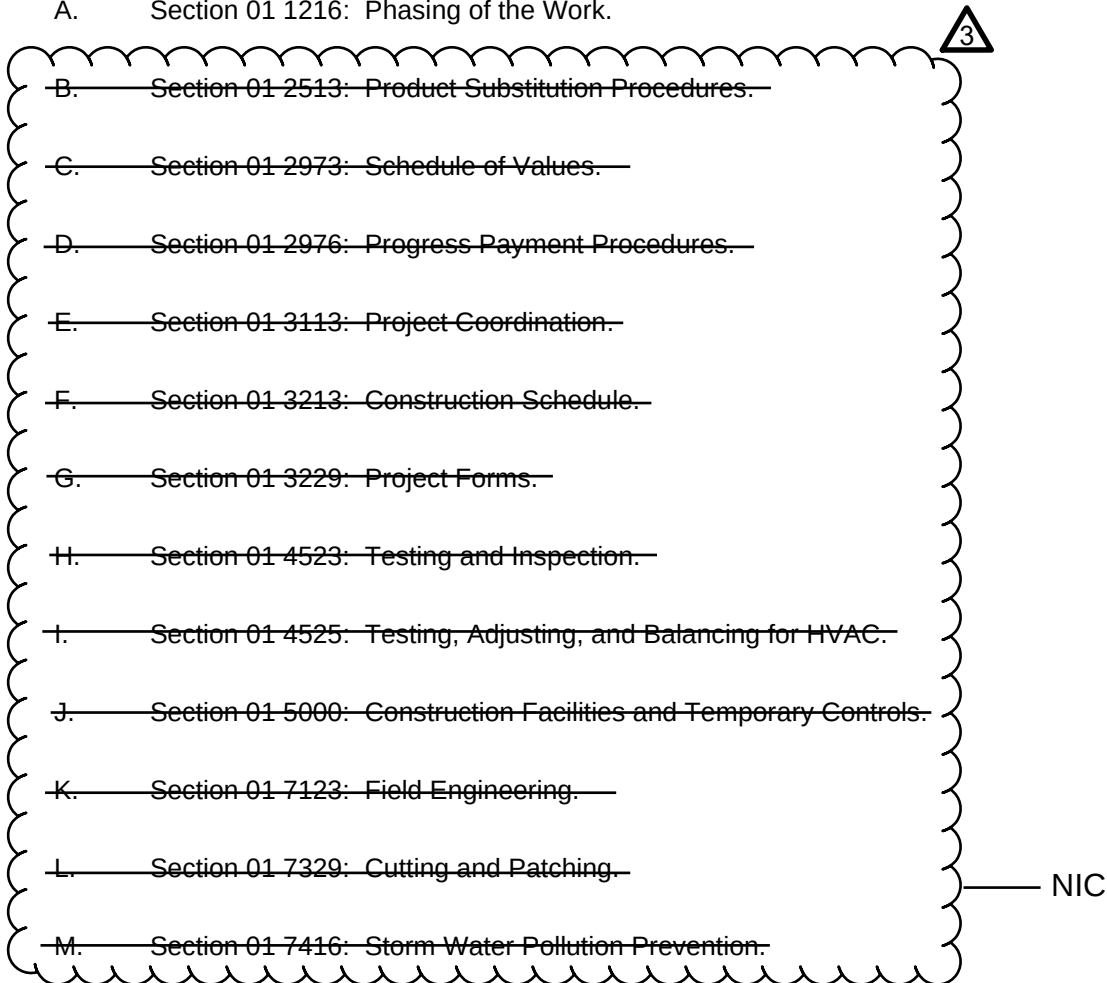
PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Administrative and procedural requirements for submittals required for the Work, including but not limited to; Shop Drawings, Product Data, Samples, material lists, and quality control items.
- B. Throughout the Contract Documents, the minimum acceptable quality of materials, fabrication, and execution have been defined by the name and catalog number of a manufacturer and by reference of recognized industry standards.
- C. To ensure that specified products are furnished and installed in accordance with the design intent, procedures have been established for submittal of design data and for its review by ENGINEER, OWNER and others.

1.02 RELATED REQUIREMENTS

- A. Section 01 1216: Phasing of the Work.





PART 2 – PRODUCTS (Not used)

PART 3 - EXECUTION

3.01 PROCEDURES

- A. CONTRACTOR is required to review and approve every submittal and shop drawing prior to transmittal and delivery to ENGINEER. Should CONTRACTOR determine a submittal contains errors, or does not meet the requirements of the contract, CONTRACTOR shall immediately return the submittals and shop drawings to the producer and expedite the corrections prior to transmitting the submittal to ENGINEER. Submittals shall not be used by CONTRACTOR to request clarifications or submit questions. CONTRACTOR will affix stamp to each submittal certifying CONTRACTOR has performed, at minimum, the following:
1. Verified the submittal is complete in all respects and follows the requirements of the Contract Documents without variance.
 2. Confirmed that no substitutions have been included. If substitutions are included, CONTRACTOR shall eliminate them from the submittal and process them in accordance with Section 00 7000 General Conditions Article 6.14.
 3. Identified any variances from the requirements of the Contract Documents and confirmed that the identified variance meets, but does not exceed the allowable limitations or tolerances as defined in these specifications.
 4. Verified that all submitted materials, dimensions and tolerances are compatible with existing or planned conditions of the Work in order to erect, fabricate, or install the submitted assembly in conformance with the requirements of the Contract Documents.
 5. Coordinated and verified that the dimensions match CONTRACTOR measured field or installation conditions.
 6. Coordinated and verified that the products of separate manufacturers required within any field produced assembly are compatible in all respects for such assembly.
 7. Packaged together all related submittals or shop drawings where such is necessary for a comprehensive ENGINEER review.
- B. CONTRACTOR shall package each submittal appropriately for transmittal and handling. Transmittal format shall be as required by OWNER. CONTRACTOR shall transmit and deliver six sets of each submittal or re-submittal to ENGINEER, two of which shall be returned to CONTRACTOR. Some specifications may require additional copies be provided. CONTRACTOR shall provide the OWNER additional copies as specified or as requested by OWNER. ENGINEER will not accept submittals received from sources other than from CONTRACTOR.

- C. After ENGINEERS review, ENGINEER will transmit submittals to OWNER and OWNER shall further distribute to CONTRACTOR, INSPECTOR and others as required. Work shall not commence, unless otherwise approved by OWNER, until approved submittals are transmitted to CONTRACTOR.
- D. CONTRACTOR shall clearly identify any deviations from the Contract Documents on each submittal. Any deviation not so noted even though stamped reviewed is not acceptable.
- E. CONTRACTOR shall coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities requiring sequential activity.
- F. Timing of Submittals:
 - 1. In accordance with General Conditions, CONTRACTOR shall submit to ENGINEER, with copy of transmittal to the OWNER, those Shop Drawings, Product Data, diagrams, materials lists, Samples and other submittals required by the Contract Documents.
 - 2. The scheduling of submittals shall be sequenced to support the progress of the Work, and shall be:
 - a. Submitted sufficiently in advance of construction, fabrication or installation in order to allow time for transmittal, review, modification, correction, (and resubmission and re-review when required.)
 - b. Phased with adequate time between submittals in order to allow for proper review by the ENGINEER without negative impact to the Milestones Schedule.
 - 3. CONTRACTOR shall coordinate submittal of related items and ENGINEER reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received by ENGINEER.
 - 4. CONTRACTOR shall revise, update and submit submittal schedule to ENGINEER and OWNER on the first of each month, or as required by OWNER.
 - 5. CONTRACTOR shall allow in the Construction Schedule, at least sixteen days for ENGINEER review following ENGINEER receipt of submittal. For mechanical, plumbing, electrical, low voltage, fire sprinklers, door and hardware, and other submittals requiring joint review with OWNER, CONTRACTOR shall allow a minimum of eighteen days following ENGINEER receipt of submittal. Deferred approval items shall be allowed additional time for DSA review.
 - 6. No adjustments to the Contract Time or Milestones will be authorized because of a failure to transmit submittals to ENGINEER sufficiently in advance of the Work to permit review and processing or where CONTRACTOR fails to provide ENGINEER submittals on related items.
 - 7. In case of product substitution, Shop Drawing preparation shall not commence until such time as OWNER accepts or rejects the proposed substitution in accordance with the procedures described in the General Conditions.

- G. If required, resubmit submittals in a timely manner. Resubmit as specified for initial submittal but identify as such. Review times for re-submitted items shall be as per the time frames for initial submittal review.
- H. Shop Drawing preparation shall not commence until such time as CONTRACTOR receives Product Data acceptance.
- I. ENGINEER will stamp each submittal with a uniform, action stamp. ENGINEER will mark the stamp appropriately to indicate the action taken, as follows:
 - 1. Final Unrestricted Release: When ENGINEER marks a submittal "Reviewed" the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
 - 2. Final-But-Restricted Release: When ENGINEER, or authorized agent, marks a submittal "Reviewed as Noted," the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.
 - 3. Returned for Re-submittal: When ENGINEER, or authorized agent, marks a submittal "Rejected, Revise and Resubmit," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat as necessary to obtain different action mark. In case of multiple submittals covering same items of Work, CONTRACTOR is responsible for any time delays, schedule disruptions, out of sequence Work, or additional costs due to multiple submissions of the same submittal item. Do not use, or allow others to use, submittals marked "Rejected, Revise and Resubmit" at the Project site or elsewhere where Work is in progress.
 - 4. Other Action: Where a submittal is for information or record purposes or special processing or other activity, ENGINEER, or authorized agent, will return the submittal marked "Action Not Required".

3.02 SHOP DRAWINGS

- A. Shop Drawings are original drawings prepared by CONTRACTOR, Sub-contractor, supplier, or distributor illustrating some portion of Work by showing fabrication, layout, setting, or erection and shall not be based on reproduced Contract Documents or copied standard information.
- B. Produce Shop Drawings to an accurate scale that is large enough to indicate all pertinent features and methods. Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches.
- C. Shop Drawings shall include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:
 - 1. Dimensions.
 - 2. Identification of products and materials included by sheet and detail number.

3. Compliance with specified standards.
 4. Notation of coordination requirements.
 5. Notation of dimensions established by field measurement.
- D. Provide a space of approximately 4 by 5 inches on the label or beside the title block on Shop Drawings to record CONTRACTOR and ENGINEER review, and the action taken. Include the following information on the label for processing and recording action taken:
1. Project name.
 2. Date.
 3. Name and address of ENGINEER.
 4. Name and address of CONTRACTOR.
 5. Name and address of Subcontractor.
 6. Name and address of supplier.
 7. Name and address of manufacturer.
 8. Name and title of appropriate Specification section.
 9. Drawing number and detail references, as appropriate.
- E. Unless otherwise agreed to or indicated in individual Specification sections, submit a sufficient number of sets to allow for adequate distribution to CONTRACTOR, Sub-Contractor, supplier, manufacturer and fabricators plus four (4) sets (two sets to be retained by ENGINEER, one set to the INSPECTOR and one set to OWNER).

3.03 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of Work or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, wiring diagrams, schedules, illustrations, or performance curves.
1. Mark each copy to show or delineate pertinent materials, products, models, applicable choices, or options. Where Product Data includes information on several products that are not required, clearly mark copies to indicate the applicable information. Include the following information:
 - a. Manufacturer's printed recommendations.

- b. Compliance with trade association standards.
- c. Compliance with recognized testing agency standards.
- d. Application of testing agency labels and seals.
- e. Notation of dimensions verified by field measurement.
- f. Notation of coordination requirements.
- g. Notation of dimensions and required clearances.
- h. Indicate performance characteristics and capacities.
- i. Indicate wiring diagrams and controls.

- 2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed by CONTRACTOR.

C. Required Copies and Distribution: Same as denoted in Article 3.02.E.

3.04 SAMPLES

A. Procedure:

- 1. Submit Samples of sufficient size, quantity, cured and finished and physically identical to the proposed product or material. Samples include partial or full sections or range of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches denoting color, texture, and/or pattern.
 - a. Mount or display Samples in the manner to facilitate review of qualities indicated. Include the following:
 - 1) Specification section number and reference.
 - 2) Generic description of the Sample.
 - 3) Sampling source.
 - 4) Product name or name of manufacturer.
 - 5) Compliance with recognized standards.
 - 6) Availability and delivery time.
- 2. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

- a. Where variations in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least three (3) multiple units that show the approximate limits of the variations.
 - b. Refer to other Specification sections for requirements for Samples that illustrate materials, fabrication techniques, assembly details, connections, operation, and similar construction characteristics.
 - c. Refer to other sections for Samples to be returned to CONTRACTOR for incorporation into the Work. Such Samples must be undamaged at time of installation. On the transmittal indicate special requests regarding disposition of Sample submittals.
 - d. Samples not incorporated into the Work, or otherwise not designated as Owner property, remain the property of CONTRACTOR and shall be removed from the Project site prior to Substantial Completion.
- 3. Color and Pattern: Whenever a choice of color or pattern is available in a specified product, submit accurate color chips and pattern charts to OWNER for review and selection.
 - 4. Number Required: Submit six, minimum, of each. Two will be returned to CONTRACTOR.
- B. When specified, erect field Samples and mock-ups at the Project site to illustrate products, materials, fabrications, or execution and to establish standards by which completed Work shall be judged.
 - C. Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of the Work. Sample sets may be used to obtain final acceptance of the Work associated with each set.

3.05 QUALITY CONTROL SUBMITTALS

- A. Submit quality control submittals, including design data, certifications, manufacturer's field reports, and other quality control submittals as required under other sections of the Contract Documents.
- B. When other sections of the Contract Documents require manufacturer's certification of a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.
- C. Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the represented company.
- D. Requirements for submittal of inspection and test reports are specified in other sections of the Contract Documents.

END OF SECTION

SECTION 01 5100
FIELD ENGINEERING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide materials, equipment, and transportation and perform labor as required for construction surveying.

1.02 RELATED DOCUMENTS

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

1.03 RELATED WORK SPECIFIED ELSEWHERE



- ~~A. Section 312000: Site Grading~~
- ~~B. Section 033100: Water & Sewer Piped Utilities~~
- ~~C. Section 334100: Storm Drainage~~
- ~~D. Section 321216: Asphalt Concrete Paving~~
- ~~E. Section 321313: Site Concrete~~

NIC

1.04 STANDARD SPECIFICATIONS

- A. Construction materials and methods shall be in accordance with the *Standard Specifications for Public Works Construction, 2018 edition (SSPWC)*, published by Building News, Inc., except as modified or otherwise specified herein (hereinafter the Standard Specifications).
- B. In case of conflict between the Standard Specifications and the project specifications, the project specifications shall govern.

1.05 REGULATORY REQUIREMENTS

- A. Construction shall comply with the *California Code of Regulations, Title 24, Part 2 (the California Building Code)*, most recent effective edition.
- B. Construction shall comply with applicable health and safety laws and standards including rules, orders and regulations of the *State of California Construction and General Industry Safety Orders*, the *Occupational Safety and Health Act of 1970*, and the *Construction Safety Act*.

1.06 SUBMITTALS

- A. Provide submittals according to the Conditions of the Contract and Division 1 "Submittal Procedures" section.
- B. Refer to "Submittal Requirements and Schedule" at the end of this Section.

1.07 RECORD DOCUMENTS

- A. Comply with requirements of Division 1, "Project Record Documents" section.

1.08 QUALITY ASSURANCE

- A. Retain a Land Surveyor, registered in the State of California, and acceptable to Architect / Engineer and Owner.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 SURVEY CONTROL

- A. Confirm location, condition, datum, horizontal and vertical control data for survey control points given on the Drawings, with the Topographic Mapping Surveyor.
 - 1. Protect survey control points during construction.
- B. Establish additional survey control points throughout the work site in locations that will not be disturbed by construction activities.
 - 1. Locate control points such that there are at least two readily useable for each individual work area requiring surveying.
 - 2. Record locations of control points on Record Documents, including description and horizontal and vertical survey data.
- C. Survey horizontal and vertical locations of existing buried conduits, pipelines and structures to be joined by, or which may conflict with, new construction and which have been exposed by potholing pursuant to requirements of individual technical specification sections; while exposed, observe and record conduit / pipe size and material. Redline this information to scale on a hardcopy of the applicable plan (or plan and profile) and provide to the Engineer for review and resolution of conflicts, if any. Allow a minimum of five (5) working days for review; more time may be required depending on the completeness of information provided and on the extent of the conflicts.
- D. Layout and provide construction stakes for the work, including:
 - 1. Line and grade control for rough grading operations, including area grading, cut and fill slopes, subgrade for building pads and pavements.
 - 2. Line and grade control for finish grading including drainage swales.
 - 3. Line and grade control and grade certification prior to backfill for gravity pipelines and related structures.
 - 4. Where called for on the Drawings, grade control and grade certification prior to backfill for pressure pipelines.

- 5. Line and grade control for concrete flatwork, walks, ramps, stairs, curbs, gutters, and walls.
- 6. Line and grade control for A.C. and concrete pavements.
- E. Survey and certify finish surface of completed building pad prior to any work involving plumbing, utilities, or foundations.
- F. Survey forms for concrete walks and ramps prior to ordering concrete to insure that accessibility requirements for slope and cross-slope will be conformed with.
- G. Where design longitudinal gradient is less than 1% (1/8 inch per foot) survey gutter or curb and gutter forms prior to ordering concrete to ensure that design slope is being achieved.
- H. For asphalt concrete and concrete pavement, prior to scheduling placement of pavement confirm that surface of aggregate base course has been constructed to the design elevation and slope within tolerances specified in Section 02310, Subsection 3.03B.
- I. Provide record surveying pursuant to requirements of individual technical specification sections.

END OF SECTION

SECTION 01 7419

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Preparation and implementation, including reporting and documentation, of a Waste Management Plan for reusing, recycling, salvage or disposal of non-hazardous waste materials generated during demolition and new construction (Construction and Demolition (C&D) Waste), to foster material recovery and re-use and to minimize disposal in land fills.

- B. Related Requirements

1. Section 01 3300 - Submittal Procedures.

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- ~~2. Section 01 5000 - Construction Facilities and Temporary Controls.~~

- ~~3. Section 01 7700 - Contract Closeout.~~

1.02 REFERENCES

- A. California Integrated Waste Management Act of 1989 (AB 939).
- B. California Code of Regulations Title 14, Section 18700 et seq.
- C. California Green Building Standards Code.

NIC

1.03 SYSTEM DESCRIPTION

- A. Collection and separation of all C&D waste materials generated on-site, reuse or recycling on-site, transportation to approved recyclers or reuse organizations, or transportation to legally designated landfills, for the purpose of recycling salvaging and reusing a minimum of 75 percent of the C&D waste generated.

1.04 SUBMITTALS

- A. C&D Waste Management Plan (Exhibit 1): Within 10 calendar days after the Notice to Proceed and prior to any waste removal, submit the following to the OWNER for review and approval. Update quarterly. Include:
1. Materials to be recycled, reused, or salvaged, either onsite or offsite.
 2. Estimates of C&D waste quantity (in tons) by type of material. (If waste is measured by volume, give factors for conversion to weight in tons.)
 3. Procedures for recycling and reuse program.
 4. Permit or license and location of Project waste-disposal areas.
 5. Site plan for placement of waste containers.

- B. C&D Waste Management Monthly Progress Report (Exhibit 2): Summary of waste generated by Project, monthly with Application for Payment. Include:
 - 1. Firms accepting the recovered or waste materials.
 - 2. Type and location of accepting facilities (landfill, recovery facility, used materials yard, etcetera). If materials are reused or recycled on the Project site, location should be designated as “on-site reuse and recycling”.
 - 3. Type of materials and net weight (tons) of each.
 - 4. Value of the materials or disposal fee paid.
 - 5. Attach weigh bills and other documentation confirming amount and disposal location of waste materials.
- C. C&D Waste Management Final Compliance Report: Final update of Waste Management Plan to provide summary of total waste generated by Project.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 IMPLEMENTATION

- A. Implement approved Waste Management Plan including collecting, segregating, storing, transporting and documenting each type of waste material generated, recycled or reused, or disposed in landfills.
- B. Designate an on-site person to be responsible for instructing workers and overseeing the sorting and recording of waste/ recyclable materials.
- C. Include waste management and recycling in worker orientation and as an agenda item for regular Project meetings.
- D. Recyclable and waste bin areas shall be limited to areas approved on the Waste Management Plan. Keep recycling and waste bins neat and clearly marked to avoid contamination of materials.

3.02 ATTACHMENTS

- A. Exhibit 1: Waste Management Plan
- B. Exhibit 2: Waste Management Monthly Progress Report.

EXHIBIT 1

WASTE MANAGEMENT PLAN CONSTRUCTION/ MAINTENANCE/ALTERATION & DEMOLITION PROJECTS

PROJECT NAME:	Santa Rosa Technology Magnet School – HVAC Replacement
PROJECT NO:	19-394
NAME OF COMPANY:	
CONTACT PERSON:	
TELEPHONE:	
PROJECT SITE LOCATION:	
PROJECT TYPE:	☐ NEW CONSTRUCTION ☐ DEMOLITION ☐ MAINTENANCE/ALTERATION PROJECTS
PROJECT SIZE (SQ. FT.):	
DATE & ESTIMATED PERIOD	

(1) Material Type	(2) Tons Estimated Recycle	(3) Tons Estimated Reuse	(4) Tons Estimated Salvage	(5) Tons Estimated Landfill	(6) Proposed Disposal or Recycling Facility (e.g., Onsite, Name of Facility)
Total					
Diversion Rate: Columns [(2)+(3)+(4)] / [(2)+(3)+(4)+(5)]					=

Signature	Title	Date
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- Column 1 "Material Types" – Enter type of materials targeted for recycling, reuse, and/or salvage, either on- or off-site, and include a category for waste materials requiring disposal.
- Columns 2 thru 4 "Estimated Generation" - Enter estimated quantities (tons) of recyclable, reusable, or salvageable waste materials anticipated to be generated and state number of salvageable items.
- Column 5 "Estimated Landfill" - Enter quantities (tons) of materials to be disposed in landfill.
- Column 4 "Disposal Location" - Enter end-destination of recycled, salvaged, and disposed materials.
- General : (1) Attach proposed Recycling and Waste Bin Location Plan.
(2) Attach name and contact data for each recycling or disposal destination to be used.

EXHIBIT 2

WASTE MANAGEMENT PROGRESS REPORT CONSTRUCTION/ MAINTENANCE/ALTERATION & DEMOLITION PROJECTS

PROJECT NAME:	<u>Santa Rosa Technology Magnet School – HVAC Replacement</u>
PROJECT NO:	<u>19-394</u>
NAME OF COMPANY:	<u></u>
CONTACT PERSON:	<u></u>
TELEPHONE:	<u></u>
PROJECT SITE LOCATION:	<u></u>
PROJECT TYPE:	☐ NEW CONSTRUCTION ☐ DEMOLITION ☐ MAINTENANCE/ALTERATION PROJECTS
PROJECT SIZE (SQ. FT.):	<u></u>
PERIOD	<u></u> to <u></u>

(1) Material Type	(2) Tons Actual Recycle	(3) Tons Actual Reuse	(4) Tons Actual Salvage	(5) Tons Actual Landfill	(6) Disposal or Recycling Facility (e.g., Onsite, Name of Facility)
Total					
Diversion Rate: Columns [(2)+(3)+(4)] / [(2)+(3)+(4)+(5)]					=

Signature	Title	Date
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- Column 1 "Material Types" – Enter type of materials targeted for recycling, reuse, and/or salvage, either on- or off-site, and include a category for waste materials requiring disposal.
- Columns 2 thru 4 "Estimated Generation" - Enter estimated quantities (tons) of recyclable, reusable, or salvageable waste materials anticipated to be generated and state number of salvageable items.
- Column 5 "Estimated Landfill" - Enter quantities (tons) of materials disposed.
- Column 4 "Disposal Location" - Enter end-destination of recycled, salvaged, and disposed materials.
- General : (1) Attach proposed Recycling and Waste Bin Location Plan.
(2) Attach name and contact data for each recycling or disposal destination to be used.

END OF SECTION

SECTION 01 9113

GENERAL COMMISSIONING REQUIREMENTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. This Section defines the Contractor's responsibilities with respect to Commissioning. The Contractor shall include this scope in the bid. This includes administrative and procedural requirements as well as a detailed execution of Commissioning. This Section supplements Section 01 4523 – Testing and Inspection, Section 01 4525 Testing, Adjusting, and Balancing for HVAC, as well as the Divisions 22 - Plumbing, Division 23 – Mechanical, and Division 26 – Electrical sections which specify testing procedures. This Section also defines the systems and equipment to be commissioned. For projects that have Specification Section 01 4516 or 01 4519, Contractor Construction Quality Control, the Commissioning schedule and activities as defined in the approved Commissioning Plan shall be incorporated by Contractor into the Construction Quality Control (CQC) plan. The Commissioning Services Provider will be part of the Owner's Quality Assurance (QA) Team and participate in the review and execution of the Project Construction Quality Control (CQC) plan, along with the Contractor, Owner's Authorized Representative (OWNER), Project Inspector (PI), and Architect of Record (AOR).

1.02 DEFINITIONS

- A. Commissioning (Cx): A systematic process which verifies that the building systems perform according to the Owner's Design Intent/Basis of Design (ODI/BOD). Commissioning includes system documentation, equipment startup, control system calibration, Testing, Adjusting and Balancing (TAB) verification, performance testing, and training.
- B. Commissioning Services Provider (CxSP): A District appointed entity that plans and coordinates all activities which implement Commissioning as outlined by the Owner's Design Intent/Basis of Design (ODI/BOD). The CxSP has overall responsibility for planning and coordinating Commissioning. Commissioning activities that take place during construction shall be based on the Contractor's construction schedule.
- C. Commissioning Plan (CxP): A contract document that identifies the project Commissioning goals, Owner's Design Intent/Basis of Design, commissioning milestones, coordination requirements, and project specific Pre-functional Equipment Checklists and Functional Performance Test Checklists. The CxP shall be incorporated by Contractor into the Construction Quality Control Plan.
- D. Pre-functional Equipment Checklist (PEC): A form for each piece of equipment referenced in '1.08 SYSTEMS TO BE COMMISSIONED' that must be completed by the Contractor as a prerequisite to the equipment's Functional Performance Test (FPT). Sample checklists and PEC forms are included in the CxP. The checklists and forms are completed by the Contractor and verified by the CxSP.
- E. Functional Performance Test (FPT): A documented test designed by the Commissioning Services Provider to verify the dynamic functioning and operation of equipment and systems with the goal of verifying that the Owners' Design Intent, Owner's Project Requirements, and Basis of Design (BOD) are met. Sample testing requirements and forms are included in the CxP. Test procedures are performed by the Contractor and witnessed by the INSPECTOR and CxSP.

- F. Acceptance - A formal action, taken by a person with appropriate authorization, to declare that some aspect of the project meets defined requirements – thereby permitting subsequent activities to proceed.
- G. Checklists - Documents that are developed and used during all phases of commissioning to verify that the Owner's intent is being achieved. This includes checklists for general verification, testing, training, and other specific requirements. Various checklists are prepared by the CxSP and the contractor to document completion of testing and/or commissioning of equipment and systems.
- I. Coordination Drawings - Drawings showing the work of all trades to illustrate that equipment can be installed in the space allocated without compromising equipment function or access for maintenance and replacement. These drawings graphically illustrate and dimension manufacturers' recommended maintenance clearances.
- K. Control system – A component of an environmental, HVAC, electrical, lighting, or energy management system for the reporting, monitoring and/or issuing of commands to and/or from field devices.
- L. Data logging -The monitoring and recording of flows, currents, status, pressures, etc., of equipment using stand-alone data recorders separate from the installed control system or the trending capabilities of those control systems.
- M. Deficiency - A condition that is not in compliance with the contract documents relative to the installation or function of a component, piece of equipment, or system.
- N. Factory Testing - Testing of equipment at the factory or on-site by factory personnel with, or without, an owner's representative present.
- O. Issues Log - A formal and ongoing record of problems or concerns – and their resolution – that have been raised by members of the commissioning team during the course of commissioning.
- P. Seasonal Performance Tests - Tests that are performed when weather conditions are comparable to the design conditions based or the design conditions can be simulated.
- R. Simulated Condition - Condition that is created for the purpose of testing the response of a system (for example: raising/lowering the set point of a thermostat to see the response in a VAV box).
- S. Startup - The initial starting or activating of dynamic equipment.
- T. Systems Manual - A system-focused composite document that includes the operation manual, maintenance manual, manufacturer's technical diagrams and additional information of use to the owner during facility occupancy and operation.
- U. Test Procedure - A written protocol that defines methods, procedures, personnel, and expected outcomes for tests conducted on components, equipment, assemblies, systems, and interfaces among systems. The test procedures are specified in the Commissioning Plan and Technical Specifications sections of the contract documents and the CxP.
- V. Training Plan - A written document that details the expectations, schedule, budget, and deliverables of commissioning activities related to the training of facility operating and maintenance personnel, users, and occupants.

- ## 1.03 RELATED REQUIREMENTS

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~~R. Section 26 0800 – Electrical Systems Commissioning.~~

GENERAL COMMISSIONING REQUIREMENTS
01 91 13 - 3

D. Sample Commissioning Plan Documentation.

1.05 COORDINATION

A. Items listed below require coordination between the Contractor, OWNER, INSPECTOR, and CxSP. Details regarding each item are provided through out this Section and/or Sections 01 7900, 23 0800, 23 0813 and 26 0800.

1. Cx Schedule and Meeting Venue.
2. Commissioning Meeting Attendance.
3. Completion of Pre-functional Equipment Checklists (PEC).
4. Functional Performance Testing (FPT).
5. Operations & Maintenance Manual Submittal and Training.
6. Documentation of Pre-functional Equipment Checklists (PEC) & Functional Performance Testing (FPT) Inspections.

B. For projects using Specification Section 01 4516 or 01 4519, the CxSP shall coordinate with the Contractor's designated Quality Control representative, OWNER and INSPECTOR.

1.06 SUBMITTALS

A. Submittal documentation required for the commissioning work will be identified by the CxSP and integrated into the normal submittal process and protocol of the construction team. At minimum, the CxSP's documentation request will identify the manufacturer and model number, the manufacturer's printed installation and detailed startup procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted. All such documentation will be included by subcontractors in their O&M manual submittals.

B. The CxSP will review and recommend acceptance or any required revision to the OWNER for all submittals related to the commissioned equipment for conformance with the contract documents as they relate to commissioning, performance of the equipment, and their adequacy of test procedures. This review is intended primarily to aid in the development of performance procedures and only secondarily to verify compliance with equipment specifications. The CxSP will notify the OWNER of items missing or areas that are not in conformance with contract documents and which require resubmission. Submittal of O&M manual documentation does not constitute compliance. The CxSP will review all such document submittals and recommend to OWNER their acceptance or any required revisions.

  C. ~~Submittal documentation specified in Specifications 23 0800, 23 0813 and 26 0800.~~ NIC

1.07 CONTRACTOR RESPONSIBILITIES

A. The general responsibilities of Contractor and Subcontractors in commissioning are defined in this section. The specific responsibilities are in the Division 22 and 23 and Division 26 Technical Specifications. All parties shall:

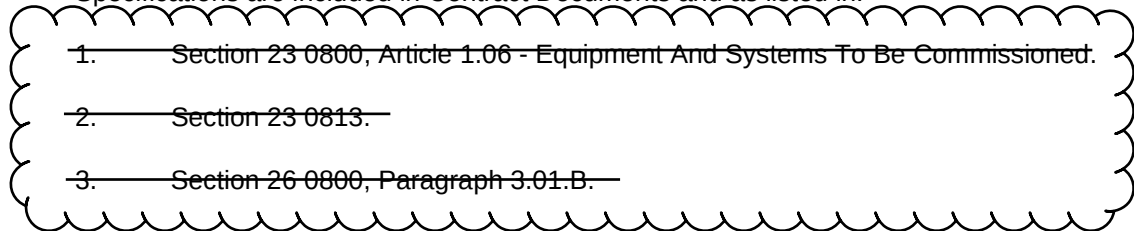
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1. Follow the Commissioning Plan.
 2. Attend commissioning meetings.
- B. Contractor, its design team, subcontractors and vendors shall assign representatives with expertise and authority to act on their behalf and schedule them to participate in and perform required commissioning activities including, but not limited to, providing all tools, or the use of tools, to start, check-out and test equipment and systems, except for specified testing with portable data recorders which shall be supplied and installed by the CxSP. Contractor and subcontractors shall:
1. Facilitate coordination of Commissioning.
 2. Incorporate Commissioning activities (the CxP) into the Project Schedule.
 3. Coordinate and direct Commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
 4. Participate in up to three meetings specifically for Commissioning-related items as scheduled by the OWNER.
 5. Review and accept construction checklists developed by the CxSP.
 6. Provide information required to perform commissioning tasks, including O&M materials, contractor startup and checkout lists.
 7. No later than 60 days prior to startup of the first piece of major equipment, meet with the CxSP and OWNER to finalize the detailed commissioning procedures and schedule.
 8. Before startup, provide detailed startup procedures including current control sequences and interlocks to comply with the detailed functional test plans.
 9. Provide one additional copy of all submittals required in Section 01 3300 for all systems being commissioned for review of compliance with commissioning needs by the CxSP.
 10. Develop and coordinate a startup and initial systems checkout plan with subcontractors and ensure that all subcontractors and vendors execute their commissioning responsibilities according to the contract documents.
 11. Review TAB execution plan.
 12. Oversee sufficient testing of the control system before TAB is executed.
 13. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
 14. Coordinate retesting as necessary until satisfactory performance is achieved
 15. Complete checklists as work is completed and provide to OWNER on a weekly basis.

16. Review equipment warranties to ensure that the owner's responsibilities to keep warranties in force are clearly defined.
17. Oversee and coordinate the training of the owner's personnel.
18. Review and approve the preparation of the O&M manuals including clarifying and updating of original sequences of operation to as-built/as-tested conditions.
19. Coordinate development of a systems manual

1.08 SYSTEMS TO BE COMMISSIONED

- A. Systems to be commissioned for this project include, but are not limited to, those for which Specifications are included in Contract Documents and as listed in:



PART 2 – PRODUCTS



NIC

2.01 TEST EQUIPMENT

- A. Standard testing equipment required to perform startup and initial checkout and required performance testing shall be provided by the contractor for the equipment being tested. This includes, but is not limited to, two-way radios and meters, etc. Testing specified as requiring portable data recorders will be performed with data recorders supplied and installed by the CxSP.
- B. Testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance within the tolerances specified in the specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a current certified calibration to an accuracy of 0.5 degree F and a resolution of plus or minus 0.1 degree F. Pressure sensors shall have an accuracy of plus or minus 2.0 percent of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 – EXECUTION

3.01 MEETINGS

- A. Commissioning Kick-off Meeting: Within 15 days following issuance of Notice-to-Proceed 1 (NTP 1), the OWNER will schedule a Construction Quality Control kick-off meeting. The INSPECTOR, Cx team and Contractor Quality Control representative will be in attendance. CxSP shall prepare and distribute a list of commissioning topics to be placed on the meeting agenda. Attendance at this meeting and participation in the Commissioning topics is mandatory for the following Contractor personnel:

1. Contractor's Quality Control Engineer and Commissioning Representative.
 2. Contractor's Project Scheduling personnel.
 3. Mechanical Subcontractors.
 4. Electrical Subcontractors.
 5. TAB Subcontractor.
 6. Controls Subcontractors.
- B. Other Commissioning Meetings. Other Cx meetings will routinely be scheduled and generally be conducted in conjunction with regularly scheduled site meetings as the Construction progresses. The Commissioning portion of meetings will cover upcoming implementation and coordination of the CxP, deficiency resolution, and planning issues with particular subcontractors.

3.02 STARTUP, CONSTRUCTION CHECKLISTS, AND INITIAL CHECKOUT

- A. The following procedures apply to all equipment/systems to be commissioned:
1. General: Contractor shall use PECs to verify that the equipment and systems are fully connected and operational. PECs for a given system must be successfully completed and accepted prior to startup and formal performance testing of equipment or subsystems of the given system.
 2. Startup and Checkout Plan: The CxSP will assist the project commissioning team members responsible for startup of any equipment. The primary role of the CxSP in this process is to ensure that there is written documentation and that each of the manufacturer-recommended procedures has been completed. The CxSP shall provide all the required pre-functional checklists and forms to be completed by Contractor in the CxP. The CxSP will ensure that the INSPECTOR and/or District Special Inspectors are informed as to the planned and scheduled startup and checkout procedures.
 - a. Sample Pre-Functional checklists are provided as an attachment to the CxP. These checklists indicate required procedures to be executed prior to equipment startup.
 - b. Contractor shall determine which trade is responsible for executing and documenting each of the line item tasks and transmit the checklists to the responsible subcontractors. Each form may have more than one trade responsible for its execution.
 - c. The contractor/subcontractor responsible for the purchase and/or installation of the equipment shall develop a comprehensive startup plan (with assistance from the CxSP) by combining the manufacturer's detailed startup and checkout procedures and the pre-functional checklists.
 - d. The contractor/subcontractor shall submit the full startup plan to the CxSP for review and approval.

- e. INSPECTOR will review and accept, based on CxSP recommendation, the procedures and the documentation format for reporting. The CxSP will return the procedures and the documentation format to Contractor through the OWNER.
 - f. Contractor shall transmit the full startup plan to the subcontractors for their review and use.
- B. Sensor and Actuator Calibration. All field-installed temperature, relative humidity, CO, CO₂, refrigerant, O₂, and/or pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated. Verify that all locations are appropriate and away from causes of erratic operation. Submit to the CxSP through the OWNER the calibration methods and results. All test instruments shall have had a current certified calibration record. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated. Contractor to field verify all installed sensors.

1. Sensor Calibration Methods:

- a. All Sensors: Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2 degrees F of each other for temperature and within a tolerance equal to 2 percent of the reading of each other for pressure.
- b. Sensors Without Transmitters: Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.
- c. Sensors With Transmitters: Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS and calibrate or replace sensor.

2. Tolerances, Standard Applications:

<u>Sensor</u>	<u>Required Tolerance (+/-)</u>
Cooling coil, chilled and condenser water temps	0.4F
AHU wet bulb or dew point	2.0F
Hot water coil and boiler water temp	1.5F
Outside air, space air, duct air temps	0.4F
Watt-hour, voltage & amperage	1 percent of design
Pressures, air, water and gas	3 percent of design
Flow rates, air, water	10 percent of design
Flow rates, water Relative humidity	4 percent of design
Combustion flue temps	5.0F

Oxygen or CO ₂ monitor	0.1 percent pts
CO monitor	0.01 percent pts
Natural gas and oil flow rate	1 percent of design
Barometric pressure	0.1 inch of Hg

3. Valve and Damper Stroke Setup and Check EMS Readout: For all valve and damper actuator positions checked, verify the actual position against the BAS readout. Set pumps or fans to normal operating mode. With the command valve and damper closed, visually verify that the command valve or damper is closed and adjust output zero signal as required. With the command valve or damper open, visually verify that the position is full open and adjust output signal as required. Set command valve or damper to a few intermediate positions. If actual valve or damper position doesn't reasonably correspond, repair or replace actuator.
4. Closure for heating coil valves (NO): Set heating set point 20 degrees F above room temperature. Visually observe valve open. Set heating set point to 20 degrees F below room temperature. Visually observe the valve close. Restore to normal.
5. Closure for cooling coil valves (NC): Set cooling set point 20 degrees F above room temperature. Visually observe the valve close. Set cooling set point to 20°F below room temperature. Visually observe valve open. Restore to normal.

C. Execution of Construction Checklists and Startup:

1. Four weeks prior to the scheduled startup, Contractor shall coordinate startup and checkout with the INSPECTOR and CxSP. The execution and approval of the PECs, startup, and checkout shall be directed and performed by Contractor, subcontractor or vendor. Signatures are required of the applicable subcontractors for verification of completion of their work.
2. The INSPECTOR shall observe, as a minimum, the procedures performed for each piece of primary equipment, unless there are multiple units; in which case a sampling strategy may be used. The CxSP shall observe all testing.
3. For lower-level components of equipment, (e.g., sensors, controllers), the CxSP shall observe a sampling of the startup procedures.
4. Pre-functional checklist documentation, identified in the CxP, is to be used by the sub-contractor to document that equipment is ready for startup.
5. The subcontractors and vendors shall execute startup and provide the CxSP, through the OWNER, with a signed and dated copy of the completed startup and construction checklists.
6. Only individuals of the contractor or sub-contractor (technicians, engineers, manufacturer's representatives/vendors, supervisors, etc.) who have direct knowledge and have witnessed that a line item task on the construction checklist was actually performed shall check off that item.

D. Deficiencies, Non-Conformance, and Approval in Checklists and Startup (Issues Log):

1. The contractor shall ensure that the subcontractors clearly list any outstanding items of the initial startup and construction checklist procedures that were not completed successfully, on an attached sheet. The form and any outstanding deficiencies shall

be provided, through the INSPECTOR, to the CxSP within two days of test completion.

2. The CxSP will review the report and issue either a non-compliance report or acceptance form, through the INSPECTOR, to Contractor. The installing subcontractors or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, shall notify the INSPECTOR as soon as outstanding items have been corrected, and resubmit an updated startup report with a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CxSP will recommend approval of the execution of the checklists and startup of each system.
3. Items left incomplete, which later cause deficiencies or delays during performance testing, may result in assessments to Contractor. Refer to Paragraph 3.05, herein, for details.

3.03 GENERAL REQUIREMENTS FOR TESTING

A. Complete the following at least two weeks prior to Functional Performance Testing:

1. Arrange for Commissioning observations to be performed by the CxSP.
2. Completion and acceptance of the Start-up Plan by the CxSP.
3. Correction of deficiencies identified during start-up.
4. Recording of pretest set points.

3.04 FUNCTIONAL PERFORMANCE TESTING (FTP)

- A. Undertake functional testing after the testing requirements listed in Paragraph 3.02 are completed.
- B. Equipment: Refer to Part 2 of this Section for test equipment requirements.
- C. Perform FPT under the observation of the CxSP who will verify the results of the functional test procedures documented by Contractor.
- D. Perform all specified tests according to approved testing procedures / plan.
 1. Verify and test performance using actual conditions whenever possible.
 2. Simulate conditions when it is not practical to test under actual conditions or when required seasonal testing conditions are not present. The procedure to be used shall be submitted to the OWNER for INSPECTOR and CxSP review and acceptance at least one week before simulated testing is to occur. After test, return settings to normal operating conditions.
 3. Alter set points when simulating conditions is not practical and when written approval to do so is received from OWNER.
 4. Override sensor values with a signal generator when actual or simulated conditions and altering set points are not practical. Do not use the sensor to act as the signal generator to simulate conditions or override values.

- E. Functional Performance Testing (FPT) Documentation: This Section specifies the general description of the minimum Divisions 22, 23 and 26 Functional Performance Testing documentation requirements that the Contractor shall provide. The CxSP will develop testing procedures in accordance to the requirements of this Section and incorporate into the Cx Plan that Contractor must follow and document. The testing documentation must include the following information:
1. Test number.
 2. Date and time of the test.
 3. Indication of whether the record is for a first test or retest following correction of a problem or issue.
 4. Identification of the system, subsystem, assembly, or equipment.
 5. Conditions under which the test was conducted, including (as applicable) ambient conditions, set points, override conditions, and status and operating conditions that impact the results of the test.
 6. Expected performance of the systems and assemblies at each step of the test.
 7. Narrative description of observed performance of the system, equipment, or assembly.
 8. Notation to indicate whether the observed performance at each step meets the expected results.
 9. Issue number, if any, generated as the result of the test.
 10. Dated signatures of the person performing the test and a witness.
- F. The CxSP and INSPECTOR will review and OWNER, if applicable, accept functional testing results. Deficiencies found during testing shall be submitted to the OWNER and, if required, based on the recommendation of INSPECTOR, by the OWNER, corrected by the Contractor and retested. Where there is a dispute over a deficiency, OWNER, based on the recommendation of ENGINEER and INSPECTOR, shall be the final authority.
- G. Problem Solving: The burden of responsibility to solve, correct and retest problems is with the Contractor and the design team with OWNER, based on the recommendations of the ENGINEER, CxSP and INSPECTOR, having final responsibility for acceptance of the Work.
- H. Substantial Completion: All testing, retesting, and acceptance of Functional Performance Testing shall be completed prior to issuing the Certificate of Substantial Completion. FPT may be conducted following building occupancy; however, all associated and reasonable additional costs incurred by the CxSP shall be assessed against Contractor Retention or Withhold funds.
- I. Deficiencies in the Cx Plan Functional Performance Test Checklist: If there is any Functional Performance Test Checklist missing for any particular piece of equipment, the Contractor shall inform the CxSP and ask for an updated Functional Performance Test Checklist.

3.05 RETESTING

- A. Retesting shall be required when a specific Pre-functional Checklist or Start-up test item, reported to have been successfully completed by Contractor or determined during functional testing to be faulty or incomplete, is identified.
- B. Contractor shall be provided one retest opportunity at no additional cost when Contractor can make corrections within two hours of identification of the need to retest. Costs for retesting beyond one retest, or when Contractor cannot make corrections within two hours of identification of the need to retest, will be assessed against Contractor funds if OWNER determines, based upon the recommendation of the INSPECTOR and CxSP, that the Contractor is responsible for the deficiency. These costs shall include all reasonable expenses incurred by the CxSP.
- C. For a deficiency identified during functional testing, but not included in the approved Start-up Plan, OWNER will direct retesting of the equipment with no costs assessed against Contractor for this initial retesting. Costs for retesting, when Contractor cannot effect corrections within two hours of identification of the need to retest, will be assessed against Contractor funds if OWNER determines, based upon the recommendation of the INSPECTOR and CxSP, that the Contractor is responsible for the deficiency. These costs shall include all reasonable expenses incurred by the CxSP.
- D. Retesting shall not be considered a reason for a claim of delay or for a time extension by the Contractor.

3.06 DEFERRED TESTING

- A. Unforeseen Deferred Tests: Checks or tests not completed due to the incomplete Work, required occupancy conditions, or other conditions may be delayed upon approval of the OWNER based upon the recommendation of the INSPECTOR and CxSP. These tests may be conducted in the same manner as the seasonal tests.
- B. Seasonal Testing: Complete seasonal testing, when weather or other testing conditions do not emulate the system's design conditions, employing simulated conditions acceptable to OWNER based upon the recommendation of the INSPECTOR and CxSP. The OWNER will coordinate with Contractor, and CxSP validate, this activity. Tests shall be executed, documented and deficiencies corrected by the Contractor, with the INSPECTOR and the CxSP witnessing. The Contractor shall make adjustments to the Operations and Maintenance Data, as necessary.

3.07 DOCUMENT REVIEW

- A. General: See paragraph 1.06 for submittal requirements.
-  B. ~~Operations and Maintenance Manuals: Refer to Section 01 7900 for specific requirements.~~ NIC

3.08 OPERATOR TRAINING

- A. ~~The CxSP, under the direction of the OWNER, coordinates and verifies training completion as shown in Section 01 7900. Forms and procedures are also described in the CxP.~~  NIC

END OF SECTION

SECTION 02 4116

DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Furnishing labor, materials and equipment necessary for demolition, dismantling, cutting and alterations as indicated, specified, or required for completion of the Work. Includes items such as the following:

1. Protection of existing improvements to remain.
2. Cleaning existing improvements to remain.
3. Disconnecting and capping utilities.
4. Removing debris, waste materials, and equipment.
5. Removal of items for performance of the Work.
6. Salvageable items to be retained by the Owner.

- B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 01 1100 - Summary of Work.

- ~~3. Section 01 5000 - Construction Facilities and Temporary Controls.~~

- ~~4. Section 01 7329 - Cutting and Patching.~~

5. Section 01 7419 - Construction and Demolition Waste Management.

6. Division 22 — Plumbing.

- ~~7. Division 23 — HVAC.~~

- ~~8. Division 26 — Electrical.~~

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1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating the extent of items and systems to be removed. Indicate items to be salvaged or items to be protected during demolition. Indicate locations of utility terminations and the extent of abandoned lines to be removed. Include details indicating methods and location of utility terminations.

1.03 QUALITY ASSURANCE

- A. Perform the Work of this section by workers skilled in the demolition of buildings and structures. Perform the Work of this section under direct superintendence at all times.
- B. Prior to commencement of Work, schedule a walkthrough with the OWNER, to confirm Owner property items have been removed from scheduled Work areas. Identify and mark remaining property items and schedule their removal.
- C. Coordinate demolition for the correct sequence, limits, and methods. Schedule demolition Work to create least possible inconvenience to the public and facility operations.
- D. Related Standard: ANSI/ASSE A10.6.

1.04 PROJECT CONDITIONS

- A. Drawings may not indicate in detail all demolition Work to be performed. Examine existing conditions to determine the full extent of required demolition.
- B. Repair damage to existing improvements or damage due to excessive demolition.
- C. Provide all measures to avoid excessive damage from inadequate or improper means and methods, improper shoring, bracing or support.
- D. If conditions are encountered that varies from those indicated, promptly notify the Architect for clarification before proceeding.

PART 2 - PRODUCTS

2.01 HANDLING OF MATERIALS

- A. Items scheduled for salvage by the Owner shall be delivered to a location designated by the OWNER. Items shall be cleaned, packaged and labeled for storage.
- B. Items scheduled for reuse shall be stored on the Project site and protected from damage, theft and other deleterious conditions.

PART 3 - EXECUTION

3.01 GENERAL

- A. Protection:
 - 1. Do not commence demolition until safety partitions, barricades, warning signs and other forms of protection are installed. Refer to Section 01 5000 - Construction Facilities and Temporary Controls.
 - 2. Provide safeguards, including warning signs, lights and barricades, for protection of workers, occupants, and the public.
- B. If safety of existing construction appears to be endangered, take immediate measures to correct such conditions; cease operations and immediately notify the OWNER.

3.02 DEMOLITION

- A. Do not throw or drop materials. Furnish ramps or chutes as required by the Work.
- B. Remove existing construction only to extent necessary for proper installation of Work and interfacing with existing construction. Cut back finished surfaces to straight, plumb or level lines as required for a smooth transition.
- C. Where openings are cut oversize or in improper locations, replace or repair to required condition.

3.03 CUTTING EXISTING CONCRETE

- A. Cutting of existing concrete shall be performed by skilled workers familiar with the requirements and space necessary for placing concrete. Perform concrete cutting with concrete cutting wheels and hand chisels. Do not damage concrete intended to remain.
- B. Extent of cutting of structural concrete shall be as indicated on Drawings. Cutting of non-structural concrete shall be as indicated on Drawings or as reviewed by the Architect or structural engineer. Replace concrete demolished in excess of amounts indicated.
- C. Prior to cutting or coring concrete, determine locations of hidden utilities or other existing improvements and provide necessary measures to protect them from damage.

3.04 REMOVAL OF EXISTING PLUMBING AND ELECTRICAL EQUIPMENT AND SERVICES

- A. Remove existing plumbing and electrical equipment fixtures and services not indicated for reuse and not necessary for completion of the Work. Remove abandoned lines and cap unused portions of existing lines.

3.05 REMOVAL OF OTHER MATERIALS

- A. Masonry: Cut back to joint lines and remove mortar without damaging units to remain. Allow space for repairs to backing where applicable.
- B. Woodwork: Cut or remove to a joint or panel line.
- C. Roofing: Remove as required, including accessory components such as insulation and flashings. At penetrations through existing roofing, trim cut edges back to sound roofing with openings restricted to the minimum size necessary to receive Work.
- D. Sheet Metal: Remove back to joint, lap, or connection. Secure loose and unfastened ends or edges and provide a watertight condition. Re-seal as required.
- E. Glass: Remove broken or damaged glass and clean rebates and stops of glazing channels.
- F. Modular materials such as acoustical ceiling panels, resilient tile, or ceramic tile: Remove to a natural joint without leaving damaged or defective Work where joining new Work. After flooring removal, clean substrates to remove setting materials and adhesives.
- G. Gypsum Board: Remove to a panel joint line on a stud or support line.
- H. Plaster: Saw cut plaster on straight lines, leaving a minimum 2-inch width of firmly attached metal lath for installing new lath and plaster.

- I. Remove existing improvements not specifically indicated or required but necessary to perform Work. Cut to clean lines, allowing for installation of Work.

3.06 PATCHING

- A. Patch or repair materials to remain when damaged by the performance of the Work of this section. Finish material and appearance of patch and/or repair Work shall match existing.

3.07 CLEANING

- A. Clean existing materials to remain with appropriate tools and equipment.
- B. Protect existing improvements during cleaning operations.
- C. Debris shall be dampened by fog water spray prior to transporting by truck.
- D. Debris pick-up area shall be kept broom-clean and shall be washed daily with clean water.
- E. Remove waste and debris, other than items to be salvaged. Turn over salvaged items to Owner, or store and protect for reuse where required. Continuously clean up and remove items as demolition Work progresses.
- F. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 03 1000
CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Formwork for cast-in-place concrete as indicated.
 - 2. Installation of items to be embedded in concrete, such as anchor bolts, inserts, embeds, and sleeves.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 03 2000: Concrete Reinforcing.
 - 3. Section 03 3000: Cast-In-Place Concrete.

1.02 REFERENCES

- A. American Concrete Institute (ACI) Publication:
 - 1. ACI 318 – Building Code Requirements for Structural Concrete, Chapter 6, Formwork, Embedded Pipes, and Construction Joints.
 - 2. ACI 347 – Guide to Formwork for Concrete.
- B. American Plywood Association (APA):
 - 1. Form No. V345 - Concrete Forming Design/Construction Guide.
- C. National Institute of Standards and Technology (NIST):
 - 1. NIST Voluntary Product Standard PS 1.

1.03 SUBMITTALS

- A. Submit detailed structural calculations and drawings approved and signed by a California registered Civil Engineer or Structural Engineer where the height of the falsework or vertical shoring, as measured from the top of the sills to the soffit of the superstructure exceeds 14 feet, or where individual horizontal span lengths exceed 16 feet, or where provision for vehicular traffic through falsework or shoring occurs. For all other falsework and shoring submit layout

signed by California registered Civil Engineer or Structural Engineer, manufacturer's authorized representative or a licensed contractor experienced in the usage and erection of falsework and vertical shoring. A copy of the plans, calculation and specifications shall be available at the jobsite at all times.

- B. Shop Drawings: Submit Shop Drawings indicating locations of forms, construction and expansion joints, embedded items, and accessories.
- C. Product Data: Submit manufacturer's Product Data for form materials and accessories.

1.04 REGULATORY REQUIREMENTS

- A. California Building Code (CBC), Chapter 19A.
- B. California Code of Regulations, Title 8, Division 1, Chapter 4, Subchapter 4, Construction Safety Orders, Article 6, Excavations, Sections 1713 and 1717.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Storage shall prevent damage and permit access to materials for inspection and identification.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Form materials may be reused during progress of the Work provided they are completely cleaned and reconditioned, recoated for each use, capable of producing formwork of required quality, and are structurally sound.
- B. Form Lumber: WCLIB Construction Grade or Better, WWPA No. 1 or Better.
- C. Plywood: NIST Voluntary Product Standard PS 1, Group 1, Exterior Grade B-B Plyform or better, minimum 5-ply and 3/4 inch thick for exposed locations and at least 5/8 inch thick for unexposed locations, grade marked, not mill oiled. Furnished plywood with medium or high density overlay is permitted.
- D. Coated Form Plywood: For exposed painted concrete, plastic overlaid plywood of grade specified above, factory coated with a form coating and release agent Nox-crete", or equal.
- E. Tube Forms: Sonoco "Seamless Sonotubes," Ceme-Tube, Quik-Tube, or equal, of the type leaving no marks in concrete, one-piece lengths for required heights.
- F. Joist Forms: Code recognized steel or molded plastic types as required.

- G. Special Forms: For exposed integrally-colored concrete, plywood as above with high density overlay, plywood with integral structural hardboard facing or fibrous glass reinforced plastic facing, providing specified finish.
- H. For Exposed Concrete Finish:
 - 1. Plywood: New, waterproof, synthetic resin bonded, exterior type Douglas fir or Southern pine plywood manufactured especially for concrete formwork and conforming to NIST Voluntary Product Standard PS 1, Grade B-B grade, Class I.
 - 2. Glass-Fiber-Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surfaces.
 - 3. Steel: Minimum 16 gage sheet, well matched, tight fitting, stiffened to support weight of concrete, without deflection detrimental to tolerances and appearances of finished concrete surfaces.
 - 4. Plywood: "Finland Form,," "Combi Form" by North American Plywood Corporation, "Plyform" by Roy O. Martin, "ProForm" by Pacific Wood Laminates, or equal. The material shall be furnished with hard smooth birch face veneers with phenolic resin thermally fused onto panel sides. Edges shall be factory sealed.
- I. Form Ties: Prefabricated rod, flat band, wire, internally threaded disconnecting type, not leaving metal within 1 1/2-inch of concrete surface.
- J. Form Coating: Non-staining clear coating free from oil, silicone, wax, not grain-raising, "Formshield" by A.C. Horn, Inc., "Release" by Edoco/Dayton Superior, "Cast-Off" by Sonneborn/BASF Building Systems or equal. Where form liners are furnished, provide form coatings recommended by form liner manufacturer.
- K. Form Liner: Rigid or resilient type by L.M. Scofield, Symons, Greenstreak, or equal.
- L. Void Forms: Manufactured by SureVoid Products, Inc., Sonotube, Void Form International, or equal. Forms shall be "WallVoid" for temporary support of concrete walls and grade beams spanning between supports, and "SlabVoid" for creating gaps between concrete slabs or steps and underlying soils. Void forms shall be fabricated of corrugated paper with moisture resistant exterior, and shall be capable of withstanding working load of 1,500 psf. Provide accessories as required.

PART 3 - EXECUTION

3.01 GENERAL

- A. Forms shall be constructed so as to shape final concrete structure conforming to shape, lines and dimensions of members required by Drawings and Specifications, and shall be sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together to maintain position and shape. Forms and their supports shall be designed so that previously placed structures will not be damaged.
- B. Use form coating at all surfaces in contact with concrete.

3.02 TOLERANCES

- A. Permitted abrupt or gradual irregularities in formed surfaces as measured within a 5 feet length with a straightedge shall per ACI 347, Table 3.1:

Class of Surface			
A	B	C	D
1/8 inch	1/4 inch		1 inch

- 1. Class A: Use for concrete surfaces prominently exposed to public view.
- 2. Class B: Use for coarse-textured concrete-formed surfaces intended to receive plaster, stucco or wainscoting.
- 3. Class D: Use for surfaces where roughness is not objectionable and will be permanently concealed.

3.03 ERECTION

- A. Plywood shall be installed with horizontal joints level, vertical joints plumb and with joints tight. Back joints by studs or solid blocking, and fill where necessary for smoothness. Reused plywood shall be thoroughly cleaned, damaged edges or surfaces repaired and both sides and edges oiled with colorless form oil. Nail plywood along edges, and to intermediate supports, with common wire nails spaced as necessary to maintain alignment and prevent warping.
- B. Openings for Cleaning: Provide temporary openings at points in formwork to facilitate cleaning and inspection. At base of walls and wide piers, bottom form board on one face for entire length shall be omitted until form has been cleaned and inspected.
- C. Chamfers: Provide 3/4 inch by 3/4 inch chamfer strips for all exposed concrete corners and edges unless otherwise indicated.

- D. Reglets and Rebates: As specified in Section 03 3000: Cast-In-Place Concrete.

3.04 REMOVAL OF FORMS

- A. Forms shall not be removed until concrete has sufficiently hydrated to maintain its integrity and not be damaged by form removal operations. Unless noted otherwise and/or permitted by the Architect, columns and wall forms shall not be removed in less than five days, floor slabs in less than seven days, beams and girders in less than 15 days, pan forms for joists may be removed after three days, but joist centering shall not be removed until after 15 days, and ramp, landing, steps and floor slabs shall not be removed in less than seven days. Shoring shall not be removed until member has acquired sufficient strength to support its weight, load upon it, and added load of construction.
- B. Compressive strength of in-place concrete shall be determined by testing field-cured specimens representative of concrete location or members, as specified in Section 03 3000: Cast-In-Place Concrete.

3.05 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.06 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 03 2000

CONCRETE REINFORCING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Concrete steel reinforcement.

B. Related Requirements:

1. Division 01 - General Requirements.

- ~~2. Section 01 4523: Testing and Inspection.~~

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3. Section 03 1000: Concrete Forming.

4. Section 03 3000: Cast-In-Place Concrete.

1.02 REGULATORY REQUIREMENTS

- A. Fabrication and placement of reinforcing shall be in accordance with requirements of CBC, Chapter 19A.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. ASTM A184 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
3. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
4. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
5. ASTM A497 - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.

6. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 7. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
- B. American Concrete Institute (ACI) Publication:
1. ACI SP-66 – ACI Detailing Manual.
 2. ACI 318 – Building Code Requirements for Structural Concrete, as modified by CBC.
- C. American Welding Society (AWS):
1. AWS D1.4 – Structural Welding Code – Reinforcing Steel.

1.04 SUBMITTALS

- A. Shop Drawings: Submit steel reinforcement Shop Drawings in accordance with ACI 315. Include assembly diagrams, bending charts and slab plans. Indicate lengths and location of splices, size and lengths of reinforcing steel.
- B. Closeout Submittals: Record exact locations of reinforcing that vary from Shop Drawings.

1.05 QUALITY ASSURANCE

- A. Comply with the following as a minimum requirement:
1. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice.
 2. American Welding Society (AWS).
 3. American Concrete Institute (ACI).
 4. CBC, Chapter 19A, Concrete.
- B. Source Quality Control: Refer to Division 01 Sections for general requirements and to the following paragraphs for specific procedures. Testing laboratory retained by the OWNER shall select test Samples of bars, ties, and stirrups from the material at the Project Site or from the place of distribution, with each Sample consisting of not less than two 18 inch long pieces, and perform the following tests according to ASTM A615, or ASTM A706, as applicable:
1. Identified Bars: If Samples are obtained from bundles as delivered from the mill, identified as to heat number, accompanied by mill analyses

and mill test reports, and properly tagged with the identification certificate so as to be readily identified, perform one tensile and one bend test for each 10 tons or fraction thereof of each size of bars. Submit mill reports when Samples are selected.

2. Unidentified Bars: When positive identification of reinforcing bars cannot be performed and when random Samples are obtained; perform tests for each 2.5 tons or fraction thereof, one tensile and one bend test from each size of bars.

- C. Certification of Welders: Shop and Project site welding shall be performed by welding operators certified by AWS.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Avoid exposure to dirt, moisture or conditions harmful to reinforcing.
- B. Reinforcing steel bars, wire, and wire fabric shall be stored on the Project site to permit easy access for examination and identification of each shipment. Material of each shipment shall be separated for size and shape.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide reinforcing of sizes, gages and lengths indicated, bent to indicated shapes.

2.02 MATERIALS

- A. Steel Reinforcing Bars: ASTM A615, or ASTM A706 deformed grade 60 billet steel unless otherwise specified or indicated.
- B. Bars or Rod Mats: ASTM A184.
- C. Welded Wire Fabric for Reinforcement: ASTM A185.
- D. Tie Wire: ASTM A82, fully annealed, copper-bearing steel wire, 16 gage minimum.
- E. Chairs, Spacers, Supports, and Other Accessories: Standard manufacture conforming to ACI 315 fabricated from steel wire of required types and sizes. For reinforcement supported from grade, provide properly sized dense precast blocks of concrete.

2.03 FABRICATION OF REINFORCING BARS

- A. Comply with CRSI Manual of Standard Practice for Reinforced Concrete Construction for fabrication of reinforcing steel.
- B. Bending and Forming: Fabricate bars of the indicated sizes and bend and form to required shapes and lengths by methods not injurious to materials. Do not heat reinforcement for bending. Bend bars No. 6 size and larger in the shop only. Bars with unscheduled kinks or bends are not permitted. Provide only tested and permitted bar materials.
- C. Welding: Provide only ASTM A706 steel where welding is indicated. Perform welding by the direct electric arc process in accordance with AWS D1.4 and specified low-hydrogen electrodes. Preheat 6 inches each side of joint. Protect joints from drafts during the cooling process; accelerated cooling is not permitted. Do not tack weld bars. Clean metal surfaces to be welded of loose scale and foreign material. Clean welds each time electrode is changed and chip burned edges before placing welds. When wire brushed, the completed welds must exhibit uniform section, smooth welded metal, feather edges without undercuts or overlays, freedom from porosity and clinkers, and good fusion and penetration into the base metal. Cut out welds or parts of welds deemed defective, using chisel, and replace with proper welding. Prequalification of welds shall be in accordance with CBC requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Bars shall be bent cold. Bars partially embedded in concrete shall not be field bent except as indicated on reviewed Shop Drawings.
- B. Before installation and just prior to placing concrete, clean reinforcing of loose scale, rust, oil, dirt and any coating that could reduce bond.
- C. Accurately position, install, and secure reinforcing to prevent displacement during the placement of concrete.
- D. Provide metal chairs to hold reinforcement the required distance above form bottoms. In beams and slab construction, provide chairs under top slab reinforcement as well as under bottom reinforcement. Space chairs so that reinforcement will not be displaced during installation. Provide metal spacers to secure proper spacing. Stirrups shall be accurately and securely wired to bars at both top and bottom. At slabs, footings, and beams in contact with earth, provide concrete blocks to support reinforcement at required distance above grade.
- E. Install and secure reinforcement to maintain required clearance between parallel bars and between bars and forms. Lapped splices shall be installed

wherever possible in a manner to provide required clearance between sets of bars. Stagger lapped splices. Dowels and bars extending through construction joints shall be secured in position against displacement before concrete is installed and subsequently cleaned of concrete encrustations while they are still soft.

- F. Do not install reinforcing in supported slabs and beams until walls and columns have been installed to underside of slabs and beams or until construction joints have been thoroughly cleaned. Reinforcing shall be inspected before placement of concrete and cleaned as required.
- G. Use deformed bars unless otherwise indicated, except for spiral reinforcement.

3.02 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.03 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Cast-in-place normal weight and lightweight concrete, placement and finishing.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 1000: Concrete Forming and Accessories.
3. Section 03 2000: Concrete Reinforcing.
4. Section 07 2600: Vapor Barriers.

5. ~~Section 32 1313: Site Concrete Work.~~  NIC

1.02 REFERENCES

A. American Concrete Institute (ACI) Publication:

1. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 301 – Specifications for Structural Concrete.
3. ACI 302.1R – Guide for Concrete Floor and Slab Construction.
4. ACI 305R - Specification for Hot Weather Concreting.
5. ACI 306.1 – Standard Specification for Cold Weather Concreting.
6. ACI 308R – Guide to External Curing of Concrete.
7. ACI 318 - Building Code Requirements for Structural Concrete, as modified by CBC Sections 1903A and 1905A.

B. American Society for Testing and Materials (ASTM) Standards:

1. ASTM C31 – Standard Specification for Making and Curing Concrete Test Specimens in the Field.
2. ASTM C33 - Standard Specification for Concrete Aggregates.
3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
5. ASTM C88 - Standard Test Method for Soundness of Aggregates by use of Sodium Sulphate or Magnesium Sulphate.
6. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
7. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
8. ASTM C150 - Standard Specification for Portland Cement.
9. ASTM C156 – Standard Test Method for Water Loss (from a Mortar Specimen) Through Liquid membrane-Forming Curing Compounds for Concrete.
10. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
11. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete.
12. ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
13. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
14. ASTM C289 - Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).
15. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
16. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
17. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.

18. ASTM C567 - Standard Test Method for Determining Density of Structural Lightweight Concrete.
19. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
20. ASTM C845 - Standard Specification for Expansive Hydraulic Cement
21. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
22. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
23. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
24. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
25. ASTM C1315 – Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
26. ASTM D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
27. ASTM C1567 - Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).
28. ASTM D1751 - Standard Test Method for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
29. ASTM D7234 – Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
30. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
31. ASTM E1155 - Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.
32. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.

33. ASTM E1745 - Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
34. ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
35. ASTM F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
36. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probes.
37. ASTM F3010 – Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use under Resilient Floor Coverings.

1.03 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating locations of cast-in-place concrete Work and accessory items such as vapor barriers. Include details and locations of reinforcing, embedded items, and interfacing with other Work.
- B. Mix Design Data: Submit concrete mix designs as specified herein and in Article 2.02.
 1. Submit name, address and telephone number of the concrete production facility which the contractor intends to engage to design the concrete mixes. Submit name and qualifications of the proposed concrete technologist.
 2. Mix Design: Submit a concrete mix design for each strength and type of concrete indicated in the drawings or specified. Include water/cement ratio, source, size and amount of coarse aggregate and admixtures. Predict minimum compressive strength, maximum slump and air content percentage. Clearly indicate locations where each mix design will be used.
 - a. Water/cement ration for concrete slabs on grade shall be 0.50 maximum.
 3. Test Reports: Submit copies of test reports showing that the proposed mixes produce concrete with the strengths and properties specified. Include tests for cement, aggregates and admixtures. Provide gradation analysis.
- C. Material Samples: Submit Samples illustrating concrete finishes and hardeners, minimum 12-inch by 12-inch.

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- D. Certificates: Submit certification that each of the following conforms to the standards indicated:
1. Portland cement: ASTM C150.
 2. Normal weight concrete aggregates: ASTM C33.
 3. Lightweight concrete aggregates: ASTM C330.
 4. Aggregates: Submit evidence that the aggregate is not reactive in the presence of cement alkalis. In the absence of evidence, aggregate shall be tested by one of the methods in ASTM C33 Appendix XI, Methods for Evaluating Potential for Deleterious Expansion Due to Alkali Reactivity of an Aggregate. . Aggregates deemed to be deleterious or potentially deleterious may be used with the addition of a material that has been shown to prevent harmful expansion in accordance with Appendix XI of ASTM C33, when approved by the building official, in accordance to CBC Section 1903A5A.
 5. Curing materials: ASTM C171.
- E. Admixtures: Submit product data for proposed concrete admixtures.

1.04 QUALITY ASSURANCE

- A. Continuous inspection shall be provided at the batch plant and for transit-mixed concrete to run check sieve analysis of aggregate, check moisture content of fine aggregate, check design of mix, check cement being used with test reports, check loading of mixer trucks, and certify to quantities of materials placed in each mixer truck.
- B. Inspection shall be performed by a representative of a testing laboratory selected by the OWNER. OWNER will pay for inspection costs. Notify the laboratory 24 hours in advance of time concrete is to be mixed. Notify the laboratory of postponement or cancellation of mixing within at least 24 hours of scheduling time.
- C. CONTRACTOR shall assist the testing laboratory in obtaining and handling samples at the project site and at the source of materials.
- D. Continuous batch plant inspection requirement may be waived in accordance with CBC Section 1705A.3.3.1. Waiver shall be in writing, including DSA approval. When batch plant inspection is waived by DSA, the following requirements shall be met:
1. Approved inspector of the testing laboratory shall check the first batching at the start of work and furnish mix proportions to the licensed weightmaster.

2. Licensed weightmaster shall positively identify materials as to quantity and certify to each load by a ticket.
 3. Tickets shall be transmitted to the Inspector by a truck driver with load identified thereon. The Inspector will not accept the load without a load ticket identifying the mix and will keep a daily record of placements, identifying each truck, its load and time of receipt and approximate location of deposit in the structure and will transmit a copy of the daily record to DSA.
 4. At the end of the project, the weightmaster shall furnish an affidavit to DSA certifying that all concrete furnished conforms in every particular to proportions established by mix designs.
- E. Special Inspections and Tests shall be in accordance with CBC Chapter 17A, Reinforcement and Anchor testing per CBC Section 1910A and Specification Section 01 4523.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Store cement and aggregate materials so as to prevent their deterioration or intrusion by foreign matter. Deteriorated or contaminated materials shall not be furnished.
- B. Packaged materials shall bear the manufacturers and brand name label, and shall be stored in their original unbroken package in a weather tight place until ready for use in the work.

1.06 PROJECT CONDITIONS

- A. Cold Weather Requirements: Batching, mixing, delivering and placing of concrete in cold weather shall comply with the applicable requirements of ACI 306.1.
- B. Hot Weather Requirements: Batching, mixing, delivering and placing of concrete in hot weather shall comply with the applicable requirements of ACI 305R.
- C. Concrete temperature of freshly mixed concrete shall be determined per ASTM C1064.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cement: ASTM C150. Portland Cement.

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- B. Aggregates: Conform to the following standards:
1. Normal weight concrete: ASTM C33.
 2. Lightweight concrete: ASTM C330, with fine aggregates per ASTM C33.
 3. Aggregate shall be tested for Potential Alkali Reactivity of Cement-Aggregate Combinations per ASTM C289.
 4. Nominal maximum size of coarse aggregate shall be no larger than:
 - a. $\frac{1}{5}$ the narrowest dimension between sides of forms, nor
 - b. $\frac{1}{3}$ the depth of slabs, nor
 - c. $\frac{3}{4}$ the clear spacing between individual reinforcing bars or wires, bundles of bars, individual tendons, or ducts.
 - d. CONTRACTOR may request the ARCHITECT and DSA waiver of the above limitations reported per ACI 318, provided that the workability and methods of consolidation are such that the concrete can be placed without honeycombs or voids.
- C. Water: Water for concrete mixes, curing and cleaning shall be potable and free from deleterious matter.
- D. Admixtures: Shall be shown capable of maintaining essentially the same composition and performance throughout the work as the product used in establishing concrete proportions in accordance with ACI 318, Section 3.6.
1. Admixtures containing chlorides or sulfides are not permitted.
 2. Air-entraining admixtures shall comply with ASTM C260. Air-entrained admixtures shall not be used for floor slabs to receive steel trowel finish.
 3. Admixtures for water reduction and setting time modification shall conform to ASTM C494.
 4. Admixtures for producing flowing concrete shall conform to ASTM C1017.
 5. Fly ash, pozzolan and ground granulated blast-furnace slag: Modify ACI 318 Sections 3.6.6 and 3.6.7 as follows:
 - a. Fly ash, other pozzolan, and/or ground granulated blast-furnace slag used as a partial substitution for ASTM C150 Portland cement shall meet the following requirements:
 - 1) Fly ash or other pozzolans shall conform to ASTM C618 for Class N or F materials (Class C is not permitted).

- 2) Ground granulated blast-furnace slag shall conform to ASTM C989
 - 3) 15 percent max by weight of fly ash, other pozzolans, and/or ground granulated blast-furnace slag may substitute for ASTM C150 Portland cement provided the mix design is proportioned per ACI 318, Section 318 5.3.
6. Admixtures containing ASTM C845 expansive cements shall be compatible with the cement and produce no deleterious effects.
 7. Silica fumes used as an admixture shall conform to ASTM C1240.
- E. Reinforcement Fibers: Chop strands of alkali-resistant polypropylene or nylon fibers added to the concrete mix for protection against shrinkage cracks.
 - F. Expansion Joint Fillers: Preformed strips, non-extruding and resilient bituminous type, of thickness indicated, conforming to ASTM D1751.
 - G. Curing:
 1. Curing Paper: Shall conform to ASTM C171 and consist of two sheets of kraft paper cemented together with a bituminous material in which are embedded cords or strands of fiber running in both directions. The paper shall be light in color, shall be free of visible defects, with uniform appearance.
 2. Elevated slabs and slabs on grade may be cured at CONTRACTOR's option with curing and proactive water vapor emission and alkalinity control system. Products shall be approved by OWNER's Office of Environmental Health and Safety.
 - a. VaporSeal 309, by Floor Seal Technology, Inc., or equal.
 - 1) ASTM C156: 0.39 kg/m².
 - 2) ASTM C309: Exceeds requirements.
 - 3) ASTM C1315: Exceeds requirements.
 - 4) ACI 308R-01 Compliant.
 - b. Remedial Treatment: Water vapor emission and alkalinity control treatment, MES 100 by Floor Seal Technology, Inc. or equal.
 - 1) ASTM E96: <0.1 Perms.
 - 2) ASTM D1308: 14pH Resistant.

- 3) ASTM D7234: 500+psi 100% concrete failure.
- 4) ASTM F2170: 100%RH resistant.
- 5) VOC Content: <100 g/L, meets SCAQMD Rule #1113.
- 6) ASTM F3010: Meets Requirements.

c. Self-leveling Compounds: Ardex Engineered Cements, K15, or V1200, Schonox ZM Rapid, US Self Leveler Armstrong, S-194, or equal.

- H. Floor Hardener: Water soluble, inorganic, silicate-based curing, hardening, sealing and dustproofing compound. Aquaseal W20 by Monopole Inc., Kure-N-Harden by BASF, Chem Hard by L&M, Liqui-Hard by W. R. Meadows, or equal.
- I. Underlayment: Two component latex underlayment for filling low spots in concrete for both interior and exterior applications, from featheredge to a maximum of 3/8 inch in thickness. Underlayment shall be non-shrink and suitable for repairing exposed concrete surfaces and for underlayment of carpet, resilient, tile and quarry floor coverings. La-O-Tex by TexRite, Underlay C, RS by Mer-Krete Systems, Underlayment 962 by C-Cure, or equal.
- J. Vapor Barrier: Refer to Section 07 2600, Vapor Barriers.
- K. Grout: ASTM C1107, non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 7 days; of consistency suitable for application and a 30 minute working time.

2.02 CONCRETE MIX

- A. Mix shall be signed and sealed by a Civil or Structural Engineer currently registered in the State of California.
- B. Strength of Concrete: Strengths and types of concretes shall be as indicated in the Drawings. Unless otherwise indicated or specified, concrete shall be provided with minimum 28-day strength of 3000 psi (f'c).
- C. Concrete mix shall meet the durability requirements of ACI 318, Chapter 4.
- D. Concrete proportioning shall be determined on the basis of field experience and/or trial mixtures shall in accordance with ACI 318, Section 5.3. Proportions of materials shall provide workability and consistency to permit concrete to be placed readily into forms and around reinforcement under conditions of placement to be employed, without segregation or excessive bleeding.

- E. Ready-Mixed Concrete: Mix and deliver in accordance with requirements of ASTM C94.

PART 3 - EXECUTION

3.01 GENERAL

- A. Surfaces to receive concrete shall be free of debris, standing water, and any other deleterious substances before start of concrete placing.
- B. Time of Placing: Do not place concrete until reinforcement, conduits, outlet boxes, anchors, hangers, sleeves, bolts, and other embedded materials are securely fastened in place. Contact the Inspector at least 24 hours before placing concrete; do not place concrete until inspected by the Project Inspector.
- C. Pouring Record: A record shall be kept on the Project site of time and date of placing concrete in each portion of structure. Such record shall be maintained on the Project site until Substantial Completion and shall be available for examination by the ARCHITECT and DSA.

3.02 TOLERANCES

- A. Concrete construction tolerances shall be as specified in ACI 117 and as modified herein.
- B. Floor Flatness (F_F) and Floor Levelness (F_L) shall be as indicated below:

	Specified Overall Value		Minimum Local Value	
	F_F	F_L	F_F	F_L
Slabs on ground: mechanical and electrical rooms, parking structures and mortar bed set tile and quarry flooring.	20	15	15	10
Slab on ground: carpet.	25	20	17	15
Slab on ground: thinset tile and resilient flooring.	35	25	24	17
Suspended slabs: mechanical	20	15	N/A	N/A

and electrical rooms, parking structures and mortar bed set tile and quarry flooring.				
Suspended slabs: carpet.	25	20	N/A	N/A
Suspended slabs: thinset tile and resilient flooring.	35	20	N/A	N/A

- C. Refer to ACI 302.1R, Tables 8.1 and 8.2 Slab on Ground and Suspended Flatness/Levelness Construction Guide, for recommended concrete placing and finishing methods.
- D. Floor Flatness and Floor Levelness shall be tested in accordance to ASTM E1155. Floor measurements shall be made within 48 hours after slab installation, and shall precede removal of shores and forms.

3.03 PREPARATION

- A. For installation of vapor barrier refer to Section 07 2600, Vapor Barriers.
- B. Reglets and Rebates:
 - 1. Form reglets and rebates in concrete to receive flashing, frames and other equipment as detailed and required. Coordinate dimensions and locations required with other related Work.
 - 2. If concrete slabs on grade adjoin a wall or other perpendicular concrete surface, form a reglet in wall to receive and carry horizontal concrete Work. Reglet shall be full thickness of the slab and shall be 3/4 inch wide, unless otherwise indicated. Requirement does not apply to exterior walks, unless specifically indicated.
- C. Screeds: Install screeds accurately and maintain at required grade or slab elevations after steel reinforcement has been installed, but before starting to place concrete. Install screeds adjacent to walls and in parallel rows not to exceed 8 feet on centers.

3.04 INSTALLATION

- A. Conveying and Placing:
 - 1. Concrete shall be placed only under direct observation of the Project Inspector. Do not place concrete outside of regular working hours, unless the Inspector has been notified at least 48 hours in advance.

2. Concrete shall be conveyed from mixer to location of final placement by methods that will prevent separation or loss of materials.
3. Concrete shall be placed as nearly as practicable to its final position to avoid segregation due to re-handling or flowing. No concrete that has partially hydrated or has been contaminated by foreign materials shall be placed, nor shall re-tempered concrete or concrete which has been remixed after initial set be placed.
4. In placing concrete in columns, walls or thin sections, provide openings in forms, elephant trunks, tremies or other recognized devices, to prevent segregation and accumulation of partially hydrated concrete on forms or metal reinforcement above level of concrete being placed. Such devices shall be installed so that concrete will be dropped vertically. Unconfined vertical drop of concrete from end of such devices to final placement surface shall not exceed 6 feet.
5. Concrete shall be placed as a continuous operation until placing of panel or section is completed. Top surfaces of vertically formed lifts shall be level.
6. Concrete shall be thoroughly consolidated by suitable means during placement, and shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms.
7. Where conditions make consolidation difficult or where reinforcement is congested, batches of mortar containing same proportions of cement, sand, and water as provided in the concrete, shall first be deposited in the forms to a depth of at least one inch.

B. Cold Weather:

1. Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather. All ground with which concrete is to come in contact shall be free from frost. No frozen materials or materials containing ice shall be used.
2. The temperature of concrete at the time of placement shall not be below the minimum temperatures given in Table 3.1 of ACI 306.1.
3. Concrete shall be maintained at a temperature of at least 50° F. for not less than 72 hours after placing or until it has thoroughly hardened. Cover concrete and provide sufficient heat as required. When necessary, aggregates shall be heated before mixing. Special precautions shall be taken for protection of transit-mixed concrete.

C. Hot Weather:

1. Concrete to be placed during hot weather shall comply with the requirements of ACI 318, Section 5.13.
2. Maintain concrete temperatures indicated in Table 2.1.5 of ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square feet of exposed concrete per hour.
3. Cool concrete using methods indicated in ACI 305R Appendix B.
4. Place and cure concrete as specified in ACI 305R Chapter 4.

D. Compaction and Screeding:

1. Tamp freshly placed concrete with a heavy tamper until at least 3/8 inch of mortar is brought to surface. Concrete shall then be tamped with a light tamper and screeded with a heavy straightedge until depressions and irregularities are eliminated, and surface is true to finish grades or elevations. Remove excess water and debris.
2. Where slabs are to receive separate cement finish or mortar setting bed, continued tamping to raise mortar to surface is not performed. Laitance shall be removed by brushing with a stiff brush or by light sandblasting to expose clean top surface of coarse aggregate.

E. Floating and Troweling:

1. When concrete has hydrated sufficiently, it shall be floated to a compact and smooth surface. After floating, wait until concrete has reached proper consistency before troweling. Top surfaces shall receive at least 2 troweling operations with steel hand trowel. Prior to and during final troweling, apply a fine mist of water frequently with an atomizing type fog sprayer. Omit troweling for slabs to receive a separate cement finish.
2. For interior finish slabs, final troweling shall provide a hard, impervious, and non-slip surfaces, free from defects and blemishes. Finished surface shall be within tolerances indicated in Article 3.02. Avoid burnishing. Do not add cement or sand to absorb excess moisture.
 - a. Floor of Walk-In Refrigerator: Finish as specified above, to a smooth finish.
 - b. Floor of Gymnasium Locker Rooms: After floating, and while the surface is still plastic, provide a fine textured finish by drawing a fine fiber bristle broom uniformly over the surface in one direction only. Floors sloped for drainage should be brushed in the direction of flow.

3. Vertical concrete surfaces shall be finished smooth and free from marks or other surface defects.

3.05 CURING

- A. Length of time, temperature and moisture conditions for curing concrete shall be in accordance with ACI 318, Section 5.11.
- B. Forms containing concrete, top of concrete between forms, and exposed concrete surfaces after removal of forms shall be maintained in a thoroughly wet condition for at least 7 consecutive days after placing.
- C. If weather is hot or surface has dried out, spray surface of concrete slabs and paving with fine mist of water, starting not later than 2 hours after final troweling and continuing until sunset. Surface of finish shall be kept continuously wet until curing medium has been installed.
- D. Immediately after finishing, monolithic floor slabs shall be covered with curing paper. Paper shall be lapped 4 inches at joints and sealed with waterproof sealer. Edges shall be cemented to finish. Repair or replace paper damaged during construction operations.
- E. When curing slabs with proactive water vapor emission and alkalinity control system:
 1. Coordinate and schedule application of curing compound with concrete pour schedule, while conforming to manufacturer's application instructions.
 2. When the surface of the concrete has hardened sufficiently to sustain foot traffic pre-cure slabs with liquefied product application following manufacturer's written instructions. Application shall be by trained applicators.
 3. Monitor Environmental Conditions: Set up weather station 20 to 30 inches above freshly placed concrete. Record temperature, humidity and wind velocity measurements at 15 minute maximum intervals.
 4. Calculate Evaporation Rate: Use recorded weather information in combination with nomograph per ACI 308R, Figure 4.1, Guide to Curing Concrete, to evaluate relevant evaporation rate.
 5. When the bleed water rate of the concrete is approximately equal to the surface water evaporation rate, spray curing compound material throughout surface of slabs and decks, following manufacturer's written instructions. Application shall be by trained applicators.

6. Perform the following tests at least 28 days after placement of concrete and prior to floor covering installation. Submit to OAR test results indicating locations that do not comply with scheduled flooring installation requirements.
 - a. Calcium chloride testing per ASTM F1869.
 - b. Relative humidity testing per ASTM F2170.
 - c. Alkalinity testing per ASTM F710.
 - d. Perform concrete bond layer humidity meter testing to determine substrate surface acceptability.
7. Areas emitting moisture and alkalinity at rates exceeding floor covering manufacturer's published ASTM F1869 limits, shall receive a corrective coating, at no cost to the OWNER, as follows:
 - a) Mask and protect adjacent walls and floor surfaces from effects of scarification and application of remedial treatment.
 - b) Scarify slab surface in area of application by shot blasting or other method acceptable to corrective coating manufacturer.
 - c) Prepare and fill cracks, control joints and cold joints.
 - d) Apply two-component modified epoxy penetrant and coating with roller and squeegee over required treatment area; saturate surfaces to ensure a through mechanical bond.
 - e) Clean and fill divots, chips, voids and other surface irregularities with one hundred percent Portland cement based patching compound or cementitious fill.
 - f) Apply cementitious surfacing over coating in areas to receive resilient and wood floor coverings to facilitate adhesion; apply to a thickness of 1/8 inch.

3.06 FILLING, LEVELING AND PATCHING

- A. Concrete slabs exhibiting high or low spots and indicated to receive resilient floor covering or soft floor covering, shall have surfaces repaired. High spots shall be honed, or ground with power-driven machines to required tolerances. Low spots shall be filled with latex underlayment, installed in strict accordance with manufacturer's written recommendations.
- B. Holes resulting from form ties or sleeve nuts shall be solidly packed, through exterior walls, by pressure grouting with cement grout, as specified. Grouted

holes on exposed surfaces shall be screeded flush and finished to match adjoining surfaces.

- C. Cement Base: Cement base shall be of the height, thickness, and shape detailed. Base shall be reinforced with one inch mesh, 18 gage, zinc-coated wire fabric. Base finish mixture shall be one part Portland cement, 2 parts of fine aggregate and one part pea gravel. Colored cement base shall include a chemically inert mineral oxide pigment in the mix.

3.07 FINISHING

- A. Soda and Acid Wash: Concrete surfaces to receive plaster, paint or other finish, and which have been formed by oil coated forms, shall be scrubbed with a solution of 1-1/2 pounds of caustic soda to one gallon of water. Surfaces where smooth wood or waste molds have been furnished shall be scrubbed with a solution of 20 percent muriatic acid. Wash with clean water after scrubbing.
- B. Sacking: Exposed concrete curbs, walls, and other surfaces shall be sacked by an application of Portland cement grout, floated, and rubbed. Sacking shall not be performed until patching and filling of holes has been completed. Entire sacking operation for any continuous area shall be started and completed within the same day.
 - 1. Mix one part Portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having consistency of thick paint. Wet surface of concrete sufficiently to prevent absorption of water from grout. Apply grout uniformly with a brush or spray gun, then immediately float surface with a cork or other suitable float, scouring wall vigorously.
 - 2. While grout is still plastic, finish surface with a sponge-rubber float, removing excess grout. Allow surface to dry thoroughly, then rub vigorously with dry burlap to completely remove dried grout. No visible film or grout shall remain after rubbing with burlap.
- C. Sandblasting: Exterior concrete surfaces to receive stucco dash coat finish, where plywood or other smooth forms have been furnished, shall be uniformly sand-blasted with sharp quartz sand under sufficient air pressure to remove dirt, form oil and other foreign materials, and roughen surface to provide a proper bond. Such surfaces shall be thoroughly washed with clean water after sandblasting.
- D. Abrasive: Concrete stair treads, landings, ramps and steps on interior and exterior of buildings, and interior exposed concrete floors in shop buildings shall receive an abrasive finish.
- E. Floor Hardener: Exposed interior concrete floors throughout shall be treated with floor hardener.

1. Protect adjacent surfaces. Clean surfaces to receive treatment in accordance with manufacturer's instructions, ensuring that all stains, oil, grease, form release agents, laitance, dust and dirt are removed prior to application.
 2. Apply hardener in accordance with manufacturer's instructions as soon as concrete is firm enough to work on after final troweling.
- F. Cement Grout and Dry-Pack Concrete: Cement grout shall be mixed at the Project site and shall be composed of one volume of Portland cement and 2-1/2 volumes of fine aggregate. Materials shall be mixed dry with sufficient water added to make mixture flow under its own weight. When grout is used as a dry pack concrete, add sufficient water to provide a stiff mixture, which can be molded into a sphere.
- G. Broom Finish: Exterior stair treads and landings shall be provided with a non-slip broom finish in addition to abrasive finish specified.
- H. Abrasive Stair Nosing: Nosing shall be installed according to manufacturers written recommendations.

3.08 EXPANSION AND CONSTRUCTION JOINTS

- A. Construction Joints: Details and proposed location of construction joints shall be as indicated on the Drawings, located to least impair strength of structure, in accordance with the following:
1. Thoroughly clean contact surface by sand blasting entire surface not earlier than 5 days after initial placement.
 2. A mix containing same proportion of sand and cement provided in concrete plus a maximum of 50 percent of coarse aggregate shall be placed to a depth of at least one inch on horizontal joints. Vertical joints shall be wetted and coated with a neat cement grout immediately before placing of new concrete.
 3. Should contact surface become coated with earth, sawdust, or deleterious material of any kind after being cleaned, entire surface shall be re-cleaned before applying mix.
- B. Expansion Joints: Provide expansion joints where indicated in walks and exterior slabs. Space approximately 20 feet apart, unless otherwise indicated. Joints shall extend entirely through slab with joint filler in one piece for width of walk or slab. Joint filler shall be 3/8 inch thick, unless otherwise indicated.
- C. Tooled Joints: Slabs, walks and paving shall be marked into areas as indicated with markings made with a V-grooving tool. Marks shall be round-edged, free

from burrs or obstructions, with clean cut angles and shall be straight and true. Walks, if not indicated, shall be marked off into rectangles of not more than 12 square feet and shall have a center marking where more than 5 feet wide.

3.09 TESTING

A. Molded Cylinder Tests:

1. Inspector or testing lab personnel will prepare cylinders and perform slump tests. Samples for concrete strength shall be taken in accordance to ASTM C172. Each cylinder shall be dated, given a number, point in structure from which sample was obtained, mix design number, mix design strength and result of accompanying slump test noted.
2. Separate tests of molded concrete cylinders obtained at same place and time shall be made at age of three days, seven days, and 28 days. A strength test shall be the average of the compressive strength of two cylinders, obtained from the same sample of concrete and tested at 28 days or at test age designated for determination of f'_c .
3. Test cylinders shall be prepared at the Project site and stored in testing laboratory in accordance with ASTM C31, and tested in accordance with ASTM C39.

B. Core Test: At request of the ARCHITECT, cores of hardened concrete shall be cut from portions of hydrated structures for testing, in accordance with CBC and ASTM C42.

1. Provide 4 inch diameter cores at representative places throughout the structure as designated by the ARCHITECT.
2. In general, provide sufficient cores to represent concrete placed with at least one core for each 4,000 square feet of building area, and at least 3 cores total for each Project.
3. Where cores have been removed, fill voids with drypack, and patch the finish to match the adjacent existing surfaces.

C. Concrete Consistency: Measure consistency according to ASTM C143. Test twice each day or partial day's run of the mixer.

D. Adjustment of Mix: If the strength of any grade of concrete for any portion of Work, as indicated by molded test cylinders, falls below minimum 28 days compressive strength specified or indicated, adjust mix design for remaining portion of construction so that resulting concrete meets minimum strength requirements.

- E. Air Content Testing: Measure in accordance to ASTM C173 or ASTM C231, for each composite sample taken in accordance to ASTM C172.
- F. Defective Concrete:
 - 1. Should strength of any grade of concrete, for any portion of Work indicated by tests of molded cylinders and core tests, fall below minimum 28 days strength specified or indicated, concrete will be deemed defective Work and shall be replaced or adequately strengthened in a manner acceptable to the ARCHITECT and DSA.
 - 2. Concrete Work that is not formed as indicated, is not true within 1/250 of span, not true to intended alignment, not plumb or level where so intended, not true to intended grades and levels, contains sawdust shavings, wood or embedded debris, or does not fully conform to Contract provisions, shall be deemed to be defective Work and shall be removed and replaced at no additional expense to OWNER.
- G. Concrete for Equipment Pads, Mechanical and Electrical Work: Unless otherwise indicated, strength shall have a minimum $f_c = 3,000$ psi. Exposed concrete shall be provided with a hand trowel finish with radius corners and edges. Form and place concrete where necessary as described in Section 03 1000 Concrete Forming and Accessories, and reinforced as described in Section 03 2000 Concrete Reinforcing. Calcium chloride shall not be furnished in any concrete mix provided for the installation of underground electrical conduits. For concrete encasement of more than one conduit, furnish 3/4 inch maximum aggregate.

3.10 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.11 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 05 0513
HOT-DIP GALVANIZING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Hot-dip galvanizing of fabricated steel assemblies.
 - 2. Preparation of galvanized steel assemblies for painting.
- B. Related Sections:
 - 1. Division 01 - General Requirements.
 - 2. Section 05 5000: Metal Fabrications.
 - 3. Section 09 9000: Painting and Coating.

1.02 REFERENCES

- A. American Galvanizers Association (AGA):
 - 1. Inspection of Products Hot-dip Galvanized after Fabrication.
 - 2. The Design of Products to be Hot-dip Galvanized after Fabrication.
 - 3. Recommended Details of Galvanized Structures.
- B. ASTM International (ASTM):
 - 1. ASTM A123 – Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
 - 2. ASTM A143 – Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - 3. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 4. ASTM A384 – Standard Practice for Safeguarding Against Warpage and Distortion during Hot-Dip Galvanizing of Steel Assemblies.
 - 5. ASTM A385 – Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip).

6. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 7. ASTM B6 – Standard Specification for Zinc.
 8. ASTM D6386 – Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
 9. ASTM D7803 - Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating.
 10. ASTM E376 - Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods.
- C. The Society for Protective Coatings (SSPC):
1. SSPC-SP1 – Solvent Cleaning.
 2. SSPC-SP2 – Hand Tool Cleaning.
 3. SSPC-SP3 – Power Tool Cleaning.
 4. SSPC-SP5 – White Metal Blast Cleaning.
 5. SSPC-SP7 – Brush-Off Blast Cleaning.
 6. SSPC-SP10 – Near White Blast Cleaning.
 7. SSPC-SP11 – Power Tool Cleaning to Bare Metal.
 8. SSPC-SP16 - Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals.

1.03 COORDINATION WITH STEEL FABRICATOR

- A. Prior to fabrication, steel fabricators shall submit approved fabrication shop drawings to the galvanizer. The Galvanizer shall review fabricator shop drawings for suitability of materials for galvanizing and coatings and coordinate any required fabrication modifications.
- B. Steel Fabricator shall notify the galvanizer of steel fabrications that exceed the ASTM A385 recommended percentages for carbon, phosphorus, manganese and silicon, so special galvanizing processing techniques are used.
- C. Coordinate with steel fabricator appropriate marking and masking materials.

1.04 QUALITY ASSURANCE

- A. Coating Applicator: Company specializing in hot-dip galvanizing after fabrication following the procedures in the Quality Assurance Manual of the American Galvanizers Association.
- B. Galvanizer shall have an in-plant inspection program designed to maintain the coating thickness, finish, and appearance within the requirements of this Section.

1.05 SUBMITTALS

- A. Galvanizing Certificate of Compliance: Provide notarized Certificate of Compliance with ASTM standards and specifications herein listed. The Certificate shall be signed by the galvanizer and contain a detailed description of the material processed. The Certificate shall include information as to the ASTM standard used for the coating.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Package and handle galvanized material in a manner which will avoid damage to the zinc coating.
- B. Store in dry, well-ventilated conditions until shipping.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel for Galvanizing: As specified in Sections:
 - 1. Section 05 5000: Metal Fabrications.
- B. Zinc for Galvanizing: Conform to ASTM B6, as specified in ASTM A123.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Remove welding slag, splatter, anti-splatter compounds and burrs remaining in steel articles.
- B. Provide drainage and venting holes in tubular assemblies. In thicker material drill holes in place of punching. Holes shall have a relatively uniform circumference. Punched holes or burned holes with a plasma torch shall be treated with a drill to even the diameter to appropriate size.
- C. Masking installed by steel fabricator shall remain in place through galvanizing process completion.

- D. Provide lifting lugs to allow for handling during galvanizing. Avoid the use of chains or wires directly connected to steel articles.
- E. Safeguard against warpage or distortion of steel members in accordance with ASTM A384.
- F. Pre-clean steel work in accordance with accepted methods to produce an acceptable surface for quality hot-dip galvanizing. Remove surface contaminants and coatings that are not removable by the normal chemical cleaning process in the galvanizing operation by grit-blasting, sand-blasting, or other mechanical means.
- G. Follow the degreasing, pickling and fluxing steps to remove remaining oxides and to deposit a protective layer on the steel to prevent any further oxides from forming on the surface prior to immersion in the molten zinc.

3.02 COATING APPLICATION

- A. Galvanize steel articles, fabrications and assemblies by the hot-dip process in accordance with ASTM A123. The bath chemistry shall be as specified by ASTM B6, and requires at least 98% pure zinc maintained at approximately 840 F.
- B. Galvanize bolts, nuts, washers and iron and steel hardware components in accordance with ASTM A153.
- C. Safeguard products against steel embrittlement in conformance with ASTM A143.
- D. Once the fabricated items' coating growth is complete, withdraw slowly from the galvanizing bath, and remove the excess zinc by draining, vibrating, and/or centrifuging.
- E. Prepare galvanized products for powder coating in accordance to ASTM D7803. Prepare galvanized products for painting in accordance to ASTM D6386.
- F. Handle articles to be galvanized in such a manner as to avoid mechanical damage and to minimize distortion.
- G. Apply a chromate passivation treatment to fabrications that will not be painted after galvanizing to minimize the wet storage staining which may occur on articles unable to be stored in dry, well-ventilated conditions.

3.03 COATING REQUIREMENTS

- A. Conform to paragraph 6.1 of ASTM A123, or Table 1 of ASTM A153, as applicable.
- B. Surface Finish: Continuous, adherent, as smooth and evenly distributed as possible and free from any defect detrimental to the stated end use of the coated article

- C. Adhesion: Withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.

1.04 TESTS

- A. Inspection and testing of hot-dip galvanized coatings shall be done under the guidelines provided in the AGA publication Inspection of Products Hot-dip Galvanized after Fabrication. Tests and inspections shall be performed immediately after the coating is applied and has cooled to ambient temperature, and before it leaves the galvanizing facility.
- B. Include visual examination and test methods in accordance with ASTM A123, or A153, as applicable, to determine the thickness of the zinc coating on the metal surface.
- C. During the visual inspection, if adhesion concerns are suspected, such as peeling or flaking of the galvanized coating, then adhesion testing using the stout knife method shall be conducted. Embrittlement testing is required when there is evidence of embrittlement and shall be conducted per the requirements of ASTM A143.
- D. Upon completion of tests furnish notarized Certificate of Compliance with ASTM standards and specifications herein listed.

3.05 REPAIR OF DAMAGED COATINGS

- A. Smooth out rough surfaces, bumpy or high spots and icicles by hand filing or power sanding the area without removing any more zinc coating than necessary. Repair damaged galvanized surface with a zinc rich coating.
- B. Repair areas damaged during galvanizing process or handling by one of the approved methods in accordance with ASTM A780 whenever damage exceeds 3/16" in width. Minimum thickness requirements for the repair shall be per ASTM A123, Section 6.2.
- C. Remove lifting lugs and repair coating with a zinc rich coating.
- D. Surface preparation for application of zinc rich coating shall be in accordance to ASTM A780.
 - 1. Clean areas in accordance to SSPC-SP2.
 - 2. Prepare surface for zinc spray in accordance to SSPC-SP5, or zinc rich paint repair in accordance to SSPC-SP10.

3.06 PREPARATION FOR TOP COATING

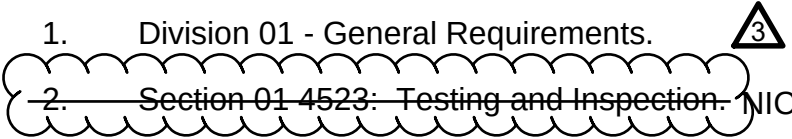
- A. Galvanized fabrications indicated on the drawings to be painted shall be prepared in accordance to ASTM D6836.
 - 1. Surface cleaning prior to surface preparation in accordance to SSPC-SP1.
 - 2. Removal of zinc high spots and cleaning of light deposits of zinc reaction products in accordance to SSPC-SP2 or SSPC-SP3.
 - 3. Profile surface in accordance to SSPC-SP7 or SSPC-SP11.
- B. Galvanized fabrications indicated on the drawings to be powder coated shall be prepared in accordance to ASTM D7803.
 - 1. Surface cleaning and removal of oil and grease in accordance to SSPC-1.
 - 2. Surface smoothing and removal of loose particles in accordance to SSPC-SP-2 or SSPC-SP3.
 - 3. Sweep blasting and surface profiling in accordance to SSPC-SP16.

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Metal fabrications:
1. Miscellaneous fabrications, as indicated on the Drawings.
- B. Related Requirements:
1. Division 01 - General Requirements.
 2. ~~Section 01 4523: Testing and Inspection.~~  NIC
 3. Section 03 3000 – Cast-in-Place Concrete.
 4. Section 05 5013: Hot-Dip Galvanizing.

1.02 REFERENCES

- A. ASTM International (ASTM):
1. ASTM A27 – Standard Specification for Steel Castings, Carbon, for General Application.
 2. ASTM A36 – Standard Specification for Carbon Structural Steel.
 3. ASTM A47 - Standard Specification for Ferritic Malleable Iron Castings.
 4. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 5. ASTM A123 - Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
 6. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 7. ASTM A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
 8. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
 9. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

10. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 11. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
 12. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 13. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
 14. ASTM D1187 - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
 15. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
 16. ASTM F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
- B. American Welding Society (AWS):
1. AWS D1.1 Structural Welding Code - Steel.
 2. AWS D1.3 Structural Welding Code - Sheet Steel.
 3. AWS D-19.0 Welding Zinc Coated Steel.

1.03 COORDINATION

- A. Coordination between Steel Fabricator and Galvanizer:
1. Prior to fabrication, submit approved fabrication shop drawings to the galvanizer.
 2. Notify galvanizer of steel fabrications that exceed the ASTM A385 recommended percentages for carbon, phosphorus, manganese and silicon, so special galvanizing processing techniques are used.
- B. Coordinate installation of metal fabrications that are anchored to concrete or masonry, or that receive work specified by other Sections. 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.
- C. Field Measurements: Field verify dimensions prior to fabrication.
- D. Coordinate selection of shop primers with galvanizing, and with paintings to be applied over them. Comply with paint and coating manufacturers' written

recommendations to ensure that shop primers and paintings are compatible with one another.

1.04 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating provided materials, dimensions, anchoring detail, and details of termination or connection to adjacent construction. Indicate items that are purchased from a manufacturer and items that are shop fabricated. Indicate component parts requiring Project site fabrication or assembly.
- B. Product Data: Submit Product Data for manufactured items. Submit Product Data for primers and finishes.
- C. Material Samples: Submit Samples of primers and finishes on fabricated items.
- D. Fabricator qualifications per Article "Quality Assurance".
- E. Welding:
 - 1. Welder's Certificates: Field welders shall be Project certified in accordance with AWS D1.1.
 - 2. Welding Material Certification: Provide certificate that welding material complies with specifications.
- F. Research/Evaluation Reports: ICC-ES for post-installed anchors.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm with a minimum five year experience in successfully producing metal fabrications similar to that shown on the drawings.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D-1.1– Structural Welding Code – Steel.
 - 2. AWS D1.3 - Structural Welding Code - Sheet Steel.
- C. Inspection of Welding: Refer to Section 01 4523: Testing and Inspection.
- D. Field applied primers, paintings, sealers and adhesives shall be approved by the OWNER's Office of Environmental Health and Safety (OEHS).
- E. Preassemble items in shop to greatest extent possible to minimize field welding. Mark units for reassembly and coordination of installation. Use marking method compatible with galvanizing.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Store miscellaneous metal items above grade on platforms, skids, or other required supports.
- B. Protect from damage and from corrosion, dirt, grease and other foreign matter.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Structural Steel Shapes: ASTM A36.
- B. Rolled Steel Plates: ASTM A36. Plates to be bent or cold-formed shall conform to ASTM A283, Grade C.
- C. Round HSS: ASTM A500 Grade B or C.
- D. Square and Rectangular HSS: ASTM A500 Grade B or C.
- E. Steel Pipe: ASTM A53 Type E or S, Grade B, standard weight (Schedule 40), unless otherwise noted. Black finish.
- F. Steel Sheet: ASTM A1008 or ASTM A1011.
- G. Steel Bolts: ASTM A307, Grade A, or F3125 with hex steel nuts per ASTM A563 and washers. Galvanized in accordance with ASTM A153 for exterior locations.
- H. Steel Bars: Conforming to ASTM A108 or ASTM A575.
- I. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27. Provide bolts, washers, and shims, hot-dip galvanized per ASTM A153.
- J. Nonshrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- K. Concrete Materials:
 - 1. Concrete per Section 03 3000, Cast-in-Place Concrete.
 - 2. Welded wire fabric and reinforcing per section 03 2000, Concrete Reinforcing.

2.02 FABRICATION

- A. General:

1. Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces. Mark units for reassembly and installation.
 2. Cut, drill, and punch metals cleanly and accurately. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated or specified. Remove sharp and rough areas on exposed surfaces. Form exposed work with accurate angles and surfaces and straight edges. Form exposed connections with hairline joints, flush and smooth. Locate joints where least conspicuous.
- B. Welding:
1. Weld connections unless otherwise indicated.
 2. Weld corners and seams continuously and in accordance with requirements of AWS D1.1 Structural Welding Code. Welds shall be inspected as required in Section 05 1200- Structural Steel Framing. NIC
 3. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

2.03 PREPARATION FOR GALVANIZING

- A. Fabricate to the largest size possible and whenever possible use slip joints to minimize field welding.
- B. Fabricate structural steel in accordance with Class I, II, III guidelines as described in AGA's Recommended Details for Galvanized Structures, to facilitate galvanizing process. Corners of gussets, stiffeners, and bracing shall be cropped to allow free flow of zinc during galvanizing process.
- C. Remove welding slag, splatter, anti-splatter compounds and burrs prior to delivery for galvanizing.
- D. Marking for Identification: Avoid unsuitable marking paints for identification, such as oil based paints and markers and crayon markers. Use water soluble paints or markers acceptable to galvanizer or steel tags wired to the work.
- E. Masking: Use masking materials recommended by the American Galvanizers Association (AGA) to produce ungalvanized areas for field welding and at slip critical bolts.
- F. Galvanize fabrications per Section 05 5013, Hot-Dip Galvanizing, in accordance with ASTM A123 and ASTM A153.

PART 3 - EXECUTION

3.01 EXAMINATION

NEW HVAC SYSTEM AT
SANTA ROSA ELEMENTARY SCHOOL
PLEASANT VALLEY SCHOOL DISTRICT

METAL FABRICATIONS
05 5000-5

- A. Examine the areas where metal fabrications are to be installed. Notify the OAR in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Provide anchorage devices and fasteners as indicated in the drawings and where necessary for securing miscellaneous metal fabrications to in-place construction.
- B. Cut, drill, and fit as required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of hot-dip galvanized fabrications intended for bolted or screwed field connections.
- D. Alignment: Verify alignment of items with adjacent construction. Coordinate related work.
- E. Grout: Follow manufacturer's recommendations for substrate preparation and application.
- F. Corrosion Protection: Coat concealed surfaces of metals that will come into contact with grout, concrete, masonry, or wood, with a heavy coat of bituminous paint or zinc chromate primer. Protect dissimilar metals from galvanic corrosion by pressure tapes, coating, or isolators.

3.03 FIELD WELDING

- A. Preparation of Weld Area of Galvanized Fabrications: Remove masking from fabrications. Remove remaining zinc coating between one inch and four inches from both sides of members to be welded, by grinding back the zinc coating, burning the zinc away or pushing back the molten zinc from the weld area.
- B. Welding: Comply with AWS Code for procedures of manual shielded metal-arch welding, appearance and quality of welds made, methods used in correcting welding work.
 - 1. Weld in accordance to AWS D-1.1.
 - 2. Weld galvanized fabrications in accordance to AWS D-19.0.
- C. Remove welding flux immediately. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surfaces matches those adjacent.

- D. Upon completion of welding plug vent, drainage and lifting holes of galvanized fabrications with appropriate diameter zinc plugs. Push in about half way by hand, and hammer to a tight fit. With a hand file or an abrasive tool, file away excess material. Repair scratches with a zinc rich coating.

- 1. Plug railing holes.
- 2. Plug visible holes of HSS members.

3.04 ADJUSTING AND CLEANING

- A. Touch Up Damaged Surfaces:
 - 1. Galvanized Surfaces: Clean field welds, connections and damaged areas. Apply two coats of Carbomastic 15, by Carboline or equal product approved by OWNER's OEHS. Brush or roll to a 4 to 6 mil thickness.

3.05 CLEAN UP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.06 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Rough carpentry Work.
 2. Installation of glued laminated members, plywood web joists or wood chord metal web joists.
- B. Related Requirements:
1. Division 01 - General Requirements. 
 - ~~2. Section 01 4523: Testing and Inspection. NIC~~
 3. Section 09 2900: Gypsum Board.

1.02 SYSTEM DESCRIPTION

- A. Regulatory Requirements:
1. Work of this Section shall comply with CBC Chapter 23A.

1.03 QUALITY ASSURANCE

- A. Comply with the following as a minimum requirement:
1. Redwood structural and framing lumber shall be graded in accordance with Standard Specifications for Grades of California Redwood Lumber of the Redwood Inspection Service.
 2. Douglas fir, larch or hemlock structural and framing lumber shall be graded in accordance with the Standard Grading Rules of the West Coast Lumber Inspection Bureau (WCLIB) or the Western Lumber Grading Rules of the Western Wood Products Association (WWPA).
 3. Plywood shall conform to requirements of Product Standard PS 1, and shall be grade marked by a recognized grading agency (APA and PTL).
- B. Lumber shall bear official grade mark of the association under whose rules it was graded or official grade mark of another recognized grading agency.
- C. Structural and framing members 2-inch thick (nominal) and larger shall be air-dried to moisture content not to exceed 19 percent before installation.

- D. Each piece of preservative treated lumber shall be identified by the Quality Mark of an approved inspection agency in accordance with CBC Chapter 23A; refer to Section 01 4523: Testing and Inspection. ~~NIC~~



- E. Lumber showing visible signs of mold growth:
1. Lumber showing visible signs of mold growth shall be removed from the project site or cleaned as outlined below.
 2. The contractor is responsible for all costs associated with cleaning, post-cleaning testing, and reporting for lumber with mold.
 - a. Lumber that shows visible signs of mold growth prior to, or after installation, shall be cleaned pursuant to USEPA's guidance publication "Mold Remediation in Schools and Commercial Buildings dated March 2001 (EPA 402-K-01-001).
 - b. A minimum of 10 percent of the total locations cleaned must be sampled (tape lift method) post cleaning to ensure cleaning effort was successful. Cleaning will be considered acceptable when tape lift sample results evaluated by direct microscopic examination determine that the general abundance of mold is non-detect or rare (normal trapping to 1+).
 - c. A report prepared by a Certified Industrial Hygienist (CIH) that details the sampling and cleaning results shall be prepared and submitted to the OAR for review and approval of the ~~LAUSD~~ ^{NIC} Office of Environmental Health and Safety.
 - d. Cleaned lumber shall not be installed or enclosed by finish materials until approval of test results. Cleaned lumber must meet moisture content requirements as required elsewhere in this specification prior to installation or application of finishes.

1.04 STORAGE, HANDLING AND PROTECTION

- A. The materials supplied as part of the Work of this section shall be protected from exposure to inclement weather before being covered by other Work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Lumber: Structural and framing lumber shall be of following species and grades:

	<u>INSTALLATION</u>	<u>SPECIES</u>	<u>GRADE</u>
1.	Subfloor, wall sheathing, roof sheathing and ceiling furring	Douglas fir and larch	Construction Board, WCLIB; WWP

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- | | | |
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| 2. | Posts, (5-inch by 5-inch and larger, Douglas fir width not more than 2 inches greater than thickness).
Timbers, WCLIB. | No. 1 or better Structural and larch Posts and

No. 1 or better Post and Timbers, WWP. |
| 3. | Beams, girders and truss members Douglas fir (5-inch and thicker, rectangular, and larch width more than 2-inches greater than thickness) where exposed as finish members. | No. 1 or better Structural Beams and Stringers, WCLIB; WWP. |
| 4. | Joists, rafters, lintels, posts, Douglas fir mullions and members (2 to 4-inch thick, 2 to 4-inch wide) | No. 1 or better; Structural Light Framing, WCLIB; |
| 5. | Other lumber (2 to 4-inch thick, 2 to 4-inch wide) not specified in subparagraph 5 above. | Douglas fir and larch

Construction Light Framing WCLIB; WWP |
| 6. | Framing lumber (2 to 4-inch thick, 5-inch and wider). | Douglas fir and Larch

No. 1 or better Structural Joists and Planks, WCLIB; WWP. |
| 7. | Mudsills and plates in contact with earth. | Douglas fir and Larch Treated

Same as subparagraphs 5 and 6. |
| 8. | Sills or plates installed on concrete or masonry surfaces 6 inches or less above earth or finish grade. | Douglas fir and Larch Treated

Same as subparagraphs 5 and 6. |
| 9. | Sills, foundation plates and sleepers
subparagraphs
installed on concrete, masonry foundations, or installed on concrete slab in direct contact with earth. | Douglas fir and Larch treated

Same as 5 and 6. |
| 10. | Miscellaneous nailing strips and blocks embedded in concrete or masonry. | Douglas fir and Larch treated

Same as subparagraphs 5 and 6. |
- B. Plywood: Plywood furnished for structural purposes, when exposed outdoors, shall be exterior type plywood. Other plywood furnished for structural purposes shall be exterior type, or Exposure 1.
- C. OSB Board or Panels:

1. Oriented strand board or panels shall not be furnished as part of the Work of this section.
- D. Preservative Treated Wood:
1. Wood and plywood specified; as treated wood shall be pressure treated wood in accordance with CBC requirements.
 2. Seasoning: Treated lumber shall be air seasoned after treatment, for a minimum of two weeks before installation. Moisture content shall be 15 percent maximum.
 3. Creosote or arsenic is not permitted for treating wood.
 4. When treated wood member have been notched, dapped, drilled, or cut, such newly cut surfaces shall be painted with a heavy coat of the same preservative material originally provided for treatment of wood member.
- E. Fire Retardant Protection: Wood and plywood specified as fire retardant protected wood shall be treated by approved methods and materials and shall be dried following treatment to maximum moisture content as follows:
1. Solid sawn lumber 2-inch thick or less: 19 percent.
 2. Plywood: 15 percent.
- F. Plywood Subflooring: Underlayment, Group 1, Exposure 1; of thickness indicated.
- G. Mineral Fiber Panels: Asbestos-free, thickness as indicated.
- H. Adhesive: Tec, Inc. Sturdi-Bond TA-175, Top Industrial Inc., Rainbuster 345, Liquid Nails LN-940, or equal elastomeric adhesive conforming to ASTM D 3498 and APA-AFG-01.

PART 3 - EXECUTION

3.01 FASTENINGS

- A. Nails and Spikes:
1. Furnish only common wire nails or spikes whenever indicated, specified or required.
 2. Whenever necessary to prevent splitting, holes shall be pre-drilled for nails and spikes.
 3. Nails in plywood shall not be overdriven.
 4. Machine Applied Nailing: Use of machine nailing is subject to a satisfactory Project site demonstration for each Project and approval by

the Architect or structural engineer retained by the Architect as an Architect Consultant and DSA. Installation is subject to continued satisfactory performance. Machine nailing is not permitted for 5/16 inch plywood. Do not permit nail heads to penetrate outer ply. Maintain minimum allowable edge distances when installing nails.

B. Lag Screws:

1. When installing lag screws in a wood member, pre-drill hole as required by the CBC.
2. Lag screws, which bear on wood, shall be fitted with standard steel plate washers under head. Lag screws shall be screwed and not driven into place.

C. Bolts:

1. Lumber and timber to be fastened together with bolts shall be clamped together with holes for bolts bored true to line.
2. Bolts shall be fitted with steel plates or standard cut washers under heads and nuts. Bolts shall be tightened when installed and again before completion of the Work of this section.

D. Wood Screws: When installing wood screws, pre-drill holes as required by the CBC.

E. Metal Framing Devices: Framing anchors, joist hangers, ties, and other mechanical fastenings shall be galvanized or furnished with a rust inhibitive coating. Nails and fastenings shall be of the type recommended by manufacturer.

F. Powder Driven Fasteners:

1. Loads shall not exceed 75 pounds unless indicated on the Drawings or when reviewed by the Architect.
2. The operator, tool, and fastener shall perform the following as observed by the Inspector.
 - a. Observe installation of first 10 fasteners.
 - b. Test the first 10 fasteners by performing a pullout test. Load shall be at least twice the design load, or 150 pounds, whichever is greater.
 - c. Random testing:
 - 1) Load less than 75 pounds - approximately 1 in 10 pins.
 - 2) Load 75 pounds or greater - 1/2 of the pins.

3. Failure of any test will result in testing of all installed pins.
4. Nail heads shall not break the outer skin of sheathing.
5. Non-compliant pins shall be replaced.

3.02 INSTALLATION

A. Stud Walls, Partitions and Furring:

1. Wood stud walls, partitions and vertical furring shall be constructed of members of size and spacing indicated. Provide single treated plate at bottom and double plate at top unless otherwise indicated. Interior, nonbearing non-shear partitions may be framed with a single top plate, installed to provide overlapping at corners and at intersections with other wall and partitions or by metal ties as detailed.
2. Walls and partitions shall be provided with horizontal staggered blocking at least 2 inch nominal thickness and same width as studs, fitted snugly, and nailed into studs. Blocking shall be installed at mid-height of partition or not more than 7 feet on center vertically. Install wood backing on top of top plate wherever necessary for nailing of lath or gypsum board.
3. Walls, partitions and furred spaces shall be provided with 2-inch nominal thickness wood firestops, same width as space to be firestopped, at ceiling line, mid-height of partition and at floor line. Firestops at floor line are not required when floor is concrete. If width of opening is such that more than one piece of lumber is necessary, provide two thicknesses of one inch nominal material installed with staggered joints.
4. Firestops shall be installed in stud walls and partitions, including furred spaces, so the maximum dimension of any concealed space is not over 10 feet.
5. Corners, and where wood stud walls and wood vertical furring meet, shall be constructed of triple studs. Openings in stud walls and partitions shall be provided with headers as indicated and a minimum of 2 studs at jambs, one stud of which may be cut to support header in bearing.
6. Where wood and masonry or concrete walls intersect, end stud shall be fastened at top, bottom and mid-height with one 1/2 inch diameter bolt through stud and embedded in masonry or concrete a minimum of 4 inches. Bolts shall be provided with washers under nuts.
7. Sills under bearing, exterior or shear walls shall be bolted to concrete with 5/8 inch diameter by 12-inch long bolts with nuts and washers, spaced not more than 4 feet on center unless noted otherwise. There shall be a bolt within 9 inches of each end of each piece of sill plate. Sills shall be installed and leveled with shims, washers, with nuts

tightened to level bearing. Space between sill and concrete shall be dry packed with cement grout.

B. Floor Joists, Roof and Ceiling Framing:

1. Wood joists shall be of the size and spacing indicated, installed with crown edge up, and shall have at least 4-inch bearing at supports. Provide 2-inch solid blocking, cut in between joists, same depth as joists, at ends and bearings, unless otherwise indicated.
2. Floor joists of more than 4 inches in depth and roof joists of more than 8 inches in depth shall be provided with bridging. Floor joists shall be bridged every 8 feet with solid blocking or metal cross bridging. Roof joists shall be bridged every 10 feet.
3. Joists under and parallel to bearing partitions shall be doubled and nailed or bolted together as detailed. Whenever a partition containing piping runs parallel to floor joists, joists underneath shall be doubled and spaced to permit passage of pipes and blocked with solid blocking spaced at not more than 4 feet intervals.
4. Trimmer and header joists shall be doubled, when span of header exceeds 4 feet. Ends of header joists more than 6 feet long shall be supported by framing anchors or joist hangers unless bearing on a beam, partition, or wall. Tail joists over 12 feet long shall be supported at header by framing anchors or on ledger strips at least 2 by 4.
5. Provide solid blocking between rafters and ceiling joists over partitions and at end supports where indicated.

C. Beams, Girders and Joists:

1. Ends of wood beams, girders and joists which are 2 feet or less above finished outside grade and which abut, but do not enter concrete or masonry walls, as well as wood blocking used in connection with ends of those members shall be treated with wood preservative.
2. Where wood beams, girders and joists enter masonry or concrete walls 2 feet or less above outside wall, metal wall boxes or equivalent moisture barriers shall be provided between wood and masonry or concrete.

D. Subflooring:

1. Floor sheathing: Plywood of thickness and nailing indicated. Install with the face grain across supports, end joints staggered and centered over supports. Provide solid blocking under plywood edges where indicated. In addition to nailing, sheets of plywood flooring shall be secured in place with elastomeric adhesive, installed at beams, joints, perimeter supports and panel edges.

E. Roof and Wall Sheathing:

1. Plywood roof sheathing shall be Structural I, Grade C-D, Exposure 1, thickness as indicated.
2. Where exposed roof sheathing is indicated, area shall be sheathed solid with dressed and center matched, V-jointed boards of sizes indicated. Boards shall be installed perpendicular to supports.
3. Soffits of overhanging eaves, where indicated, shall be boxed-in using Group I, Exterior Type, Grade A-C, plywood, thickness as indicated.
4. Plywood for shear walls shall be Structural I, Grade C-D Exterior Type, thickness as indicated. Install with the long dimension parallel or perpendicular to the supports. Blocking shall be provided behind edges not located over supports. Shear wall construction, nailing, and top and bottom anchorage shall be as indicated.
5. Provide and install metal H-clips of required size, midway between rafters at unsupported edge joints of plywood roof sheathing where rafters are spaced at 24 inches on center. Clips shall be Plyclips, by Timber Fasteners Inc., Panel Clips by Simpson Co., USP Structural Connectors, or equal.

F. Attic Space Partitions and Attic Walkways:

1. Attic space partitions shall be constructed of 2 by 4 wood members spaced at 2 feet on center maximum with 5/8 inch gypsum board.
2. Doors in attic space partitions shall be self-closing, of the same sheathing material as partition, constructed with 2 battens and a diagonal brace across back.
3. Shear walls passing through attic space shall be sheathed with 5/8 inch gypsum board on each side.
4. Attic walkways shall be constructed of 2 by 12 planks installed one-inch apart and nailed at each support with three 16d nails.

G. Furring:

1. Rafters or ceiling joists indicated to be furred for support of materials other than acoustical tile shall be furred with 2 by 4 wood members installed at right angles to supports, spaced as indicated and nailed in place. Furring shall be aligned, and bottoms shall be leveled by installing wood shims as required, and nailed as indicated.
2. Furring for protective wall padding in gymnasium shall be 1 by 3 Douglas fir, Construction Boards, S1S1E; applied horizontally to concrete walls at top and bottom of padding panels; and at uniform intermediate spacing not more than 18 inches on center. Stripping shall be shimmed where required, aligned to a true plane, and secured to concrete walls with concrete nails at not more than 18 inches on center.

- H. Furring: Where metal furring is not indicated or specified, provide wood furring at points indicated and required for concealing conduit, piping, structural framing or other unfinished materials. Wood furring shall be 2-by studs of required width. Vertical members contacting concrete or masonry shall be attached as specified for anchoring interior wood stud partitions.
- I. Grounds:
1. Provide and set wood grounds at points where wood trim occurs and work is to be plastered. Grounds at 3/4 inch metal lath shall be 5/8 inch thick, net, 1 1/2-inch wide Douglas Fir, S1S. Grounds shall be doubled where trim member exceeds 5-inch width, or wherever indicated. Grounds shall be applied after lath has been installed set plumb, level and true to line.
 2. Apply grounds over wood framed surfaces and lath and securely nail to wood backing at each stud or bearing. Grounds applied over steel channel studs and lath shall be securely nailed at each stud or bearing to nail-blocks provided and installed in metal studs.
 3. Grounds applied to concrete surfaces shall be securely nailed to woodblocks provided and built into concrete.
- J. Nailing Strips and Plates:
1. Provide wood nailing strips, plates and blocking indicated or required. Nailing strips in connection with metal work shall be bolted to metal. Wood nailing blocks for securing grounds shall be built into concrete, or masonry.
 2. Nailing schedule shall comply with CBC requirements.
 3. Treated wood nailing strips for lightweight insulated concrete roof decks at eaves, ridges, rakes, base of curbs and wherever else indicated, shall be provided and installed. Strips shall be treated Douglas fir, 4 inches (nominal) width by thickness of insulated concrete.
- K. Wood Backing: Provide wood backing as indicated and as required to receive plumbing, electrical fixtures and equipment, cabinets, door stop plates and other fixed equipment.
- L. Wood Bucks: Furnish and set wood bucks to form openings for doors and other openings in concrete or masonry walls and in steel stud or channel partitions and furring. Bucks shall be Douglas fir, S1S2E, 2 inches (nominal) thickness and of width indicated or required. Bucks in connection with concrete shall be bolted thereto, and bucks in masonry walls shall be attached by means of strap anchors embedded in masonry joints. Bucks in connection with steel studs and metal channels shall be secured with nails or screws spaced not to exceed 24 inches on centers.
- M. Bench Tops and Backs: Tops and backs shall be 3/4 inch thick asbestos free board, fabricated to minimize number of joints. Edges shall be neatly cut,

smoothly finished and joints accurately fitted and butted. Tops and backs shall be secured with countersunk flathead galvanized wood screws. At bench with steel pan, apply with manufacturer's recommended adhesive. Cut and drill as required for Work to be attached to benches.

3.03 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.04 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Thermal batt insulation for exterior walls and under roof decks.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 09 2423 – Cement Plaster and Metal Lath.

1.02 SUBMITTALS

A. Product Data:

1. Material List: Provide a list of materials for installation under this section.
2. Provide manufacturer's printed Product Data for each type insulation and accessory.

B. Manufacturer's Instructions: Submit manufacturer's printed installation instructions.

C. Certification: Provide certification that insulation materials conform to requirements of CBC Chapter 26.

D. Recycled Content: Provide certification that insulation materials contain a minimum 30 percent recycled materials.

1.03 QUALITY ASSURANCE

A. Surface Burning Characteristics: Flame spread rating shall not exceed 25 and smoke density shall not exceed 50 when tested in accordance with ASTM E84.

B. Combustion Characteristics: Rated as non-combustible when tested in accordance with ASTM E136.

C. Comply with following as a minimum requirement:

1. ASTM C209 – Standard Test Methods for Cellulosic Fiber Insulating Board.
2. ASTM C553: Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
3. ASTM C578: Specification for Rigid, Cellular Polystyrene Thermal Insulation.
4. ASTM C1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.
5. ASTM D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
6. ASTM D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics.
7. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
8. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

- D. CHP Low-Emitting Materials Table: Materials submitted for building insulation must be listed as low emitting on the CHPS website, www.CHPS.net, or must be tested by an independent laboratory to meet CHPS requirements. Components of an assembly must meet CHPS requirements individually or in an assembly.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to Project site and store in a safe, dry place, with labels intact and legible at time of installation.
- B. Protect building insulation materials from damage.

1.05 PROJECT CONDITIONS

- A. Avoid exposure to humidity and moisture. Protect from exposure to sunlight.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Owens Corning.

- B. Johns Manville.
- C. CertainTeed Corporation.
- D. The DOW Chemical Company.
- E. DiversiFoam Products.
- F. Equal.

2.02 MATERIALS

A. General:

1. Provide Unfaced, friction-fit batt insulation where both sides of installation are enclosed.
2. Provide batt insulation with integral vapor barrier when one side of installation will be unenclosed.
3. Provide batt insulation with integral vapor barrier where at least one side of installation will be exposed to high humidity, such as showers.
4. Recycled content shall be a minimum of 30 percent.

B. Mineral Fiber Batt Insulation:

1. Unfaced Mineral Fiber Batt Insulation: Provide friction-fit, unfaced mineral fiber batts. Insulation shall consist of mineral fibers, glass or slag, and thermosetting resins complying with ASTM C665, Type I.
2. Faced Mineral Fiber Batt Insulation: Provide mineral fiber batts with vapor barrier consisting of mineral fibers, glass or slag, and thermosetting resins complying with ASTM C665, Type III, Class A, with vapor-retardant membrane facing.
3. Fasteners for Attaching Insulation to Wood Framing:
 - a. For faced batt insulation provide one of following types of staples: Stainless steel, monel, or copper-coated steel, size as required by manufacturer or applicable code.
 - b. For unfaced batt insulation provide 18 gage, minimum, galvanized steel wire where required to maintain proper insulation placement.
4. Fasteners for Attaching Insulation to Underside of Metal Roof Decks:
 - a. Spindle Anchors: Stic-Klip Mfg. Co., Type A or B as required, with Type S adhesive; Miracle Adhesives Corp. "Miracle StukUps" with

Type HT994 adhesive; or Goodloe E. Moore Gemco or Tuff-Weld with G-P Improved or Tuff-Bond Quik-Set Type Adhesive as applicable; or equal. Provide adhesives of correct type for substrates and type of anchor.

- b. String Wires: Minimum 18 gage galvanized steel wire.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine Work to verify suitability to receive insulation. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General:

1. Fit batt insulation, of R-value indicated on Drawings, snugly between framing members.
2. Maintain total insulation integrity over entire area to be insulated, including areas between closely spaced members.
3. Extend full thickness insulation over entire area to be insulated. Furnish manufacturer's recommended clips to tightly fit batts at joints.
4. Cut and fit batt insulation tightly around pipes, conduits and penetrations.
5. Do not compress batt insulation in excess of 10 percent (R-19 may be installed in 2 by 6 stud walls).
6. Prevent batt insulation from sagging during and after installation by installing adequate wire.
7. Metal door and window frames in acoustically insulated walls shall be filled with insulation, unless otherwise indicated.
8. Where vapor barrier is provided, install with vapor barrier facing room.
 - a. Batts in Metal Framing: Provide friction-fit batts tightly fitted to stud webs and to metal furring.
 - b. Batts under Metal Roof Decks where underside of insulation will be exposed install foil-faced flanged-type insulation batts and staple flanges together at maximum 4-inch centers and seal joints at abutting vertical surfaces with a pressure-sensitive plastic tape.

Where underside of insulation will be inaccessible, install secure with spindle anchors. Provide 18 gage galvanized string wires under batts wherever necessary to prevent sagging. Stretch wire taut.

- c. Batts in Horizontal or Sloped Applications: Provide tightly stretched string wires along center of horizontal or sloping batts where support spacing exceed 16 inch on centers.
- d. Batts in Ceiling Framing: Install batts between joists, so top of insulation is level with top of framing members. Do not install insulation over recessed lighting fixtures, speakers, or other heat producing elements in ceilings. At junction boxes, access panels, and other items requiring access from above or below ceiling, cut insulation on each side to fit item and install loosely on top. Fit insulation snugly around ducts, conduits, pipes, and other items projecting through ceiling construction.

3.03 PROTECTION

- A. Protect Work of this section until Substantial Completion.

3.04 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

END OF SECTION

SECTION 07 2200

ROOF AND DECK INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Roof and non-tapered polyisocyanurate roof insulation.

B. Related Requirements:

1. Division 01 - General Requirements.

1.02 REGULATORY REQUIREMENTS

- ###### A.
- Comply with requirements of DSA and authorities having jurisdiction over the Work.

1.03 SUBMITTALS

- ###### A.
- Shop Drawings: Submit roof plans and details. Include roof dimensions, drain and scupper locations, gutter locations, and the layout of insulation boards. Provide details indicating components, attachment and insulation thickness. Provide calculations indicating the average R-value for the system. Indicate drainage patterns and slopes required.
- ###### B.
- Product Data: Submit manufacturer's data substantiating the insulation complies with specified requirements.
- ###### C.
- Installation Instructions: Submit manufacturer's installation instructions.

1.04 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. ASTM C 1289 - Faced Rigid Cell Polyisocyanurate Thermal Insulation Board; Type II Class 1 Grade 2.
2. Provide systems complying with requirements for FM Class 1.
3. Provide systems complying with requirements for UL Class A.
4. Achieve a minimum thermal resistance value of R-7 for re-roofing projects, unless noted otherwise.
5. UL 2818 Green Guard Gold certification. Gold Standard for Chemical Emissions for Building Materials.

- ###### B.
- Installer Qualifications: Minimum five years experience installing specified type of insulation under roofing systems, and certified by the insulation manufacturer to install the Work of this section.

- C. Pre-installation Meetings: In accordance with related Division 01 sections, conduct a pre-installation meeting on the Project site.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's original sealed and labeled containers.
- B. Avoid exposure to sunlight and the elements.
- C. Handle materials in a manner to avoid damage or contamination with moisture or foreign matter.

1.06 PROJECT CONDITIONS

- A. Environmental requirements:
 - 1. Install products in strict accordance with manufacturer's recommendations.
 - 2. Do not install any materials when water in any form is present on the deck or materials are wet. Do not install any materials if precipitation is forecast and partially completed Work will be left unprotected.
 - 3. Do not install the Work of this section if the temperature of the roof deck is below 40 degrees F.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Insulation: Rigid polyisocyanurate foam insulation, with specially formulated organic/inorganic facers as manufactured by:
 - 1. Dyplast Products.
 - 2. Celotex Insulation.
 - 3. GAFTEMP.
 - 4. Sarnatherm (Atlas ACII).
 - 5. Equal.

2.02 DESCRIPTION

- A. Tapered Roof insulation shall provide minimum per foot slope and provide minimum insulation values as indicated on drawings.
- B. Roof and Deck insulation shall consist of polyisocyanurate foam panels, chemically bonded during the foaming process to special organic/inorganic facers on the top and bottom surfaces, and shall conform to the following:

<u>PROPERTIES</u>	<u>TEST METHOD</u>	<u>VALUE</u>
Compressive Strength	ASTM D 1621	20PSI min.

Dimensional Stability (Thermal and Humid Aging)	ASTM D 2126 (-4 degrees F, amb RH) (158 degrees F, 97 percent RH) (200 degrees F, ambient RH)	Less than 2 percent linear change Less than 2 percent Linear change Less than 2 percent linear change
Flexural Strength (Modulus of Rupture) (Break load)	ASTM C 203	40 PSI min. 17 PSI min.
Tensile Strength (Perpendicular to surface)	ASTM C 203	500 PSF min.
Water Absorption	ASTM C 209	
Water Vapor Transmission	ASTM E 96	
Core Foam Flame Spread	ASTM E 84	

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify suitability of substrates to receive the Work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Verify suitability of related Work such as the following:
 - 1. Roof drains and scuppers are properly installed.
 - 2. Roof curbs, nailers, equipment supports, vents, and other items penetrating the roof are of the proper height, properly prepared and fastened to the substrate.
 - 3. Concrete surface are sufficiently dry, free from extremes in pH, properly primed and free of fines, edges, or voids.

3.02 INSULATION APPLICATION

- A. General:
 - 1. Install the Roof and Deck insulation in accordance with the manufacturer's recommendations and to provide the R values indicated. Butt the panels snugly together.
 - 2. Start boards from either the roof drain or the high point depending on the insulation system. Stencil direction of slope on each board. Stagger joints of underlayment boards from insulation boards.
 - 3. Cut valleys and hips. Field cut crickets from insulation boards. Install valleys, hips, and crickets as required for R values and drainage.
- B. Roofing Systems: Fasten insulation with a method recommended by the manufacturer. Method of attachment shall provide a minimum FM I-90 Wind Uplift Rating.

3.03 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.04 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 07 2600
VAPOR BARRIERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Vapor barrier and accessories for installation under concrete slabs.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 03 3000: Cast-in-Place Concrete.
 - 3. Division 09: Finishes; flooring sections.

1.02 REFERENCES

- A. American Concrete Institute (ACI) Publication:
 - 1. ACI 302.2R - Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
- B. ASTM International (ASTM):
 - 1. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
 - 2. ASTM D1709 - Standard Test Methods of Impact Resistance of Plastic Film by the Free-Falling Dart Method.
 - 3. ASTM E154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth under Concrete Slabs.
 - 4. ASTM E1643 - Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.
 - 5. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for vapor barrier and accessories.
- B. Samples:
 - 1. 12 inch by 12 inch vapor barrier samples.
 - 2. Pressure-Sensitive Tape: 12 inch long sample.
- C. Test Reports: Conducted by nationally recognized independent testing agency indicating conformance with specified performance requirements.

1.04 QUALITY ASSURANCE

- A. ASTM tests referenced in this Section shall be performed on a single production roll per ASTM E1745 Section 8.1. Submit third party documentation certifying this requirement.
- B. Pre-Installation Conference: CONTRACTOR shall coordinate and conduct pre-installation conference in accordance to Section 01 3119, Project Meetings, to review the progress of construction activities and preparations for the installation of vapor barrier.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, handle and protect in accordance with manufacturer's instructions and recommendations.
- B. Deliver materials in manufacturer's packaging with labels intact.
- C. Store materials in a clean and dry area.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Multi-layer plastic extrusion manufactured with high grade prime, virgin, polyolefin resins. Thickness shall be 15 mils minimum.
 - 1. Stego Wrap by Stego Industries LLC.
 - 2. Perminator by W.R. Meadows.
 - 3. Ecoshield-E by Epro.
 - 4. Husky Yellow Guard by Poly-America.
 - 5. Equal.

- B. Physical Properties:
1. Maintain permeance of less than 0.01 Perms [grains/(ft² · hr · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
 2. Class Rating per ASTM E1745: Class A.
 3. Puncture resistance per ASTM D1709: 2200 g or higher.
 4. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1
- C. Accessories: Provide manufacturer recommended accessories for seams, penetrations and perimeter edges, including tapes, mastics, termination for a complete vapor barrier installation per ASTM E1643.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsoil and notify OAR of deficiencies detrimental to proper vapor barrier installation; do not proceed until corrected.

3.02 INSTALLATION

- A. Install vapor barrier in accordance ASTM E1643 and manufacturer's instructions.
1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
 2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise, where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself using manufacturer ASTM E1643 compliant accessory designed to adhere to concrete. Seam tape shall not be used for sealing the vapor barrier to the foundation wall, grade beam or slab.
 3. Overlap joints 6 inches and seal with manufacturer's seam tape.
 4. Seal vapor barrier penetrations per manufacturer's instructions.
 5. Avoid the use of non-permanent stakes driven through the vapor barrier.
- B. Prior to concrete placement inspect vapor barrier for damage. Clean damaged areas and with vapor barrier material cut a minimum 6 inches larger than

damaged area on all sides. Seal to main vapor barrier with continuous seam tape.

3.03 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.04 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 07 51 13.13
COLD APPLIED BITUMINOUS ROOFING
(PATCH AND REPAIR)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Cold Applied built-up roof membrane.
 - 2. Base sheet.
 - 3. Roofing insulation.
 - 4. Aggregate ballast.
- B. Related Sections include the following:
 - 1. 06 10 00 Rough Carpentry
 - 2. 07 22 00 Roof Deck Insulation
 - 3. 07 92 00 Joint Sealants
- C. Unit Prices: Refer to Division 1 Section "Unit Prices" for description of Work in this Section that is affected by unit prices.

1.3 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 for definitions of terms related to roofing work not otherwise defined in this Section.
- B. Cold Applied Built Up Roofing – An asbestos free formulation of asphalt, solvent, thixotrope, mineral stabilizer and reinforcing fibers used as an interply adhesive and surface coat.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Install or tie-into a watertight, built-up roofing and base flashing roofing system with compatible components that will not permit the passage of liquid water and will withstand wind loads, thermally induced movement, and exposure to weather without failure.

1.5 SUBMITTALS

- A. Product Data: For each type of roofing product specified. Include data substantiating that materials comply with requirements.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work, for the following:
 - 1. Base flashings, cants, and membrane terminations.
 - 2. Tapered insulation, including slopes.
 - 3. Crickets, saddles, and tapered edge strips, including slopes.
- C. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install specified roofing system and is eligible to conduct the repairs or modifications in accordance with and to preserve the roofing manufacturer's warranty currently in place.
- D. Inspection Report: Copy of roofing system manufacturer's inspection reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to perform Work of this Section who has specialized in installing roofing similar to that required for this Project; who is approved, authorized, or licensed by the roofing system manufacturer to install manufacturer's product; and who is eligible to receive the standard roofing manufacturer's warranty.
- B. Manufacturers Technical Services: Contractor shall provide the Roofing System Manufacturers Technical Services Inspections. The job site inspections are to be performed by the Manufacturers full time employees. Inspections shall be documented in writing. Provide a minimum of four (4) days of job site inspection per school site.
- C. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method indicated below by UL, FM, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Exterior Fire-Test Exposure: Class A; complying with ASTM E 108/UL 790, for application and slopes indicated.
- D. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site. Meet with the same participants and review the same items listed for the pre-installation conference. In addition, review status of submittals and coordination of work related to roof construction. Notify participants at least 5 working days before conference.
- E. Pre-installation Conference: Before installing roofing system, conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Notify participants at least 5 working days before conference.
 - 1. Meet with Owner; Architect; Owner's insurer, if applicable; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; deck Installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and attachment to structural members.
 - 4. Review loading limitations of deck during and after roofing.

5. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
6. Review governing regulations and requirements for insurance, certifications, and inspection and testing, if applicable.
7. Review temporary protection requirements for roofing system during and after installation.
8. Review roof observation and repair procedures after roofing installation.
9. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, warm, well-ventilated, weathertight location according to roofing system manufacturer's written instructions. Store rolls of felt and other sheet materials on end on pallets or other raised surfaces. Do not double-stack rolls.
 1. Handle and store roofing materials and place equipment in a manner to avoid significant or permanent damage to deck or structural supporting members.
- B. Do not leave unused felts and other sheet materials on the roof overnight or when roofing work is not in progress unless protected from weather and moisture and unless maintained at a temperature exceeding 50 deg F (10 deg C).
- C. Deliver and store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
- D. Protect roofing insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturers written instructions for handling, storing, and protecting during installation.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with roofing work only when existing and forecasted weather conditions permit roofing to be installed according to manufacturers' written instructions and warranty requirements.

1.9 WARRANTY

- A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
 1. Warranty Period: Continuance of Existing Tremco Warranty.
- B. Contractors Warranty
 1. Contractors Warranty shall cover all labor and materials required to install the specified assemblies. Warranty period shall be 2 years from Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: **Materials are to be compatible with existing roofing materials and capable of inclusion into existing long-term warranty.** Subject to compliance with requirements, provide products by the following: **The Existing Roofing systems are Tremco.**

1. Built-up Asphalt Roofing and Single Ply Roofing Products:
 - a. Tremco, Inc.

2.2 BASE-SHEET MATERIALS

- A. Sheathing Paper: **Red-rosin** type, minimum 3 lb/100 sq. ft. (0.16 kg/sq. m).
- B. Base Sheet: Unperforated, asphalt-impregnated and -coated, glass-fiber reinforced sheet, dusted with fine mineral surfacing on both sides, complying with ASTM D 4601, Type II.
1. **BURmastic Composite Ply HT by Tremco.**

2.3 ROOF MEMBRANE PLIES

- A. Ply Felt: Asphalt-coated, glass-fiber reinforced felt, complying with ASTM D 4601, Type II. 33 Pounds per square
1. **BURmastic Glass Ply by Tremco.**

2.4 FLASHING MATERIALS

- A. Backer Sheet: Asphalt- coated glass-fiber and polyester bilaminate reinforced felt, dusted with fine mineral surfacing on both sides, complying with ASTM D 4601, Type II.
1. **BURmastic Composite Ply HT by Tremco**
- B. Base Flashing Sheet:
1. Single Ply: **60mil TPA by Tremco.**
- C. Glass-Fiber Fabric: Woven glass reinforcement treated with organic resin complying with ASTM D 1668, Type III.
1. **BURmesh by Tremco.**

2.5 ASPHALT MATERIALS

- A. Asphalt Primer Water-based asphalt primer: **TremPrime WB by Tremco**
- B. Cold-Applied Adhesive: Roofing system manufacturer's standard asphalt-based, 1-part asbestos-free, cold-applied adhesive specially formulated for compatibility and use with built-up roofing membranes and flashings. Each container labeled with UL and FM logos indicating material was manufactured under the specified UL and FM quality assurance programs. Use one of the following:
1. **BURmastic LV Adhesive by Tremco.** For use in large roof replacement areas as indicated
 2. **BURmastic SF Adhesive by Tremco.** For use in immediate areas around individual designated mechanical equipment in use, HVAC intakes or otherwise directed on site specific plan.
 3. **White Rock-It Surfacing Adhesive**

2.6 AUXILIARY MEMBRANE MATERIALS

- A. General: Furnish auxiliary materials recommended by roofing system manufacturer for intended use and compatible with built-up roofing.
 - 1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdiction.
- B. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application
 - 1. **ELS by Tremco**
- C. Elastomeric Flashing Adhesive Butyl rubber based, trowel grade
 - 1. **Sheeting Bond by Tremco.**
- D. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions of FM 4470; designed for fastening base sheets and base flashings and for backnailing ply felts to substrate; tested by manufacturer for required pullout strength; and acceptable to roofing system manufacturer.
- E. Type and kind as required for the deck area in the area of work.
- F. Wood Nailer Strips: Furnish wood nailer strips complying with requirements of Division 6 Section "Rough Carpentry."
- G. Cants: Cellulosic-fiber board, complying with ASTM C 208, Type 2.
- H. Walkway Pads: Mineral-surfaced asphaltic composition panels, factory formed, nonporous, with a slip-resisting surface texture, manufactured specifically for adhering to built-up roofing as a protection course for foot traffic, of the following thickness:
 - 1. TremTred by Tremco.
 - 2. Thickness: 1/2 inch (12 mm) unless other indicated.
- I. Aggregate Surfacing: Clean, dry, double washed, water-worn gravel, complying with ASTM D 1863. Color and size to match existing.
- J. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer for intended use.

2.7 INSULATION MATERIALS

- A. Polyisocyanurate Board Insulation: **Approved Generic Rigid, cellular polyisocyanurate** thermal insulation with core formed by using HCFCs as blowing agents complying with ASTM C 1289, classified by facer type as follows:
 - 1. Facer Type: Type II, black, non-asphaltic fiber reinforced felt on both major surfaces.
 - 2. Facer Type: Type IV, cellulosic-fiber insulating board, complying with ASTM C 208, Type II, Grade 2,
- B. Fiber-Board Insulation: Fibrous-felted, rigid insulation boards of wood fiber or other cellulosic-fiber and water-resistant binders, asphalt impregnated, chemically treated for deterioration, complying with ASTM C 208, Type II, Grade 2. **Structo-Deck by Tremco**

- C. HAVC and Curb Vertical curb surfaces: **Approved generic Primed Dens Deck.**

2.8 INSULATION ACCESSORIES

- A. General: Furnish roofing insulation accessories recommended by insulation manufacturer for intended use and compatible with sheet roofing material.
- B. Insulation Adhesive: Solvent free, bituminous urethane adhesive
 - 1. **Low Rise Insulation Foam Adhesive by Tremco.**
- C. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions of FM 4470, designed for fastening roofing insulation to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
- D. Tapered Edge Strips: Rigid, cellulosic-fiber insulation board, complying with ASTM C 208, Type 2.
- E. Tapered Edge Strips: Rigid, glass-fiber insulation board, complying with ASTM C 726.
- F. Substrate Joint Tape: 6 or 8 inches (150 or 200 mm) wide, coated, glass-fiber joint tape.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions under which roofing will be applied, with Installer present, for compliance with requirements.
- B. Verify that roof openings and penetrations are in place and set and braced and that roof drains are properly clamped into position.
- C. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at roof penetrations and terminations and match the thicknesses of insulation required.
 - 1. Verify that wood nailer strips are located perpendicular to roof slope and spaced according to requirements of roofing system manufacturer.
- D. Do not proceed with installation until after the minimum concrete curing period recommended by roofing system manufacturer.
- E. Verify that flatness and fastening of metal roof decks comply with installation tolerances specified in Division 5 Section "Steel Deck."
- F. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean around area where new penetration has occurred. Remove aggregate surfacing and all materials that will prevent proper adhesion of new materials.
- B. Roofing Contractor or General Contractor shall cut existing membrane in manner to provide clean even edges. Take necessary precautions to prevent tearing and lifting of membrane to remain in place. General Contractor shall be responsible for maintaining openings in a weathertight condition. The existing Manufacturers Warranty shall be placed in suspension until all roofing work has been completed and accepted by the Manufacturer. Upon acceptable completion, the Warranty shall be re-instated as applicable.
- C. Clean substrate of dust, debris, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- D. 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.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install built-up roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Built-Up Roofing."
 - 1. Install roofing system according to applicable specification plates of NRCA's "The NRCA Roofing and Waterproofing Manual."
- B. Start installation of built-up roofing membrane in presence of roofing system manufacturer's technical personnel.
- C. Cants: Install and secure preformed 45-degree wood cants at junctures of built-up roofing membrane system with vertical surfaces or angle changes greater than 45 degrees.
- D. Cooperate with inspecting and testing agencies engaged or required to perform services for installing built-up roofing membrane system.
- E. Coordinate installing roofing system components so insulation and roofing plies are not exposed to precipitation or left exposed at the end of the workday or when rain is forecast.
 - 1. Provide cutoffs at end of each day's work to cover exposed ply sheets and insulation with a course of coated felt with joints and edges sealed.
 - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
 - 3. Remove and discard temporary seals before beginning work on adjoining roofing.
- F. Cold process adhesive heating:
 - 1. An in-line heat exchange unit may be used to facilitate application
 - a. Maximum adhesive temperature: 100° F. Do not exceed the flash point of the adhesive.
 - 2. Heat exchange unit: Filled with heat transfer oil approved by equipment manufacturer.
 - 3. Follow operation procedures as recommended by equipment manufacturer.
- G. Surfacing Adhesive

1. Aggregate Surfacing: Limit temperature of cold adhesive surface coat to the minimum required for proper embedment of aggregate and the maximum that will permit retention of required coating weight based on slope of surface.
2. Substrate-Joint Penetrations: Prevent roofing adhesive from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction. If it is applied directly to substrate, tape substrate joints.

3.4 INSULATION INSTALLATION (Where Occurs)

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system manufacturer's written instructions for installing roofing insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated and to Shop Drawings.
- D. Install tapered insulation crickets behind curbs and units.
- E. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- F. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches (50 mm) or greater, install required thickness in 2 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.
- G. Trim surface of insulation where necessary at roof drains so completed surface is flush with ring of drain.
- H. Install insulation with long joints of insulation in continuous straight lines with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- I. Attached Insulation:
 1. Over nailable decks, secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roofing insulation to deck type indicated.
 2. Over non-nailable decks, prime and install panels using maximum 4' x 4' panel size for first layer.
 3. Over LWC, mechanically install a base sheet and then adhere insulation using 4' x 4' maximum panel size for first layer.
 4. Install subsequent layers of insulation in a ribbon coverage of insulation adhesive at a rate of 1-½ gallons per 100 sq. ft. or as recommended by manufacture. Immediately after placement, walk insulation boards into adhesive to achieve solid contact.
 5. Fasten insulation according to requirements of FM's "Approval Guide" for specified Windstorm Resistance Classification and the insulation and roofing system manufacturers' written instructions.
 6. Fasten insulation according to the insulation and roofing system manufacturers' written instructions.

3.5 BASE-SHEET INSTALLATION

- A. Install one lapped course of base sheet according to roofing system manufacturer's written instructions, extending sheet over and terminating beyond cants. Attach base sheet as follows:
 - 1. Install **1 layer of base sheet.**
 - 2. Mechanically fasten to substrate; where occurs
 - 3. Over coverboard, adhere to substrate in a uniform coating of cold adhesive; where occurs;
3 gallons per 100 sq. ft for base sheets

3.6 ROOF MEMBRANE INSTALLATION

- A. Install ply felts according to roofing system manufacturer's written instructions, starting at low point of roofing system. Cut roofing ply sheets in 18 – 20 ft. lengths and allow to relax 30 to 60 minutes. Stack lengths. Do not re-roll. Shingle side laps of ply felts uniformly to achieve required number of membrane plies throughout. Shingle in direction to shed water. Extend ply felts over and terminate beyond cants.
 - 1. Install **2 ply sheets.**
 - 2. Application: Adhere each ply felt in cold adhesive, applied within temperature range and at rate of **2.5 gallons per 100 sq. ft. for interplay sheets.** to form a uniform membrane without ply felts touching each other.
- B. Surfacing Application:
 - 1. Prior to application of surface coat, contractor shall inspect roof with manufacturer's technical representative and repair any deficiencies.
 - 2. Over entire roof surface of new work, apply uniform and continuous surface coat of surfacing adhesive at a rate of **5 gallons per 100 sq. ft for new roofing areas and 7 gallons per 100 sq. ft. for resurfacing or restoration areas.**
- C. Aggregate Surfacing: Immediately broadcast minimum of 400 lbs /100 sq. ft. of new, clean roofing gravel. Cover surface coat material completely.

3.7 FLASHING AND STRIPPING INSTALLATION

- A. Elastomeric Flashing
 - a. Ensure a suitable sub-straight has been installed on the vertical sides of curbs, walls, etc.
 - b. Roofer is to provide and install a ¼" primed deck at any exposed sheet metal or plywood curbs sides. Review attachment with General/Owner before proceeding.
 - c. All newly installed wood platforms are to be roofed over with TPA single ply prior to installation of sheet pans and or equipment.
 - d. Install pre-formed or field fabricated boot detail at all newly added conduits, support legs, piping, etc. The use of a pitch-pan flashing or pelican hood is not acceptable without review and written approval from Roof System Manufacture.
 - e. Adhere elastomeric sheeting completely to flashing surface, cant and roofing with flashing adhesive; allow adhesive to remain open for 15 minutes to flash off solvent prior to setting elastomeric sheeting into flashing adhesive.
 - f. Apply consistent pressure to entire surface of elastomeric sheeting using a steel hand roller to achieve full adhesion of the sheeting to the flashing substrate. Ensure complete bond and continuity without wrinkles or voids. Lap sheeting ends 4 inches.
 - g. Elastomeric sheeting width: Sufficient to extend at least 6 inches beyond toe of cant onto new roof.

- h. Seal vertical and horizontal edges of sheeting with reinforcing membrane embedded in a base course of flashing adhesive and a top course of modified asphalt mastic.
- i. Terminate top of flashing with approved turn-bar detail or sheet metal counter-flashing.
- j. Strip onto existing BUR roofs with **5 course of Rock-it adhesive and BURmesh membrane**

B. Two Ply stripping for metal flanges:

- 1. Set flange in asphalt mastic. Seal flange with 2 stripping plies embedded between alternate applications of stripping adhesive/bitumen. Extend first ply 8 inches beyond flange; second ply 6 inches beyond first ply.

3.8 TIE-IN TO EXISTING MEMBRANE

- A. Follow Tremco Roofing standards for the Tie-In details. Surfacing at existing membrane adjacent to new penetration, shall be removed to expose existing felts.
- B. Prime existing felts and allow to flash off.
- C. Install one 18-inch wide Composite Ply felt evenly across joint line of new and existing.
- D. Install two ply strip-in using ply felts that extend past the edge of the previous felt a minimum of 6 inches
- E. GRAVEL: Surface coat and apply surfacing aggregate of same size and color as existing.

3.9 WALKPADS

- A. Install new roof walk pads at all serviceable units and per layout provide in the drawings.
- B. Install walk pads under newly installed conduit blocking; where occurs.

3.10 FIELD QUALITY CONTROL

- A. Owner will engage, at their option, an independent testing and inspecting agency to perform field inspections and quality-assurance tests.
 - 1. Testing agency will prepare reports stating whether inspected and tested Work complies with or deviates from requirements.
 - 2. Testing agency personnel shall be versed and have minimum of 5 years experience in the type of roofing being inspected.
 - 3. The Manufacturer and the Testing Agency shall agree in writing to acknowledge and accept the comments of the other agency.
- B. Correct deficiencies in or remove and replace roof membrane that inspections and test reports indicate does not comply with specified requirements or are capable of being incorporated into the existing warranty.

1. Repair roof membrane that does not comply with specified requirements by re-adhering test specimens back in place and by applying additional plies, equal to the original number of plies specified, over test specimens according to roofing system manufacturer's written instructions.
- C. Test Cuts: Before surface coating and surfacing built-up roofing membrane, test specimens will be removed to evaluate problems observed during quality-assurance inspections of roof membrane as follows:
1. Test specimens will be examined for interply voids according to ASTM D 3617 and to comply with the criteria established in Appendix 3 of ARMA/NRCA'S "Quality Control Guidelines for the Application of Built-up Roofing."
- D. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.
1. Notify Architect and Owner, General Contractor and Roof System Representative, 48 hours in advance of the date and time of inspection.

3.11 PROTECTING AND CLEANING

- A. Protect built-up roofing membrane from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove built-up roofing that does not comply with requirements, repair substrates, reinstall roofing, and repair base flashings to a condition free of damage and deterioration at the time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 51 13.13

SECTION 07 9200

JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Joint sealants.
2. Preparation for application of sealants.

B. Related Requirements:

1. Division 01 - General Requirements.



~~2. Section 06 2000 - Finish Carpentry.~~

~~3. Section 07 6000 - Flashing and Sheet Metal.~~

~~4. Section 07 8413 - Penetration Firestopping.~~

5. Division 08 - Openings.

6. Division 09 - Finishes.

7. Section 10 2813 - Toilet Accessories.

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1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating sealant joint locations, with full-size sealant joint details.
- B. Product Data: Submit manufacturer's literature for each sealant material.
- C. Material Samples: Submit Samples indicating color range available for each sealant material intended for installation in exposed locations.
- D. Certifications: Submit manufacturer's certification materials comply with requirements specified.
- E. Site Samples: At locations required, provide a Sample of sealant for each typical installation, approximately 24 inches long, including joint preparation, backing, sealant and tooling. Allow backing to extend 6 inches beyond end of sealant for inspection of substrate.
- F. Test Reports: Submit manufacturer's adhesion compatibility test reports according to ASTM C794 for each substrate.

1.03 QUALITY ASSURANCE

- A. Qualifications of Installer: The Work of this section shall be installed by a firm which has been in the business of installing similar materials for at least five consecutive years; and can show evidence of satisfactory completion of five projects of similar size and scope. Installer shall have applicators trained and approved by manufacturer for performing this Work.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Store in accordance with manufacturer's recommendations. Provide a uniform ambient temperature between 60 and 80 degrees F.

1.05 WARRANTY

- A. Manufacturer: five year material warranty.
- B. Installer: two year installation/application warranty.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Furnish sealants meeting following in-service requirements:
 - 1. Normal curing schedules are permitted.
 - 2. Non-staining, color fastness (resistance to color change), and durability when subjected to intense actinic (ultraviolet) radiation are required.
- B. Furnish the products of only one manufacturer unless otherwise required, sealant colors as selected to match the adjoining surfaces.

2.02 MANUFACTURERS

- A. Sealants must be approved by LAUSD's Office of Environmental Health and Safety (OEHS). Check OEHS website for approved products. Not all products by a manufacturer are approved by OEHS.

2.03 MATERIALS

- A. Sealants:
 - 1. Sealant 1: Acrylic latex, one-part, non-sag, mildew resistant acrylic emulsion compound complying with ASTM C834, Type S, Grade NS, formulated to be paintable.
 - a. Tremco Inc., Acrylic Latex Caulk.
 - b. Pecora Corporation, AC-20.

- c. Equal.
- 2. Sealant 2: Butyl sealant, one-part, non-sag, solvent-release-curing sealant complying with ASTM C1311, gun grade and formulated with a minimum of 75 percent solids.
 - a. Tremco Inc., Tremco Butyl Sealant.
 - b. Pecora Corp., BC-158.
 - c. Equal.
- 3. Sealant 3: Silicone sealant, one-part non-acid-curing silicone sealant complying with ASTM C920, Type S, Grade NS, Class 25.
 - a. Dow Corning Corp., Dow Corning 790, 791, 795.
 - b. General Electric Co., Silpruf.
 - c. Tremco, Inc., Spectrem 1.
 - d. Pecora Corp., 864.
 - e. Equal.
- 4. Sealant 4: One-part mildew-resistant silicone sealant, complying with ASTM C920, Type S, Grade NS, Class 25.
 - a. Dow Corning Corp., Dow Corning 786.
 - b. General Electric Co., Sanitary 1700.
 - c. Tremco, Inc., Proglaze White.
 - d. Equal.
- 5. Sealant 5: One-part non-sag urethane sealant, complying with ASTM C920, Type S, Grade NS, Class 25.
 - a. Sika Corporation, Sikaflex -221e.
 - b. Equal.
- 6. Sealant 6: Multi-part pouring urethane sealant, complying with ASTM C920, Type M, Grade P, Class 25.
 - a. Sika Corporation, Sikaflex 2C NS/SL.
 - b. Equal.

7. Sealant 7: Acoustical sealant, non-drying, non-hardening permanently flexible conforming to ASTM D217.
 - a. Pecora Corp., BA-98 Acoustical Sealant.
 - b. Equal.
- B. See 07 8413 - Penetration Firestopping for rated sealants.
- C. Joint Backing: ASTM D1056; round, closed cell Polyethylene Foam Rod; oversized 30 to 50 percent larger than joint width, reticulated polyolefin foam.
- D. Primer: Non-Staining Type. Provide primer as required and shall be product of manufacturer of installed sealant.
- E. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer.
- F. Sealants shall have normal curing schedules, shall be nonstaining, color fast and shall resist deterioration due to ultraviolet radiation.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that joint openings are ready to receive Work and field tolerances are within the guidelines recommended by sealant manufacturer.

3.02 SURFACE PREPARATION

- A. Joints and spaces to be sealed shall be completely cleaned of all dirt, dust, mortar, oil, and other foreign materials which might adversely affect sealing Work. Where necessary, degrease with a solvent or commercial degreasing agent. Surfaces shall be thoroughly dry before application of sealants.
- B. If recommended by manufacturer, remove paint and other protective coatings from surfaces to be sealed before priming and installation of sealants.
- C. Preparation of surfaces to receive sealant shall conform to the sealant manufacturer's specifications. Provide air pressure or other methods to achieve required results. Provide masking tape to keep sealants off surfaces that will be exposed in finished Work.
- D. Etch concrete or masonry surfaces to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance. Etch with 5 percent solution of muriatic acid; neutralize with dilute ammonia solution, rinse thoroughly with water and allow to dry before sealant installation.
- E. Perform preparation in accordance with ASTM C804 for solvent release sealants, and ASTM C962 for elastomeric sealants.

- F. Protect elements surrounding Work of this section from damage or disfiguration.

3.03 SEALANT APPLICATION SCHEDULE

	<u>Location</u>	<u>Type</u>	<u>Color</u>
A.	Exterior and Interior joints in horizontal surfaces of concrete; between metal and concrete masonry and mortar.	Sealant 6	To match adjacent material
B.	Exterior door, entrance and window match adjacent frames. Exterior and interior vertical joints in concrete and masonry metal flashing.	Sealant 3 or 5	To match adjacent material
C.	Joints within glazed curtain wall system. Skylight framing system. Aluminum entrance system glass and glazing.	Sealant 3	Translucent or Black
D.	Interior joints in ceramic tile and at plumbing fixtures.	Sealant 4	Translucent or White
E.	Under thresholds.	Sealant 2	Black
F.	All interior joints not otherwise scheduled	Sealant 1	To Match Adjacent Surfaces
G.	Heads and sills, perimeters of frames and other openings in insulated partitions	Sealant 7	Match Adjacent Surfaces

3.04 APPLICATION

- A. Provide sealant around all openings in exterior walls, and any other locations indicated or required for structure weatherproofing and/or waterproofing.
- B. Sealants shall be installed by experienced mechanics using specified materials and proper tools. Preparatory Work (cleaning, etc.) and installation of sealant shall be as specified and in accordance with manufacturer's printed instructions and recommendations.

- C. Concrete, masonry, and other porous surfaces, and any other surfaces if recommended by manufacturer, shall be primed before installing sealants. Primer shall be installed with a brush that will reach all parts of joints to be filled with sealant.
- D. Sealants shall be stored and installed at temperatures as recommended by manufacturer. Sealants shall not be installed when they become too jelled to be discharged in a continuous flow from gun. Modification of sealants by addition of liquids, solvents, or powders is not permitted.
- E. Sealants shall be installed with guns furnished with proper size nozzles. Sufficient pressure shall be furnished to fill all voids and joints solid. In sealing around openings, include entire perimeter of each opening, unless indicated or specified otherwise. Where gun installation is impracticable, suitable hand tools shall be provided.
- F. Sealed joints shall be neatly pointed on flush surfaces with beading tool, and internal corners with a special tool. Excess material shall be cleanly removed. Sealant, where exposed, shall be free of wrinkles and uniformly smooth. Sealing shall be complete before final coats of paint are installed.
- G. Comply with sealant manufacturer's printed instructions except where more stringent requirements are indicated on Drawings or specified.
- H. Partially fill joints with joint backing material, furnishing only compatible materials, until joint depth does not exceed 1/2 inch joint width. Minimum joint width for metal to metal joints shall be 1/4 inch. Joint depth, shall be not less than 1/4 inch and not greater than 1/2 inch.
- I. Install sealant under sufficient pressure to completely fill voids. Finish exposed joints smooth, flush with surfaces or recessed as indicated. Install non-tracking sealant to concrete expansion joints subject to foot or vehicular traffic.
- J. Where joint depth prevents installation of standard bond breaker backing rod, furnish non-adhering tape covering to prevent bonding of sealant to back of joint. Under no circumstances shall sealant depth exceed 1/2 inch maximum, unless specifically indicated on Drawings.
- K. Prime porous surfaces after cleaning. Pack joints deeper than 3/4 inch with joint backing to within 3/4 inch of surface. Completely fill joints and spaces with gun applied compound, forming a neat, smooth bead.

3.05 MISCELLANEOUS WORK

- A. Sealing shall be provided wherever required to prevent light leakage as well as moisture leakage. Refer to Drawings for condition and related parts of Work.
- B. Install sealants to depths as indicated or, if not indicated, as recommended by sealant manufacturer but within following general limitations:

1. For joints in concrete walks, slab and paving subject to traffic, fill joints to a depth equal to 75 percent of joint width, but not more than 3/4 inch deep or less than 3/8 inch deep, depending on joint width.
2. For building joints, fill joints to a depth equal to 50 percent of joint width, but not more than 1/2 inch deep or less than 1/4 inch deep.

3.06 CLEANING

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.07 CURING

- A. Sealants shall cure in accordance with manufacturer's printed recommendations. Do not disturb seal until completely cured.

3.08 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 08 3116
ACCESS PANELS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Steel access panels, except those specified under Divisions 22 - Plumbing, ~~23 - HVAC, or 26 - Electrical.~~ NIC

B. Related Sections:

1. Division 01 - General Requirements.
2. Section 06 1000 - Rough Carpentry.
3. Section 09 2423 - Cement Plaster and Metal Lath.
4. Section 09 2900 - Gypsum Board.
5. Section 09 30 13 Ceramic Tiling.
6. Section 09 9000 - Painting and Coating.
7. Division 22 - Plumbing.

- ~~8. Division 23 - HVAC.~~
- ~~9. Division 26 - Electrical.~~
- ~~10. Division 27 - Communications.~~

NIC

1.02 SUBMITTALS

A. Shop Drawings:

1. Indicate sizes, materials, thickness, fabrication methods, panel door and frame reinforcement, anchorage, and installation details.
2. Provide layout drawings, indicating dimensioned locations of proposed access panels, size of each panel, and installation details. Determine and indicate required access panels in finished surfaces, whether furnished under this section or as part of Work of Divisions 22- Plumbing, ~~23 - HVAC, and 26 - Electrical.~~ NIC

1.03 QUALITY ASSURANCE

- A. Panels shall be provided with UL listings and labels.
- B. Access panels and frames shall be products of one manufacturer.
- C. Coordinate access panels with plumbing, HVAC, and electrical work.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Panels and Frames: Provide protection as required by manufacturer to protect panels from damage during storage.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Access Panels:

<u>Non-Rated</u>	<u>Milcor</u>	<u>Karp</u>	<u>Nystrom</u>
Ceramic Tile	MS	DSC214M	NT
Plaster	K	DSC214M	NP
Drywall, Plaster Veneer	DW	DSC214M	NW
<u>Fire Rated</u>			
Ceramic Tile	MS	KRP150FR	IT
Plaster	M	KRP150PR	IP
Drywall, Plaster Veneer	M	KRP150FR	IW

Equal.

- B. Unless otherwise indicated, provide brushed stainless steel finish for panels installed in ceramic tile. Provide prime coat finish suitable for field painting for panels installed in other finishes.
- C. Access Panels shall be 18 gage minimum with vandal-proof lock operated by Allen wrench or other special tool. Exposed fastenings shall be secured with vandal-proof screws.

PART 3 - EXECUTION

3.01 GENERAL

- A. Provide access panels in finish construction, where indicated on Drawings, wherever required for access to concealed mechanical and electrical equipment, and where required by codes. Panels indicated on architectural Drawings shall be furnished under this section. Required panels for access to equipment, but not indicated on architectural Drawings, shall be furnished as part of Work requiring access.

3.02 INSTALLATION

- A. Install panels accurately in location, perfect alignment, plumb, straight and true. Brace to prevent displacement by adjacent Work.
- B. Examine panels after installation for proper opening, closing and clearances. Replace damaged or defective panels.

3.03 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off Project site.

3.04 PROTECTION

- A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 2423
CEMENT PLASTER AND METAL LATH

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Lath and Portland cement plaster and stucco.
2. Lath and scratch coat of Portland cement plaster as a substrate for ceramic wall tile.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 3000 – Cast-in-Place Concrete.
3. Section 06 1000 - Rough Carpentry.
4. Section 07 2100 – Thermal Insulation.
5. Section 09 3013 - Ceramic Tiling.

1.02 SYSTEM DESCRIPTION

A. Three coat 7/8" cement plaster on metal lath over water resistive barrier over plastic sheet air barrier over sheathing over metal studs.

B.

B. One coat cement plaster base for ceramic tile installation.

1.03 REFERENCES

A. ASTM International (ASTM):

1. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
2. ASTM A510 - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel.
3. ASTM A641 – Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

4. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
5. ASTM C150 – Standard Specification for Portland Cement.
6. ASTM C206 – Standard Specification for Finishing Hydrated Lime.
7. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring.
8. ASTM C847 - Standard Specification for Metal Lath.
9. ASTM C897 – Standard Specification for Aggregate for Job Mixed Portland Cement-Based Plasters.
10. ASTM C926 – Standard Specification for Application of Portland Cement-Based Plaster.
11. ASTM C932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering.
12. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
13. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
14. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
15. ASTM C1116 – Standard Specification for Fiber-Reinforced Concrete.
16. ASTM E1190 – Standard Test Methods for Power-Actuated Fasteners Installed in Structural members.

B. Federal Specifications (FS):

1. FS FF-N-105: Nails, Brads, Staples and Spikes: Wire, Cut and Wrought.
2. UU-B-790A: Building Paper, Vegetable Fiber: (Kraft, Waterproofed, Water Repellent, and Fire Resistant).

C. International Code Council (ICC):

1. ICC-ES AC11: Acceptance Criteria for Cementitious Exterior Wall Coatings.
2. ICC-ES AC 191: Acceptance Criteria for Metal Plaster Bases (Lath).

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each material and component proposed for installation.
- B. Plaster Samples: Submit minimum 48-inch by 48-inch samples of each stucco and Portland cement plaster texture for review. Samples shall be representative of texture, color, and proposed fabrication and finish quality. Maintain reviewed Samples on Project site for reference.
- C. Accessories Samples: Submit 12 inch long samples of metal lath accessories: control joints, expansion joints, corner reinforcements, reveals and screeds.
- D. Certificates: Submit test reports or ICC Evaluation Reports indicating that materials are in compliance with CBC requirements. Cementitious materials shall meet the acceptance requirements of ICC AC11, and metal lath the acceptance requirements of ICC AC191.

1.05 QUALITY ASSURANCE

- A.
- A. Pre-Installation Conference: CONTRACTOR shall coordinate and conduct pre-installation conference in accordance to Section 01 3119, Project Meetings, to review the progress of construction activities and preparations for the installation of metal lath and cement plaster and other related work of this Section.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Store weather sensitive materials under cover, off the ground, and kept in a dry condition until ready for use.
- B. Deliver materials to the Project site in manufacturer's sealed and labeled packages.

PART 2 - PRODUCTS

2.01 METAL LATH AND WEATHER RESISTIVE BACKING

- A. Metal Lath:
 - 1. Walls and Ceilings: Diamond mesh expanded metal lath, in conformance to ASTM C847, without paper backing. 3.4 pounds per square yard, hot-dip galvanized coating G60 in accordance with ASTM A653. Alabama Metal Industries Corporation (AMICO), California Expanded Metal Products Company (CEMCO), ClarkDietrich, Marino-Ware, or equal.
 - a. V-grooved self-furring type for installation over sheathing. Lath shall be furred out a minimum of 1/4 inch when installed over a solid surface in accordance to DSAIR 25-4.

- b. Flat type for installation over spaced framing.
- 2. Walls: Self-furring Welded Wire Lath: Weight 1.95 pounds per square yard, with Class 1 galvanized coating in conformance to ASTM A641. Structa Mega Lath per ICC ESR-2017, as manufactured by Structa Wire Corp, or equal.
- 3. Walls & Ceilings: Self-furring Welded Wire Lath: Weight 2.2 pounds per square yard, with Class 1 galvanized coating in conformance to ASTM A641 with heavy perforated Kraft paper. V-Truss per ICC ESR-2017, as manufactured by Structa Wire Corp, or equal.
- B. Water Resistive Barrier Backing for Metal Lath:
 - 1. One layer of asphalt saturated, water resistant Kraft paper backing conforming to Fed Spec UU-B-790A, Type 1, Grade D60, manufactured by Fortifiber, Davis Wire, Leather back, or equal. Furnish for exterior plastering (except on soffits and ceilings), and for mortar-set ceramic wall tile.
- C. Self-Adhered Flashing:
 - 1. Compatible with the Plastic Sheet Air Barrier, minimum 25 mils thick, self-sealing and waterproof.
 - 2. Adhesives, primers and sealers for self-adhered flashings and water repellant backing shall be as recommended by manufacturer for installation with specified products and substrates, and shall be approved by the OWNER's Office of Environmental Health and Safety (OEHS).

2.02 METAL LATH ACCESSORIES

- A. Materials: Minimum 0.0172 inch galvanized steel or 0.0207 zinc alloy with expanded wings. PVC is not permitted. Furnish casing beads, expansion and control joints, weep and vent screeds.
- B. Manufacturers: Alabama Metal Industries Corporation (AMICO), California Expanded Metal Products Company (CEMCO), ClarkDietrich, Stockton Products, Marino-Ware, equal.
- C. Products:
 - 1. Exterior Stress Relief Joints: Sizes and profiles, indicated or required. Control joints shall have expanded wings when attachment flange is installed above the primary water-resistant barrier.
 - 2. Expansion Joints: Two piece sections designed to accommodate expansion, contraction and shear forces. Industry generic name: #40-2 piece joint.

3. Control Joints: One-piece sections, with flange designed to engage plaster. Grounds shall provide full 7/8 inch thickness of cement plaster. Industry generic name: XJ-15.
4. Soffit Drip Screed: Similar to Stockton Products No. 5, with key holes.
5. Casing Beads: Expanded or standard flange type with 7/8 inch grounds to establish plaster thickness. Industry generic names: J-Mold or # 66.
6. Welded Wire Corner Reinforcement: 2-5/8 inch wire wings square or bullnose. Industry generic name: CornerAid.
7. Inner Corner Reinforcement: Shaped reinforcing expanded metal with 3 inch legs, for angle reinforcement. Industry generic name: Cornerite.
8. Lath Reinforcement: Flat expanded metal lath reinforcing units. Industry generic name: Striplath.
9. Outside Corner Reinforcing: 2 1/2" legs Class 1 Galvanized Coating complying with ASTM A641. VTruss Straight Corner per ICC ESR-2017, as manufactured by Structa Wire Corp, or equal.

2.03 LATH FASTENERS

A. Fasteners at Locations with no Continuous Insulation:

1. Wood Studs: Fasteners shall be corrosion resistant.
 - a. Nails: In accordance to FS FF-N-105, 0.113 with a 3/8 inch diameter head with length that penetrates wood framing (exclusive of sheathing) 3/4 inch minimum.
 - b. Screws: Type A, in accordance to ASTM C1002, length that penetrates wood framing (exclusive of sheathing) 3/4 inch minimum.
 - c. Staples: In accordance to FS FF-N-105. Minimum 3/4 inch crown, 0.053 inch steel. Staples shall have sufficient length to penetrate studs at least 3/4 inch.
2. Metal Studs: Wafer head type S or S-12, corrosion resistant, with length to penetrate framing steel thickness plus three threads minimum.
 - a. Screws for fastening to steel members from 0.033 inch to 0.112 inch in thickness shall be in accordance to ASTM C954.
 - b. Screws for fastening to steel members 0.033 inch in thickness and less shall be in accordance to ASTM C1002.

B. Fasteners for Concrete and CMU Substrates: Power Actuated Fasteners: For attachment of lath to concrete and concrete masonry, recommended by

manufacturer for the specific use intended. Minimum 3/4 inch long hardened drive style pin with a 1/2 inch diameter style washer. Fasteners shall be corrosion resistant and provide minimum withdrawal resistance of 50 pounds minimum.

- C. Wire: Wire for fastening lath to supports, tying ends and edges of lath sheets, and securing accessories to lath, 0.0475 inch diameter (# 18 wire). Galvanized soft-annealed steel wire in conformance to ASTM A641.

2.04 PLASTER MATERIALS

- A. Factory Blended Portland Cement Plaster Basecoats and Finish: Products as fabricated by California Stucco, La Habra, Shamrock Stucco, Merlex, Omega Stucco, Inc., Expo Stucco, Spec Mix, Quikrete or other manufacturer member of the Stucco Manufacturer's Association (SMA).

1. Material Standards:

- a. Portland Cement: ASTM C150.
- b. Hydrated Lime: ASTM C206.
- c. Sand: ASTM C897.
- d. Fibers: ASTM C1116.

2. Three Coat Systems:

- a. Scratch and Brown Coats: Factory blended fiber reinforced plaster and sand mix conforming to ASTM C926, and requiring only the addition of water. Total thickness of coats: 3/4 inch.
- b. Finish Coat: Factory blended cementitious stucco color coat, integrally colored with fade-resistant pigments. Coat thickness 1/8 inch.
 - 1) Finish: **Light Sand**
 - 2) Color: As selected by ARCHITECT.

3. Two Coat Systems for tile installation:

- a. Scratch and Brown Coat: Factory blended fiber reinforced plaster and sand mix conforming to ASTM C926, and requiring only the addition of water. Total thickness of coats: 3/4 inch.

- B. Water: Clean, potable and from domestic source.

- C. Plaster Bonding Agent: In conformance to ASTM C932 and formulated for exterior use. "Weld-Crete", manufactured by Larsen Products Co., or equal.

- D. Plaster Patching Materials:

1. Bonding Agent: Acrylic resin type, Acryl 60, LHP Bonder, or equal.
 2. Patching Plaster: Manufactured by Merlex Stucco, Inc., or equal. Furnish fast setting, compatible with existing plaster materials, "Exterior Pronto Patch," Portland cement base coat material, requiring only addition of water. Material shall provide initial set within 20 minutes and final set within one hour.
- E. Flashing: Single ply self-adhesive waterproofing membrane as manufactured by W.R. Grace Company, Jiffy-Seal by Protecto Wrap, W.R. Meadows, Inc., or equal. Furnish for installation behind stress relief joints and backing on horizontal and vertical surfaces exposed to weather; under metal copings and flashings; and window jambs and sills.
- F. Miscellaneous Materials: Provide additional components and materials required for a complete installation.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that installation of plastic sheet air barrier and flashings, per Section 07 2719, and continuous insulation per Section 07 2100 are complete before starting Work of this Section.

3.02 INSTALLATION-OF WATER RESISTIVE BARRIER

- A. Install one layer of water resistant barrier over air barrier. Install Kraft paper horizontally with each course weather lapped 2 inches over layer below and 6 inches on ends.
- B. Repair and seal tears and holes in water resistive barrier prior to installing lath.
- C. Install single ply self-adhesive flashing per manufacturer's recommendations in areas indicated on the Drawings and at locations where the plaster will be in less than a 60 degree plane or where water can pond, with a six inches extension onto the vertical wall surface. Apply self-adhesive flashing in a "shingle fashion".

3.04 INSTALLATION OF LATH AND LATH ACCESSORIES

- A. Install longest length of metal lath as possible. Do not use pieces shorter than six feet in length. Attach lath to framing supports not more than seven (7) inches apart along framing supports only.
- B. Apply metal lath with long dimension at right angles to framing or furring supports and lap lath a minimum 1/2 inch at sides and minimum 1 inch on ends. Lap wire lath minimum one mesh on sides and ends. Stagger vertical laps at least 16 inches. Lath shall lap flanges of solid flanged trim accessories by a minimum of 50%.

- C. Ends of lath on open framing (unsheathed) shall occur over supports. Where necessary, install additional studs to provide support for lath ends and support for separate flanges of stress relief joints.
- D. Install trim accessories plumb, level and straight, attachments should not exceed 24 inches on center.
- E. Lath shall not be continuous through control joints. Two-piece Expansion Joints shall have the lath cut, be attached to framing and lath lap the flanges. Place control joints as indicated on elevations. Water resistant barrier shall be continuous behind all control joints and vertical reveals.
- F. Install a weep screed at or below foundation plate line on exterior stud walls in conformance to CBC section 2512. Screed shall be of a type permitting water to drain to exterior of building. Weather-resistant barrier and exterior lath shall cover and terminate on attachment flange of screed.
- G. Powder Actuated Fasteners shall be used on concrete/masonry substrates when lath is applied. Fasteners shall be driven home and avoid spalling of concrete. Pattern shall simulate that of framed walls.
- H. Interior Lathing, General: Install in conformance to ASTM C841 and CBC Chapter 25.
- I. Metal lath shall be fastened to metal supports with specified fastener spaced not more than 6 inches apart or with other recognized fasteners.

3.05 PLASTER APPLICATION - GENERAL

- A. Verify that installation of lath is complete prior to start plastering. Notify the Technical Service Information Bureau upon completion of lath and prior to start of plaster to schedule a lathing installation compliance meeting. TSIB will submit a written field observation report delineating any deficiencies. Site meeting shall be coordinated with OAR.
- B. Proportion, mix, apply, and cure plaster in conformance with ASTM C926 and CBC Chapter 25.
- C. Install each plaster coat to an entire wall or ceiling panel without interruption to avoid cold joints and abrupt changes in uniform appearance of succeeding coats. Wet plaster shall abut existing plaster at naturally occurring interruptions in plane of plaster (such as corner angles, openings and control joints) wherever possible. Cut joining, where necessary, square and straight and at least 6 inches away from a joining in preceding coat.
- D. Provide sufficient moisture or curing methods to permit continuous and complete hydration of cementitious materials, considering climatic and Project site conditions. If water cured, each basecoat shall be continuously damp for at least 48 hours, including weekends and holidays. Other curing methods, spray applied curing compounds, or OEHS approved equal are permitted.

- E. Provide sufficient time between coats to permit each coat to cure or develop enough rigidity to resist cracking or other damage when next coat is installed.

3.06 INTERIOR PLASTERING

- A. Portland Cement Plaster, Scratch Coat: Install to vertical lathed surfaces where ceramic tile is indicated, and install Portland cement plaster finishes where indicated.
- B. Preparation for Plastering:
 - 1. Verify that lath has been installed securely and that grounds, screeds, casing beads and other accessories are straight, in correct position, and securely fastened in place.
 - 2. Bonding Agent: Install to vertical concrete or masonry surfaces to receive ceramic tile.
 - 3. Concrete and masonry surfaces on which suction must be reduced shall be sufficiently moistened before plastering operations start.
 - 4. Install galvanized expanded metal lath on supports in conformance with requirements of ASTM C1063 and CBC.
- C. Number of Coats and Thickness: Interior plastering to receive paint shall consist of the following, with thickness measured from face of supports or surface:
 - 1. On Concrete or Masonry: two coats, brown and finish, 5/8 inch thick.
 - 2. On Metal Lath: three coats, scratch, brown and finish 7/8 inch thick.
- D. Proportions for Interior Plaster: Adhere to current edition of CBC for proportions and curing requirements.
 - 1. Admixtures shall be proportioned, mixed and installed in accordance with printed directions of manufacturer.
- E. Mix factory blended plaster using only sufficient water to obtain proper consistency before installation. Do not mix any more material at any time than can be installed within ½ hour after mixing. Do not allow material to remain in mixer or mixing boxes overnight.
- F. Application:
 - 1. Dash Bond Coat: Dash on surface, leave undisturbed, and maintain damp at least 24 hours following installation. Omit Dash bond coat when liquid bonding agent is used.
 - 2. Scratch Coat: Install with sufficient material to form good keys, thoroughly cover lath, and cross scratch.

3. Brown Coat: Rod to a straight, true and even surface. Brown coat must be 1/16 inch below face of grounds to provide adequate space for finish coat. Float surface to increase density.
4. Smooth Finishes: Install two coats for a thickness of 1/8 inch. Install second coat after finish coat begins to set. Install to a true, even plane and trowel to a smooth finish, free from blemishes.
5. Float Finishes: Install to a thickness between 1/16 inch to 1/8 inch, install and uniformly float to true planes.
6. Plaster Screeds: On metal lath or wire fabric lath, install plaster screeds wherever permanent grounds are too far apart to serve as guides for rodding.

G. Curing Interior Plaster: Adhere to requirements of CBC.

3.08 QUALITY CONTROL

- A. Finish interior and exterior plaster to a uniform texture, free of imperfections and flat within 1/4 inch in 5 feet. Form a suitable foundation for paint and other finishing materials. Avoid joining marks in finish coats.

3.09 REPAIR OF DAMAGED PLASTER

A. Plaster Detached from Framing:

1. Remove loose and broken plaster.
2. Repair or replace damaged water-resistant backing and lath in compliance with specified standards.
3. Remove stucco finish from surrounding area in the same plane by sandblasting.
4. Install a scratch coat and a brown coat mixed with liquid bonding agent instead of water to the areas devoid of plaster.
5. Install a coat of liquid bonding agent to entire wall plane.
6. Install a 1/8 inch thick stucco finish coat to entire wall plane and match existing texture and color.

B. Cracked Plaster 1/8 inch to 1/2 inch:

1. Remove loose material from crack with a wire brush.
2. Fill crack with slurry of stucco and liquid bonding agent.
3. Install a coat of liquid bonding agent to entire wall plane.

4. Install 1/8 inch thick stucco finish to entire wall plane and match existing texture and color.

C. Cracks Larger than ½ inch - Painted:

1. Remove loose material from crack with a wire brush.
2. Fill crack with slurry of one part Portland cement to three parts masonry or stucco sand and liquid bonding agent to match existing texture of adjacent surface.
3. Paint entire wall plane, color to match existing.
4. Where patching of plaster over existing lath is feasible, fasten loose lath and install new lath with nails at 6 inch centers. Where metal is furnished, lap new lath over existing 6 inches and tie at 6 inch centers. Install paper backings as required, shingled into existing.
5. Patching of Holes, Cracks, and Gouges: Holes, cracks, gouges, missing sections, and other defects in existing improvements shall be patched. For holes over 1 inch in size, cut small sections of lath and place in opening attached to existing material. Install 3 coats of plaster. For holes one inch and smaller, install bonding agent to existing surfaces and neatly fill hole with plaster, installing necessary coats to match adjacent surfaces, eliminate cracks and match existing surface texture. Cracks, gouges, and other defects shall be filled with plaster or spackle as required and neatly finished to match adjacent existing improvements.

3.10 CLEANING

- A. Remove rubbish, debris, and waste material and legally dispose of off the Project site.

3.11 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 2900

GYPSUM BOARD

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Gypsum board wall and ceiling systems.
2. Gypsum Liner.
3. Cement Tile Backer Board.

B. Related Requirements:

1. Division 01 - General Requirements.

~~2. Section 05 4100 - Structural Metal Stud Framing. - NIC~~

3. Section 06 1000 - Rough Carpentry.

4. Section 07 9200 - Joint Sealants.

~~5. Section 09 2216 - Non-Structural Metal Framing. - NIC~~

6. 09 9000 Painting Coating.

1.02 PROJECT REQUIREMENTS

- A. Design Requirements: Provide systems capable of resisting deflection as required by CBC and authorities having jurisdiction.
- B. Regulatory Requirements: Comply with CBC requirements for design and installation.

1.03 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating complete suspension system including connections, anchorage, and trim features.
- B. Material Samples: Submit 18 inch by 18 inch Samples of the texture coat of gypsum board panels with edges taped.
- C. Product Data: Submit manufacturer's catalog data for each product proposed for installation.

1.04 QUALITY ASSURANCE

- A. Comply with following as a minimum requirement:

NEW HVAC SYSTEM AT
SANTA ROSA ELEMENTARY SCHOOL
PLEASANT VALLEY SCHOOL DISTRICT

GYPSUM BOARD
09 2900-1

1. ASTM C475 – Standard Specification for Joint Compound and Joint Tape for finishing Gypsum Board.
 2. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
 3. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.
 4. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 5. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 6. ASTM C1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.
 7. ASTM C1396 - Standard Specification for Gypsum Board.
 8. ASTM C1629 - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
 9. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 10. ASTM D3274 – Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation.
 11. Underwriters Laboratories (ULI) requirements and listings for fire-rated materials and products classification.
 12. GA 214 - Gypsum wallboard finish shall conform to requirements of GA 214, Application and Finishing of Gypsum Panel Products, published by the Gypsum Association, and as specified herein.
 13. GA 600 - Gypsum wallboard shall conform to requirements of GA 600 Fire Resistance Design Manual, published by the Gypsum Association.
 14. American National Standards for the Installation of Ceramic Tile.
 15. ANSI A118.9 - Specification for Cementitious Backer Units.
- B. Qualifications: Installer shall have a minimum 5 years experience in installing and finishing gypsum board.
- C. CHPS Low-Emitting Materials table: Materials submitted must meet the CHPS Low-Emitting criteria and be listed as Low-Emitting on the following web site: www.CHPS.net or be listed on UL website Greenguard.org as Greenguard Gold Certified

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original, factory sealed packages, containers or bundles bearing brand name and name of manufacturer.
- B. Materials shall be kept dry. Gypsum wallboard shall be neatly stacked flat; avoid sagging and damage to edges, ends, and surfaces.
- C. Fire-rated materials shall have fire classifications numbers attached and legible.
- D. Provide all means necessary to protect gypsum board systems before, during, and after installation.
- E. Gypsum wallboard showing any evidence of water damage shall not be installed. Gypsum wallboard showing evidence of water damage after installation shall be removed and replaced.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Georgia-Pacific.
- B. National Gypsum Co.
- C. U.S. Gypsum Co.
- D. Or equal.

2.02 MATERIALS

- A. Gypsum Board Type X (fire-resistant) or Type C or Type ULIX as required by fire rated design and acoustic requirements: 5/8 inch thick, 4-foot wide and up to 16-foot long conforming to ASTM C1396 with long edges tapered.

EDIT NOTE: IMPACT RESISTANT SYSTEMS SHALL BE USED IN CORRIDORS, STAIRWAYS AND ANY OTHER AREAS SUBJECT TO POTENTIAL HIGH ABUSE AT ALL PRIMARY, ELEMENTARY AND SECONDARY SCHOOLS. DRAWINGS MUST CLEARLY INDICATE LOCATIONS FOR EACH WALL SYSTEM USED.

- B. Impact Resistant Gypsum Board, Type X (fire-resistant): 5/8 inch thick or Type C as required by fire rated design and acoustic requirements, 4-foot wide and up to 16-foot long complying with the following:
 - 1. Fire resistant rated gypsum core with additives to enhance impact resistance, faced with moisture and mold resistant paper and reinforcing fiber mesh. Comply with ASTM C1629 level 3 hard body impact resistance.

EDIT NOTE: PROVIDE MOLD RESISTANT SHAFTWALL LINER AND MOLD

RESISTANT GYPSUM PANEL SYSTEM AT WALL SHAFTS.
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- C. Mold and Water Resistant Gypsum Board, Type X (fire-resistant): (Use at elevator shaft interior), 5/8 inch thick 4-foot wide, up to 16-foot long conforming to ASTM C1396 with long edges tapered.
 - 1. Resistance to Mold Growth: Minimum score of "10" when tested in accordance to ASTM D3273 and evaluated in accordance with ASTM D3274.
- D. Gypsum Liner, Type X (fire-resistant): 1 inch thick 24-inch wide, up to 14-foot long, conforming to ASTM C1396 or C1658.
 - 1. Resistance to Mold Growth: Minimum score of "10" when tested in accordance to ASTM D3273 and evaluated in accordance with ASTM D3274.
- E. Cement Tile Backer Board: In addition to manufacturers listed in Article 2.01, James Hardie Building Products Inc.
 - 1. Water resistant panels, 1/4 inch thick on horizontal and 1/2 inch thick on vertical surfaces, 4-foot wide and up to 8-foot long conforming to conforming to one of the following requirements:
 - a. Aggregated Portland cement board with polymer-coated, woven glass-fiber mesh embedded in front and back surfaces.
 - b. Cementitious board surfaced with fiberglass reinforcing mesh on front and back and complying with ANSI A118.9 and ASTM C1325.
 - 2. Tile backer boards shall meet the following requirements:
 - a. Resistance to Mold Growth: Minimum score of "10" when tested in accordance to ASTM D3273 and evaluated in accordance with ASTM D3274.

EDIT NOTE: INDICATE STAINLESS STEEL FASTENERS IN COASTAL OR AGGRESSIVE ENVIRONMENTS.

2.03 ACCESSORIES

- A. Metal Trim: Paper-faced metal drywall beads and trim meeting ASTM C1047, as manufactured by USG/Beadex, or equal. Trim units shall be of size and type to fit gypsum board construction and shall include corner beads, casings, edge trim and other shapes indicated and required. Provide 30 year warranty against edge cracking.
- B. Joint Compound for gypsum board products: meeting the following requirements:
 - 1. Shall conform to ASTM C475.

2. In areas subject to moisture after installation such as bathrooms and locker areas use setting type joint compound.
 3. Interior areas not subject to moisture after installation use drying Type Joint compound.
- C. Joint Tapes for gypsum boards: Shall conform to ASTM C475.
- D. Joint mortar and Tape for Cement board.
- a. Use type as recommended by cement board manufacturer
 - b. Fiberglass tape: Durock brand tile backer tape
 - c. Joint Mortar: Meet ANSI 118.4
- E. Finishing Materials: Texture coat finish material shall be manufactured by U.S. Gypsum, Hamilton, or Highland Stucco and Lime Products, Inc., or equal.
- F. Acoustical Sealant: Non-hardening, non-shrinking, for use in conjunction with gypsum board, as recommended by Board Manufacturer and conforming to ASTM C919. Sealant shall maintain fire and sound rating assembly.
- G. Fasteners:
1. Self-drilling, self-tapping bugle-head drywall screws; in conformance to ASTM C1002. No. 6 Type S or S12, 1 5/8-inch long for metal framing,
 2. Wood framing: Screws: Type W 1 5/8-inch minimum length for single-layer panels. Screws shall be furnished with a corrosion-resistant treatment.
 3. Adhesive: as recommended by board manufacturer and in compliance to ASTM C557.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Metal Trim:
1. Provide corner beads at outside corners and angles, metal casing where gypsum board terminates at uncased openings, metal edge trim where board edges abut horizontal and vertical surfaces of other construction.
 2. Install trim in accordance with manufacturer's directions with appropriate joint compound. Install trim in longest practical pieces.
- B. Gypsum Board:

1. Install gypsum board in conformance with ASTM C840, fire rated design, and sound rating.
2. Gypsum board shall be cut by scoring and breaking or by sawing, working from face side. Where board meets projecting surfaces it shall be scribed and neatly cut. Unless conditions require otherwise, gypsum board shall be installed first to ceilings, then to walls. End joints shall occur over a support. Install panels of maximum practical length so a minimum number of end joints occur.
3. End joints shall be staggered and joints on opposite sides of a partition shall be arranged to occur on different studs. Joint layout at openings shall be installed so no end joints will align with edges of openings.
4. Except where specified otherwise, fasteners shall be spaced not less than 3/8 inch from edges and ends of gypsum board. Do not stagger fasteners at adjoining edges and ends.
5. Install gypsum board vertically or horizontal as permitted by specific UL Design at walls. Fasten board with drywall screws spaced not to exceed 8 inches on centers around perimeter of boards and 8 inches on centers on intermediate studs. Space screws at 8 inches on centers along top and bottom runners. Screws shall be driven to provide screwhead penetration just below gypsum board surface without breaking surface paper. Where electrical outlet and switch boxes are indicated, provide adjustable attachment brackets between studs.
6. Install gypsum board to ceiling framing with long dimension at right angles to furring channels, or wood framing members, and fasten with specified drywall screws or nails spaced 6 inches to 7 inches on centers across board. Screws or nails shall be not less than 1/2 inch from side joints and 3/8 inch from butt end joints. Abutting end joints shall occur over furring channels and end joints of boards shall be staggered. Support cutouts or openings in ceilings with furring channels.
7. Install access doors, furnished under another section, in correct location, plumb, or level, flush with adjacent construction, and securely fastened to framing.

C. Cement Board Backer System:

1. In shower areas, install water barrier in shingle-like manner to prevent water infiltration into stud cavity. Pre-cut all board to required sizes and make necessary cut-outs.
2. Install cement board in accordance with UL Design and SA-932. Install Cement board plumb and flat. Shim behind board as required.
3. Fasten cement board to steel studs spaced max. 16" o.c. and bottom runners with cement board fasteners spaced 8" o.c. maximum with perimeter fasteners at least 3/8" and less than 5/8" from ends and edges. Studs shall be not less than 20 gage.

4. Tape joints with cement board tape and joint mortar. Finished surface shall be level within 1/8" in 10".

3.02 TOLERANCES

- A. System shall appear flat and monolithic with no exposed joints.

3.03 JOINT TREATMENT AND FINISHING

*At completion of specified taping and finishing, install one coat of drywall primer as specified hereafter

<u>EDIT NOTE:</u> INDICATE LEVELS OF FINISH ON FINISH SCHEULE.

- B. Levels: Install tape bedding compound, tape, and finishing cement on joints in wallboard as required for specified levels of finish.
- C. Levels 2 through 5:
 1. Install joint cement and finishing cement over screw heads. Treat all inside corners with joint cement, tape, and finishing cement. Treat outside corners with corner beads and finishing cement.
 2. Provide metal casing beads at all edges of gypsum wallboard, which abut ceiling, wall, or column finish, and elsewhere as required, such as openings, offsets, etc. Install all exposed joints, trims, and attachments non-apparent following installation of paint or other finishes. If joints and fasteners are visibly apparent, correct defects as required.
 3. Seal raw edges of plumbing openings and boards that have been cut to fit with sealing compound brushed on.
 4. When entire installation is completed, correct and repair broken, dented, scratched or damaged wallboard before installation of finish materials by other trades.
- D. Levels 3 and 4: Install one coat of drywall primer over entire surface prior to painting.
- E. Level 5: Install one coat of skim coat over entire surface, followed by one coat of drywall primer over entire surface prior to painting.

3.04 REQUIRED LEVELS OF FINISH

- A. Finishes shall conform to GA 214
- B. Unless otherwise indicated or specified, levels of finish required shall be as follows:
 1. Level 1: Plenum areas above ceilings, insides of shafts, and other concealed areas. Taping to be as required for fire rated assemblies.

2. Level 2: Water-resistant wallboard backing for high moisture areas to be covered with a water resistant surface other than tile, vinyl or paint, i.e stainless steel cladding etc.
3. Level 3: Backing for vinyl wall covering and adhered acoustic tile. Also, provide where textured finish is indicated.
4. Level 4: Exposed painted wallboard in classrooms, utility rooms, and similar spaces not requiring Level 5 finish.
5. Level 5: Exposed, painted wallboard in offices and corridors.

EDIT NOTE: IF TEXTURE COATING IS TO BE USED, IT MUST BE INDICATED ON DRAWINGS. TEXTURE COATING SHALL NOT BE USED IN FOOD PREPARATION AREAS.

3.05 TEXTURE COAT

- A. Spray install texture coat to interior gypsum board surfaces where indicated on Drawings.
- B. Texture coat shall provide a uniform splatter pattern finish with an 80 percent minimum coverage of the entire surface area.
- C. Provide protection from spray for interior surfaces of electrical boxes and wiring.

3.06 CLEAN-UP

- A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

3.07 PROTECTION

- A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 3013

CERAMIC TILING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Ceramic tile.
2. Waterproof membrane for tile.
3. Stone thresholds.
4. Mortar setting beds for floor and wall tile.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 3000 - Cast-In-Place Concrete.
3. Section 06 1000 - Rough Carpentry
4. Section 07 9200 - Joint Sealants
5. Section 09 2423 - Cement Plaster and Metal Lath.
6. Section 09 2900 - Gypsum Board.
7. Division 22 - Plumbing

1.02 SUBMITTALS

- A. Product Data: Manufacturer's data, standard specifications, Material Safety Data Sheets, and other technical information for each product specified.
- B. Material Samples: Manufacturer's standard palette, indicating full range of tile colors, textures, and grout colors.
- C. Mock-Ups: For each type, color, and texture, minimum one foot square or three full tile courses, on Plexiglas to demonstrate proper bond mortar and coverage; grout color, hardness and depth.
- D. Installation Instructions: Manufacturer's preparation and installation instructions.

- E. Product Certificates: Signed by manufacturer certifying that products furnished comply with requirements of this Specification.

1.03 QUALITY ASSURANCE

- A. Comply with applicable parts of the following codes or standards as a minimum requirement:
1. ANSI A108, American National Standard Specifications for the Installation of Ceramic Tile.
 2. ANSI A118, American National Standard Specifications for Ceramic Tile Installation Materials.
 3. ANSI A136.1, Standard Specifications for Ceramic Tile.
 4. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 5. ASTM C185 - Standard Test Method for Air Content of Hydraulic Cement Mortar.
 6. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
 7. ASTM C150 - Standard Specification for Portland Cement.
 8. ASTM C241 - Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic.
 9. ASTM C206 - Standard Specification for Finishing Hydrated Lime
 10. ASTM C503 - Standard Specification for Marble Dimension Stone.
 11. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
 12. ASTM D4551 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Flexible Concealed Water-Containment Membrane.
 13. Tile Council of North America (TCNA) – Current edition of “Handbook for Ceramic Tile installation”.
 14. CHPS Low-Emitting Materials Table: Materials submitted for tile assemblies must be listed as low emitting on the CHPS website www.CHPS.net.
- B. Grade Certificate and Labeling: With each delivery of tile, furnish manufacturer's "Master Grade Certificate" to the Project Inspector.

- C. Source of Materials: Provide materials obtained from one source for each type and color of tile, grout, and setting materials.
- D. Consistent Quality: Products shall be consistent in appearance and physical properties.
- E. Comply with requirements of California Building Code and ADAAG.
- F. Qualifications of Tile Manufacturer: Company specializing in ceramic tile, mosaics, pavers, trim units, and thresholds with five years minimum experience.
- G. Qualification of Installation System Manufacturer: Company specializing in installation systems/ mortars, grouts/ adhesives with ten years minimum experience.
- H. Qualifications of Installer: Company specializing in installation of ceramic tile, mosaics, pavers, trim units and thresholds with five years experience with installations of similar scope, materials, and design.
- I. Pre-Construction Meetings: Prior to start of Work of this section and after approval of submittals, schedule an on-site meeting between Contractor, OAR, Project Inspector, and representatives of the material manufacturer and tile installer to review construction conditions and Drawings for conformance with the requirements of this Specification for each substrate.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver tile and other materials in sealed containers, with manufacturer's labels intact.
- B. Keep all materials clean and dry.

1.05 MAINTENANCE

- A. Extra Materials: Provide a minimum of five percent of each type and color as the installed tile, in manufacturers' cartons and labeled.

1.06 WARRANTY

- A. Manufacturer shall provide a five year material warranty.
- B. Installer shall provide a five year fabrication and installation warranty.
- C. For waterproofing, manufacturer shall provide a 10 year material warranty for waterproofing installation, tile setting, and grouting materials.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Tile: To establish quality, Specification is based on ANSI A137.1 Standard Grade. Equivalent tile products from the following manufacturers may be provided:
 - 1. Product lines equal to Volume 1.1, Portfolio and Keystones by Dal-Tile Corporation.
 - 2. Equal.
- B. Installation Materials: To establish quality for setting and waterproofing materials, Specification is based on ANSI A137.1. Products and methods of the following manufacturers may be provided:
 - 1. Laticrete International, Inc.
 - 2. Custom Building Products.
 - 3. Mapei.
 - 4. Equal.

2.02 MATERIALS

- A. Colors, Textures, and Patterns of Tiles: As noted on drawings.. Tile trim and accessories shall match adjoining tile. Grout color shall match tile unless otherwise indicated.
- B. Tile sizes: Tile sizes specified are modular dimensions unless otherwise indicated.
- C. Mortar Sand: ASTM C144.
- D. Portland Cement: ASTM C 50, Type I or II.
- E. Hydrated Lime: ASTM C207, Type S; or ASTM C206 Type S
- F. Portland Cement Mortar: ANSI 118.1
- G. Portland Cement Mortar Bed: Sand-cement mortar mix gauged with Laticrete Acrylic Admix or Custom Building Products Thin-Set Mortar Admix.
- H. Portland Cement Mortar Bed for Shower Areas: Laticrete 226 Thick Bed Mortar Mix Gauged with Laticrete 3701 Mortar and Grout Admix or on site mix per ANSI A108.1A with Custom Building Products Thin-Set Mortar Admix.
- I. Latex Portland Cement Bond Mortar: Laticrete 317 Floor & Wall Thinset gauged with Laticrete 3701 Admix, or Custom Building Products Master Blend mixed with Thin-Set Mortar Admix.

- J. Waterproof Membrane: Cold-applied, single component liquid with embedded reinforcing fabric where recommended by manufacturer: Laticrete Hydro Ban Waterproof Membrane or Custom Building Products Red Guard Waterproof Membrane.
- K. Reinforcing Wire Fabric: 2-inch by 2-inch, 16 by 16 gage, galvanized electrically welded wire reinforcing, per ASTM A 185.
- L. Latex Portland Cement Grout: Laticrete Sanded Grout (1500 Series), Custom Polyblend Sanded Grout or Laticrete Unsanded Grout 1600 Series (for joints smaller than 1/8"), Custom Polyblend Unsanded Grout.
- M. Cleavage Membrane and Wall Backing Paper: Cleavage membrane shall be 15-pound asphalt-saturated felt manufactured according to ASTM D226 Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
- N. Separation Material (for all sealed joints including perimeters and quarry-tile fields of floor mortar beds): Quality Foam, QF 200 white, 3/8 inch wide by 5-inch high.
- O. Backer Rod for sealants (for ceramic mosaic fields): Polyethylene foam, closed-cell, flexible and compressible, 3/16 inch diameter.
- P. Cleaner and Sealer:
 - 1. Cleaner and sealer shall be from one manufacturer, acceptable to tile and grout manufacturers. To establish quality, the Specification is based on Aqua Mix Inc. Equivalent products from Miracle Sealants Co., Watco Tile and Brick, or equal may be provided.
 - 2. Cleaner: Aqua Mix Concentrated Tile Cleaner, neutral phosphate-free cleaner, or Custom Building Products Tile Lab Concentrated Tile and Stone Cleaner.
 - 3. Sealer: Aqua Mix Penetrating Sealer, fungus- and bacteria-resistant, stain-resistant, and slip-resistant as specified for tile, Custom Building Products Tile Lab Surface Gard, or equal.
- Q. Sealants:
 - 1. Sealant and primer shall be from one manufacturer, acceptable to tile and grout manufacturers. See Section 07 9200 - Joint Sealants.
 - 2. Ceramic Mosaic Tile: One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other

nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

2.03 TILE

A. Unglazed Ceramic Mosaic Floor Tile:

1. Size: match existing.
2. Colors and patterns to match existing.
3. Slip Resistance: Resistant to slipping appropriate to the installed conditions of use, as required by the California Building Code and ADAAG.
 - a. As a minimum, the coefficient of friction as measured by ASTM C1028 shall be 0.6 except ramps shall be 0.8.
 - b. For tile in shower and locker areas, incorporate grit into tile to increase slip resistance.

B. Glazed Wall Tile:

1. Size: match existing.
2. Colors and patterns to match existing.

C. Trim:

1. Integral bullnose at external corners.
2. Provide bullnose where tile projects from jamb.
3. Mosaic tile base with wall tile above: A3401.
4. Mosaic tile base without wall tile above: S3619T (6-inch high sanitary coved base).
5. Bullnose at wainscot: A4200 and A4402.

D. Stone Thresholds:

1. Exterior installation: Marble thresholds with minimum abrasive hardness value of 10 tested in accordance with ASTM C241.
2. White honed marble complying with Marble Institute of America Group "A," unless other color indicated.
3. Size and profile shaped to provide transition between tile surfaces and adjoining finished floor surfaces, or as indicated. Width not less than 4

inches. Edges beveled on a slope of no greater than 1:2. Cut to fit door frame profile.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Examine substrates and conditions for compliance with installation requirements. Verify that all penetrations through substrate have been installed. Proceed with Work only after all conditions are in compliance.
- B. Substrates shall be firm; dry; clean and within flatness tolerances required by relevant ANSI A108 tile installation standards. Prepare surfaces as follows:
 - 1. Concrete Floors: Allow concrete floors to cure for 28 days minimum before beginning tile and grout installation. Remove laitance, sand, dust, and loose particles.
 - 2. Plywood Subfloors: Before installing mortar setting bed over plywood sub-floors, install cleavage membrane over sub-floor. Anchor firmly in place and lap joints 6 inches minimum. Turn membrane up 6 inches at walls and beneath building felt on walls.
- C. Substrates to receive wall tile and base shall be:
 - 1. Scratch coat of cement plaster, as specified in Section 09 2423 - Cement Plaster and Metal Lath (required in student restrooms, showers and locker rooms, and quarry tile bases).
 - 2. Cementitious backing panels, as specified in Section 09 2900 - Gypsum Board.
- D. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical items of Work, and similar items located in or behind tile has been completed before installing tile.
- E. Verify that joints and cracks in tile substrates are coordinated with caulked-joint locations; if not coordinated, adjust as required by the Architect.
- F. Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are maintained in compliance with referenced standards and manufacturer's written instructions.
- G. Protect adjacent surfaces during progress of Work of this section.

3.02 TILE INSTALLATION, GENERAL

- A. Install tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Center the tile fields in both

directions for each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

- B. For tile mounted in sheets: Joints between tile sheets shall be the same width as joints within tile sheets.
- C. Extend Work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate Work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without damaging tile. Carefully grind the cut edges of tile abutting trim, finish, or built-in items. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- E. Locate joints, directly above joints in concrete substrates, at horizontal and vertical changes in plane, or where indicated during installation of mortar beds. In quarry tile floors, provide at 12 feet on center maximum. Provide 3/8-inch wide foam at joints. Do not saw-cut joints after installing tiles.
- F. Prepare and clean joints to be sealed. Apply sealants to comply with requirements of Section 07 9200 - Joint Sealants.
- G. Conform to manufacturers printed instructions, and applicable requirements of ANSI and TCNA Standards.

3.03 TILE INSTALLATION, FLOOR

- A. Install reinforcing and latex Portland-cement mortar setting bed over cured concrete slab or cleavage membrane on plywood floor. Lap reinforcing at least one full mesh, and support or lift so that it is approximately in the middle of mortar bed. Do not abut against vertical surfaces. Install foam separation material at perimeters and expansion joint locations for caulked joints.
- B. Mix setting mortar in accordance with ANSI recommendations.
- C. Once begun, mortar installation must continue until room is completed. Discard any batch not floated and finished within ½ hour of mixing. Firmly compact before screeding. Screed to true plane and pitch as indicated. Slope mortar bed sufficiently that water flows to drain and no puddling will occur. Slope mortar down to floor drains for proper installation of waterproof membrane. After screeding, firmly rub down with steel or wood float.
- D. Cure mortar bed with a light fog spray of water and cover with 6-mil Visqueen for 72 hours.
- E. Waterproof Membrane:

1. Install waterproof membrane where indicated and in all kitchen, toilet, shower, and locker areas according to TCNA Standards. Extend membrane up wall mortar or backing board as follows:
 - a. 3 inches above top of curb wall.
 - b. 6 inches minimum above floor.
 - c. In shower rooms, install from floor to ceiling.
2. Insure that layers of membrane are fully inserted into clamping ring of floor drain. After membrane installation and before tile setting, install pea gravel around sub drain to prevent blockage of weep holes and place mortar to proper level for setting tile.
3. For tile installations other than slab on grade, before setting tile and after seven days curing, water test membrane by damming drains and doors, filling floor with water to 4-inch minimum depth, and leaving for 24 hours. Correct any leaks and re-test before proceeding. After testing, protect membrane from traffic until tile Work begins.

F Thin Set Method: Confirm substrate is completely clean and free of dust. Cut foam at floor perimeters flush with top of mortar bed. Insure that bond coats do not intrude into joints to be sealed. Install tile over properly cured setting bed or waterproof membrane utilizing "thin-set" method with latex portland cement bond mortar, in accordance with manufacturer's printed instructions and ANSI A108.5.

G. Minimum coverage of bond mortar shall be 80 percent except 95 percent in shower areas, for quarry tile, and exterior installations. Place tile into fresh mortar press tile to insure full contact. Before setting proceeds, set and remove three tiles or sheets of tiles to confirm specified coverage of bond mortar. If coverage is insufficient, utilize a larger toothed trowel or back butter tiles until proper coverage is provided.

H. Install tile on floors with the following joint widths:

1. Ceramic Mosaic Tile: 1/16 to 1/8 inch.

3.04 TILE INSTALLATION, WALLS

A. Install wall mortar beds before floor mortar beds.

B. On plaster walls, clean scratch coat surface of loose or foreign materials, fog spray with water, and install brown coat mortar bed over scratch coat to a thickness not less than 3/8 inch and not greater than 3/4 inch. Once started, wall mortar installation must continue until wall is completely floated. Discard any batch not floated and finished within 1/2 hour of mixing. As soon as wall mortar is dried to sufficient hardness, but still plastic, firmly rub with wood float.

- C. Cover cure with 40-weight Kraft paper for 72 hours minimum.
- D. Install tile over properly cured setting bed, waterproof membrane, or cementitious backing panels utilizing "thin-set" method with latex portland cement bond mortar, in accordance with manufacturer's printed instructions and ANSI A108.5. Confirm substrate is completely clean and free of dust. Insure that bond coats do not intrude into joints to be caulked.
- E. Minimum coverage of bond mortar shall be 80 percent except 95 percent in shower areas or exterior installations. Set and test as specified for floors.
- F. Lay out Work so tiles will be centered on each wall or section of wall in order to minimize tile cuts. Lay out tile wainscots to next full tile beyond dimensions indicated. Spot setting bed with mortared tile, set plumb and true, accurately indicate plane of finished tile surfaces.
- G. Install tile on walls with following joint widths:
 - 1. Glazed Wall Tile: 1/16 inch.
 - 2. Ceramic Mosaic Tile: 1/16 to 1/8 inch.
 - 3. Special Large Tile: 3/16 to 3/8 inch.
- H. Horizontal joints shall be level, vertical joints plumb with surfaces true and plumb, edges of tiles flushed.
- I. Rub exposed cuts smooth with a fine stone; no cut edge shall be set against a fixture or adjoining surface without a 1/16 inch joint to be caulked.
- J. Install access doors where required, furnished under another section, in correct location, plumb or level, flush with adjacent construction, and securely fastened to framing.

3.05 GROUTING

- A. Prior to starting, ensure that all tile surfaces are clean and excessive bond mortar is scraped and vacuumed from joints (approximately 2/3 depth of tile should be open for grouting). Follow manufacturer's instructions for mixing grout. Once grout Work commences, proceed until complete wall or floor area is finished utilizing one batch of grout.
- B. Latex portland cement grouting: Dampen tile surface and joints with water using sponge, but leaving no puddles in joints. Force grout into joints using sufficient pressure on rubber float so as to fill joints completely, and scrape excess grout off tile surface with rubber float. Smooth or tool grout to uniform joint finish. Do not over water.

- C. Curing latex Portland cement grout: Remove final grout haze with clean soft cloth, and cover with 40-weight Kraft paper to cure. Leave paper in place for protection. Cover wall surfaces with 40-weight Kraft paper for 72 hours.
- D. Epoxy grouting: Do not dampen tile. Follow manufacturer's instructions for mixing grout. Force grout into joints with sufficient pressure on rubber float so as to fill joints completely, and scrape excess grout off tile surface with rubber float. Smooth or tool grout to uniform joint finish. Do not allow grout to harden on face of tile.
- E. Curing epoxy grout: Do not cover floor, but do not allow foot traffic for 72 hours. Then, if grout is not tacky, cover with 40-weight Kraft paper for protection.

3.06 CLEANING AND SEALING

- A. If grout scum is not visible on tile surface after curing, clean tile surface with clear water. Remove and replace cracked, broken or defective Work with proper material.
- B. If, when curing membrane is removed, grout scum is visible on tile surface, use the following cleaning method:
 1. Immediately recover floor with paper or felt and allow to continue curing for a minimum of 14 days; uncover floor and maintain entire tile surface saturated with clean cool water for not less than two hours.
 2. Utilize a neutral cleaner acceptable to manufacturers of tile and grout, and follow manufacturer's instruction. Do not provide generic acid cleaners.
 3. Wet tile floors and apply cleaning solution to floor surface, then scrub with a brush. Rinse area several times with clean water to flush solution off floor surface.
- C. Apply penetrating sealer in accordance with manufacturer's instructions utilizing a dense sponge applicator, paint pad, sprayer or brush. Avoid overlapping, puddling, and rundown. Completely wipe surface dry within 3 to 5 minutes using cotton or paper towels; do not allow sealer to dry on tile. After two hours, test surface by applying water droplets to surface. If water is absorbed, apply a second coat. Avoid surface traffic for 24 hours.

3.06 SEALANTS

- A. Insure joints to be sealed are free of setting and grouting materials and construction debris. Do not permit any foot traffic on installed sealants for a minimum of 48 hours or protect with hardboard strips.
- B. Install in accordance with Section 07 9200 - Joint Sealants.

3.07 PROTECTION

- A. Admit no traffic where tile is installed until mortar and grout has set for a minimum of 72 hours.
- B. Protect Work of this section until Substantial Completion.

3.08 CLEAN UP

- A. Remove rubbish, debris, and waste material and legally dispose of off the Project site.

END OF SECTION

SECTION 09 6513

RUBBER BASE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Topset coved rubber base for installation with surface flooring.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 09 6516 - Sheet Vinyl Flooring.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's published technical data describing materials, construction and recommended installation instructions. Submit technical data and installation instructions for each adhesive material.
- B. Maintenance Instructions: Submit manufacturer's recommendations for maintenance, care and cleaning of base.
- C. Samples: Submit Samples of topset base in each available color. Following color selections, submit Samples, not less than 12 inches long of each selected color and type. Submit pint cans of each type adhesive.
- D. Maintenance Materials: Before Substantial Completion, deliver at least 50 lineal feet and five outside corner units of each color of rubber base installed. Deliver the materials in unopened factory containers or in sealed cartons with labels identifying the contents, matching installed materials. Include unopened cans of adhesives adequate to install the maintenance materials.

1.03 QUALITY ASSURANCE

- A. Qualifications of Installer: Minimum five years experience in successfully installing the same or similar flooring materials.
- B. Comply with the following as a minimum requirement:
 1. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.
 2. ASTM F1861: Standard Specification for Resilient Wall Base.
 3. Comply with current CHPS requirements, www.chps.net.

4. Chemically based products such as sealers, primers, fillers, adhesives, etc. must be approved by Owner's Office of Environmental Health and Safety (OEHS).
5. Each selected color and configuration shall be from same dye lot and color.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered to the Project site in original unopened manufacturer's packaging clearly labeled with manufacturer's name. Store materials at room temperature, but not less than 70 degrees F, for a minimum of 48 hours before installation, unless otherwise indicated in manufacturer's printed instructions.

1.05 PROJECT CONDITIONS

- A. Ventilation and Temperature: Verify areas that are to receive rubber base are ventilated to remove fumes from installation materials, and areas are within temperature range recommended by the various material manufactures for site installation conditions.

1.06 WARRANTY

- A. Manufacturer shall provide a five year material warranty.
- B. Installer shall provide a two year fabrication and installation warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Burke/Mercer Wall Base.
- B. Roppe, Pinnacle Rubber Base.
- C. Flexco Company, Wallflower Premium Rubber Wall Base.
- D. Johnsonite.
- E. Equal.

2.02 MATERIALS

- A. Rubber base: Conform to ASTM F 861; Group 2, solid (homogeneous); Type 1, TS, (thermoset) vulcanized rubber, Style B (coved), 4-inch high unless otherwise indicated, integral colors as selected, non-shrinking, 1/8 inch thick, with matching molded outside corners.

- B. Base Adhesive: Water based, low odor type, as recommended by manufacturer of rubber base.

PART 3 - EXECUTION

3.01 COORDINATION

- A. Coordinate the Work of this section with other sections to provide a level, smooth and clean finish surfaces to receive rubber base.

3.02 EXAMINATION

- A. Field verify dimensions and other conditions affecting the Work of this section before commencing the Work of this section.
- B. Before Work is started, examine surfaces that are to receive rubber base. Deficiencies shall be corrected before starting the Work of this section.

3.03 PREPARATION

- A. Do not start preparation until adjacent concrete floor slabs are at least 90 days old and finish flooring is installed.
- B. Install rubber base when ambient temperature is 70 degrees F. or higher.

3.04 INSTALLATION

- A. Install topset base at:
 - 1. Hard floors, including resilient flooring, concrete and wood, carpet tile and other soft floors.
 - 2. Along cabinetry base and where flooring extends into open cabinets.
- B. Securely fasten cement base to backing in long lengths in accordance with manufacturer's recommendations. Lay out lengths so that not less than 18 inches long filler pieces are provided. Assure that top and toe continuously contact the wall and floor, and that all joints are tight. Install matching factory formed external corners at all offsets. Inside corners shall be coped; wrapped corners are not acceptable.
- C. Use of adhesive gun is prohibited. Apply adhesive directly to substrate using the appropriate notched trowel or spreader according to manufacturer's instructions. Maintain 1/8 inch gap from top of base to prevent adhesive oozing onto adjacent surfaces.
- D. Base and outside corners shall be rolled with a seam roller before adhesive sets.

3.05 CLEANING

- A. Maintain surfaces of base clean as installation progresses. Clean rubber base when sufficiently seated and remove foreign substances.
- B. Clean adjacent surfaces of adhesive or other defacement. Replace damaged and/or defective Work to the specified condition.

3.06 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.07 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 65 16
SHEET VINYL FLOORING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Flooring and accessories as shown on the drawings and schedules and as indicated by the requirements of this section.
- B. Related Documents
 - 1. Drawings and General Provisions of the Contract (including General and Supplementary Conditions and Division 1 sections) apply to the work of this section.
- C. Related Sections:
 - 1. Other Division 9 sections for floor finishes related to this section but not the work of this section
 - 2. Division 3 Concrete
 - 3. Division 6 Wood and Plastics
 - 4. Division 7 Thermal and Moisture Protection

1.02 REFERENCES

- A. Armstrong Flooring Technical Manuals
 - 1. Armstrong Flooring Guaranteed Installation Systems manual, F-5061
 - 2. Armstrong Flooring Maintenance Recommendations and Procedures, manual, F-8663
- B. ASTM International:
 - 1. ASTM E 648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
 - 2. ASTM E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
 - 3. ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
 - 4. ASTM F 1303 Standard Specification for Sheet Vinyl Floor Covering with Backing
 - 5. ASTM F 1482, Standard Guide to Wood Underlayment Products Available for Use Under Resilient Flooring
 - 6. ASTM F 1861 Standard Specification for Resilient Wall Base
 - 7. ASTM F 1869 Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
 - 8. ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
- C. National Fire Protection Association (NFPA):
 - 1. NFPA 253 Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source

2. NFPA 258 Standard Test Method for Measuring the Smoke Generated by Solid Materials

1.03 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide flooring which has been manufactured, fabricated and installed to performance criteria certified by manufacturer without defects, damage, or failure.
- B. Administrative Requirements
 1. Pre-installation Meeting: Conduct an on-site pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section.
 2. Pre-installation Testing: Conduct pre-installation testing as follows: [Specify testing (i.e. moisture tests, bond test, pH test, etc)]
- C. Sequencing and Scheduling
 1. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring.
 2. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond, moisture tests and pH test.

1.04 SUBMITTALS

- A. Submit shop drawings, seaming plan, coving details, and manufacturer's technical data, installation and maintenance instructions (latest edition of Armstrong Flooring Guaranteed Installation Systems manual, F-5061) for flooring and accessories.
- B. Submit the manufacturer's standard samples showing the required colors for flooring, welding rods, and applicable accessories.
- C. Submit Safety Data Sheets (SDS) available for adhesives, weld rod, moisture mitigation systems, primers, patching/leveling compounds, floor finishes (polishes) and cleaning agents and Material Information Sheets for flooring products.
- D. Closeout Submittals: Submit the following:
 1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
 2. Warranty: Warranty documents specified herein

1.05 QUALITY ASSURANCE

- A. Single-Source Responsibility: provide types of flooring and accessories supplied by one manufacturer, including moisture mitigation systems, primers, leveling and patching compounds, and adhesives.
- B. installer shall be experienced and competent in the installation of Armstrong resilient sheet flooring using Armstrong Flooring S-761 Seam Adhesive method and the use of Armstrong Flooring subfloor preparation products.
 - 1. Installer shall be certified as Armstrong Commercial Flooring Certified Installers
 - 2. Provide installer's certification.
- C. Fire Performance Characteristics: Provide resilient vinyl sheet flooring with the following fire performance characteristics as determined by testing material in accordance with ASTM test methods indicated below by a certified testing laboratory or other testing agency acceptable to authorities having jurisdiction:
 - 1. ASTM E 648 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I
 - 2. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Division 1 Product Requirements Sections
- B. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- C. Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.
- D. Store materials in a clean, dry, enclosed space off the ground, protected from harmful weather conditions and at temperature and humidity conditions recommended by the manufacturer. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

1.07 PROJECT CONDITIONS

- A. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65°F (18°C) and a maximum temperature of [100°F (38°C)][85°F (29°C)] for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55°F (13°C) in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances. Refer to the Armstrong Flooring Guaranteed Installations Systems manual, F-5061 for a complete guide on project conditions.

1.08 LIMITED WARRANTY

- A. Resilient Flooring: Submit a written warranty executed by the manufacturer, agreeing to repair or replace resilient flooring that fails within the warranty period.
- B. Limited Warranty Period: 5 years
- C. The Limited Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.
- D. For the Limited Warranty to be valid, this product is required to be installed using the appropriate Armstrong Flooring Guaranteed Installation System. Product installed not using the specific instructions from the Guaranteed Installation System will void the warranty.

1.09 MAINTENANCE

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials from same production run as products installed. Packaged with protective covering for storage and identified with appropriate labels.
 - 1. Quantity: Furnish quantity of flooring units equal to 50% %of amount installed.
 - 2. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra material.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Resilient sheet flooring, wall base, adhesives and accessories:
 - 1. Armstrong Flooring Inc., 2500 Columbia Avenue, Lancaster, PA 17603, www.armstrongflooring.com/commercial
 - 2. Manufacturer must have a headquarters in the United States of America

2.02 RESILIENT SHEET FLOORING MATERIALS

- A. Provide Heterogeneous Through Color Sheet Vinyl Flooring: DecoArt™ Corlon®
 - 1. Description: An inlaid sheet flooring consisting of an embossed wear layer of vinyl chips/granules consolidated on a flexible fibrous backing. Protected by a UV-cured polyurethane finish, the colors and pattern detail are dispersed uniformly throughout the wear layer of the product. Color pigments are insoluble in water and resistant to cleaning agents and light.
 - 2. Inlaid vinyl sheet flooring shall conform to the requirements of ASTM F1303 Standard Specification for Sheet Vinyl Floor Covering with Backing, Type II, Grade 1, with Class A backing
 - 3. Pattern and Color: in color selected from the range currently available from Armstrong Flooring Inc.

4. Width: 6 ft. (1.83 m).
5. Length: up to 82 lineal feet (25 meters)
6. Thickness: 0.080 in. (2.0 mm)

B. Seam Adhesive:

1. Provide Armstrong Flooring S-761 Seam Adhesive at seams as recommended by the resilient flooring manufacturer.

2.03 ADHESIVES

- A. Provide Armstrong S-599 Vinyl Sheet Flooring Adhesive Premium Commercial] for field areas as recommended by the flooring manufacturer.
- B. For non-heat welded seams: Provide Armstrong Flooring S-761 Seam Adhesive at seams as recommended by the resilient flooring manufacturer.

2.04 ACCESSORIES

- A. For patching, smoothing, and leveling monolithic subfloors (concrete, terrazzo, quarry tile, ceramic tile, and certain metals), provide Armstrong S-184 Fast-Setting Cement-Based Patch and Underlayment.
- B. For priming porous substrates to aid in adhesive bond strength and reducing subfloor porosity, provide S-454 Prime Strong™ acrylic primer for porous substrates. For non-porous substrates, provide S-455 Prime Strong™ acrylic primer for non-porous substrates.
- C. For creating a moisture barrier, provide S-452 Seal Strong™ two part moisture mitigation system.
- D. For sealing joints between the top of wall base or integral cove cap and irregular wall surfaces such as masonry, provide plastic filler applied according to the manufacturer's recommendations.
- E. Provide transition/reducing strips tapered to meet abutting materials.
- F. Provide threshold of thickness and width as shown on the drawings.
- G. Provide resilient edge strips of width shown on the drawings, of equal gauge to the flooring, homogeneous vinyl or rubber composition, tapered or bullnose edge, with color to match or contrast with the flooring, or as selected by the Architect from standard colors available.
- H. Provide metal edge strips of width shown on the drawings and of required thickness to protect exposed edges of the flooring. Provide units of maximum available length to minimize the number of joints. Use butt-type metal edge strips for concealed anchorage, or overlap-

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including technical bulletins, product catalog, installation instructions, and product carton instructions for installation and maintenance procedures as needed.

3.02 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions (i.e. moisture tests, bond test, pH test, etc.).
- B. Visually inspect flooring materials, adhesives and accessories prior to installation. Flooring material with visual defects shall not be installed and shall not be considered as a legitimate claim.
- C. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.
- D. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.
- E. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
- F. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.03 PREPARATION

- A. Subfloor Preparation: Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, and other defects with Armstrong Flooring S-184 Fast-Setting Cement-Based Patch and Underlayment as recommended by the flooring manufacturer. Refer to Armstrong Flooring Guaranteed Installation Systems manual, F-5061 and ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring for additional information on subfloor preparation.]
- B. Subfloor Preparation Moisture Mitigation: Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, mitigate moisture and other defects with Armstrong Flooring S-184 Fast-Setting Cement-Based Patch and Underlayment. Refer to Armstrong Flooring Guaranteed Installation Systems manual, F-5061 and ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring for additional information on subfloor preparation.

- C. Subfloor Cleaning: The surface shall be free of dust, solvents, varnish, paint, wax, oil, grease, sealers, release agents, curing compounds, residual adhesive, adhesive removers and other foreign materials that might affect the adhesion of resilient flooring to the concrete or cause a discoloration of the flooring from below. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations for flooring. Avoid organic solvents. Spray paints, permanent markers and other indelible ink markers must not be used to write on the back of the flooring material or used to mark the concrete slab as they could bleed through, telegraphing up to the surface and permanently staining the flooring material. If these contaminants are present on the substrate they must be mechanically removed prior to the installation of the flooring material. Refer to the Armstrong Flooring Guaranteed Installation Systems manual, F-5061 and ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring for additional information on subfloor preparation.
- D. When using S-599 Adhesive, perform subfloor moisture testing in accordance with ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Slabs Using *in-situ* Probes][ASTM F 1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride and Bond Tests as described in publication F-5061, Flooring Guaranteed Installation Systems, manual, to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring. Internal relative humidity of the concrete shall not exceed 90%.MVER shall not exceed 5 lbs./1000 sq. ft./24 hrs. On installations where both the Percent Relative Humidity and the Moisture Vapor Emission Rate tests are conducted, results for both tests shall comply with the allowable limits listed above. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained.
- E. Concrete pH Testing: Perform pH tests on concrete floors regardless of their age or grade level. All test results shall be documented and retained.

3.04 INSTALLATION OF FLOORING

- A. Install flooring in strict accordance with the latest edition of Armstrong Flooring Guaranteed Installation Systems manual, F-5061. Failure to comply may result in voiding the manufacturer's warranty listed in Section 1.08.
- B. Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.
- C. If required, install flooring on pan-type floor access covers. Maintain continuity of color and pattern within pieces of flooring installed on these covers. Adhere flooring to the subfloor around covers and to covers.
- D. Scribe, cut, and fit or flash cove to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.

- E. Adhere flooring to the subfloor without cracks, voids, raising and puckering at the seams. Roll with a 100-pound (45.36 kilogram) roller in the field areas. Hand-roll flooring at the perimeter and the seams to assure adhesion. Refer to specific rolling instructions of the flooring manufacturer.
- F. Lay flooring to provide a minimum number of seams. Avoid cross seams, filler pieces, and strips. Match edges for color shading and pattern at the seams in compliance with the manufacturer's recommendations.
- G. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.
- H. [Prepare heat-welded seams with special routing tool supplied for this purpose and heat weld with vinyl welding rod in seams.] [Prepare sealed seams with special seam adhesive supplied for this purpose.] Use methods and sequence of work in conformance with written instructions of the flooring manufacturer. Finish all seams flush and free from voids, recesses, and raised areas.
- I. [Provide integral flash cove wall base where shown on the drawings, including cove fillet support strip and top edge cap trim. Construct flash cove base in accordance with the flooring manufacturer's instructions. [Heat-weld seams][seam adhesive] as specified for those on the floor].

3.05 INSTALLATION OF ACCESSORIES

- A. Apply top set wall base to walls, columns, casework, and other permanent fixtures in areas where top-set base is required. Install base in lengths as long as practical, with inside corners fabricated from base materials that are mitered or coped. Tightly bond base to vertical substrate with continuous contact at horizontal and vertical surfaces.
- B. Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed.
- C. Apply butt-type metal edge strips where required after flooring installation. Secure units to the substrate, complying with the edge strip manufacturer's recommendations.

3.06 CLEANING

- A. Perform initial and on-going maintenance according to the latest edition of the maintenance recommendations for Corlon.

3.07 PROTECTION

- A. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings. (See Finishing The Job in the latest edition of Armstrong Flooring Guaranteed Installation Systems manual, F-5061.)

END OF SECTION

SECTION 09 7700
FIBERGLASS REINFORCED WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Prefinished polyester glass reinforced plastic sheets and adhered to unfinished gypsum wallboard.
 - 1. Aluminum trim.
- B. Products Not Furnished or Installed under This Section:
 - 1. Gypsum substrate board.
 - 2. Resilient Base.

1.2 RELATED SECTIONS

- A. Section 09_2900 – Gypsum substrate board.
- B. Section 06_1000 – Rough Carpentry
- C. Section 09_9000 - Painting.
- D. Section 09_6513 – Rubber Base.

1.3 REFERENCES

- A. American Society for Testing and Materials: Standard Specifications (ASTM)
 - 1. ASTM D 256 - Izod Impact Strengths (ft #/in)
 - 2. ASTM D 570 - Water Absorption (%)
 - 3. ASTM D 638 - Tensile Strengths (psi) & Tensile Modulus (psi)
 - 4. ASTM D 790 - Flexural Strengths (psi) & Flexural Modulus (psi)
 - 5. ASTM D 2583- Barcol Hardness
 - 6. ASTM D 5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
 - 7. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

- A. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.
- C. Selection Samples: Submit manufacturer's standard color pattern selection samples representing manufacturer's full range of available colors and patterns.
- D. Samples for Verification: Submit appropriate section of panel for each finish selected indicating the color, texture, and pattern required.
 - 1. Submit complete with specified applied finish.
 - 2. For selected patterns show complete pattern repeat.
 - 3. Exposed Molding and Trim: Provide samples of each type, finish, and color.
- E. Manufacturers Material Safety Data Sheets (MSDS) for adhesives, sealants and other pertinent materials prior to their delivery to the site.

1.5 QUALITY ASSURANCE

- A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:
 - 1. ASTM E 84 (Method of test for surface burning characteristics of building Materials)
 - a. Wall Required Rating – Class C.
- B. Sanitary Standards: System components and finishes to comply with:
 - 1. United States Department of Agriculture (USDA) / Food Safety & Inspection Services (FSIS) requirements for food preparation facilities, incidental contact.
 - 2. Food and Drug Administration (FDA) 2013 Food Code 6-101.11.
 - 3. Canadian Food Inspection Agency (CFIA) requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials factory packaged on strong pallets.

- B. Store panels and trim lying flat, under cover and protected from the elements. Allow panels to acclimate to room temperature (range of 60 to 75°F) for 48 hours prior to installation.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Building are to be fully enclosed prior to installation with sufficient heat (70°) and ventilation consistent with good working conditions for finish work
- B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.
 - 1. Provide ventilation to disperse fumes during application of adhesive as recommended by the adhesive manufacturer.

1.8 WARRANTY

- A. Furnish one-year guarantee against defects in material and workmanship.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

- A. Marlite; 1 Marlite Drive, Dover, OH 44622. 800-377-1221 FAX (330) 343-4668 Email: info@marlite.com www.marlite.com. Or approved equal.
- B. Product:
 - 1. Laminated FRP

2.2 PANELS

- A. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.
 - 1. Dimensions:
 - a. Thickness – 0.090 “ (2.29mm) nominal
 - b. Width - 4'-0” (1.22m) nominal
 - c. Length – [10'-0” (3.0m)][8'-0” (2.4m)][As indicated on the drawings] nominal
 - 2. Tolerance:
 - a. Length and Width: +/-1/8 “ (3.175mm)

- b. Square - Not to exceed 1/8 " for 8 foot (2.4m) panels or 5/32 " (3.96mm) for 10 foot (2.4m) panels
- B. Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering.
 - 1. Flexural Strength - 1.7×10^4 psi per ASTM D 790.
 - 2. Flexural Modulus – 6.0×10^5 psi per ASTM D 790.
 - 3. Tensile Strength – 8.0×10^3 psi per ASTM D 638.
 - 4. Tensile Modulus – 9.43×10^5 psi per ASTM D 638.
 - 5. Water Absorption - 0.17% per ASTM D 570.
 - 6. Barcol Hardness (scratch resistance) of 30 as per ASTM D 2583.
 - 7. Izod Impact Strength of 7.0 ft. lbs./in ASTM D 256
- C. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.
- D. Front Finish: Smooth, color to match existing adjacent walls.

Specifier Note: Marlite's Standard FRP panels are available in several configurations, including Class A (I) and Class C (III) Fire-rated, along with various surface textures – smooth and pebble. Color: [Specifier to choose.]

- 1) Marlite Standard FRP is available in a variety of colors, including;
 - a) P100 White
 - b) P106 Beige
 - c) P118 Natural Almond
 - d) P140 Ivory
 - e) P145 Silver
 - f) P151 Light Grey
 - g) P807 Black
 - h) P199 Bright White
 - i) P400N Red
 - j) P410N Brown
 - k) P420N Blue
 - l) P430N Medium Grey
 - m) P440N Biscuit
 - n) P450N Maroon
 - o) P460N Light Yellow
 - p) P470N Dark Grey
 - q) S100 S/2/S White
 - r) S100G White
 - s) S118G Almond
 - t) S490N S2S Light Grey
 - u) S807N Black

Custom patterns and colors are available. Minimum quantities may apply. Contact a Marlite representative for details.

- a. Surface [Specifier to choose.] Marlite Standard FRP and Symmetrics are available on two standard surface textures. Pebbled (indicated by "P" designation i.e., P 100 White) and Smooth (indicated by "S" designation i.e., S 100 White).
- b. Fire Rating [Specifier to choose.] Marlite FRP is available in either Class A (I) or Class C (III) Fire Rating. Specifier should add designation to product number only for Class A (i.e., P 100 White, Class A).
- c. Size: [Specifier to choose, or as indicated on drawings.] standard sizes are;
 - 1) Marlite Standard FRP
 - a) 48" x 96" [1.2m x 2.4m] x .090" (3mm) nom.
 - b) 48" x 108" [1.2m x 2.7m] x .090" (3mm) nom.
 - c) 48" x 120" [1.2m x 3m] x .090" (3mm) nom.
 - 2) Laminated FRP
 - a. 48" x 96" [1.2m x 2.4m] x .090" (3mm) nom.

2.3 MOLDINGS

A Aluminum Anodized Trim: Heavy weight extruded aluminum 6063-T5 alloy prefinished at the factory.

1. Profiles :
 - a. F 550 Inside Corner, 8' length
 - b. F 561 Outside Corner, 8' length
 - c. F 565 Division, 8' length
 - d. F 570 Edge, 8' length
 - e. Color: [Brite Satin Anodized][Black Satin Anodized]

2.4 ACCESSORIES

- A. Fasteners: Non-staining nylon drive rivets.
 1. Match panel colors.
 2. Length to suit project conditions.
- B. Adhesive: Either of the following construction adhesives complying with ASTM C 557.

1. Marlite C-551 FRP Adhesive - Water- resistant, non-flammable adhesive.
2. Marlite C-915 Construction Adhesive - Flexible, water-resistant, solvent based adhesive, formulated for fast, easy application.
3. Titebond Advanced Polymer Panel Adhesive – VOC compliant, non-flammable, environmentally safe adhesive.

C. Sealant:

1. Marlite Brand MS-250 Clear Silicone Sealant.
2. Marlite Brand MS-251 White Silicone Sealant.
3. Marlite Brand - Color Match Sealant.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.
 1. Verify that stud spacing does not exceed 24" (61cm) on-center.
- B. Repair defects prior to installation.
 1. Level wall surfaces to panel manufacturer's requirements. Remove protrusions and fill indentations.

3.2 INSTALLATION

- A. Comply with manufacturer's recommended procedures and installation sequence.
- B. Cut sheets to meet supports allowing 1/8" (3 mm) clearance for every 8 foot (2.4m) of panel.
 1. Cut and drill with carbide tipped saw blades or drill bits, or cut with shears.
 2. Pre-drill fastener holes 1/8" (3mm) oversize with high speed drill bit.
 - a. Space at 8" (200mm) maximum on center at perimeter, approximately 1" from panel edge.
 - b. Space at in field in rows 16' (40.64cm) on center, with fasteners spaced at 12" (30.48 cm) maximum on center.
- C. Apply panels to board substrate, above base, vertically oriented with seams plumb and pattern aligned with adjoining panels.
 1. Install panels with manufacturer's recommended gap for panel field and corner joints.

- a. Adhesive trowel and application method to conform to adhesive manufacturer's recommendations.
 - b. Drive fasteners for snug fit. Do not over-tighten.
- D. Apply panel moldings to all panel edges using silicone sealant providing for required clearances.
 - 1. All moldings must provide for a minimum 1/8 "(3mm) of panel expansion at joints and edges, to insure proper installation.
 - 2. Apply sealant to all moldings, channels and joints between the system and different materials to assure watertight installation.

3.3 CLEANING

- A. Remove excess sealant from panels and moldings. Wipe panel down using a damp cloth and mild soap solution or cleaner.
- B. Refer to manufacturer's specific cleaning recommendations Do not use abrasive cleaners.

END OF SECTION 09 7700

**SECTION 09 8100
ACOUSTICAL INSULATION**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Acoustical insulation and sealants.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 07 2100 - Thermal Insulation.
 - 3. Section 09 2216 - Non-Structural Metal Framing.



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1.02 SUBMITTALS

- A. Product Data:
 - 1. Provide manufacturer's printed Product Data for each product.
 - 2. Provide manufacturer's printed installation instructions.

1.03 QUALITY ASSURANCE

- A. Fire Ratings: Comply with fire-resistance and flammability ratings specified.
- B. Acoustic Performance: Acoustic Insulation shall be tested in accordance to ASTM C423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method, with Type A (#4) mounting.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation from physical damage and from becoming wet or soiled.
- B. Comply with manufacturer's recommendations for handling, storage and protection during installation.

PART 2 - PRODUCTS

2.01 ACOUSTICAL INSULATION

- A. Unfaced Mineral/Glass Fiber Blanket/Batt Acoustical Insulation: Acoustical insulation produced by combining mineral/glass fibers with thermosetting resins to comply with ASTM C665, Type I.
 - 1. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50 when tested in accordance with ASTM E84.
 - 2. Manufacturers: Johns Manville "Sound Control Batts", Owens Corning "Sound Attenuation Batts", or equal.
 - 3. Thickness: 3-inch unless otherwise indicated.

2.02 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Concealed Joints: Non-drying, non-hardening, non-skinning, non-staining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound:
 - 1. Pecora Corp. "BA-98".
 - 2. Tremco Inc. "Tremco Acoustical Sealant".
 - 3. Hilti, Inc. "CP 506".
 - 4. Equal.
- B. Acoustical Sealant for Exposed Joints: Non-oxidizing, skinnable, paintable, gunnable sealant recommended for sealing interior exposed joints to reduce transmission of airborne sound.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with manufacturer's instructions for installation conditions.
- B. Do not install insulation until building is sufficiently enclosed or protected against absorption of moisture by the insulation, and do not install insulation unless supporting framing and construction is in a thoroughly dry condition.

- C. Install snugly between framing members with ends snugly fitted between units and against adjacent construction.
- D. Carefully cut and fit insulation around pipes, conduit, and other obstructions and penetrations.
- E. Where door and window frames occur in framing; cut additional strips of insulation and hand-pack as required to fill voids in and around such frames.
- F. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C919 for use of joint sealants in acoustical applications as applicable to materials, applications and conditions indicated. Install sealants in accordance with manufacturer's instructions.

3.02 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose off of Project site.

3.03 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 9000
PAINTING AND COATING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Interior and exterior painting.
- B. Following items shall not be painted:
 - 1. Brass valves, chromium or nickel-plated piping and fittings.
 - 2. Boiler control panels and control systems.
 - 3. Fabric connections to fans.
 - 4. Flexible conduit connections to equipment, miscellaneous name plates, stamping, and instruction labels and manufacturer's data.
 - 5. Mechanical and electrical utility lines, piping and heating and ventilation ductwork in tunnels, under-floor excavated areas or crawl spaces, attic spaces and enclosed utility spaces.
 - 6. Flag, floodlight, parking light poles and loudspeaker poles, metal stairs, handrails and chain-link fence with a galvanized finish, unless otherwise noted.
 - 7. Structural and miscellaneous steel, open web steel joists and metal floor decking, which will not be exposed in final construction, shall have no finish other than one coat of shop primer.
 - 8. Hardboard covering on tops and backs of counters and benches.
 - 9. Brass, bronze, aluminum, lead, stainless steel and chrome or nickel-plated surfaces.
 - 10. Non-metallic walking surfaces unless specifically shown or specified to be painted.

1.02 REGULATORY REQUIREMENTS

- A. Paint materials shall comply with the Food and Drug Administration's (F.D.A.) Lead Law and the current rules and regulations of local, state and federal agencies governing the use of paint materials.

1.03 SUBMITTALS

NEW HVAC SYSTEM AT
SANTA ROSA ELEMENTARY SCHOOL
PLEASANT VALLEY SCHOOL DISTRICT

PAINTING COATING
09 9000-1

- A. List of Materials: Before submittal of samples, submit a complete list of proposed paint materials, identifying each material by distributor's name, manufacturer's name, product name and number, including primers, thinners, and coloring agents, together with manufacturers' catalog data fully describing each material as to contents, recommended installation, and preparation methods. Identify surfaces to receive various paint materials.
- B. Material Samples: Submit manufacturer's standard colors samples for each type of paint specified. Once colors have been selected, submit Samples of each color selected for each type of paint accordingly:
 - 1. Samples of Paint and Enamel must be submitted on standard 8 ½" x 11" Leneta Opacity-Display Charts. Each display chart shall have the color in full coverage. The sample shall be prepared from the material to be installed on the Work. Identify the school on which the paint is to be installed, the batch number, the color number, the type of material, and the name of the manufacturer.
 - 2. Elastomeric shall be submitted in duplicate samples of the texture coating. Samples will be not less than 2 ½ by 3 ½ in size and installed upon backing. Finished Work will match the reviewed Sample in texture.
 - 3. Materials and color samples shall be reviewed before starting any painting.
- C. For transparent and stained finishes, prepare samples on same species and quality of wood to be installed in the Work, with written description of system used.

1.04 QUALITY ASSURANCE

- A. Certification of Materials: With every delivery of paint materials, the manufacturer shall provide written certification the materials comply with the requirements of this section.
- B. Coats: The number of coats specified is the minimum number. If full coverage is not obtained with the specified number of coats, install additional coats as required to provide the required finish.
- C. Install coats and undercoats for finishes in strict accordance with the recommendations of the paint manufacturer as reviewed by the Architect.
- D. Paint materials shall comply with the following as a minimum requirement:
 - 1. Materials shall be delivered to Project site in original unbroken containers bearing manufacturer's name, brand number and batch number.
 - 2. Open and mix ingredients on premises in presence of the Project Inspector.

1.05 DELIVERY, STORAGE AND HANDLING

NEW HVAC SYSTEM AT
SANTA ROSA ELEMENTARY SCHOOL
PLEASANT VALLEY SCHOOL DISTRICT

PAINTING COATING
09 9000-2

- A. Storage and Mixing of Materials: Store materials and mix only in spaces suitable for such purposes. Maintain spaces clean and provide necessary precautions to prevent fire. Store paint containers so the manufacturer's labels are clearly displayed.

1.06 SITE CONDITIONS

- A. Temperature: Do not install exterior paint in damp, rainy weather or until surface has thoroughly dried from effects of such weather. Do not install paint, interior, or exterior, when temperature is below 50 degrees F, or above 90 degrees F, or dust conditions are unfavorable for installation.

1.07 WARRANTY

- A. Manufacturer shall provide a three year material warranty.
- B. Installer shall provide a three year application warranty.

1.08 MAINTENANCE

- A. Provide at least one gallon of each type, color and sheen of paint coating installed. Label containers with color designation indicated on Drawings.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS

- A. Furnish the products of only one paint manufacturer unless otherwise specified or required. Primers, intermediate and finish coats of each painting system must all be the products of the same manufacturer, including thinners and coloring agents, except for materials furnished with shop prime coat by other trades.
- B. Factory mix paint materials to correct color, gloss, and consistency for installation to the maximum extent feasible.
- C. Paint materials to be minimum "Architectural Grade".
- D. Gloss degree standards shall be as follows:

HIGH GLOSS	70 and above	EGGSHELL	30 to 47
SEMI-GLOSS	48 to 69	SATIN	15 to 29

2.02 MANUFACTURERS

- A. Acceptable manufacturers, unless otherwise noted:
 - 1. Dunn-Edwards Corporation Paints
 - 2. Frazee Paints and Wall coverings

3. Vista Paints
4. Sherwin Williams
5. ICI Paints
6. Equal.

EDIT NOTES:

1. IF MURALS ARE IN SCOPE OF WORK INCLUDE SECTION 09 9623, GRAFFITI RESISTANT COATINGS, IN SPEC BOOK.
2. DELETE ARTICLE 2.03 IF MURALS ARE NOT USED.

2.03 MURALS

- A. Manufacturer: Behr, Premium Plus Ultra Flat, or equal.
- B. Anti-Graffiti Coating: Per Section 09 9623 Graffiti-Resistant Coatings.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Examine surfaces to receive paint finish. Surfaces which are not properly prepared and cleaned or which are not in condition to receive the finish specified shall be corrected before prime coat is installed.
- B. New woodwork shall be thoroughly cleaned, hand sandpapered, and dusted off. Nail holes, cracks or defects in Work shall be filled. On stained woodwork, fill shall be colored to match stain. Filling shall be performed after the first coat of paint, shellac or varnish has been installed.
- C. Plaster surfaces except veneer plaster shall be allowed to dry at least 3 weeks before painting. Veneer plaster shall be allowed to dry sufficiently to receive paint as determined by moisture meter tests.
- D. Metal surfaces to be painted shall be thoroughly cleaned of rust, corrosion, oil, foreign materials, blisters, and loose paint.
- E. Do not install painting materials to wet, damp, dusty, dirty, finger marked, rough, unfinished or defective surfaces.
- F. Concrete surfaces shall be dry, cleaned of dirt and foreign materials and in proper condition to receive paint. Neutralize spots demonstrating effects of alkali.
- G. Mask off areas where necessary.

3.02 APPLICATION

- A. Backpainting: Immediately upon delivery to the Project site, finish lumber and millwork shall be backpainted on surfaces that will be concealed after installation. Items to be painted shall be backpainted with priming coat specified under "Priming".
- B. Priming: New wood and metal surfaces specified to receive paint finish shall be primed. Surfaces of miscellaneous metal and steel not embedded in concrete, and surfaces of unprimed plain sheet metal Work shall be primed immediately upon delivery to the Project site. Galvanized metal Work and interior and exterior woodwork shall be primed immediately after installation. Priming of surfaces and priming coat shall be as follows:
 - 1. Knots, Pitch and Sap Pockets: Shellac before priming.
 - 2. Exterior Woodwork and Wood Doors: Prime with one coat of exterior waterborne emulsion wood primer.
 - 3. Interior Woodwork: Where indicated to be painted, prime with one coat of waterborne wood primer.
 - 4. Stain: Woodwork indicated to receive a stain and varnish finish shall be stained to an even color with water borne stain. On open-grained hardwood, mix stain with paste filler and completely fill pores in wood.
 - 5. Galvanized Metal Work: Clean oil, grease and other foreign materials from surfaces. Install vinyl wash pretreatment coating. Follow manufacturer's instructions for drying time, and then prime with one coat of metal primer.
 - 6. Unprimed Iron, Steel, and Other Uncoated Metals: Where specified to be painted, prime with one coat of metal primer.
 - 7. Shop Primed Metal Items: Touch up bare and abraded areas with metal primer before installation of second and third coats.
 - 8. Coats shall be installed evenly and with full coverage. Finished surfaces shall be free of sags, runs and other imperfections.
- C. Allow at least 24 hours between coats of paint.
- D. Rollers shall not be used on wood surfaces.
- E. Each coat of painted woodwork and metal, except last coat, shall be sandpapered smooth when dry. Texture-coated gypsum board shall be sanded lightly to remove surface imperfections after first coat of paint has been installed.
- F. Each coat of paint or enamel shall be a slightly different tint as required. Each coat of paint, enamel, stain, shellac, and varnish will be inspected by the IOR before next coat is applied. Notify the Project Inspector that such Work is ready for inspection.

1. Tinting Guideline: The first coat, primer/undercoat(s) to be untinted or tinted up to 50 percent lighter or darker (at the discretion of the installer) than the finish coat. The second coat (or third coat if a seal coat and undercoat have been specified) is to be factory tinted in the range of 10 percent to 15 percent lighter or darker (at the discretion of the installer) than the finish coat. The final coat is to be factory tinted to the required color selected. These tinting guidelines shall be provided on all surfaces receiving paint.
- G. Do not "paint-out" UL labels, fusible links and identification stamps.
- H. Paint Roller, brush and spray.
1. Only Paint rollers shall be used on interior plaster, drywall, masonry/plaster and plywood surfaces, nap shall not exceed one half inch in length.
 2. First coat on wood overhang and ceilings shall have material applied by roller and then brushed out in a professional manner to leave surface free of imperfections. Finish coat may be sprayed.
 3. Other surfaces shall have all coatings applied with brushes of proper size.
 4. Spray work is permitted only on radiators, acoustic plaster, masonry and plaster.
- I. Where ceilings are specified to be painted, beams, cornices, coves, ornamental features, plaster grilles, etc. shall be included.
- J. Ceilings shall be white, including classrooms, storage rooms, offices, arcades, etc. Boiler room and fan room ceiling color shall match adjacent walls.

3.03 CLEANING

- A. Remove rubbish, waste, and surplus material and clean woodwork, hardware, floors, and other adjacent Work.
- B. Remove paint, varnish and brush marks from glazing material and, upon completion of painting Work, wash and polish glazing material both sides. Glazing material, which is damaged, shall be removed and replaced with new material.
- C. Clean hardware and other unpainted metal surfaces with recommended cleaner. Do not furnish abrasives or edged tools.

3.04 SCHEDULE

- A. Interior:
1. Woodwork, Painted: 3 coats.

- a. First Coat: As specified in this section under Priming.
 - b. Second and Third Coats: Interior enamel, semi-gloss or gloss as indicated.
2. Woodwork, Stained and Varnished: 4 coats.
 - a. First Coat: As specified in this section under Priming.
 - b. Second, Third and Fourth Coats: Varnish, semi-gloss.
3. Wood Corridor doors: 4 coats.
 - a. First Coat: As specified in this section under Priming.
 - b. Second, Third, and Fourth Coats: Varnish, gloss.
4. Other Wood Doors: 4 coats.
 - a. Varnished or painted as indicated.
 - b. If varnished, same finish system as painted woodwork, with semi-gloss or gloss finish to match adjacent wall.
5. Miscellaneous Woodwork: 4 coats. Wood items including, but not limited to: stair treads and risers, handrails, rolling ladders, wood base and shoe, chair rails, counter tops and locker room benches.
 - a. First Coat: As specified in this section under Priming.
 - b. Second, Third and Fourth: Exterior varnish, gloss.
6. Casework: Interior surfaces of casework (except plastic laminate-faced casework) including top, edges and underside of shelving, poles, surfaces of drawers (except fronts), interior surfaces of mailbox pigeonholes, and particle board.
 - a. First Coat: Waterborne stain.
 - b. Second and Third Coats: Satin varnish.
7. Plaster: 4 coats.
 - a. First Coats: Pigmented wall sealer.
 - b. Second coat: Enamel under coater.
 - c. Third and Fourth Coats – Interior enamel, semi-gloss or gloss as indicated.
8. Gypsum Board: 4 coats.

- a. First Coat: Drywall sealer.
 - b. Second Coat: Enamel under coater.
 - c. Third and Fourth Coats: Interior enamel, semi-gloss or gloss as indicated.
 - 9. Concrete: 3 coats.
 - a. First: Concrete sealer.
 - b. Second and Third: Interior enamel, semi-gloss or gloss as indicated.
 - 10. Concrete Block: 3 coats.
 - a. First: Concrete block filler.
 - b. Second and Third: Interior enamel, semi-gloss or gloss as indicated.
 - 11. Metal: Shall be cleaned, pre-treated and painted with 3 coats. Items to be painted include, but are not limited to: exposed structural and miscellaneous steel, metal doors and frames, ladders, table and bench legs.
 - a. First Coat: Metal primer.
 - b. Second and Third Coats: Interior gloss enamel, except metal doors and frames which shall be semi-gloss or gloss to match adjacent wall.
- B. Exterior:
- 1. Woodwork: 3 coats.
 - a. First Coat: As specified in this section under Priming.
 - b. Second and Third Coats: Exterior house and trim enamel.
 - 2. Wood Doors: 3 coats.
 - a. First Coat: As specified in this section under Priming.
 - b. Second and Third Coats: Exterior gloss enamel.
 - 3. Plaster and Stucco: 3 coats. Flat 100 percent acrylic.
 - a. Prime Coat: Alkali resistant primer/sealer.
 - b. Exterior 100 percent acrylic.

4. Concrete: 3 coats. Flat 100 percent acrylic.
 - a. First Coat: Concrete sealer.
 - b. Second and Third Coats: Exterior 100 percent acrylic.
5. Concrete Block: 3 coats. Flat 100 percent acrylic.
 - a. First Coat: Concrete block filler.
 - b. Second and Third Coats: Exterior 100 percent acrylic.
6. Metal: 3 coats. Shall be cleaned and pre-treated. Items to be painted include, but are not limited to: steel columns and miscellaneous steel items, gravel stops, metal doors and frames, hoods and flashings.
 - a. First Coat: As specified in this section under Priming.
 - b. Second and Third Coats: Exterior gloss enamel.

C. Mechanical and Electrical Work:

1. Except where interior mechanical and electrical Work to be painted is specified to receive another paint finish, Work occurring in finished rooms and spaces shall be cleaned, pre-treated, and painted with 3 coats. Items to be painted include, but are not limited to: steel and copper piping, pipes, vents, fittings, ducts, plenums, miscellaneous supports and hangers, electrical conduit, fittings, pull boxes, outlet boxes, unfinished surfaces of plumbing fixtures, miscellaneous metal cabinets, panels, and access doors and panels.
 - a. First Coat: As specified in this section under Priming.
 - b. Second and Third Coats: Interior enamel, semi-gloss or gloss to match adjacent wall or ceiling finish.
2. Insulation and Taping on Pipes and Ducts: 3 coats.
 - a. Finished Rooms:
 - 1) First Coat: Interior waterborne primer.
 - 2) Second and Third Coats: Interior semi-gloss or gloss enamel to match adjoining wall or ceiling finish.
 - b. Building Exterior:
 - 1) First Coat: Exterior waterborne primer.
 - 2) Second and Third Coats: Exterior gloss enamel.

3. Inside surfaces of ducts, vents, dampers and louvers as far back as visible from room in which they open shall be painted with 2 coats of flat black paint.

D. Miscellaneous:

1. Outside Storage Units (wood or metal): 3 coats.
 - a. First Coat: As specified in this section under Priming.
 - b. Second and Third Coats: Exterior gloss enamel.
2. Exterior and interior surfaces of storage bins, and potting tables shall have 3 coats of acrylic stain.
3. Wood compost bins shall be finished with 3 coats of acrylic stain.

3.05 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.06 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 10 1400 SIGNAGE AND SYMBOLS

PART 1 - GENERAL

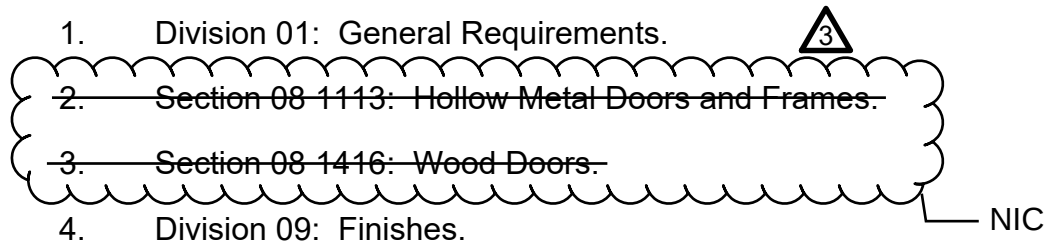
1.01 SUMMARY

A. Section Includes:

1. Interior and exterior accessibility, identification, directional and informational signs and Symbols.

B. Related Requirements:

1. Division 01: General Requirements.



4. Division 09: Finishes.

1.02 REFERENCES

A. ASTM International:

1. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
3. ASTM D4802 - Standard Specification for Poly (Methyl Methacrylate) Acrylic Plastic Sheet.

1.03 SUBMITTALS

- A. Product Data: Submit material descriptions, finishes and color charts for each type of sign.
- B. Shop Drawings: Submit Shop Drawings indicating sign style, lettering, overall dimensions and quantities. Submit floor plans showing locations for each sign.
- C. Material Samples: Submit three samples illustrating full size sample sign, of type, style and color specified.
- D. Manufacturer's installation instructions.

1.04 QUALITY ASSURANCE

- A. Pre-Installation Conference: Notify OWNER when signs are ready for installation. Arrange for conference at site. Do not proceed with installation until ARCHITECT'S approval of specific locations and methods of attachment has been obtained.
- B. Provide signs from one manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site and protect from damage. Store until immediately prior to installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Products of following manufacturers are acceptable and are the basis for intended design and quality.
 - 1. H. Toji and Company.
 - 2. Karman Ltd., Architectural Signs.
 - 3. Vomar Products Inc.
 - 4. ASI-Modulex, Inc.
 - 5. Mohawk Sign Systems, Inc.
 - 6. Accent Signage Systems.
 - 7. The Gruenke Company.
 - 8. Ada Sign Products.
 - 9. AccuBraille.
 - 10. Equal.

2.02 MATERIALS AND FABRICATION

- A. Interior Sign Materials:
 - 1. Substrate Panel: 1/8 inch minimum thick, integrally colored or clear acrylic plastic, or laminated acrylic. Conforming to ASTM D4802; non-glare (matte), UV stable, suitable for interior and exterior use.
 - a. Corners shall be radius.

- b. Edges shall be square and eased.
- c. Colors as selected by ARCHITECT from manufacturer's custom color range.

2. Fasteners:

- a. Stainless steel tamper-proof screws and plastic anchors.
- b. Signs mounted on fire-rated doors shall be secured with adhesive.
- c. Adhesives and sealants shall comply with the limits for VOC content and shall be approved by OWNER's Office of Environmental Health Services (OEHS).

B. Exterior Sign Materials:

- 1. Sign: ASTM B209 aluminum sheet, 0.080 inch thick with rounded corners of at least 1/8 inch radius and eased edges. White figure on a blue background; non-glare, high contrast signs. The blue shall be equal to color number 15090 in Federal Standard 595C.
- 2. Post: 2 by 2 inch galvanized steel tubing, weighing minimum of 4.31 pounds per foot and conforming to ASTM A500, Grade B, 3/16 inch thick wall thickness.



~~3. Concrete Post Footings: Refer to Section 32 1313, Site Concrete Work.~~

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- 4. Fasteners: Stainless steel carriage bolts with tamper resistant nuts.

C. Characters and Symbols: Shall be fabricated by one of the processes described below:

- 1. Computer cut raised characters and graphics shall be cut from 1/16 inch integrally colored acrylic. Raised characters and graphics shall be inlaid 1/32 inch minimum into first surface of sign background, secured with adhesive so it cannot be removed without the use of tools. Raised characters and graphics shall have beveled, eased or rounded edges. Non-tactile text and graphics shall be applied to the second surface, and background color shall be applied to the second surface and protected with film or an additional backplate. Pictograms and other symbols including the International Symbol of Accessibility, which are included on signs with raised characters and Braille, are not required to be raised.
- 2. Raised characters and graphics including braille shall be integral to sign face and shall be formed into sign face by high pressure thermoforming using a negative mold. No applied, glued, welded tactile elements are acceptable. Raised characters and graphics shall have beveled, eased or rounded edges. No sharp, square edges are acceptable. Non-tactile text and graphics shall be applied to the second surface, and background color shall be applied to the second surface and protected with vinyl film. Pictograms and other symbols including the International

Symbol of Accessibility, which are included on signs with raised characters and Braille, or other signs are not required to be raised.

2.03 COMMUNICATION ELEMENTS AND FEATURES

A. Raised Characters Raised characters shall comply with CBC 11B-703.2.

1. Character Type: Characters on signs shall be raised 1/32 inch minimum above their background and shall be sans serif uppercase characters duplicated in Braille. Characters and Braille shall be in a horizontal format.
2. Character Height: Character height measured vertically from the baseline of the character shall be 5/8 inch minimum and 2 inch maximum based on the height of the uppercase letter "I".
3. Character Proportions: Characters shall be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the letter "I".
4. Stroke Thickness: Stroke thickness of the uppercase letter "I" shall be 15 percent maximum of the height of the character.
5. Character and Line Spacing shall be in conformance to CBC 11B-703.2.7 and 11B-703.2.8.
6. Character Placement: Shall be placed in accordance to Paragraph 2.03, C below.

B. Visual Characters: Visual characters shall comply with CBC Section 11B-703.5. Characters shall be conventional in form, and shall be uppercase or lowercase or a combination of both, as indicated on the drawings. Characters shall not be italic, oblique, highly decorative, or of other unusual forms.

1. Finish and Contrast: Characters and their backgrounds shall have a non-glare finish. Characters shall contrast with their background with either light characters on a dark background or a dark characters on a light background.
2. Character Proportions: Characters shall be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the uppercase of the letter "I".
3. Character Height: Minimum character height shall comply with CBC Table 11B-703.5.5.
4. Height from Finish Floor or Ground: Visual characters shall be a 40 inches minimum above the finish floor or ground
5. Stroke Thickness: Uppercase letter "I" shall be 10 percent minimum and 20 percent maximum of the height of the character.

6. Character and Line Spacing: Shall be in accordance to CBC 11B-703.5.8 and 11B-703.5.9.
- C. Braille: Contracted Grade 2 Braille, conforming to CBC 11B-703.3. Braille characters shall be inlaid optically correct acrylic Raster beads into computer drilled holes in the panel surface.
1. Dimensions and Capitalization: Braille dots shall have a domed or rounded shape and shall comply with CBC Table 11B-703.3.1. The indication of an uppercase letter or letters shall only be used before the first word of sentences, proper nouns and names, individual letters of the alphabet, initials, and acronyms.
 2. Position: Braille shall be positioned below the corresponding text in a horizontal format, flush left or centered. If text is multi-lined, Braille shall be placed below the entire line of text. Braille shall be separated 3/8 inch minimum and 1/2 maximum from any other tactile characters and 3/8 inch minimum from raised borders and decorative elements.
- D. Pictograms: In conformance to CBC 11B-703.6. Pictograms shall have a field height of 6 inches minimum. Characters and Braille shall not be located in the pictogram field.
1. Finish and Contrast: Pictograms and their field shall have a non-glare finish. Pictograms shall contrast with their field with either a light pictogram on a dark field or a dark pictogram on a light field.
 2. Text Descriptors: Pictograms shall have text descriptors located directly below the pictogram field, and shall comply with CBC 11B-703.2, 11B-703.3 and 11B-703.4.
- E. International Symbol of Accessibility (ISA): Shall comply with CBC 11B-703.7 and CBC Figure 11B-703.7.2.1. The ISA shall consist of a white figure on a blue background. The blue color shall be approximate to FS. 15090 in Federal Standard 595C.
- F. Mounting Locations and Height: Signs with tactile characters shall be as indicated on the drawings and in conformance to CBC 11B-703.4.
1. Mounting Locations:
 - a. Identification signs for rooms and spaces shall be located on the wall adjacent to the latch side of the door, as one enters the room or space.
 - b. Signs that identify exits shall be located at the exit door when approached in the direction of egress travel.
 - c. Signs containing tactile characters shall be located so that a clear floor space 18 inches minimum by 18 inches minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.

- d. Where a tactile sign is provided at a door, the sign shall be located alongside the door at the latch side.
 - e. Where a tactile sign is provided at double doors with one active leaf, the sign shall be located at the inactive leaf.
 - f. Where a tactile sign is provided at double doors with two active leafs, the sign shall be located to the right of the right hand door.
 - g. Where there is no wall space at the latch side of a single door or at the right side of double doors, signs shall be located on the nearest adjacent wall.
2. Mounting height above finish floor or ground: Tactile characters on signs shall be located 48 inches minimum above the finish floor or ground surface, measured from the baseline of the lowest Braille cells and 60 inches maximum above the finish floor or ground surface, measured from the baseline of the highest line of raised characters.

2.04 ROOM IDENTIFICATION SIGNS

A. Room Identification Sign Types:

- 1. Room Identification Sign with Changeable Insert: 7 inches high by 9 inches wide, minimum, with 4 inches high by 9 inches wide window for name and title removable insert. Locate room name immediately below window, and centered above room number. Room name shall be raised characters 3/4 inches high minimum, and room number 1 inch minimum; and shall be accompanied with Braille indicators.
- 2. Room Identification Sign with Room Name and Room Number: 7 inches high by 9 inches wide, minimum. Room name shall be raised characters 3/4 inches high minimum, and room number 1 inch minimum; and shall be accompanied with Braille indicators.
- 3. Room Number Sign: 7 inches wide by 4 inches high; room number, 1 inch high minimum, raised character, accompanied by Braille indicator immediately below.

B. Room Identification Sign Requirements:

- 1. Finish and Contrast: Refer to paragraph 2.03.B.
- 2. Raised Characters and Proportions: Refer to paragraph 2.03.A.
- 3. Braille: Refer to paragraph 2.03.C.
- 4. Mounting Location and Height: Refer to paragraph 2.03.F.

2.05 RESTROOM SIGNAGE

- A. Multiple-Occupancy restrooms shall be provided with geometric symbols and wall mounted pictograms with text descriptors.
- B. Geometric Symbols:
 - 1. Doorways leading to toilet rooms shall be identified by a geometric symbol complying with CBC Section 11B-703.7.2.6.
 - 2. Male Restroom Door Symbol: 1/4 inch thick equilateral triangle with edges 12 inches long, with vertex pointing upward, the triangle symbol shall contrast with the door, either light on a dark background or dark on a light background.
 - 3. Female Restroom Door Sign: 1/4 inch thick circle 12-inch diameter, the circle symbol shall contrast with the door, either light on a dark background or dark on a light background.
 - 4. "All Gender" Restroom Door Sign (Single occupancy restrooms): 1/4 inch thick circle, 12-inch diameter with a 1/4 inch thick equilateral triangle with the vertex pointing upward superimposed on the circle and within the 12-inch diameter. Triangle and circle shall be of contrasting colors; the circle symbol shall contrast with the door.
 - 5. Edges and Vertices on Geometric Symbols: Shall be eased or rounded at 1/16 inch minimum, or chamfered at 1/8 inch maximum. Vertices shall be radiused between 1/8 inch minimum and 1/4 inch maximum.
 - 6. Location and Mounting Height: Symbols shall be mounted at 58 inches minimum and 60 inches maximum above the finish floor or ground surface measured from the centerline of the symbol. Where a door is provided the symbol shall be mounted within one inch of the vertical centerline of the door.
- C. Room Identification for Multiple-Occupancy Restrooms: Provide a 16 inch long by 6 inch tall room identification sign, including a pictogram of the International Symbol of Accessibility on a side. Restroom names shall be "Girls" or "Boys", for students, and "Women" and "Men" for staff. Characters, Braille, pictograms and mounting locations and height shall be in conformance to Article 2.03.
- D. Room Identification for Single-Occupancy Restrooms: Provide a 16 inch long by 6 inch tall room identification sign, including a pictogram of the International Symbol of Accessibility on a side. Text descriptor shall be "All Gender Restroom". Characters, Braille, pictograms and mounting locations and height shall be in conformance to Article 2.03.
- E. Room Identification for Non-Accessible Single-Occupancy Restrooms: Provide an 8 inch long by 3 inch tall room identification sign. Text descriptor shall be "All Gender Restroom". Characters, Braille, and mounting locations and height shall be in conformance to Article 2.03.

2.06 RAISED CHARACTER AND BRAILLE EXIT SIGNS

- A. Tactile Exit Sign Types:
 - 1. "EXIT".
 - 2. "EXIT ROUTE".
 - 3. "TO EXIT".
- B. Sign Requirements:
 - 1. Finish and Contrast: Refer to paragraph 2.03.B.
 - 2. Raised Characters and Proportions: Refer to paragraph 2.03.A.
 - 3. Braille: Refer to paragraph 2.03.C.
 - 4. Mounting Location and Height: Refer to paragraph 2.03.F.

2.07 DIRECTIONAL EXIT SIGNAGE

- A. At exits serving a required accessible space but not providing an approved accessible means of egress, at elevator landings and within areas of refuge, provide signage indicating the location of accessible means of egress.
 - 1. Finish and Contrast: Refer to paragraph 2.03.B.
 - 2. Character Height and Proportions: Refer to paragraph 2.03.B.
 - 3. Symbol of Accessibility: Refer to paragraph 2.03.E.

2.08 ACCESSIBILITY ENTRANCE SIGNS AND PATH OF TRAVEL DIRECTIONAL SIGNS

- A. Entrance Sign: Provide at each building entrance an International Symbol of Accessibility sign. Signs shall be visible to persons along approaching pedestrian ways.
- B. Directional Signs: Provide where indicated on the drawings with arrow indicators and International Symbol of Accessibility.
- C. Signs shall be mounted on wall with lower edge between 48 inches and 60 inches above ground surface or finish floor. Pole mounted, overhead and projecting signs shall have the lower edge at least 80 inches from the ground surface or finish floor.
- D. Sign shall comply with the following requirements.
 - 1. Directional Signs: Refer to paragraph 2.03.B.
 - 2. Symbol of Accessibility: Refer to paragraph 2.03.E.

- E. No Smoking Sign: Provide at each building entrance. Reverse cut white vinyl sign with 4 1/2-inch high no smoking symbol, mounted on glass entry doors. Under No Smoking symbol, place words "No Smoking", 1/2 inch high minimum, San Serif upper and lower case characters.

2.09 OCCUPANT LOAD SIGNS

- A. Provide maximum occupancy load signs. Post in a conspicuous place near the main exit or exit access doorway from the room or space of rooms and areas indicated in the drawings.
- B. Minimum size: 4 inches high by 8 inches wide, 7/8 inch high letters, 1 inch high numerals.
- C. Sign to read: "MAXIMUM OCCUPANCY LOAD XXX". Indicate occupant load shown on drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Beginning of installation means installer accepts condition of existing surfaces.

3.02 METHODS OF INSTALLATION

- A. Interior Identification Signs and Interior Directional Signs:
 - 1. Fasten to wall with four tamper-proof round-head screws, one at each corner of sign. Furnish plastic anchors.
 - 2. When concealed installation is specified, install backplate to wall as above. Fasten sign to backplate with very high-bond double-faced tape.
 - 3. For installation on glass, fasten sign to glass with very high bond double faced tape. On opposite side of glass, anchor matching backplate to glass with very high-bond double-faced tape.
- B. Geometric Signs: Geometric toilet room signs shall be fastened to doors with three tamper-proof oval-head counter-sunk screws.
- C. Exterior Post Mounted Directional Signs: Size of required footing shall be as indicated on the drawings. Fasten sign with tamperproof stainless steel bolts.
- D. Exterior Wall Mounted Identification Signs and Directional Signs:
 - 1. Aluminum signs: Fasten to wall with 4 tamper-proof round-head screws, one at each corner of sign. Furnish plastic anchors.

- a. Cement Plaster, Brick, or Masonry: Provide plastic anchors. For signs greater than 640 square inches use Leadwood Screw Anchors, concrete fasteners 1WSA 10112, or equal.
 - b. Chain Link Fence: Fasten with 9 gage hog rings, King Hughes Fasteners 5150DG50, or equal, with 11/16 inch opening at each corner of sign.
 - c. Wrought Iron Fence: Install at each corner with 3/16 inch stainless steel rivets.
2. Acrylic signs: Install backplate to wall as indicated above. Fasten sign to backplate with high-bond double-faced tape and silicone.

3.03 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

3.04 PROTECTION

- A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 102113.17
PHENOLIC-CORE TOILET COMPARTMENTS



SECTION 102113.17 - PHENOLIC-CORE TOILET COMPARTMENTS

PART 1 - GENERAL



1.1 SUMMARY

A. Section Includes:

1. Phenolic-core toilet compartments.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for **blocking**.
2. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

1.2 COORDINATION

- A. Coordinate requirements for blocking, reinforcing, and other supports concealed within wall to ensure that toilet compartments can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data.

1. Phenolic-core toilet compartments.
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of centerlines of toilet fixtures.
3. Show locations of floor drains.

C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of toilet compartment.

1. Include Samples of hardware and accessories involving material and color selection.

D. Samples for Verification: Actual sample of finished products for each type of toilet compartment, hardware, and accessory.

1. Size: **Manufacturers' standard size**.

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- E. Delegated Design Submittals: For grab bars mounted on toilet compartment panels, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- 1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For toilet compartments.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Materials: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

- 1. Door Hinges: **One** hinge(s) with associated fasteners.
 - 2. Latch and Keeper: **One** latch(es) and keeper(s) with associated fasteners.
 - 3. Door Bumper: **One** door bumper(s) with associated fasteners.
 - 4. Door Pull: **One** door pull(s) with associated fasteners.
 - 5. Fasteners: **10** fasteners of each size and type.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain phenolic-core toilet compartments from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Regional Materials: Products shall be manufactured within **500 miles** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles** of Project site.
- B. Regional Materials: Products shall be manufactured within **500 miles** of Project site.
- C. Product shall be made without urea formaldehyde.

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- D. Product 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."
- E. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: **25** or less.
 - 2. Smoke-Developed Index: 450 or less.
- F. Structural Performance: Where grab bars are mounted on toilet compartments, design panels to comply with the following requirements:
 - 1. Panels are able to withstand a concentrated load on grab bar of at least **250 lb** applied at any direction and at any point, without deformation of panel.
- G. Regulatory Requirements: Comply with applicable provisions in **the 2022 California Building Code Chapter 11B** for toilet compartments designated as accessible.

2.3 PHENOLIC-CORE TOILET COMPARTMENTS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide **ASI Accurate Partitions; Color-Core Phenolic** or comparable product.
- B. Toilet-Enclosure Style: **Overhead braced and Floor anchored, privacy type**. To maximize privacy, panel and doors shall extend to within 4" of floor and be 72" tall.
- C. Door, Panel, and Pilaster Construction: Solid phenolic-core material with melamine facing on both sides fused to substrate during manufacture (not separately laminated), and with eased and polished edges. Provide minimum **3/4-inch-** thick doors and pilasters and minimum **1/2-inch-** thick panels. **Provide with no-sightline system consisting of door and pilaster lapped edges on strike side of door and door and pilaster lapped edges on hinge side of door unless continuous hinge is used).**
- D. Pilaster Shoes: Formed from stainless steel sheet, not less than **0.031-inch** nominal thickness and **3 inches** high, finished to match hardware.
- E. Pilaster Sleeves (Caps): Formed from stainless steel sheet, not less than **0.031-inch** nominal thickness and **3 inches** high, finished to match hardware.
- F. Brackets (Fittings):
 - 1. Full-Height (Continuous) Type: Manufacturer's standard design, stainless steel.
- G. Phenolic Compartment Finish: **One color** in each room.
 - 1. Through-Color Phenolic: Manufacturer's standard solid through-color.
 - a. Color: **Fog #3405C**.

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PHENOLIC-CORE TOILET COMPARTMENTS

2.4 HARDWARE AND ACCESSORIES

- A. Door Hardware and Accessories, Heavy Duty: Manufacturer's heavy-duty institutional operating hardware and accessories.
 - 1. Hinges: Manufacturer's minimum **0.062-inch-** thick, stainless steel **continuous, cam type that swings to a closed or partially open position**, allowing emergency access by lifting door. Mount with through bolts.
 - 2. Latch and Keeper: Manufacturer's heavy-duty, surface-mounted, cast stainless steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible. Mount with through bolts.
 - 3. Coat Hook: Manufacturer's heavy-duty, combination cast stainless steel hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories. Mount with through bolts.
 - 4. Door Bumper: Manufacturer's heavy-duty, rubber-tipped, cast stainless steel bumper at outswinging doors. Mount with through bolts.
 - 5. Door Pull: Manufacturer's heavy-duty, cast stainless steel pull at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible. Mount with through bolts.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.5 MATERIALS

- A. Aluminum Castings: ASTM B26/B26M.
- B. Aluminum Extrusions: **ASTM B221**.
- C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless Steel Castings: ASTM A743/A743M.

2.6 FABRICATION

- A. Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Manufacturer's standard corrosion-resistant supports, leveling

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mechanism, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

- C. Floor-Anchored Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- D. Door Size and Swings: Unless otherwise indicated, provide **24-inch-** wide, inswinging doors for standard toilet enclosures and **36-inch-** wide, outswinging doors with a minimum **32-inch-** wide, clear opening for toilet enclosures designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels or Screens: **1/2 inch.**
 - b. Panels or Screens and Walls: **1 inch.**
 - 2. Full-Height (Continuous) Brackets: Secure panels or screens to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than **1-3/4 inches** into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

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- C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware in accordance with hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113.17

SECTION 10 2813
TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Toilet accessories.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 06 1000- Rough Carpentry.
 - 3. Section 10 2113 - Plastic Toilet Compartments.

1.02 REGULATORY REQUIREMENTS

- A. Comply with CBC Chapter 11B requirements and ADAAG recommendations for accessibility.

1.03 SUBMITTALS

- A. Shop Drawings: Submit a schedule of accessories and Shop Drawings indicating installation methods and fasteners.

1.04 QUALITY ASSURANCE

- A. Coordinate related Work as required to ensure proper and adequate provision in framing of backing and wall finish for installation of accessories.
- B. Coordinate requirements of Section 10 2113 - Plastic Toilet Compartments to ensure that correct openings are provided in partitions for toilet accessories where required.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Protect accessories from damage.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Accessories shall be provided with necessary anchoring devices and fasteners appropriate for surfaces on which items are to be fastened.

2.02 MATERIALS

- A. Liquid Soap Dispenser: 20 gage stainless steel, 40-ounce. capacity, tamper-proof cap and concealed vandal-proof mounting. Continental V 444SS, ASI 0347, Bobrick B-2111, or equal.
- B. Toilet Paper Boxes:
 - 1. For Student and Public Restrooms:
 - a. Non-accessible toilet compartments: Surface mounted, JR Billington JRB-016, or equal.
 - b. Accessible adult toilet rooms or compartments: semi-recessed Bobrick B-3888, ASI-0031, Bradley 5412 (double roll tissue holder without paper roll spindle stops), or equal.
- C. Paper Towel Boxes: Surface mounted, less than 4 inches deep; Bobrick B-262 or equal.
- D. Grab Bars: 1-1/4 inches diameter by 18 gage stainless steel tubing, of size and configuration indicated. Ends shall be screwed to 11 gage stainless steel wall plate, with snaplock cover flanges. Grab bars over 36 inches in length shall be furnished with stainless steel support at mid point. Exposed stainless steel to be 180 grit satin finish. ASI 3700 series, Tubular Specialties Manufacturing, Inc. series Q-CS-1, Bobrick, or equal.
- E. Mirrors: Framed mirror, with one piece roll-formed 3/4 inch by 3/4 inch Type 304 stainless steel angle frame, with satin finish. Corners shall be heliarc welded, ground and polished smooth. Glass shall be No. 1 quality 1/4 inch float glass, electrolytically copper-plated. Frame shall be furnished with a continuous integral stiffener on sides. Back of mirror shall be protected by 1/8 inch thick, waterproof, shock-absorbing polyethylene padding and 20 gage galvanized steel back attached to frame with concealed screws. Mirror shall be provided with a 20 gage wall hanger. ASI 0600, Bobrick B-290 series, Bradley, or equal. Size as indicated on Drawings.

F.

- G. Toilet Seat Cover Dispensers (Faculty and Staff Toilet Rooms only): Surface-mounted, Type 304 stainless steel, satin finish. ASI 0477SM, Bobrick B-221, Bradley, or equal.
- H. Sanitary Napkin Vendors and Disposals
 - 1. Vendors (In Nurse's Office Restrooms only): Surface mounted, Type 304 stainless steel, satin finish, tumbler lock, single 25 cent coin operation. ASI 0864, Bobrick B-2800, Bradley, napkin/tampon dispenser, or equal.
 - 2. Disposals in non-accessible toilet compartments Surface-mounted, Type 304 stainless steel, satin finish, ASI 0473-A, Bobrick B-270, Bradley, or equal.
 - 3. Disposals in accessible toilet rooms or compartments: recessed, semi-recessed or 3-inch maximum projection from wall surface; Bobrick B 353 (recessed), ASI 0473 (recessed), Bradley, or equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Check openings in substrates to receive accessories. Verify openings are correctly located and sized to receive accessories, and that locations will comply with disability access requirements. Confirm that blocking, backing or support is properly located and adequate for the accessory installation.
- B. Verify spacing of plumbing fixtures and toilet partitions. Confirm spacing and locations are compatible with proposed accessory locations and will allow compliance with disability access requirements.

3.02 INSTALLATION

- A. Install toilet accessories in accordance with manufacturer's written recommendations and accessibility requirements. Fasten components firmly in place.
- B. Drill holes to correct size and application that is concealed by item with ¼ inch tolerance.
- C. Install recessed accessories into wall openings with sheet metal screws into metal frames.
- D. Install surface-mounted accessories to backing plates with machine screws, plumb, and aligned.

E. Grab Bars:

1. Fasten to toilet partition with 3-inch diameter stainless steel back plates with studs, couplings, and stainless steel machine screws.
2. At wood stud walls, fasten wood blocking with threaded stainless steel wood screws of sufficient length to penetrate blocking 1 ¼-inch minimum.
3. At metal stud walls, provide 1/8 inch cold-rolled steel plate, drilled and tapped for machine screws, or 16 gage cold-rolled steel plate complete with threaded sleeves for stainless steel machine screws. Weld plates to studs.
4. At concrete or masonry walls, install bars with sheet metal screws and expansion anchors.
5. At plaster or gypsum board walls, provide spacers of same thickness as wall material to prevent crushing of wall material.

F. Mirrors: Install mirror on manufacturer supplied concealed wall hanger and fasten with two theft-resistant locking screws.

G. Before Substantial Completion, deliver keys and maintenance instructions and product data to OWNER.

3.03 ADJUSTING AND CLEANUP

- A. Adjust accessories for proper operation.
- B. Remove rubbish, debris, and waste material and legally dispose of off the Project site.

3.04 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 – GENERAL

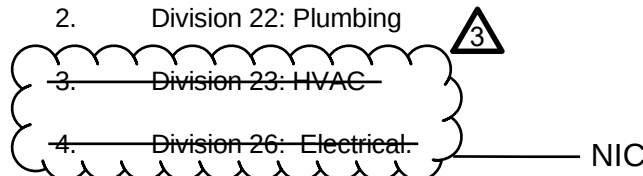
1.1 SUMMARY

A. Section Includes:

1. This Section provides the basic plumbing requirements that apply to the Work of Division 22.

B. Related Requirements:

1. Division 01: General Requirements.
2. Division 22: Plumbing



1.2 REGULATORY REQUIREMENTS

- A. Current federal Safe Drinking Water Act (SDWA) regulations require the furnishing of lead-free pipe, solder, and flux in the installation or repair of plumbing in non-residential facilities connected to public drinking water systems. Under this regulation, solders and flux are considered lead-free when they contain 0.2 percent lead or less. Under California regulations pipes and pipe fittings are considered lead-free when they contain 0.25 percent lead or less as defined in California Assembly Bill 1953 (AB 1953). No pipe, pipe fittings, or any other fitting or fixture intended to convey or dispense water for human consumption by drinking or cooking is allowed in the domestic plumbing system, if they do not meet the low lead definition of AB 1953. Weighted average lead content of the wetted surface area of pipes, fittings and fixtures may not exceed 0.25 percent.

1. Provide lead-free water pipe, solder, and flux materials that meet the standards as outlined by the federal SDWA regulations and California AB 1953 if installed in drinking water system.
2. Collect pipe, solder, and flux material samples as required by the Project Inspector. Test samples shall be delivered to an Owner designated testing laboratory for testing of lead content.
 - a. Test samples for lead content by the atomic absorption spectrophotometry method.
3. Materials found not conforming to SDWA and California AB 1953 regulations shall be deemed defective Work and shall be replaced with lead-free materials.
4. Comprehensive testing of the remaining materials for their lead content shall be performed as required by the Project INSPECTOR.

- A. Materials, fabrication, equipment, and installation shall comply with industry standards and code requirements. Where manufacturer's recommendations exceed industry standards, the manufacturer's recommendation shall establish the minimum standard. As a minimum, standards from the following organizations shall apply:
1. ANSI - American National Standards Institute.
 2. ASME - American Society of Mechanical Engineers.
 - a. ASME Boiler and Pressure Vessel Code.
 - b. ASME B31 - Standards for Pressure Piping.
 3. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers.
 4. ASTM - American Society for Testing and Materials.
 - a. ASTM A53 Specification for Welded and Seamless Pipe.
 5. AWWA - American Water Works Association.
 6. CSA - Canadian Standards Association.
 7. FM Global - Factory Mutual Global
 8. IAPMO - International Association of Plumbing and Mechanical Officials.
 9. NFPA - National Fire Protection Association.
 10. OSHA - Occupational Safety and Health Administration.
 11. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association.
 12. UL - Underwriters Laboratories Inc.
 13. Intertek (ETL Certification).
- B. Materials, fabrication, equipment, and installation shall comply with federal, state, and local codes including, but not limited to, the following:
1. CBC, California Building Code, and CMC, California Plumbing Code.
 - a. Latest edition as adopted by the City of Ventura, the County of Ventura, and the State of California including amendments effective on the Effective Date of the Contract.
 2. California Code of Regulations, Title 8, Industrial Relations, Division 1, Chapter 4, Division of Industrial Safety.
 3. OSHA - Occupational Safety and Health Administration.
 4. CDPH - California Department of Public Health.
 5. SCAQMD - South Coast Air Quality Management District.

- C. Specifications or Drawings shall not be construed to permit deviation from the requirements of governing codes unless approval has been obtained from legally constituted authorities having jurisdiction, and the Architect. The Contract Documents may contain more stringent requirements than those legally required.
- D. Permits and Fees: Refer to the General and Supplementary Conditions.

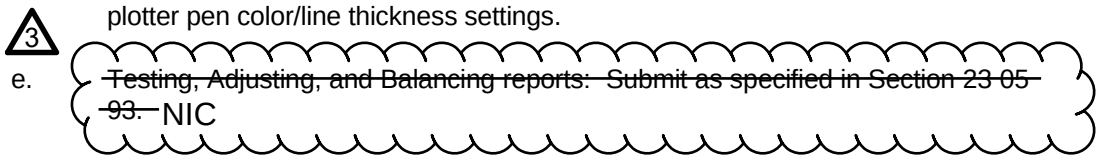
1.3 SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00: Submittal Procedures and with specific requirements of Division 22 sections, as applicable.
- B. The above information shall become the basis for inspecting and testing materials and actual installation procedures performed in the Work.
- C. Shop Drawings: Submit one additional copy when control diagrams having line voltage connections are indicated. Shop Drawings shall be specifically prepared for the Work of this Project. Drawings prepared in accordance with requirements of ~~Section 01 31 13: Project Coordination and~~ Section 01 33 00 may be provided by the Architect to serve as a background for the Shop Drawings. Shop Drawings ~~shall comply with the requirements of Section 01 31 13 and Section 01 33 00 and shall indicate at a minimum:~~ NIC

1. Complete system layout of equipment, components, plumbing fixtures, piping, indicating service clearances, and pipe sizes, fitting types and sizes and pipe elevations, distances of pipes and equipment from building reference points and hanger support locations. The above items shall be coordinated on the shop drawings ~~according to the requirements of Section 01 31 13.~~ NIC
2. Schedule and description of equipment, piping and fittings.

1.4 PROJECT RECORD DOCUMENTS

- A. ~~Comply with provisions of Section 01 77 00: Contract Closeout.~~ NIC
- B. Project Record Drawings:
 1. Provide a complete set of plumbing and fire protection drawings in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks and plotter pen color/line thickness settings on CD-ROM. Also submit one set of full size reproducible plots on vellum and 3 sets of prints.
 2. Before Contract Completion, deliver corrected and completed prints to the OAR. Delivery of project record documents to the OAR does not relinquish responsibility of furnishing required information omitted from project record documents.
- C. Operation and Maintenance Manuals:
 1. Submit two copies of operation and maintenance manuals in required form and content. If no revisions are required, furnish one additional copy. If revisions are required, one copy shall be returned with instructions for changes, perform such changes and return three copies of manuals. Manuals shall be bound in accordance to ~~Section 01 77 00:~~ NIC Deliver manuals to the OAR. Submit an electronic copy of the entire manual in PDF file format.
 2. Contents of Manual:

- a. Title sheet with Project name, including names, addresses and telephone number of Contractor, installer, and related equipment suppliers.
- b. Manufacturer's operating instructions including, but not limited to, the following:
 - 1) Identification of components and controls.
 - 2) Trouble shooting checklist and guidelines.
 - 3) Recommendations for optimum performance.
 - 4) Warnings and safety precautions on improper or hazardous operational procedures or conditions
- c. Manufacturer's product data and parts and maintenance booklet for each item of equipment furnished under Division 22 that includes the following as a minimum:
 - 1) Manufacturer's model, identification and serial numbers.
 - 2) Exploded view of assembly drawings identifying each component or part with the relevant part number.
 - 3) Directory of manufacturer's representatives, service contractors and part distributors.
 - 4) Maintenance and trouble-shooting instructions, including schedule for preventive maintenance, periodic inspection and cleaning criteria.
- d. Project Record Drawings: Complete set of plumbing, fire protection and control system drawings in 50 percent reduced print format shall be furnished with the manual. Submit the above record drawings on CD-ROM in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks, and plotter pen color/line thickness settings.
- e.  ~~Testing, Adjusting, and Balancing reports: Submit as specified in Section 23 05 93- NIC~~
- f. South Coast Air Quality Management District (SCAQMD) permits to install and operate boilers, water heaters and other fuel burning equipment and third-party source test reports as required by SCAQMD to allow start-up and operation of equipment.
- g. Ventura County industrial waste permits.
- h. Valve directory complete with location, function, size, and model of each valve with reference to the project record drawings.
- i. Equipment and component identification chart complete with location, function, size, and model of each equipment or component with reference to the project record drawings.

1.5

COORDINATION

- A. ~~Contract Documents indicate extent and general arrangement of Work under Division 22. Contractor shall coordinate work in accordance with Section 01 31 13 requirements and make adjustments as required to provide maximum headroom, a clear arrangement to keep passageways and openings clear to provide accessibility and provisions for maintenance, and to meet code requirements.~~

NIC

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Storage: Deliver materials to Project site in their original unopened containers with labels intact and legible at time of delivery. Store in strict accordance with manufacturer's recommendations.
- B. Do not store plastic pipe or materials in direct sunlight.

1.7 PRELIMINARY OPERATION

- A. OAR may require any portion of plumbing Work to be operated before Substantial Completion. Such operation shall be in addition to regular tests, demonstrations and instructions required under the Contract Documents, and shall be performed as required.
- B. Notify the INSPECTOR at least 24 hours in advance of lighting or re-lighting pilots.

1.8 TRAINING OF OWNER PERSONNEL

- A. Training of Owner's personnel shall include:
1. A minimum of 4 hours of on-site overview of the overall Plumbing System.
 2. Refer to Division 22 sections for specific training on each of the components of the Plumbing System.
- B. Contract shall include the cost of training Owner operation and maintenance personnel in operating, adjusting, maintenance, trouble-shooting, and Project site repair of each component, equipment, or system provided under this Contract.
- C. Operational and maintenance training shall be conducted on the Project site, unless indicated otherwise.
- D. Upon completion of Owner training, a completion certificate indicating the nature of the training and a description of the systems, complete with equipment and component lists shall be issued to each trainee. The certificate should be issued in duplicate with one copy retained by OAR.
- E. An attendance sheet with the names and signatures of all participants attending the training shall be submitted to the OAR and kept as part of the project documents.

1.9 GUARANTEES AND DAMAGE RESPONSIBILITY

- A. Sound of water flowing in piping shall not be transmitted to building structure. Operation of mechanical system shall not produce operational sounds that can be heard outside of rooms enclosing apparatus or equipment.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Unless otherwise specified, materials and equipment shall be new, in good and clean condition. Equipment, materials, and components shall be of the make; type and model number noted on Drawings or specified. Pieces of equipment of the same type shall be by the same manufacturer.
- B. Whenever an item is listed by a single proprietary name, with or without model number and type, it shall be for purpose of design only, to indicate characteristics and quality desired. Proprietary designation listed on Drawings, or listed first in Specifications, is used as a basis for design to establish a standard for quality and performance and space requirements.
- C. Equipment and materials indicated or required to be installed outdoors shall be of the type that is designed, manufactured, listed or approved by authorities having jurisdiction for outdoor installation by being resistant to the adverse effects of weather. The additional protective measures against outdoor weather required by the manufacturers' installation instructions and prevalent practice shall be provided.
- D. For substitution of materials or products, refer to the General Conditions.

PART 3 – EXECUTION

3.1 SERVICE INTERRUPTIONS, OFF-SITE, GAS AND WATER

- A. Schedule Work so there shall be no service interruptions of existing systems or systems during normal hours of operation of affected systems and facilities.
- B. When service interruptions are mandatory, arrange in advance with the OAR as to time and date of such interruptions.
- C. Systems, which are interrupted, shall be returned back into operation in such manner that they will function as originally intended.

3.2 CUTTING, NOTCHING, AND BACKING

- A. Conform to California Building Code, Title 24, Part 2, for notches and bored holes in wood and for pipes and sleeves embedded in concrete and for cuts in steel, as detailed on structural Drawings.
- B. Where pipes pass through, or are located within one inch of any construction element, install a resilient pad, ½ inch thick minimum, to prevent contact.
- C. Furnish provisions for recesses, chases, and accesses and provide blocking and backing for proper reception and installation of plumbing Work.

3.3 LOCATION OF PIPING AND EQUIPMENT

- A. Location of piping, apparatus and equipment indicated on the Drawings is approximate and shall be altered to avoid obstructions, preserve headroom, and provide free and clear openings and passageways.
- B. Trenches parallel to footings shall not be closer than 18 inches to the face of footings and shall not be below a plane having a downward slope of 2 horizontal to one vertical, from a line 9 inches above bottom of footing.

- C. Pipe in tunnels shall be installed close to one side of tunnel to provide maximum space for passage. Pipe shall not be installed through crawl hole unless otherwise specified or detailed on Drawings.
- D. Place equipment in locations and spaces indicated, disassemble and/or reassemble equipment as required by Project conditions.

3.4 TESTS AND TESTING

- A. Tests shall be as required under the applicable sections of Division 22, including this Section.
- B. Additional tests may be required in the case of products, materials, and equipment if:
 - 1. Submitted items are altered, changed, or cannot be determined as exactly conforming to the Contract Documents.
 - 2. Performance testing and results may also be required on certain items which are as specified, including fan, and pump performance.
- C. Piping Tests:
 - 1. Perform tests required to demonstrate that operation of plumbing systems and their parts are in accordance with Specifications covering each item or system, and furnish materials, instruments and equipment necessary to conduct such tests. Tests shall be performed in presence of the Inspector, and representatives of any governmental agency having jurisdiction. Work shall not be concealed or covered until required results are provided.
 - 2. If required tests are not performed, Owner may provide in accordance with the Contract Documents.
 - 3. Pressure gauges furnished in testing shall comply with CPC. Air shall be bled from lines requiring hydrostatic or water tests.
 - 4. Systems shall be pressure-tested in accordance with pipe testing schedule below. Pipe test shall indicate no loss in pressure after a minimum duration of 4 hours at test pressures indicated. Where local codes require higher test pressures than specified herein for fire sprinkler systems, local codes shall govern.
 - 5. Fuel gas lines shall be first tested with piping exposed, before backfilling trenches or lathing; second with piping in finished arrangement, backfilled and paved where required, and walls finished.
 - 6. Piping systems may be tested as a unit or in sections, but entire system shall successfully meet requirements specified herein, before final testing by the Inspector.
 - 7. Repair of damage to pipes and their appurtenances or to any other structures resulting from or caused by these tests, shall be provided.

D. Pipe Testing Schedule:

System Tested	Test Pressure (psig)	Test With:
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Durham system, glass or plastic acid waste, vent and roof drain (except pipes running under a slab or underground)	Fill with water to top of highest vent; allow to stand two hours, or longer, as required by Inspector. Minimum head required for any joint shall be 10 feet in building.	Water
Cast-iron soil, waste and interior downspout, condensate drain from air conditioning equipment	10 feet of water, vertically	
Storm water disposal lines	Running water test	Water
Domestic water piping	200	Water
Fire sprinkler piping	200	Water

E. Equipment Performance Assurance Tests:

1. Before operating any equipment or systems, a thorough check shall be performed to determine that systems have been flushed and cleaned as required and that equipment has been properly installed, aligned, lubricated, and serviced. Factory instructions shall be checked to verify installations have been completed and recommended lubricants have been installed in bearings, gearboxes, crankcases, and similar equipment. Particular care shall be furnished in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Equipment shall also be checked for damage that may have occurred during shipment, after delivery, or during installation. Damaged equipment, products, and materials shall be replaced or repaired as required.
2. Upon completion of the above, adjust the system settings to within normal operating conditions to prevent the system from being damaged upon start-up.
3. Run-test the equipment after start-up for five consecutive days. Tests shall include operation of all equipment and systems for a period of not less than two 8 hour periods at 90 percent of the full specified capacities.
4. Equipment Start-up Reports: For each equipment or system on which start-up is performed, submit 8 copies of start-up report for review by the Architect.
 - a. The start-up report shall include the manufacturer's standard start-up form completed and signed by the start-up technician.
5. Provide, maintain, and pay costs for equipment, instruments, and operating personnel as required for specified tests.
6. Provide electric energy and fuel required for tests.
7. Final adjustment to equipment or systems shall meet specified performance requirements.
8. Equipment, systems, or Work deemed defective during testing shall be replaced or corrected as required. Test until satisfactory results are provided.

F. Specific Coordinated Plan for Test and Balance:

1. Provide a narrative of the operational intent that clearly describes the function and sequence of operation of each component, equipment, or system installed. Instruct designated Owner personnel in the operation of the installed systems.
2. Prior to final test and balance, plumbing equipment and systems shall be operated and tested as indicated in Article 3.04.F above to demonstrate satisfactory overall operation of the installed systems.
3. Welding performed as part of this Division may be subject to radiographic inspections at random in accordance with requirements specified in Section 22 05 13: Basic Plumbing Materials and Methods.

3.5 NOISE AND VIBRATION REDUCTION

- A. Correct noise or vibration caused by plumbing systems. Provide all necessary adjustments to specified and installed equipment and accessories to reduce noise to the lowest possible level
- B. Correct noise or vibration problems caused by failure to install work in accordance with Contract Documents. Include all labor and materials required as a result of such failure. Pay for re-testing of corrected noise or vibration problems by the project acoustical consultant including travel, lodging, test equipment expenses, etc.

3.6 PROTECTION, CARE AND CLEANING

- A. ~~In addition to storage criteria of the General Conditions, and provisions under Section 01 50 00- Construction Facilities and Temporary Controls, the following shall be provided.~~



1. Provide for the safety and good condition of materials and equipment until Substantial Completion. Protect materials and equipment from damage.
2. Protect installed Work.
3. Replacements: In case of damage, immediately provide repairs and/or replacements as required.
4. Protect covering for bearings, open connections to tanks, pumps, compressors and similar equipment.
5. Interior of piping shall be maintained free of dirt, grit, dust, and other foreign materials.
6. Fixtures, piping, finished brass or bronze, and equipment shall have grease, adhesive, labels, and foreign materials removed. Chromium, nickel plate, polished bronze or brass Work shall be polished. Glass shall be cleaned inside and out.
7. Before initial start-up and again before Substantial Completion, piping shall be drained and flushed to completely remove grease and foreign matter. Pressure regulating assemblies, traps, strainers, boilers, flush valves, and similar items shall be thoroughly cleaned. Tag system with an information tag listing responsible party and date of element, before initial start-up and again before Substantial Completion. Compressed air, oil, and gas piping shall be blown out with oil-free compressed air or inert gas.

END OF SECTION

SECTION 22 05 13

BASIC PLUMBING MATERIALS AND METHODS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. This Section prescribes basic materials and methods generally common to the Work of Division 22.

B. Related Requirements:

1. Division 01: General Requirements.



2. Division 22: Plumbing.

~~3. Division 26: Electrical. NIC~~

1.2 SUBMITTALS

- ###### A.
- Provide in accordance with Division 01, Section 22 05 00 and specific requirements of each section of Division 22.

- ###### B.
- Types of welding rods to be used.

1.3 QUALITY ASSURANCE

- ###### A.
- Standards: Comply with applicable national, state, and local codes and standards: ASTM, ASME, and ANSI. Federal Specifications, AWWA, SISPI, NFPA, FM, UL, CPC (California Plumbing Code), CMC (California Plumbing Code), CSA.

- ###### B.
- Qualifications of Manufacturer: Products used in the Work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production as reviewed by the Architect.

1.4 COORDINATION

- ###### A.
- ~~Coordinate related Work in accordance with provisions of Section 01 31 13: Project Coordination. NIC~~

PART 2 – PRODUCTS

2.1 GENERAL

- ###### A.
- Provide the following products if they are indicated in the Contract Documents or if they are required for the proper installation, function or operation of equipment, systems or components indicated in the Contract Document.

- B. Provide the following products as a complete assembly with required accessories for a complete and functioning entity in compliance with governing codes and applicable standards as specified in Section 22 05 00, manufacturer's instructions or as required.
1. Omission of minor details in the Contract Documents does not waive and/or otherwise relinquish compliance with the above requirements.

2.2 MANUFACTURERS AND MATERIALS

- A. Ball Valves: Bronze, 2-inch and smaller:

BV-1: Class 150, 600 psi, CWP, 2 piece construction reinforced Teflon seats, full port, adjustable packing gland, stainless ball and stem, threaded ends.

Hammond UP-8303A/UP-8305/UP-8513, NIBCO T-685-80-LF/TS-685-66-LF, Milwaukee UPBA400S/450S, or equal.

- K. Piping:

1. Piping shall be continuously and permanently marked with manufacturer's name, type of material, size, pressure rating, and the applicable ASTM, ANSI, UL, or NSF listing. On plastic pipe, date of extrusion must also be marked.

2. Underground non-ferrous pressure pipes shall be installed with proper color tracer wires. Refer to color code provisions in Section 22 05 53: Plumbing Identification.

P-4 Copper drainage tube, inside structure and above grade. Type DWV hard temper, ASTM B 306, Mueller, Anaconda, Cerro Brass, Cambridge-Lee, Halstead or equal.

P-6 Copper water tube, Type L hard, ASTM B88. Mueller, Cambridge-Lee, Halstead or equal. (when used above ground only)

P-18 CPVC (Chlorinated polyvinyl Chloride) schedule 40 pipe, conforming to ASTM D1784 and complying with UL723 (ASTM E84). The joints shall be of solvent cement type conforming to ASTM F493. Installer shall be certified by the manufacturer for this type of joint installation. Spears, Corzan, Charlotte or equal.

- L. Pipe Fittings:

PF-4 Cast brass drainage fittings ASA B 16.23, ASTM B 42. Provide with copper drainage tube.

Mueller Brass, Nibco, Stanley Flagg, Lee Brass Or equal.

PF-5 Wrought copper - solder type ANSI B 16.22

Mueller Brass, Nibco, Lee Brass or equal.

Central Plastics Company or equal.

PF-8 Bronze and brass, 250 psi, threaded, ASA B16.17 and F S WW-P-460.

Mueller Brass, Lee Brass Or equal.

PF-9 Malleable iron, Class 125, ANSI B 16.3, threaded or welded Schedule 40 black steel for 2-inches and below and welded for 2 ½-inch and above, by Stockham or equal.

PF-10 Cast iron, threaded, Class 125, ANSI B 16.1.

Stockham or equal.

PF-11 Cast-iron OD sized,, bell and spigot gasket joints.

PF-12 Steel butt weld type, ASTM A 234WPB.

PF-13a No-hub couplings for factory grooved PVDF or polypropylene, schedule 40 piping. The coupling shall be of the same material and gauge as the pipe. Each coupling shall have 300 series stainless steel outer band and 5/16 inch bolts, nuts and washers plated to meet a 100-hour salt spray test per ASTM B117. Installer shall be certified by the manufacturer for this type of joint installation. Orion, Fuseal or equal.

PF-13b The pipe and fitting shall be joined using the socket fusion system conforming to ASTM 2657. Installer shall be certified by the manufacturer for this kind of joint installation. Orion, Fuseal or equal.

PF-13c CPVC (Chlorinated Polyvinyl Chloride) schedule 40 pipe and fittings, conforming to ASTM D1784 and complying with UL723 (ASTM E84), shall be joined using solvent cement conforming to ASTM F493. Installer shall be certified by the manufacturer for this kind of joint installation. Spears, Corzan or equal.

PF-14a Drains, bottle traps and similar devices for CPVC, PVDF or polypropylene, schedule 40 piping, shall be of same material and gauge as the pipe with mechanical joints. Installer shall be certified by the manufacturer for this kind of joint installation. Orion, Fuseal or equal.

PF-14b Type 316L Stainless steel joint for chemical waste piping systems including drain or bottle traps. Blucher-Josam or equal.

Victaulic Vic Press 304TM or equal.

PF-15 Precision cold drawn austenitic 304/304L stainless steel, with elastomer O-rings

PF-16 Grooved end type– ASTM A395 and A536 ductile iron; ASTM A234 WPB forged steel; fabricated from ASTM A53 carbon steel. Couplings shall be supplied with angle-pattern bolt pads for rigidity, except in locations where flexibility is desired. Gaskets shall be pre-lubricated. Galvanized or painted, by Victaulic or equal.

PF-17 Grooved end type– ASTM B75 or B152 and ANSI B16.22 wrought copper, bronze sand casting per ASTM B584-87 copper alloy CDA 836 per ANSIB16.18. Couplings shall be CTS style 606 supplied with angle pattern bolt pads for rigidity, coated with copper coated alkyd enamel. Gaskets shall be pre-lubricated Flush seal type by Victaulic or equal.

PF-18 CPVC fittings must conform to ASTM D2846 specification for chlorinated polyvinylchloride (CPVC) plastic for hot and cold water distribution system.

M. Pipe Isolators:

PLA-1 Absorption pad shall be not less than ½ inch thick, unloaded. Pad shall completely encompass pipe.

Holdrite, LSP, Stoneman, Potter-Roemer, Trisolator, PR-Isolator, or equal.

Hydra-Zorb Cushion Clamps, Acousto-Clamp, or equal.

U. Pipe and Fitting Requirements Schedule: Unless otherwise specified or indicated on Drawings, pipe and fittings shall be installed in accordance with the following table:

TABLE I

PIPE AND FITTING SCHEDULE

Use	Limits	Pipe	Fittings
Domestic Hot and Cold water, underground	Up To 8 inches	P-6	PF-5
Copper, underground only		P-7	PF-5
Cold water, underground (Site piping)	4-inch and over	P-15	PF-11
Domestic hot and cold water, in building and above ground	All	P-6	PF-5
In building above ground	2 to 8-inch	P-6	PF-5
Compressed air	Underground or in concrete	P-9	PF-8
	Above ground	P-10	PF-3
Condensate drains and drains From HVAC Equip.		P-6	PF-5
Downspouts, interior above and below grade, up to 5 feet from building.		P-1	PF-1 Or PF-2
Acid Vent	All	P-12	PF-10
Fire Mains (Fire Hydrant)	Underground	P-15	PF-11
Gas Natural	Underground	P-8	PF-6

Gas Natural	Above ground	P-10	PF-9
Copper Drainage Tube (Underground)	Waste and Vent	P-3	PF-4
Copper Drainage Tube (Above Ground)	Waste and Vent	P-4	PF-4
Vents	New Building	P-1	PF-1 or PF-2 (IRE) if required by engineer
Vents	Existing Buildings and Exposed Downspouts	P-2	PF-3
Vents	For acid waste lines underground	P-13, 14, 16, 17, 18	PF- 13a, 13b, 13c, 14a, 14b or 15
Waste lines, Sanitary		P-1	PF-1 or PF-2 (IRE) if required by engineer
Waste lines, Acid	To nearest water dilution jet	P-13, 14, 16, 17, 18	PF- 13a, 13b, 13c,14a, 14b or 15

R. Unions:

- 1.. Unions shall be furnished and installed in accordance with the following requirements (unless flanges are furnished):
 - a. At each threaded or soldered connection to equipment and tanks, except in Freon or fuel gas, piping systems, whether indicated or not.
2. Unions shall be located so that piping can be easily disconnected for removal of equipment, tank, or valve.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions under which Work of this Section shall be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Provide all materials and equipment for the Work. Furnish and install necessary apparatus, parts, materials, and accessories.
- B. Pipe Installation:

1. Install piping parallel to wall and provide an orderly grouping of proper materials and execution.
2. Piping shall clear obstructions, preserve headroom, provide openings and passageways clear, whether indicated or not. Verify the Work of other Divisions to avoid interference.
3. If obstructions or the Work of other Divisions prevent installation of piping or equipment as indicated by the Drawings, perform minor deviations as required by the Architect.
4. Install piping after excavation or cutting has been performed. Piping shall not be permanently enclosed, furred in, or covered before required inspection and testing is performed.
5. Exposed polished or enameled connections from fixtures or equipment shall be installed with no resulting tool marks or threads at fittings. Residue or exposed pipe compound shall be removed from exterior of pipe.
6. Piping shall be concealed in chases, partitions, walls, and between floors, unless otherwise directed or specifically noted on Drawings. When penetrating wood studs, joists, and other wood members, provide such members with reinforcement steel straps of Continental Steel & Tube Co., ULINE, Independent Metal Strap, or equal.
7. Reduce fitting where any change in pipe size occurs. Bushings shall not be furnished unless specifically reviewed by the Architect, or indicated on Drawings.
8. Piping subject to expansion or contraction shall be anchored in a manner, which permits strains to be evenly distributed. Swing joints or expansion loops shall be installed. Seismic restraints shall be installed so as not to interfere with expansion and contraction of piping. Seismic loops required at all building separations.
9. Immediately after lines have been installed, openings shall be capped or plugged to prevent entrance of foreign materials. Caps shall be left in place until removal is necessary for completion of installation.
10. Couplings shall not be installed except where required pipe runs between other fittings are longer than standard length of type of pipe being installed and except where their installation is specifically reviewed by the Architect.
11. Water piping shall be installed generally level, free of traps, unnecessary offset, arranged to conform to building requirements, clear of ducts, flues, conduits, and other Work. Piping shall be arranged with valves installed to provide for complete drainage and control of system. Piping shall not be installed which causes an objectionable noise from flow of water therein under normal conditions. Refer to Section 23 0500: Common Work Results for Plumbing.
12. Water lines may be installed in same trench with sewer lines, provided bottom of water line is 12 inches minimum above top and to the side of sewer line.
13. Changes in pipe sizes shall be furnished with eccentric reducers, flat on top. Offsets to clear obstruction shall not be installed so as to produce air pockets.

C. Pipe Sleeves and Plates:

1. Provide pipe sleeves of Schedule 40 black steel pipe or Schedule 40 PVC plastic pipe in concrete or masonry walls, footings, and concrete floors below grade. Provide adjustable submerged deck type sleeves at locations where pipes pass through concrete floors, except concrete slab floors on grade, and at locations where soil pipe for floor type water closets passes through concrete floors.
2. Sleeves shall provide ½ inch clearance around pipes, except plastic pipe shall have 1 inch clearance. Caps of deck type sleeves shall be removed just prior to installation of pipe. Area around sleeves shall be smooth and without high or low spots. Sleeves in walls shall not extend beyond exposed surface of wall. Sleeves in concrete floors and walls shall be securely fastened to forms to prevent movement while concrete is being placed.
3. Piping installed on a roof shall clear the roof surface by 10 inches minimum, with or without insulation. Bottom of individual fittings may infringe on 10 inches clear space but not groups of fittings or fittings located within 27 inches of each other.
4. Stiles shall be provided to facilitate crossing of piping when parallel piping runs are laterally greater than 12 inches out-to-out, or any pipe is higher than 18 inches, and more than 40 feet long or runs between two or more major pieces of equipment or housings greater than 20 feet apart. Stiles shall be not less than 20 inches wide with a minimum tread depth of 10 inches. Where stiles are required, they shall be located so greatest obstructed distance is 30 feet.
5. Where pipes pass through waterproofed walls, floors, or floors on grade, sealant with Link-Seal Modular Seals, or equal, between pipe and sleeve to provide a waterproof joint. Where earth is in contact with pipe on both sides of a wall or foundation, the waterproof joint is not required. Commercial rubber compression units may be furnished instead of sealed sleeves if reviewed by the Architect.
6. A swing joint, or other required device, shall be furnished and installed in hot water lines with 10 feet of sealant or compression joint to allow for expansion.
7. Provide polished, chrome-plated flanges when plumbing pipes pass through walls at plumbing fixtures, etcetera as specified in Section 22 4000 Plumbing. Provide polished steel, chromium-plated split floor and ceiling plates at locations where pipes pass through walls, floors, ceilings, and partitions in finished portion that neatly conceals pipe insert.
8. Pipe sleeves shall be provided where pipes intersect footings or foundation walls and sleeve clearances shall provide for footing settlement, but not less than one inch all around pipe.
4. Before any welder performs welding on the Work, furnish the INSPECTOR with a copy of welder's valid qualification papers and obtain verification. Welder qualification is not valid unless it has been issued while welder was performing work for current employer, and has performed type of work described by qualification in the preceding 3 months.
5. Welding performed under these Specifications is subject to special tests and inspections including rigid Ultra Sonic Testing (UT) and radiographic inspection at random, in accordance with Technique for Radiographic Examination of Welded Joints by an Owner recognized, DSA approved testing laboratory.

Q. Valves: Valves shall conform to the following:

1. Piping systems shall be furnished with valves at points indicated on Drawings and specified, arranged to provide complete regulating control of piping system throughout building and the Project site.
2. Valves shall be installed in a neat grouping, so that parts are easily accessible and maintained.
3. Valves shall be full size of line in which they are installed, unless otherwise indicated on Drawings or otherwise specified, and shall be one of types specified.
4. Provide chain operators on valves 2-inch and larger located 7 feet or more above the servicing floor level.
5. Valves for similar service shall be of one manufacturer.
6. Except where otherwise specified, valves shall be Belimo, Victaulic, Stockham, Crane, Jenkins, Milwaukee, Hammond, American, NIBCO, Hoffman, or equal.
7. Ball valves below grade in yard boxes shall have stainless steel handles.
8. Hose bibs in dense garden areas shall be $\frac{3}{4}$ inch in size with one hose bib in the lunch pavilion 1 inch in size. Other hose bibs shall be $\frac{3}{4}$ inch lock shield type. Bibs shall be furnished with vacuum breaker protection.
9. Safety valves and pressure relief valves shall have stamp of approval as required by ASME and shall be provided with annual test lever. Where a hot water storage tank is heated by means of a coil, pressure relief valve shall have a steam BTU discharge rating of the coil. Discharge pipe from safety or pressure relief valves shall be not less than one pipe size larger than inlet pipe size of valve. Discharge pipe shall terminate as indicated and shall be free of traps. In addition to locations specified, pressure relief valves shall be installed in the following locations:
 - a. On discharge side of each pressure-reducing valve.
 - b. On each water heater connected to a hot water storage tank and other pressure vessels.
 - c. On cold water line to each water heater or hot water storage tank when there is a check valve, backflow prevention valve or similar device between water heater or hot water storage tank and meter or relief valve at the pressure reducing valve assembly.
 - d. On discharge side of each air compressor.
 - e. On each air receiver connected to an air compressor.
10. Temperature relief valves and combination temperature and pressure relief valves shall be as specified and furnished as set forth in this Section. Discharge pipe from relief valves shall be not less than discharge area of valve or valves it connects, based on discharge area of valves, and shall terminate as indicated and free of any traps. Valves shall be installed at following locations:
11. A combination temperature and pressure relief valve or combination of valves on each heating hot water storage tank. Temperature sensing element shall extend into water inside tank.

12. Manual air vent valve assemblies shall be installed at each high point of hot water space heating and chilled water piping systems. Valves shall discharge through 1/4 inch diameter copper tubing and drain to nearest floor sink. Automatic type air vent valve shall only be installed where specifically indicated. Radiator, convectors, and finned pipe convectors shall be fitted with packless radiator valves, angle or straight pattern. Each convector or radiator installed as part of a space hot water heating system shall be furnished with a manual-type air vent valve.
- R. Strainers: Strainers shall be installed on each water main (except for fire line) downstream of the meter, above grade, when a pressure regulator assembly is not installed. Main strainer shall be of Y-flange or groove type. On closed loop chilled and heating hot water systems pump systems, a strainer shall be installed at each pump inlet and upstream of each flow control valve assembly. The control valve assembly may include a modulating temperature control valve and a flow-limiting valve, manufactured by Griswold, AutoFlow, Flow Control Industries, Inc., or equal.
- S. Hangers and Supports:
1. Piping shall be securely fastened to building structure by approved iron hangers, supports, guides, anchors, and sway braces to maintain pipe alignment to prevent sagging and to prevent noise or excessive strain on piping due to uncontrolled or seismic movement under operating conditions. Hangers and supports shall conform to Manufacturer's Standardization Society Specification SP-69. Hangers shall be relocated as required to correct unsatisfactory conditions that may become evident when system is placed into operation. Appliances, heat exchangers, storage tanks, and similar equipment shall be securely fastened to structure in accordance with seismic requirements. Outdoor metal hangers and supports shall be hot-dipped galvanized steel, unless otherwise specified.
 2. Hose faucets, compressed air outlets, and similar items at ends of pipe branches shall be rigidly fastened to building construction near point of connection.
 3. Piping shall not be supported by wire, rope, wood, plumbers' tape, or other non-recognized devices.
 4. Hangers and supports shall be designed to support weight of pipe, fittings, weight of fluid and weight of pipe insulation, and shall have a minimum factor of safety of five, based on ultimate tensile strength of material installed.
 5. Burning or welding of any structural member under load is not permitted. Field welding not specified on Drawings or reviewed Shop Drawings is not permitted without review by Architect and DSA.
 6. Burning holes in beam flanges or other structural members is not permitted without review by the Architect and DSA.
 7. Pipe hangers on piping covered with low temperature insulation shall be installed on outside of insulation and not in contact with pipe unless otherwise detailed on Drawings. Insulation shall be protected by 18 gage galvanized steel shield, with a minimum length of 10 inches, installed completely around pipe covering between covering and hanger. Installing hangers directly on pipe and butting adjoining sections of insulation against hanger is permitted provided void and hanger rod are properly insulated and sealed so that no sweating occurs at hangers.

8. Hanger rods shall be fastened to structural steel members with suitable beam clamps. Clamps shall be Tolco, Carpenter & Patterson, Fee and Mason, or equal, as follows:
 - a. Tolco I beam, Fig.62 for maximum 1000 pounds.
 - b. Tolco I or WF beam, Fig. 329, for maximum of 1290 pounds.
9. Hanger rods shall be fastened to concrete inserts in concrete slabs or beams. Inserts shall be Tolco, Carpenter & Patterson, Fee and Mason, or equal, as follows:
 - a. Tolco Fig.310 for maximum of 600 pounds.
 - b. Tolco Fig. 309 for maximum of 1140 pounds.
10. For fastening to wood ceilings, beams, or joists, furnish Grinnell Fig. 128R, Grinnell Fig. 153, Tolco 78, or equal pipe hanger flange fastened with drive screws. Under wood floors, 3/8 inch hanger rods shall be hung from 2-inch by 2-inch by 1/4 inch angle clips 3 inches long, with 2, staggered 10d nails, clinched over joist.
11. Hanger rod sizes for copper, iron, or steel pipe: 3/8 inch for pipe sizes 1/2 inch through 2-inch, 1/2 inch for pipe sizes 3-inch, 4-inch and 5-inch, 5/8 inch for pipe size 6-inch, and 3/4 inch for 8-inch and 10-inch pipe.
12. Turnbuckles, if furnished, shall provide a load carrying capacity equal to that of the pipe hanger with which they are being installed.
13. Pipe hangers shall be of same size, or nearest larger manufactured size available, as pipe or tubing on which they are being installed.
14. Hangers, clamps, and guides furnished for support of non-metallic pipe shall be padded with 1/8 inch thick rubber, neoprene, or soft resilient cloth.
15. Where special pipe-supporting requirements in the Specifications conflict with any standard requirements specified herein, the Specification requirements shall govern.
16. Horizontal Piping:
 - a. Roof Mounted Piping: Pressure and non-pressure piping shall be supported from channels, stands, clamps, trapezes, rollers, or structures mounted on 100% rubber, UV resistant rooftop supports with reflective strips, Dura-Block, or equal. Roller type supports shall be provided below and above pipe to prevent its dislodgement. Bottom of pipes shall clear the roof surface by 10 inches.
 - b. Maximum hanger and support spacing shall conform to CPC schedule for horizontal piping installed above grade.
18. A hanger or support shall be installed close to the point of change in direction of a pipe run, in either a horizontal or vertical plane.
19. When practicable, supports and hangers for cast iron soil pipe shall be installed as close as possible to joints and when hangers or supports are not located within one foot of a branch line fitting, an additional hanger or support shall be installed at fitting.

T. Flashings:

1. Each pipe, duct, or gas-fired equipment vent passing through roof shall be installed with waterproof flashing.
 2. Flashing or flanges on pipes, vents, and ducts passing through a tile or slate roof shall be constructed of sheet lead. Flashing for pipes and heater vents passing through a roof shall be 4 pound soft sheet lead. Flashing and flanges for ducts and heater vents passing through exterior walls shall be 22 gage sheet metal. Flanges and flashing shall be installed waterproof at point of connection with pipe or duct. No soldered joints on roof flashings will be allowed.
 3. Lead flashing and flanges shall be constructed of 4 pound sheet lead with burned joints. Flange of lead flashing or lead flange on a duct shall extend out onto roof a minimum of 12 inches from pipe or duct. Lead flashing shall extend up the pipe or duct not less than 7 inches.
 4. Sheet metal flashing shall be constructed of 24 gage galvanized sheet steel. Flanges on these flashings shall extend out onto roof a minimum of 10 inches from pipe or duct. Flanges on ducts through exterior walls shall extend out from duct a minimum of 2 ½ inches. Flanges on gas-fired equipment single-wall vents shall be of ventilated type. Type B gas vents through a roof shall be furnished with non-ventilated flashing as per NFPA Pamphlet 211.
 5. Cast iron, steel, brass, and copper pipe, which terminates less than 18 inches above roof, shall be furnished with a combination counter-flashing and vandal-proof hood for protection against water, birds and foreign matter. Cast iron, steel, brass and copper pipe, which does not terminate within 18 inches of roof, shall be furnished with a counter-flashing sleeve. Pipe, which terminates more than 18 inches above roof, shall be furnished with protection against entrance of water, birds, and foreign matter.
 6. Counter-flashing and combination counter-flashing sleeves and vandal-proof hoods shall be cast iron, vandal-proof, threaded, sealed or approved gas-heated sleeve type. Counter-flashing sleeves on each of these items shall extend down over flashing a minimum of ¾ inch.
 7. Flashing and flanges on ducts shall be installed waterproof at point of connection to the duct by riveting and soldering. Storm collars shall be securely screwed and installed waterproof around appliance vent pipe immediately above flashing.
 8. Vent piping above roof shall be furnished with a combination counter-flashing sleeve and vandal-proof hood.
- U. Equipment Installation: Install roof or floor mounted equipment on level platforms, housekeeping pads or curbs and provide sound, vibration and seismic control measures per Section 23 0548 even if not indicated on Drawings.

END OF SECTION

SECTION 22 05 53

PLUMBING IDENTIFICATION

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes: Marking and identification on mechanical piping systems, ducts, controls, valves, and apparatus.
- B. Related Requirements:
 - 1. Division 01: General Requirements
 - 3. Section 22 05 13: Basic Plumbing Materials and Methods.
 - 4. Section 22 10 00: Plumbing.



~~5. Section 22 20 13: Plumbing Piping. NIC~~

1.2 SUBMITTALS

- A. Submit in accordance with Division 01 and Section 22 05 00: Common Work Results for Plumbing.
- B. Submit product data and installation instructions for each item specified.
- C. Submit Samples of materials.

1.3 QUALITY ASSURANCE

- A. Comply with provisions of:
 - 1. Section 22 05 00: Common Work Results for Plumbing.
 - 2. ANSI/ASME A13.1: Scheme for the Identification of Piping Systems.
 - 3. APWA: Uniform Color Code.
 - 4. IAPMO: Uniform Plumbing Code (UPC)

PART 2 – PRODUCTS

2.1 MATERIALS

- A. General: Piping systems, controls, valves, apparatus, etc., except those that are installed in inaccessible locations in partitions, walls, and floors, shall be permanently identified.

2.2 VALVES

- A. Furnish prepared chart or diagram for each piping system, indicating by identifying letter or model number of each valve in the system, its location, and function.
- B. Install charts in aluminum frame with clear glass front and secure on wall where designated by the Project Inspector.
- C. Bind copies of each chart in operating instructions manual.
- D. Provide each valve with a brass, aluminum, or plastic disc, not less than 1-1/4 inches diameter bearing engraved numbers corresponding to those indicated on chart. Fasten discs to valve with No. 14 brass wire.
- E. Provide an additional tag for safety valves and other valves that could be hazardous to safety and health of occupants. Distinguish these tags from regular valve tags by color (such as yellow with black letters, and marked "Danger"); submit Sample tag to the Architect for review.

2.3 INSTRUMENTS AND CONTROLS

- A. Identify panel-mounted instruments and controls with engraved bakelite nameplates permanently affixed to panel boards.
- B. Identify alarm indicating devices and alarm reset devices by nameplates.
- C. Identify automatic valves, flow switches, and pressure switches, with embossed aluminum or plastic tape affixed to controller, indicating service and setting.

2.4 EQUIPMENT

- A. Identify each major piece of equipment with engraved bakelite nameplates permanently affixed to the equipment, indicating the room numbers it services, Equipment identification designation shall be the same to its designation indicated on the "As-Built Drawings". Room numbers in the nameplates shall correspond to the final room numbers.

2.5 ABOVE GRADE PIPE IDENTIFICATION

- A. Identify pipes by means of colored labels with directional flow arrows and identification of the pipe content, in conformance to ANSI/ASME A13.1 or the UPC.
- B. Materials: Precoiled acrylic plastic with clear polyester coating, all-temperature, self-adhering, as manufactured by Brady, Brimar Industries, Seton, Stranco, Inc., or equal.
- C. Size:

Outside Diameter of Pipe or Insulation (in inches)	Length of Color Field (in inches)	Size of Letter (in inches)
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 ½
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D. Locations:

1. On accessible piping, whether insulated or not (including mechanical rooms, attic and ceiling spaces); except that labels shall be omitted from piping where contained material is obvious due to its connection to fixtures (such as faucets, water closets, etcetera.).
2. Near each valve and branch connection in such accessible piping.
3. At each pipe passage through wall or floor.
4. At not more than 20 feet spacing on straight pipe run between bands required in 2 and 3 above.
5. At each change in direction.

E. Application: Install on clean surfaces free of dust, grease, oil, or any material that will prevent proper adhesion. Replace non-adhering or curling labels with new labels.

F. Color Schedule:

Content of Pipe	Legend	Background Color	Lettering Color
Domestic cold water	Domestic. C.W.	Green	White
Non-potable cold water	Caution: Non-potable Water Do Not Drink (1)(2)	Purple	Black
Domestic hot-water 140°F	Domestic H.W. 140°F	Blue	Black
Sanitary waste	San waste	Green	White
Sanitary vent	San vent	Green	White
Storm drain or downspout	Storm drain	Green	White
Indirect drain	Ind drain	Green	White
Sump pump discharge	Pump discharge	Green	White
Fire sprinkler supply	Fire Sprinkler supply	Red	White
Fire sprinkler drain	Sprinkler drain	Red	White
Fuel oil	Diesel oil	Yellow	Black
Gas	Gas	Yellow	White

Reclaimed Water	Caution: Reclaimed Water Do Not Drink (1)(3)	Purple	Black
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H. Notes on Schedule:

- Note (1) indicates 2 ¼ inch by 1 inch yellow label with ½ inch letters reading UNSAFE WATER at one end of primary label.

Note (2) words should read “CAUTION: NONPOTABLE WATER DO NOT DRINK.” with international *do not drink* symbol.

Note (3) words should read “CAUTION: RECLAIMED WATER DO NOT DRINK.” with international *do not drink* symbol.

2.6 UNDERGROUND PIPE

A. Detectable Marking Tape:

- Provide and install detectable marking tape along buried piping. Tape shall be specifically manufactured for marking and locating underground utilities with electronic equipment. Tape shall be acid and alkali resistant, and manufactured with integral wires or foil backing, encased with protective cladding. Tape shall be a minimum of two inches in width.
- Manufacturer: Reef Industries, Inc., Advantage Brands, Inc., Northtown Company, Mutual Industries, Inc., or equal.
- Detectable marking tape shall be color-coded per APWA Color Code:
 - Yellow: Oil and gas.
 - Blue: Water, irrigation and slurry lines.
 - Green: Sewer and drain lines.

B. Tracer Wire:

- Solid copper wire type THWN, 12 AWG gauge, with heat and moisture resistant insulation.

PART 3 – EXECUTION

3.1 INSTALLATION

- Correct detrimental conditions prior to commencing the Work of this Section. Install markers and identification tags as specified with materials and installation procedures recommended by manufacturer.
- Place tracer wire on top of non-metal utility lines allowing some slack. Do not wrap tracer wire around pipe. Fasten tracer wire in place at approximately 10 feet on centers with non-metal ties.

- C. Install underground detectable pipe marking tape continuously buried 8 to 10 inches above the buried utility pipe. Wrap tape on pipe risers up to a height of 12 inches above grade.

3.2 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 22 07 00

PLUMBING INSULATION

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation for plumbing piping.

B. Related Requirements:

1. Division 01: General Requirements.
2. Section 22 05 00: Common Work Results for Plumbing.
3. Section 22 0513: Basic Plumbing Materials and Methods.
4. Section 22 05 53: Plumbing Identification.
5. Section 22 10 00: Plumbing.

1.2 REFERENCES

A. American Society for Testing and Materials International (ASTM):

1. ASTM C302 - Standard Test Method for Density and Dimensions of Preformed Pipe-Covering-Type Thermal Insulation.
2. ASTM C411 - Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
3. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
4. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
5. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
6. ASTM C1104 - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
7. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
8. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

- B. Underwriters Laboratories, Inc.
 - 1. UL 723 - Test for Surface Burning Characteristics of Building Materials.
- C. National Fire Protection Association:
 - 1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- D. California Code of Regulation Title 24.
 - 1. California Green Building Standards Code.

1.3 SUBMITTALS

- A. Submit in accordance with Division 01 and Section 22 05 00: Common Work Results for Plumbing.
 - 1. Complete material list of items to be furnished and installed under this Section.
 - 2. Manufacturer's specifications and other data required demonstrating compliance with the specified requirements.
 - 3. Shop Drawings, catalog cuts and manufacturer's data indicating insulation, jacketing, adhesives, and coating. Insulating materials shall be certified by manufacturer to comply with the California quality standards for insulating materials.
 - 4. Display sample cutaway sections.
 - 5. Manufacturer's recommended method of installation procedures, which will become part of this Section.

1.4 QUALITY ASSURANCE

- A. Qualifications of Manufacturer and Installer, Materials, Fabrication, Execution, and Standard of Quality: Comply with provisions stated under Section 22 05 00: Common Work Results for Plumbing and Section 22 05 13: Basic Plumbing Materials and Methods.
- B. Insulation Work shall be in accordance with the California Building Energy Efficiency Standards, CBC, and Uniform Mechanical Code and the California Green Building Standards Code.
- C. Test Ratings:
 - 1. Comply with provisions stated under Section 22 05 00 and 22 05 13 with emphasis on ASTM E84, NFPA 255, or UL 723. ASTM C167, ASTM C302, UL label or listing of satisfactory test results from the National Institute of Standards and Technology, or a satisfactory certified test report from an acceptable testing laboratory. Approval by the State Fire Marshal is required.
 - 2. Furnish labels, legibly printed with the name of the manufacturer or listings indicate that fire hazard ratings do not exceed those specified for materials proposed for

installation. Flame spread index of not more than 25 and smoke developed rating not exceeding 50.

3. Tests shall be performed on each item individually when insulation, vapor barrier covering, wrapping materials, or adhesives are installed separately at the Project site.
 4. Test insulation, vapor barrier covering, wrapping materials and adhesives as an assembly when they are factory composite systems.
- D. Regulatory Requirements: Insulation furnished and installed under this Section shall meet minimum legal requirements of the Building Energy Efficiency Standards adopted and incorporated in the California Energy Commission, Title 24, Part 2, Chapters 2 through 53 and the California Green Building Standards Code unless otherwise noted, for the piping,
- E. Chemically based products such as sealers, primers, fillers, adhesives, etcetera must meet the California air quality regulations.

1.5 PRODUCT HANDLING

- A. Protection, Replacement, Delivery and Storage: Comply with provisions stated under Sections 22 05 00: Common Work Results for Plumbing and 22 0513: Basic Plumbing Materials and Methods.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. General:
1. Insulating material shall be fire resistant, non-corrosive, shall not break, settle, sag, pack or disintegrate under vibration, nor absorb more than 1 percent moisture by weight.
 2. Insulating material shall be furnished with thickness indicated in Table 1, and shall furnish thermal resistance in the range of R-4.0 to 4.6 in accordance with inch at 75 degrees F. For any other value of R, insulation thickness shall be calculated accordingly and submitted for review.
 3. Asbestos in any quantity in insulating material is not permitted.
 4. Provide insulation materials, adhesives, coatings, sealants, fitting covers, and other accessories with a fire hazard rating not to exceed 25 for flame spread, 25 for fuel contributed and 50 for smoke developed, except for materials listed as follows:
 - a. Nylon anchors for installing insulation to equipment.
 - b. Treated wood blocks.
 5. Flame-proofing treatments subject to moisture damage are not permitted.

TABLE 1 - MINIMUM PIPING INSULATION THICKNESS ⁽¹⁾

Insulation Thickness Required (in inches)

Piping System Type	Temp. Range (degrees F)	Runouts up to 2 (2)	1 and less	1.25 to 2	2.5 to 4	5 to 6	8 and larger
Service Water Heating Systems (recirculating, piping supply and return)							
Hot Water	Up to 180	0.5	1.0	1.0	1.5	1.5	1.5
Condensate Drain	½ inch minimum insulation thickness.	0.5	0.5	0.5	0.5	0.5	0.5
From A/C Equipment:	Insulate condensate drain lines within building, in room, inside walls and above ceilings.	0.5	0.5	0.5	0.5	0.5	0.5

NOTES: (1) For piping exposed to ambient temperatures, increase thickness by 0.5 inch.

(2) Runouts to individual terminal units, not exceeding 12 feet in length.

- B. Lagging Adhesives: Shall be nonflammable and fire-resistant and shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Insulation finished with canvas shall be provided with laps adhered in accordance to manufacturer's recommendation. A finish coat of same material shall be applied to entire outer surface of lagging cloth at coverage specified by manufacturer.
- C. Canvas Jackets: Provide 6 ounce, in accordance with square foot minimum, 48 by 48 thread count canvas jacketing.
- D. Insulation Jackets:
1. Exterior insulation exposed to weather shall be weatherproofed with Childers aluminum jacketing as basis of design, or Pabco, RPR, or equal. Jacketing shall be manufactured from 1100, 3105 or 5010 aluminum alloy with 3/16 inch corrugations. Smooth or embossed jackets may be permitted in special situations to match an existing installation. Jacketing shall be furnished with an integrally bonded moisture barrier over entire surface in contact with insulation. A minimum thickness of 0.016 aluminum jacketing is to be provided on ducts and piping. A minimum thickness of 0.020 shall be provided on tanks, equipment, and heat exchangers.
 2. Insulated elbows, of 90 degrees and 45 degrees, with a nominal iron pipe size of ½ inch to 8-inch shall be provided with Childers aluminum Ell-Jacs insulation covers as basis of design, or Pabco, RPR, or equal, manufactured from 1100 aluminum

alloy of 0.024 inch thickness. Insulated elbows with a nominal pipe size of 10-inch to 18-inch shall be provided with Childers 4-piece aluminum Ell-Jacs as basis of design, or Pabco, RPR, or equal.

3. Tees, Flanges, and Valve Insulation in Conjunction with Aluminum Jacketing: Furnish Childers Aluminum Special Fabrications Insulation Covers as manufactured by Childers Products Company, Pabco, RPR, or equal.

E. Adhesives: Adhesives shall be water based, UL Classified, meet the requirements of NFPA 90A and NFPA 90B, have been tested according to relevant ASTM requirements, and be acceptable to the State Fire Marshal. Name, type and method of installation shall be submitted for review.

F. Valve and Fitting Cover: When installed in conjunction with PVC jacketing, furnish Zeston 25/50 rated polyvinyl chloride fitting covers as manufactured by Johns Manville, Knauf Insulation, Speedline, or equal.

2.2 DOMESTIC HOT WATER PIPING SYSTEM INSULATION (NOT USED)

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Except as specified herein, install material in accordance with recommendations of manufacturer. Do not install insulation materials until tests specified in other sections are completed. Remove foreign material such as rust, scale, or dirt. Surfaces shall be clean and dry. Maintain insulation clean and dry at all times.
- B. On cold surfaces where a vapor barrier must be provided and maintained, insulation shall be installed with a continuous, unbroken moisture and vapor seal. Hangers, supports, anchors, or other projections that are fastened to cold surfaces shall be insulated and vapor sealed to prevent condensation.
- C. Surface finishes shall be extended in such a manner as to protect raw edges, ends, and surfaces of insulation.
- D. Pipe or duct insulation shall be continuous through walls, ceiling or floor openings, or sleeves; except where firestop or firesafing materials are required.
- E. Metal shields shall be installed between hangers or supports and the piping insulation. Rigid insulation inserts shall be installed between the pipe and the insulation shields. Inserts shall be of equal thickness to adjacent insulation and shall be vapor sealed accordingly.
- F. Insulation shall not be installed in the following locations unless otherwise noted:
 1. On unions, flanged connections or valve handles.
 2. Over edges of any manhole, clean-out hole, clean-out plug, and to restrict opening or identification of access.
 3. Over any label or stamp indicating make, approval, rating, inspection, or similar data, unless provision is made for identification and access to label or stamp.

3.2 INSTALLATION OF DOMESTIC HOT WATER PIPING SYSTEM INSULATION

- A. General: Domestic hot water, tempered water supply and return piping and condensate return piping, after having been tested, shall be cleaned and insulated.
- B. Application: Insulate condensate return piping, domestic hot water supply and return, including tempered supply and return piping in accordance with manufacturer's instructions and as specified herein.
 - 1. Install insulation on valve bodies up to valve bonnet. Fill void in saddles, in accordance with Section 22 05 13: Basic Plumbing Materials and Methods, with insulation and seal joints.
 - 2. Install insulating material to fittings, valves, and strainers and smooth to thickness of adjacent covering. Leave strainer clean-out plugs accessible. Covers fabricated from polyvinyl chloride shall be furnished.
- C. Insulation Jackets in Exposed Indoor Locations:
 - 1. Cover completed insulation with canvas jacket tightly pasted to covering with lagging adhesive. Lap jacket seams 1 1/2-inch minimum. Finish entire jacket with coating of undiluted adhesive.
 - 2. Equivalent factory applied pre-sized, glass fiber reinforced, or glass fiber jackets may be furnished. Seal jacket seams with adhesive in accordance with manufacturer's instructions.
 - 3. Johns Manville Zeston 2000, Knauf Insulation Proto PVC Fitting Cover, Speedline Polycy Smoke Safe, or equal, fitting covers may be furnished, with molded or segmented insulation equal to specified insulation applied to fittings. Secure covers in accordance with manufacturer's instructions.
 - 4. In addition to above requirements, cover exposed insulated piping within a distance of 8 feet above floors with 26 gage galvanized steel jacket. Omit jacket in areas accessible only to maintenance personnel, such as mechanical equipment rooms, utility corridors, accessible pipe tunnels and manholes.
- D. Concealed Indoor Locations: Cover insulation over fittings, valves, and strainers with canvas. Provide pipe insulation with factory or field applied standard jacket of 4 ounce minimum canvas, fiberglass cloth, or glass fiber reinforced jacket. Seal jacket laps with adhesive in accordance with manufacturer's instructions.
- E. Exposed Outdoors: In addition to canvas or fiberglass cloth cover, pipe insulation exposed to weather shall be provided with an additional 0.016 inches thick aluminum jacket with 2-inch lap connected with one inch hem overlap joint located on side of pipe and turned down to shed water. Jacket shall be strapped 12 inches on center with 1/2-inch wide stainless steel strapping and wing seals. Aluminum jacket shall be mitered to fit fittings.

3.3 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.4 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

END OF SECTION

SECTION 22 10 00

PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Labor, materials, tools, and equipment to install plumbing systems as indicated.
- B. Related Sections:
 - 1. Division 01 - General Requirements.
 - 2. Section 22 05 00: Common Work Results for Plumbing.
 - 3. Section 22 05 13: Basic Plumbing Materials and Methods.
 - 4. Section 22 05 53: Identification for Plumbing piping and Equipment.
 - 5. Section 22 07 00: Plumbing Insulation.

1.2 SUBMITTALS

- A. Provide in accordance with Division 01 and Section 22 05 00: Common Work Results for Plumbing.
- B. Provide necessary documentation to Owner for processing rebates for water efficient fixtures.

1.3 QUALITY ASSURANCE

- A. Unless otherwise noted, the California Plumbing Code is hereby made part of this section.
- B. Conform to provisions of Section 22 05 00: Common Work Results for Plumbing.
- C. Manufacturer of plumbing products must be third-party certified to ANSI/NSF Standard 61, Section 9 certification, and ANSI/NSF 372 to demonstrate compliance with the federal requirements for lead contribution to drinking water, the Safe Drinking Water Act SDWA, and the California Health and Safety Code Section 116875.

1.4 PRODUCT HANDLING

- A. Conform to provisions of Section 22 05 13: Basic Plumbing Materials and Methods.

PART 2 - PRODUCTS

2.1 PIPING SYSTEMS

- A. Materials: Refer to Section 22 05 13: Basic Mechanical Materials and Methods.

- B. Insulation for Piping: Refer to Section 23 07 00: Plumbing Insulation.

2.2 FIXTURES AND DRAINS

- A. General: Fixtures specified shall be furnished complete with trim and fittings. Cast iron plumbing fixtures shall be acid resistant enamel, and identified by casting letters "AR" or words "acid-resistant" into metal. Fixtures shall be white unless otherwise specified. Cast iron fixtures shall be white enamel inside and on back, rim and apron, with exposed unfinished surfaces painted white. Fixtures of same general classifications shall be of same make.
- B. Finished Brass:
1. Unless otherwise specified, finished brass of a similar type shall be of same manufacturer and model throughout buildings.
 2. Finished and exposed brass equipment, except floor, shower and urinal drains shall be chromium-plated and polished. Floor, shower and urinal drains, unless otherwise specified, shall be nickel-bronze metal.
- C. Traps, Trap Arms and Tailpieces:
1. Fixture traps shall be all cast brass, chromium-plated and polished. (No tubular traps). Exceptions as follows:
 - a. Traps that are an integral part of a fixture.
 - b. Traps concealed in floors, walls and furring.
 - c. Traps standard for service sinks and Industrial Shop equipment.
 - d. Laboratory traps and tailpieces shall be as specified in section 22 07 00.

"Basic Plumbing Materials and Methods"
 2. Concealed traps and 17 gage tailpieces may be rough brass finish, except as otherwise specified. Laboratory traps and tailpieces shall be as specified in Section 22 07 00: Basic Plumbing Materials and Methods. Furnish chromium-plated and polished cast brass wall flanges with setscrews and chromium-plated and polished brass casing on discharge side of each trap.
 3. Tailpieces shall be not lighter than 17 gage, brass, chromium-plated, and polished. Furnish and install chromium brass plated wall flanges with set screws and chromium-plated 20 gage brass casing on discharge side of each chrome-plated all cast trap.
- E. Fixture Supplies:
1. Supplies for water heaters shall be unplated rigid copper water tube with threaded adaptors for connections to valves and other threaded connections. All other supplies shall be chromium-plated brass with hospital threads or shall be furnished with fittings and valves, which completely cover threads.

2. Exposed supplies for showers shall be chromium-plated brass pipe up to header with hospital threads or shall be furnished with fittings and valves, which completely cover threads.
3. Supplies to water closet tanks, lavatories, and drinking fountains shall be furnished with chromium-plated and polished screwed type angle compression stops with square shank stems and lock shields extending beyond stem. Instead of solid supply piping, polished chrome-plated risers of 3/8 inch outside diameter with ferrule stop end and metal nosepiece may be furnished. The installation of braided stainless or easy hooker's supplies is not permitted. Exception: Supplies that rise vertically from floor shall be furnished with straight type instead of angle type stops.
4. Each supply or pipe that penetrates a finished surface and plumbing pipes passing through a countertop or part of a cabinet shall be furnished with a chromium-plated brass flange except flanges furnished by manufacturer of flush valves as an assembly.
5. Water supplies of plumbing fixtures shall be protected against back-siphonage in event of a vacuum in piping system.
6. Discharge outlets of supply faucets for lavatories and sinks shall clear top of overflow rim by at least one inch.
7. Toilet and urinal flush valves shall be furnished with recognized atmospheric vacuum breakers, installed a minimum of 6 inches above fixture.

2.3 ACCESS PLATES (To cleanouts, valves, water hammer arrestors and hose faucets)

A. Schedule Numbers:

AP-1: Square, unless otherwise noted, steel, prime coated; frame, 18 gage minimum. Door shall be 16 gage minimum with concealed hinge or be removable, with vandal-proof lock operated by Allen wrench.

(Specify for painted and stucco walls.)

SMITH	ZURN	ELMDOR	MILKOR	WATTS	MIFAB	JOSAM
Fig 4760 AK	Z-1462- VP	DW-AKL	MOR DW AK1	CO-300- S-6	UA-A	58650-VP OR EQUAL

AP-2: Round type, stainless steel, vandal-proof, 5/16 inch No. 18 or 1/4 inch No. 20 flat-head machine screw into cleanout plug. Plate shall be prime coated minimum 18 gage steel or polished chrome-plated brass, 18-8 No. 302 stainless steel, or polished nickel bronze.
(To be specified for painted walls, screwed into cleanout plug.)

SMITH	ZURN	JOSAM	WADE	WATTS	MIFAB	OR EQUAL
4710U	Z-1469-VP	58600	8480R	CO-480- RD-6	C1400-RD-6	

- AP-3: Square, polished face chrome-plated bronze, aluminum alloy or brass chrome-plated brass frame with 14 gage polished 18-8 No. 302 stainless steel or brass chrome-plated secured cover with vandal-proof screws.
(To be specified for tile walls.)

SMITH	ZURN	WADE	WATTS	MIFAB	JOSAM	OR EQUAL
4735U	Z-1460-VP	58630	CO-300-S-6	C1400-S-3-6	58640-VP	

- AP-4: Square, floor type, cast nickel-bronze aluminum alloy or brass, with carborundum or scoriated, secured top.

(To be specified for floor access to solid interceptor in Science Room, Ceramic Room, and Agriculture Room.)

SMITH	ZURN	JOSAM	WATTS	MIFAB	OR EQUAL
4910U	Z-1461-VP	58630	CO-300-S-6	C1300-S-6	

2.4 CLEANOUT ASSEMBLIES

- A. Cleanout plug shall be line size.
B. Schedule Numbers:

- CO-1: Iron body cleanout tee full line size up to 4 inches and round access plate, plugs shall be brass, countersunk with tapped boss for 5/16 inch No. 18 or ¼ inch No. 20 screws. (Specify for finished walls at base of waste stack, above urinal and service sink.) AB&I and TYLER may be used as iron body cleanouts. Trim and accessories shall be Smith or Zurn or equal.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
4532-U	Z-1446-BP	CO-460-RD-34B	C1460-RD-6	58600-CO	

3

- CO-2: Iron body with approved UPC plug, top and adjustable sleeve, cut-off ferrule, polished scoriated brass nickel bronze secured cover. AB&I and TYLER may be used as iron body cleanouts. Trim and accessories shall be Smith or Zurn or equal.

Square:

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
4053L-U-NB	ZN-1400-T	CO-200-S	C1220-S-1-6	55000-1-SQ	

Round:

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
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4033-L-U-NB

ZN-1400

CO-200-R

C1220-1-6

55000-1

2.5 DRINKING FOUNTAINS

- A. Also see Electric Water Coolers, below.
- B. Drinking Fountains shall be provided with brass free waterways and lead mitigating water filtering systems (DFWF), ANSI-NSF 53 certified, to remove Lead and other contaminants having detrimental health effects.
- C. Schedule Numbers:

DF-12A: Dual Height - Two unit, access compliant dual height (high low) white porcelain enamel cast iron drinking fountains, with bottle filler constructed of all 14 gauge type 304 stainless steel powder-coated white and no plastic shall be used in its construction for vandal resistance. A laminar flow of water shall be activated with a front mounted and ADA accessible push button and be within ADA reach guidelines when properly installed. Any excess water draining into the fountain basin shall utilize a single common drain for both fountain and bottle filler. All waterways shall be brass free and unit shall be certified to ANSI/NSF 61 and ANSI/NSF 372 lead free. No electricity shall be needed to operate the unit. For bubbler stream activation, a non-proprietary, adjustable flow push button activated cartridge shall be used. (To be specified for indoor or outdoor general use.)

ELKAY	OR EQUAL
VRCTL8WSK WITH ELKAY EZH20 VANDAL RESISTANT BOTTLE FILLING STATION & BI-LEVEL COOLER	

2.6 DIELECTRIC UNIONS

- A. Schedule Numbers:
1. Dielectric style Unions using ferrous and no-ferrous metals are prohibited. Dielectric flanges are admitted for use – see DU-2.

DU-1: Lead Free Brass union with 6-inch Lead Free Brass nipple.

DU-2: Lead Free Brass union or Lead Free Brass flanged fittings are to be used in between pipes made of dissimilar metals to prevent accelerated corrosion and deterioration in the piping systems due to galvanic and stray current.

WATTS	WILKINS	ZURN	NIBCO	OR EQUAL
LF3100M3			733-LF	

2.7 FAUCETS

- A. Access compliant faucets: Force to activate controls shall be no greater than 5 pounds. Self-closing metering, where specified, to remain open 10 seconds minimum when activated. Handles shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist.

- B. Schedule Numbers:

- F-15: Single water inlet lavatory faucet self-closing metering, to remain open 10 seconds minimum when activated. Adjustable time cycle with vandal resistant base plate and chrome plated finish.

(To be specified for student and Faculty restrooms).

3

CHICAGO	ZURN	OR EQUAL
3400-ABCP	Z86100-XL-CP4	

3

2.01 FLOOR DRAINS

- A. Schedule Numbers:

- FD-1: Cast iron body, no hub with seepage pan and flat, round nickel bronze strainers not less than 5-inch diameter for 2-inch outlet bodies, 7-inch for 3-inch outlet bodies and 8-inch for 4-inch outlet bodies, with maximum of ½ inch square holes or slots not larger than ¼ inch by 1 ¼-inch.

(To be specified for use in locations other than tile floors.)

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
2005Y-A	ZN-415-B	FD-100-A	F1100-C-1	30000-A	

2.8 FLEXIBLE HOSES

- A. Schedule Numbers:

FLH-1: Braided stainless steel metal hose (for gas use). US Flex, Metraflex, Nelson Dunn or equal.

FLH-2: Braided bronze metal hose (for non-pressure condensate connection use). US Flex, Metraflex, Nelson Dunn or equal.

2.9 FLUSH VALVE ASSEMBLY

3

FLV-1: DO NOT USE

FLV-1a: Manual Flush Valve for Water Closet: Shall deliver 1.28 gallon of water at each operation.

SLOAN	ZURN	OR EQUAL
Royal 111-1.28	Z6000AV-HET	

FLV-2: DO NOT USE

FLV-2a: Manual Flush Valve for Urinals: shall deliver 1/8 gallon of water per flush.

SLOAN	ZURN	OR EQUAL
Royal 186-0.125-DBP	Z6003AV-ULF	

2.10

LAVATORIES

- A. Access compliant faucets for Lavatories: Force to activate controls shall be no greater than 5 pounds. Self closing metering, when specified, to remain open 10 seconds minimum when activated.
- B. Cast Iron Lavatories shall be acid resistant enamel, and shall conform to Commercial Standards CS 77.63. Unites furnished in conjunction with strainer installation or faucet installation shall be brass. Exposed brass nuts shall be chrome plated.
- C. Exposed trim shall be free from sharp edges or points. Fixture shall be furnished with other listed manufacturer specified trim. Instead of solid supply pipe, polished chrome-plated risers, 3/8 inch outside diameter with ferrule stop end and metal nosepiece may be furnished.
- D. Insulate cold water, hot water and drain lines under all access compliant lavatories with approved type insulation.

PLUMBEREX	LAV-GUARD	OR EQUAL
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Schedule Numbers:

- L-1: 20-inch by 18-inch cast iron, acid-resistant enamel punched with three holes, 4-inch on center and supplied with tempered or cold water only. Unit shall be furnished with cast iron hangers. Stops shall be loose key, square shank, lock shield type.

(To be specified for use in Student Toilet Rooms, Typing, Math, and Industrial Art Rooms.)

	COMMERCIAL ENAMEL	KOHLER	BRASS CRAFT	CHICAGO	ZURN OR EQUAL
Bowl	551 (3 holes)	K-2867			Z5844-CB
Faucet (See Section 2.13)	F-15	F-15	F-15	F-15	F-15
Drain		K-7715		327 XCP	Z8743

Supply			HSTR 1720 A-CB-C	1017	ZH-8822-CE-LK
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3

L-4: 20-inch by 18-inch cast iron, acid-resistant enamel punched with three holes, 4-inch on center and supplied with tempered or cold water only. Unit shall be furnished with cast iron hangers. Stops shall be loose key, square shank, lock shield type. (To be specified for access compliant installations at faculty restrooms).

	COMMERCIAL ENAMEL	KOHLER	BRASS CRAFT	CHICAGO	ZURN OR EQUAL
Bowl	551 (3 holes)	K-2867			Z5844-CB
Faucet (See Section 2.13)	F-15	F-15	F-15	F-15	F-15
Drain		K-7715		327 XCP	Z8743
Supply			HSTR 1720 A-CB-C	1017	ZH-8822-CE-LK

3

2.11

HOSE BIBB:

HB-8: Recessed hose box furnished with wall flange and built-in drip lip. Box shall be one piece construction; door shall have a recessed cam lock. Door shall remain up and out of the way when in fully opened position. Valve shall be replaceable loose key wheel handle and screwdriver stop. Install within 2 feet above finished floor. Provide vacuum breaker.

(To be specified for use in Toilet Rooms.)

ACORN	WOODFORD	PRIER	OR EQUAL
Hose box 8104 or 8151	B75	C-634BX1	

2.12

PIPE HANGERS

- A. Refer to Section 22 05 13: Basic Plumbing Materials and Methods.
- B. Schedule Numbers:
 - 1. PH-1: Complete with clamps, inserts, etc.

SUPERSTRUT	UNISTRUT	TOLCO	B-LINE	OR EQUAL
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2.13

P-TRAPS

A. Schedule Numbers:

PT-1: Cast brass complete, chrome-plated.

ZURN	AB&A	KOHLER	OR EQUAL
Z-8712-LC	107	K-9018	

B. Exposed trim shall be free from sharp edges or points. Fixture shall be furnished with other listed manufacturer specified trim. Instead of solid supply pipe, polished chrome-plated risers, 3/8-inches outside diameter with ferrule stop end and metal nosepiece may be furnished.

C. For access compliant sinks: Insulate cold water, hot water and drain pipes under sinks with district approved type insulation.

PLUMEREX	LAV GUARD	OR EQUAL
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D. Schedule Numbers:

ST-1: Cast Iron, 24-inch by 16-inch by 5-inch, flat rim, with 3 ½-inch flat strainer, and deck mounted stainless steel pantry faucet, mounted on left side center line, with stainless steel drinking bubbler mounted on right side near front.

(To be specified for use in Elementary and kindergarten classrooms.)

	AMERICAN STANDARD	HAWS	KOHLER	JUST
Sink		4110 ADA	K-5990	
Faucet		F-16 (see 2.13)	F-16 (see 2.13)	
Strainer	4311.023	6455	K-8807	
Bubbler				JSB-10-VR

ST-2: Same as ST-1, except stainless steel faucet on the right side and stainless steel bubbler on the left side.

(To be specified for use in Elementary and Kindergarten classrooms.)

- ST-3: Cast Iron, 18-inch by 12-inch – 24-inch by 18-inch or 30-inch by 18-inch (Designer to select and specify the size) or as indicated on drawings, with basket strainer, hot and cold deck mounted faucet.

(To be specified for use in Administration Offices, Conference Rooms, Teacher Workrooms, Faculty Lounge, Library and Kiln Room.)

	KOHLER	AMERICAN STANDARD	CECO	HAWS	OR EQUAL
Sink			720C, 720G, 720I		
Faucet	F-15	F-15	F-15	F-15	
Strainer	K-8801	4331.013		6457	

- ST-4: Same as ST-3, except with flat strainer and deck mounted faucet.

(To be specified for Art Classroom, Shop and Industrial Craft rooms, Ceramic, Science Room - replacement only, and Special Education Classrooms.)

Strainer	KOHLER K-8807	CHICAGO	HAWS 6455	AMERICAN STANDARD 4311.023	OR EQUAL
Faucet	F-10	F-10	F-10	F-10	

2.14 SERVICE STOP GAS VALVES

A. Schedule Numbers:

- SGV-1: Bronze/Brass gas cock valve with double stake packing nut, ½ inch to 2-inch, with IPS, inclusive, with flat or square head. CSA approved.

(To be specified for oven ranges, convection ovens, skillets.)

AMERICAN	Mc DONALD	NIBCO	OR EQUAL
85 CBK or 86C	10596, flat 10604, square	GB2A	

- SGV-2: Bronze/Brass, ¾-inches to 2-inch IPS (WOG) water, oil, or gas – full port ball valve. CSA approved.

(To be specified for larger water heaters, small boilers, pool heaters, and A/C units on roofs.)

WATTS	NIBCO	WILKINS	OR EQUAL
LFFBV-4	F-510-CS-R-66-FS	Model 850	

SGV-3: Cast iron, 2-inch to 4-inch flanged ball valves (WOG) water, oil, or gas. CSA approved.

(To be specified for larger heating equipment.)

WILKINS	NIBCO	WATTS	OR EQUAL
Model 850	F-510-CS-R-66-FS	G4000M1	

SGV-4: Lubricated plug gas valve, 3/4-inch to 2-inch IPS valve.

To be specified for use after gas meter headers, gas regulators, and isolation valves for building isolation, individual floor level isolation, and boiler rooms.)

NORDSTROM	WALWORTH	RESUN	OR EQUAL
142	1786	1430	

SGV-5: Lubricated plug gas valve flanged type 2 ½-inch and larger valve.

(To be specified for use after gas meter headers, gas regulators, isolation valves for buildings isolation, individual floor level isolation and boiler rooms.)

NORDSTROM	WALWORTH	RESUN	OR EQUAL
142	1786-F	1431	

SGV-6: Bronze/Brass ½-inches to 2-inch IPS with lever handle full port ball valve (WOG) water, oil, or gas, CSA Approved.

(To be specified for use in Science, Home Economics, Physics, Biology, physiology, and Modern Science work rooms behind access panel.)

RED and WHITE	NIBCO	WILKINS	OR EQUAL
Fig. 5544	T-585-70-UL T-580-70-UL	Model 80	

SGV-7: Bronze/Brass ½ inch to 2-inch IPS X Flare Appliance ball valves with Tee handle. Flares to be used in conjunction with corrugated flex lines.

(To be specified for clothes dryer, water heaters, unit heaters, and wall heaters up to 100,000 BTU.)

RED and WHITE	BRASSCRAFT	NIBCO	OR EQUAL
RW 5210 RW 5211 RW 5221	TBV 10-12 TBV 8-8 TBV 6-8	GBV 12 GBV 1516	

2.15 STOP VALVES

- A. Stops shall be loose key type, ½-inches IPS inlet and outlet chrome-plated brass casting, except as noted.
- B. Schedule Numbers:

STV-1: Angle:

CHICAGO,	CRANE	NIBCO	OR EQUAL
442-LKABCP	8.5113.	77	

STV-2: Partition:

CHICAGO	T& S BRASS	OR EQUAL
1771-ABCP	B-1028	

STV-3: Straight Type, with Loose Key:

CHICAGO	CRANE	T&S BRASS	OR EQUAL
45-LKABCP (1/2 inch)	8-5111	B-O418	

3

2.16 TRAP PRIMERS

- A. Schedule Numbers:

ATP-1: Automatic, multi-trap primer, cast bronze. Minimum pressure drop of 3 PSI shall activate trap seal primers. Limit serving traps to two using Sioux Chief 695-Y52 splitter.

MIFAB	JAY R SMITH	OR EQUAL
MR-500-NPB	2694	

2.17

2.17 URINALS

- U-3: Low flush urinal, 1/8 gallon. Wall-hung vitreous china, furnish complete with hanger brackets, fasteners, gaskets and ¾-inch top spud. Roughed-in at access compliant height.

Bowl:

SLOAN	ZURN	OR EQUAL
SU-1009-STG	Z5755-U	

1. Manual-flush valve: FLV-2a.

~~U-4: KINDERGARTEN - AMERICAN STANDARD 6590.001 - WASHBROOK - FLOWISE WALL MOUNTED, 0.125 GPF. WITH BATTERY OPERATED SELECTRONIC FLUSH VALVE. INSTALL PER ACCESS COMPLIANT REQUIREMENTS. NIC~~

2.18

WATER CLOSETS

WC-3: Floor-mounted, 15 to 17 inches height to top of seat for secondary school students and adult use, with flush valve at 1.28 gallons per flush and open front fire retardant white seats.

(To be specified for non-accessible use for Secondary School students and adults use)

Bowl:

AMERICAN STANDARD	KOHLER	SLOAN	ZURN	OR EQUAL
3451.001	K-96053	ST-2009	Z5655-BWL1	

1. Manual-flush valve: FLV-1a.
2. Seat: White, ring thickness including bumpers shall be one inch.

OLSONITE	BEMIS	CENTOCO	OR EQUAL
10SSCTFR	1955 SSFR	AMFR500STSCCSS	

WC-4: Floor mounted, access compliant, 17 to 19 inches height to top of seat with flush valve at 1.28 gallons per flush and open front, fire retardant seat.

(To be specified for access compliant use in Secondary schools for students and adults use.)

Bowl:

AMERICAN STANDARD	KOHLER	SLOAN	ZURN	OR EQUAL
3461.001	K-96057	ST-2029	Z5665-BWL-1	

1. Manual-flush valve: FLV-1a.
2. Seat: White, ring thickness including bumpers shall be one inch.

OLSONITE	BEMIS	CENTOCO	OR EQUAL
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10SSCTFR	1955 SSFR	AMFR500STSCSS	
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WC-5: Floor mounted, 11 to 12 inches height to top of seat with flush valve at 1.28 gallons per flush and open front fire-retardant white seats.

(To be specified for Kindergarten age and younger users.)

3. Bowl:

AMERICAN STANDARD	ZURN	Kohler	OR EQUAL
2282.001	Z-5675-BWL	K-96064	

4. Manual-flush valve: FLV-1a.

5. Seat: White, ring thickness including bumpers shall be 1-1/4 inch.

BEMIS	OR EQUAL
BB 955 CT	

2.19

FIXTURE CONNECTIONS

A. Branches to individual fixtures shall be of the following sizes (Inches) unless larger sizes are indicated on Drawings:

Fixture	Copper, Cold (Inches)	Copper, Hot (Inches)	Trap and Connections (Inches)	Soil/ Waste (Inches)	Vent (Inches)
WC Flush Valve	1	N/A	4	4	2
Lavatories	1/2	1/2	1-1/2 by 1-1/4	2	1-1/2
Service Sink	1/2	1/2	2	2	1-1/2
Kitchen Sink	1/2	1/2	1-1/2 by 1-1/2	2	1-1/2
Classroom Sink	3/8	3/8	1-1/2 by 1-1/2	2	1-1/2
Wash Sink	3/4	1/2	1-1/2 by 1-1/2	2	1-1/2

Multiple Drinking Fountains	3/8	N/A	1-1/2 by 1-1/2	2	1-1/2
Single Drinking Fountains	3/8	N/A	1-1/2	2	1-1/2
Individual Showers	1/2	1/2	2	2	2
Standard Urinals, Wall-Hung Flush Valve:	3/4	N/A	N/A	2	1-1/2
Access Compliant Urinals, Wall-Hung Flush Valve:	1	N/A	N/A	2	1-1/2
Sillcocks	3/4 minimum	N/A	N/A	N/A	N/A

B. Water headers serving water closets shall be copper water tube, with following size throughout length:

1. 1-1/2 inches for 2 flush valves.
2. 2 inches for 3 to 9 flush valves.

C. Water headers serving urinals shall be of following size throughout length:

1. 1" for 1 or 2 flush valves.
2. 1-1/4" for 3 flush valves.
3. 1-1/2" for 4 to 8 flush valves.

D. Water headers serving showers shall be same as listed above for urinals.

E. Water headers serving lavatories shall be of following size throughout length:

1. 1/2 inch for 2 lavatories.
2. 3/4 inch for 3 and 4 lavatories.
3. One inch for 5 and 6 lavatories.

2.20 HEIGHT OF FIXTURES

A. Heights for standard fixtures.

Fixture	Adults and	Elementary	Kindergarten
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	Students Ages 12 and Over (Inches)	Ages 6 to 11 (Inches)	and Younger Ages 3 to 5 (Inches)
Toilets, height to top of seat	15 to 17	15	11 to 12
Lavatories, sink top height	32	30	25
Wash Sinks	30	28	24
Urinals, lip height	24	18	N/A
Shower Heads From tip of shower head to finish floor	72		
Shower valves	48		

B. Heights for access compliant fixtures.

Fixture	Adults and Students Ages 12 and Over (Inches)	Elementary Ages 6 to 11 (Inches)	Kindergarten and Younger Ages 3 to 5 (Inches)
Toilets, center line from wall/partition	17-1/2	15	12
Toilets Seat Height	18	15	12
Lavatories, sink top height	34 maximum	30	24 maximum
Lavatories, sink knee clearance	27 minimum	24 minimum	Parallel (Side) Approach
Urinals, lip height	16	15 maximum	13 maximum
Urinals, flush handle height	43	40 maximum	32 maximum
Drinking fountains, bubbler height.	36 maximum	30 maximum	30 maximum
Drinking fountains, knee clearance	27 minimum	24 minimum – not required	24 minimum – not required
Wash Sink	Per Drawings		
Shower Valves	Per CBC		
Shower Seat	Per CBC	Per CBC	Per CBC
Shower Head (adjustable) Bar	Per CBC		

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions under which Work of this section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Unless otherwise specified, plumbing fixtures, equipment and appliances that require connections to plumbing line shall be connected. This shall include fixtures specified or indicated as furnished by others, furnished by Owner, or specified in other related sections. Install supplies, stops, valves, traps, wall flanges, or pipe casing for connection of this equipment.
2. Install equipment as indicated on reviewed and accepted Shop Drawings.
3. Avoid interference with Work of other trades. Do not deviate from Drawings without review of the Engineer.

B. Examination: Check each piece of equipment in system for defects verifying that parts are properly furnished and installed.

C. For piping Work, refer to Section 22 05 13: Basic Plumbing Materials and Methods.

D. Plumbing Fixture and Equipment Installation:

1. Unless otherwise indicated, fixtures shall be installed with 5/16 inch brass bolts or screws of sufficient length to securely fasten fixture to backing, wall, or closet ring.
2. Fixtures installed against concrete or masonry walls shall have their hangers fastened with 5/16 inch brass bolts, Philip Shield type anchors, or 2 unit cinch anchors. Wood or plastic plugs are not permitted.
3. Fixtures installed against wood or metal stud walls shall have their hangers fastened to metal backing plates with 5/16 inch brass bolts screwed into plate. Fixture hangers for urinals shall be fastened centered vertically on metal backing plate with three 5/16 brass bolts each for small individual hangers and six, for larger one piece hangers. Lavatories shall be hung with not less than four 5/16 inch brass bolts or not less than five 1/4 inch brass bolts. Each sink hanger shall be hung with not less than four 5/16 inch brass bolt or not less than five 1/4 inch brass bolts.
4. Rough-in for fixtures, equipment and appliances shall be as indicated on Drawings and as specified, including those items indicated as furnished by others, furnished by Owner, or future capacity. When connections to equipment from capped or plugged lines are required, caps or plugs shall be removed at time equipment is set and stops or valves installed and connections provided as specified.
5. Piping materials for trap arms shall be Brass, Cast Iron or DWV copper
6. Piping shall be stubbed out to exact location of fixtures and stubs shall be installed symmetrical with fixtures. Hot and cold water supplies for center set faucets on lavatories shall be installed on 8-inch centers, unless otherwise specified or required.

E. Cleanouts in Drain, Waste, Vent and Sewer Lines:

1. Cleanouts shall be installed at locations stated in the California Plumbing Code and accessible at following locations:
 - a. At locations above first floor as stated on construction documents and 5 feet outside of the building.
 - b. Install an accessible main line upper terminal cleanout in all restrooms above water closet over flow. (Install above upper terminal water closet where there are more than one water closet in a restroom).
 - c. Above faucets of each sink with brass plug.
 - d. Above service sink with brass plug.
 - e. At each Drinking Fountain with brass plug.
 - f. At each urinal and locate above urinal with brass plug.
 - g. Above overflow level of pot sinks with brass plug.
 - h. In vertical line at base of each downspout connected to an underground storm drain system extend cleanout to exterior of building.
 - i. At upper end of a horizontal vent line when any part of horizontal line is below overflow level of fixture it serves.
 - j. Not to exceed 100-foot intervals in sewer and waste lines exterior of building.
 - k. At property line connection.
 - l. Where indicated on Drawings.
2. Cleanouts shall be extended to grade as follows:
 - a. Not to exceed 100-foot intervals in straight runs of pipe outside buildings.
 - b. At horizontal changes of direction in aggregate greater than 135 degrees (underground).
 - c. At property lines.
 - d. Where cleanouts occur under concrete.
 - e. Where marked for future connections.
3. Cleanouts in building shall be extended to floor level or above floor level or above floor level in walls or furring when cleanouts are not accessible or where clearance is less than 18 inches.
4. Cleanouts in finished areas in building shall be concealed except that cleanouts above service sinks in janitor's rooms or closet, and cleanouts above service sinks or in exposed piping in boiler or heater equipment rooms, may be exposed.

Cleanouts for urinals shall be installed above urinal and shall terminate behind an access plate.

5. Cleanouts in floors of covered areas and those extended to grade in concrete areas shall be floor level type with extensions body brass plugs and detachable nickel-bronze or aluminum alloy scoriated.
6. Concealed cleanouts in vertical lines shall be service weight soil cleanout tees with brass plugs and round cover plates unless otherwise specified or indicated. A snug fitting sleeve of galvanized sheet metal shall be placed around hub of tee and shall extend to flush with finished soil, or cleanout shall be extended to finished wall.
7. Cleanouts extended from below floor to a wall or furring or on horizontal lines above floor that terminate at a wall or furring shall be iron body type with brass plugs and round cover plates.
8. Cover plates over cleanouts in painted walls shall be steel, bonderized and prime coated. Cover plates cover cleanouts in tile walls shall be chromium-plated brass or nickel bronze. Plates shall be attached to cleanout plugs with 5/16 inch No. 18 or 1/4 inch No. 20 stainless steel vandal-proof type screws. Plates shall be one inch larger in diameter than fitting opening.
9. Cleanouts at bases of downspouts shall be tapped soil tees with brass plugs as hereinafter specified, full size of line.
10. Cleanouts extended to grade in exterior sewer lines other than floors or concrete areas shall be a cleanout assembly with secured top, extra heavy-duty, adjustable sleeve, cut-off ferrule, countersunk threaded brass plug and scoriated tractor type cover.
11. Other cleanouts shall be iron body type.
12. Cleanout extensions shall be no-hub cast iron soil pipe. Exterior cleanouts, those in concrete excepted, shall terminate in a 14-inch by 6-inch thick concrete block with cleanout assembly and top of block flush with finish grade.
13. Fittings in lines utilized as cleanouts shall be approved soil fittings including no-hub pipe. Tees and crosses in vent headers excepted.
14. Pipe joint compound shall not be installed on cleanout plug. After lines are tested and approved, each cleanout plug shall be removed, greased, and replaced.

3.3



EXCAVATION, TRENCHING AND BACKFILLING

- ~~A. Perform trenching, excavation, and backfilling required for Work of this section as specified herein and in Section 31 23 23. Excavating, Backfilling, and Compacting for Utilities.~~

3.4

SERVICE CONNECTIONS

- A. Determine exact location of required water, drain, and sewer connections and provide proper connections.
- B. Potable water lines shall be purged completely before connecting to sources of water for the Project. Determine quality of water supply before connection.

3.5

WATER HAMMER ARRESTORS

- A. Install water hammer arrestors indicated on Drawings and in following locations (only non-ferrous arrestors may be installed in copper water system):
 1. Water lines to lavatory headers, water closet and urinal headers, service sinks, kitchen sinks, wash fountains, drinking fountains, laboratories with medical type faucets and on wash sinks having three or more stations and all other quick closing fixture such as clothes washers, as close to fixture as possible.
 2. Between last two fixtures when three or more fixtures, other than those listed in Number 1 above, are served by a common header.
- B. When possible, arrestor shall be installed in wall or furring. When arrestor is installed in wall or furring, furnish an access plate large enough to permit removal of arrestor. Access plate shall be a minimum of 2 inches larger in each direction than the arrestor.

- C. Fixture water lines shall be provided with mechanical water arrestor hammer dampening devices. Air chambers are not approved.



3.6

CONDENSATE DRAINS - FROM AIR CONDITIONING UNITS

- A. Connect drain piping from drain pan of air conditioning unit to condensate disposal location indicated. When coil or unit housing is shock or vibration isolated, connection shall be furnished through a flexible connector not less than 10 inches long. Drain line shall pitch to flow out at not less than one inch in 8 feet. Drain line shall not be reduced smaller than unit outlet connection.
- B. Condensate drain piping installed within building whether in air conditioned space or not shall be insulated. Refer to Section 22 07 00: Plumbing Insulation, for type of material required.
- C. Condensate Trap:
 1. A condensate trap shall be installed for each air conditioning coil. Trap shall be assembled from 2 brass unions: one between A/C unit and inlet of trap, and one at outlet of trap that connects to main drain.
 2. Trap configuration shall be per manufacturer's recommendations based on total unit casting static pressure (simulated plugged filter condition), but not less than 3 inch water seal.
 3. Running trap design is not permitted.
 4. Secondary drain shall not be trapped.
- D. Condensate trap shall be checked at equipment operational tests for proper water drainage flow from air conditioning unit. Cooling condensate pan shall be filled with water, filters covered with plastic (plugged filter simulated), unit panels replaced, and unit motor running at design condition. Pan shall drain without hesitation to bottom of inlet connection. Tests are made prior to installation of ceiling.
- E. Secondary Overflow Drain:

1. Drain pan installed underneath air conditioning units in concealed ceiling space or units that incorporate dam fitting shall be furnished with secondary drain piped to outside planter area with outflow location clearly visible.
2. If outside building location is not available or feasible, secondary drains shall be piped to a classroom sink, if sink is not available pipe to a room corner away from cabinets, computers, desks, door ways/entrances or stairs.
3. Secondary vertical pipe that penetrates through suspended ceiling shall be furnished with a coupling or threaded adapter so ceiling tile can be removed without damage.

3.7 CONDENSATE DRAINS - FROM WINDOW TYPE HEAT PUMP AND EXTERIOR WALL MOUNT HEAT PUMP UNITS

- A. Whether indicated on Drawings or not, window units and wall mount units without built in bottom drain pan for evaporator and condenser coils shall be provided with galvanized steel condensate pan at bottom of unit with drain line that drains into approved drywell. Install copper 1/2 inch diameter pipe for window type air conditioners and 3/4 inch diameter pipe for exterior wall-mounted heat pump units.

3.8 MAKE-UP WATER SYSTEMS (NOT USED)

3.9 GREASE TRAPS (INTERCEPTORS): (NOT USED)

3.10 GAS SERVICE

- A. Above Grade Service: Pipe shall be steel, hammered, free of dirt and scale, and blown out with oil-free air or nitrogen to a clean, dry condition. Piping shall not be installed in or through a ventilation duct or plenum.
- B. Underground Service, Gas approved (yellow) Polyethylene Plastic Pipe. Refer to Section 22 05 13: "Basic Plumbing Materials and Methods".
1. Pipes shall be joined with polyethylene fitting and joined together by thermal fusion in accordance with procedures recommended by Polyethylene plastic pipe and fitting manufacturer.
 2. Plastic pipe shall be installed not less than 30 inches below grade..
 3. Underground Warning Tape shall be installed 12 inches above buried gas piping. Warning tape shall be yellow with caution statement as follows: "CAUTION - BURIED GAS LINE BELOW".
 4. Plastic pipe shall not be installed in or under a building or structure. Pipe shall be installed under bituminous surfacing or compacted soil area, free from large stones. Pipe may be installed under sidewalks or driveways, as long as no joint occurs. Pipe installed under paved covered areas wider than 40 feet shall be installed in ventilated conduits extending 2 feet past paving.
 5. Pipe shall be installed on a 6 inches deep sand bed. After required pressure-leak test, pipe shall be covered with sand not less than 6 inches thick.



6. Piping shall not support weight of valves, metal fittings or other items. Pipe shall be installed strain free.
7. Plastic pipe fittings shall not be stored or left exposed to sunlight. Pipe in open trenches shall be shielded. A sand envelope of 6 inches minimum shall be placed around pipe, with exception of joints, until inspection by IOR is completed. Protection for pipe shall be provided when necessary to leave pipe exposed overnight.
8. Installer of piping is required to have training and to have attained a certification. Non-trained/Non-certified installer must contact the manufacturer or manufacturer's representative to provide on-site fusion training and certification, prior to work commencement
9. Polyethylene plastic pipe shall connect to a steel epoxy coated anodeless type riser to minimum of 6 inches above grade, when exiting the underground installation and transitioning to steel pipe connection.
10. Where a steel pipe riser passes into a structure or building, a double swing or double-offset joint shall be furnished. Pipe shall pass into structure 6-inches above grade and through a sleeve with a minimum one inch clearance. An isolation valve is required before pipe entering the building.

3.11

CLEANING - PLUMBING PIPING SYSTEMS AND FIXTURES

- A. Plumbing lines and fixtures shall be flushed to remove dirt and foreign material until water runs clear and no foreign substance or odor is present. Strainers and screens on faucets shall be removed during this cleaning operation.
- B. After satisfactory cleaning of strainer and screen replacements has been witnessed by the Project Inspector, post and maintain signs stating: "CAUTION - Water at this construction project has not yet been certified for human consumption." Signs shall be furnished with letters at least 1/2 inch in height, and shall be conspicuously posted at entrances to the Project site. Signs shall be paneled, black and yellow, in conformance with OSHA Section 1910.1455.

3.12

DISINFECTING DOMESTIC WATER PIPING SYSTEMS

- A. Newly installed or replaced piping and/or fixtures dispensing potable water shall be disinfected and undergo an approved bacteriological analyses before water system is allowed for public use.
- B. Work shall be performed by Technicians Certified by the American Water Works Association (AWWA) and/or the State of California Department Health Services, Grade II Water Treatment Operator Certification or higher issued by the Department of Health Services (DHS) for the State of California. Comply with Title 22, Code of Regulations Division 4, Chapter 13, and Article 2 Operator Certification Grades.
- C. Method:
 1. A Reduced Pressure Backflow assembly shall be installed to protect from cross contamination of the local water purveyor's meter service supply when at any time there is any type of water connection with the piping to be disinfected (Chlorinated) and the water meter service supply.

2. System is to be flushed to remove any materials that may have entered the system.
 3. Using a chemical feed metering pump and a chlorine tank, the chlorine solution is injected into the water system.
- D. Disinfection and De-chlorination procedure (24 or 3 Hour Contact Time):
1. 24-hour Test Method:
 - a. Prior to disinfection, post signs on all water outlets of the system to be disinfected. Sign or tags shall read, "Water System Being Chlorinated- "Danger Do Not Drink Water" or similar warning.
 - b. Piping system shall then be adequately flushed with water to remove any particles and eliminate air pockets.
 - c. Using the continuous feed method, sodium hypochlorite conforming to ANSI/ AWWA B300 will be injected into the water system at a minimum of 50 PPM. A water flow meter provided by the water treatment technician will be used to determine the rate of injection and a chlorine test kit, Hach or equivalent, will be used to monitor the residual.
 - d. Chlorine residual test will be taken at all appropriate points and outlets to verify 50 PPM residual levels.
 - e. The chlorinated system shall be shut down for any use and the chlorinated water shall remain in the water system for retention of 24 hours.
 - f. After 24 hours, chlorine residual levels will again be tested at various points throughout the system to insure a minimum of 25 PPM residual. If the system has not met the minimum of a 25 PPM residual, the above disinfection process shall be repeated.
 - g. After satisfactory completion of the residual testing, flush out system until Hach or equivalent test reveal the water outlets have a free chlorine residual concentration less than 0.5 PPM. The procedure shall be in accordance with the AWWA standard C651-05.
 - h. The OWNER may allow temporary use of the water system for construction purposes pending results of the bacteriological test analysis. Sign or Tags shall be left on all outlets stating water system is not safe for consumption until laboratory results are complete and meet these specifications.
 2. 3 Hour Test Method:
 - a. If the water systems must be turned on for use as soon as possible, a 3 hours chlorine contact time to allow for disinfection is permitted with the OWNER's approval.
 - b. Prior to disinfection, post signs on all water outlets of the system to be disinfected. Sign or tags shall read, "Water System Being Chlorinated- "Danger Do Not Drink Water" or similar warning.

- c. Piping system shall be then adequately flushed with water to remove any particles and eliminate air pockets. Using the continuous feed method, sodium hypochlorite conforming to ANSI/ AWWA B300 will be injected into the water system at a minimum of 200 PPM. A water flow meter provided by the water treatment technician will be used to determine the rate of injection and a chlorine test kit, Hach or equivalent, will be used to monitor the residual.
- d. Chlorine residual test will be taken at all appropriate points and outlets to verify 200 PPM levels. The chlorinated system shall be shut down for any use and the chlorinated water shall remain in the water system for retention of 3 hours.
- e. After satisfactory completion of a 3 hour disinfection period, flush out system until Hach or equivalent test reveal the water outlets have a free chlorine residual concentration less than 0.5 PPM. The procedure shall be in accordance with the AWWA standard C651-05.
- f. The OWNER may allow temporary use of the water system for construction purposes pending results of the bacteriological test analysis. Sign or Tags shall be left on all outlets stating water system is not safe for consumption until laboratory results are complete and meet these specifications.

E. Bacteriological Test:

- 1. After final flushing and satisfactory results from the residual free chlorine concentration test, Bacteriological test samples shall be collected. The intent of the following is to provide insurance for an accurate representation to a complete Bacteriological test of the water system. At least two samples shall be taken from each floor of each building.
- 2. Bacteriological test samples shall be delivered to a State of California Department of Health Services Certified Laboratory to perform qualitative and quantitative bacterial analyses on the water samples for the presence of any Total Coliform bacteria and Plate Count. This count must be less than 500 cfu/mL.
- 3. The procedure shall be repeated if it shown by bacteriological examination made by an approved agency that the level of Disinfection does not meet these specifications.
- 4. After satisfactory results for the bacteriological test are provided to the OWNER, warning sign or tags shall be removed.

- F. Drinking Fountain and Bottle Filler Lead Test: After installation of Drinking Fountain or Bottle Filler, and successful Disinfection Test, shut off domestic water supply line feeding the fixture, and inform OWNER. OWNER will coordinate with the Drinking Water Quality Program (DWQP) Supervisor in local Project Unit and M&O's Plumbing Technical Unit Supervisor to conduct lead detection test, and mitigate as necessary. Do not remove related construction warning sign and tags.

3.13 VALVES ON PLUMBING SYSTEM

- A. Furnish and install gates, ball, globes, angles, and check valves on plumbing Work at following locations whether indicated on drawings or not.
- B. Hot and cold valves shall be:
 1. Lead free complying with AB1953.
 2. Above the ground copper water system, 2-inch and larger, may utilize Victaulic butterfly valves and fittings for their connections. A 2-inch or larger Victaulic valve may be in a wall if an adequately sized access panel is provided for maintenance or removal.
- C. Valves shall be accessible and installed within an access panel approximately 3 feet above floor and no more than 7 feet above floor, or in a marked yard box to prevent tampering.
 1. Immediately after each water meter, in addition to any valve furnished by utility company, there shall be an accessible valve on the inlet side for a strainer assembly, dual backflow device assembly and/or possibly a dual pressure reducing valve assembly.
 2. A gate or ball valve on each water supply before it enters building. Valves shall be accessible from outside building and shall be installed in a marked yard box, unless otherwise indicated on drawings. Ball valves 2 ½-inch size or larger shall omit gate valve handle and furnish 2-inch square operating nut.
 3. Install a gate or ball valve on each building branch line, which serves two or more fixtures, when these fixtures are not provided with a group isolation valve as specified above. These valves shall be located approximately 3 feet but not more than 7 feet above finish floor.
 4. Install a gate, ball valve or partition stop for hot and cold water supply to plumbing fixtures with no accessible supply stops, such as wall mounted faucets.
 5. Install a gate, ball valve or partition stop for stops adjacent to, and controlling water flow to each sill cock and hose bib except as follows:
 - a. A sill cock immediately below an exterior drinking fountain may be controlled by the same gate, ball valve or partition stop as drinking fountain.
 - b. Valves or stops will not be required for individual hose bibs when these hose bibs are on a branch line serving only hose bibs and branch line is furnished with a shut-off valve.
 6. Install a loose key angle stop, on each exposed fixture supply, and for each flush valve unless otherwise specified,
 7. Install gate or ball valve at each location where a water line is connected to a piece of equipment other than items mentioned above.
 8. Provide a handle or a key for each five, or fraction thereof, loose key valves, bibs, or stops and deliver them to the project OWNER.



3.14



- A. A gas readily accessible shut-off stop shall be installed on each gas line entering a building immediately prior to the point it enters the building. Unless otherwise specified or indicated, shut-off valves for lines entering a permanent structure, buildings or portable buildings, shall be installed in a vertical riser above grade.
1. Gas shut off valve for portable buildings – A dedicated Gas shut off valve shall be provided in a marked Yard Box, for each portable building to facilitate relocation/removal of building without the need to shut off gas to entire school.
- B. Gas Shut off valve within a building – A gas shut off valve with handles shall be accessible and serviceable within an access panel. Install valve minimum 3 feet above floor but less than 7 feet above floor.
- C. In addition to locations specified, gas shut off valve shall be installed at following locations:
1. Install a lubricated plug gas shut off valve on any line connected to gas main or header at master assembly.
 2. Install a lubricated plug gas shut off valve before entering any building or structure.
 3. Install a gas valve on each outlet, in addition to any gas stop furnished with equipment.
 4. Service to laboratory gas cocks shall be furnished with a special precision check valve, located downstream from gas stop servicing room outlet at each laboratory cock. Unless otherwise specified, 1/8-inches bore shall be provided for each outlet cock.
 5. Install a gas shut-off valve on each gas line serving 2 or more gas outlets in same room. Service stop shall be installed not more than 7 feet above floor, and shall be in the room it serves.
 6. Install a gas shut-off valve on inlet side of each gas pressure regulating valve.
 7. Gas shut-off valves to be furnished with equipment.
 8. Install gas shut-off valve at not more than 1,000 foot intervals on each gas main.
 9. At multi-story buildings, provide gas-shut off valve(s) to isolate and control each floor or level. Install valves in a concealed manner in walls with access panels.
 10. Gas shut-off valves in classrooms and locations subject to tampering shall be protected while remaining accessible.
- D. When a gas-shut off valve adjacent to gas-fired equipment is indicated in Contract Documents it shall be furnished and installed as part of Work of this section.
- E. When electrical wall switches with emergency push button are specified for controlling gas outlets at Laboratory Classrooms, provide main shut-off gas valve with normally closed electric solenoid valve within an accessible access panel.

- A. Brass nipples, 6 inches, with recognized brass unions; flanges shall be furnished and installed at locations described herein. Flanges shall be installed with complete insulating component consisting of gasket bolt sleeves and bolt washers. Dielectric insulators shall be installed at following locations:
 - 1. Where special applications indicated on Drawings require an insulation flange or brass union, with 6-inch brass nipple to be installed in a condensate line, or steam line, flange insulation shall be of a high temperature type, suitable for continuous operation at temperatures up to 220 degrees F. for condensate and 400 degrees F. for steam.
 - 2. Where steel or cast iron in ground connects to copper or brass piping above ground, transition from steel or cast iron pipe to copper or brass pipe shall be provided in an accessible location.
 - 3. Underground dielectric connections shall be furnished in accessible yard boxes.
 - 4. Above ground dielectric connections shall be exposed; or if in finished rooms shall be located in accessible access boxes.

3.16 UNDERGROUND PIPE MARKERS

- A. Pipe markers shall be furnished according to Section 22 05 53: "Plumbing Identification"
- B. Under ground Caution Tape shall be placed 12 to 18 inches above the utility line. The Caution Tape shall be a designated color and marked with the appropriate name for the specific type of utility pipe as follows:
 - 1. Yellow – with the words: CAUTION GAS LINE BELOW
 - 2. Blue – with the words: CAUTION WATER LINE BELOW

3.17 HOT WATER CIRCULATING PUMPS (NOT USED)

3.18 WATER TEMPERATURE CONTROLLERS (NOT USED)

3.19 DEPTH OF SEWER LINES

- A. Minimum depth of below grade sewer lines shall be 24 inches to centerline of pipe. Sewer lines shall slope $\frac{1}{4}$ inch per foot minimum, unless otherwise indicated. Minimum depth at Owner property line shall be 6 feet, unless otherwise required.

3.20 BACKFLOW PREVENTION DEVICES

- A. Backflow Devices: Installation of backflow devices shall be tested and certified by Ventura County backflow device tester before Substantial Completion. Tests shall be performed in presence of Project Inspector. Test reports shall be turned over to Project Inspector for mailing to proper agency.

3.21 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose off Project site.

3.22 PROTECTION

- A. Protect Work of this section until Substantial Completion.

END OF SECTION