



STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION
800 BAY ROAD
P.O. Box 778
DOVER, DELAWARE 19903

JENNIFER COHAN
SECRETARY

VIA OVERNIGHT DELIVERY

August 21, 2017

Contract No. T201680104.01
St. Georges Maintenance Yard Improvements
New Castle County

Ladies and Gentlemen:

Enclosed is Addendum No. 3 for the referenced contract consisting of the following:

1. The Bid Proposal Cover, revised, to be substituted for the same page in the Proposal.
2. One (1) page, Completion Time, page i, revised, to be substituted for the same page in the Proposal. The Notice to Proceed date has been moved.
3. One (1) page, Prospective Bidders Notes, page ii, paragraph 17 has been added, to be substituted for the same page in the Proposal.
4. One (1) page, Prevailing Wages, page 10 of the PDF, has been deleted from the Proposal.
5. Two (2) pages, Prevailing Wages for both Building Construction and Highway Construction, have been added to the Proposal.
6. One (1) page, Special Provision 763504-Site Work, revised, to be substituted for the same page in the Proposal.
7. One (1) page, Breakout Sheet 3, has been added to the Proposal.
8. Two (2) pages, Bid Proposal Forms, page 3 and 5, revised, to be substituted for the same pages in the Proposal. Item Number 710500-Installation of Watermain and Accessories, revised. Item Numbers 610009-Portland Cement Concrete Masonry, Class B and 701013-PCC Curb, Type 1-8 have been added.
9. The following Plan Sheets have been revised and replaced: 4, 5, 9, 18, 41, 71, 72, 73, 76, 78, 79, 80, 85, 90, 103, 104, 105, 106, 107, 111, 113 and 116.
10. Plan Sheet 9A has been added to the Proposal.
11. Plan Sheet 29 has been enhanced for more clarity.
12. Four (4) pages, Appendix A, Section 033000-Cast in Place Concrete, paragraph 1.4, Pre-Installation Meetings has been added. This has moved down the paragraph section numbers starting with 1.5 through 1.8.

13. Fourteen (14) pages, Appendix A, Section 222124-Lubrication Piping and Equipment, paragraph 1.1 Summary, Section A has been revised, number 5 has been added, this has moved all lines down one space. Paragraph 2.6, Waste Oil Storage System has been added, This has moved down the paragraph section numbers starting with 2.7 through 2.13.
14. Four (4) pages, Appendix A, Section 085113-Aluminum Windows, paragraphs 1.1 Summary, 1.5 Warranty Period, 2.2 Window and 2.3 Glazing, revised, to be substituted for the same pages in the Appendix.
15. One (1) page, Appendix A, Section 260001-Basic Electrical Materials and Methods, paragraph 2.1, Basic Materials, Section F, Conduit and Fittings, page 1189 of the PDF document, for Maintenance Building (MB-260001- 2) revised, to be substituted for the same page in the Appendix.
16. One (1) page, Appendix A, Section 260001-Basic Electrical Materials and Methods, paragraph 2.1, Basic Materials, Section F, Conduit and Fittings, page 570 of the PDF document, for Crew Operations Building (CO-260001-1), revised, to be substituted for the same page in the Appendix.
17. Six (6) pages, Appendix A, Section 260573- Overcurrent Protective Device Coordinations Study, for Electrical outside of buildings (SITE-260573), has been added to Appendix A.
18. Twelve (12) pages, Appendix A, Section 230923-Direct Digital Control (DDC) System For HVAC, for Maintenance Building (MB-230923), has been added to Appendix A.
19. Twelve (12) pages, Appendix A, Section 230923-Direct Digital Control (DDC) System For HVAC, for Crew Operations Building (CO-230923), has been added to Appendix A.
20. Nine (9) pages, Appendix A, Section 14600-Top Running Bridge Crane, for Building Maintenance (CO-230923), has been added to Appendix A.
21. Expedite File Disc, Amendments No. 1.

Please note the revisions listed above and submit your bid based upon this information.

Sincerely,

~signature on file~

Robert A. Kovacs

Competitively Bid Contracts Coordinator
Delaware Department of Transportation

STATE OF DELAWARE



DEPARTMENT OF TRANSPORTATION

BID PROPOSAL

for

CONTRACT T201680104.01

St. Georges Maintenance Yard Improvements

New Castle County

ADVERTISEMENT DATE: July 10, 2017

**PROSPECTIVE BIDDERS ARE ADVISED THAT THERE WILL BE A PRE-BID MEETING WEDNESDAY
JULY 26, 2017 AT 2:00 P.M. IN THE DeIDOT ADMINISTRATION BUILDING,
800 BAY ROAD, DOVER, DELAWARE, 19903.**

COMPLETION TIME: 620 Calendar Days

SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION
DELAWARE DEPARTMENT OF TRANSPORTATION
AUGUST 2016

Bids will be received in the Bidder's Room at the Delaware Department of Transportation's Administration Building, 800 Bay Road, Dover, Delaware until 2:00 P.M. local time **August 15 29, 2017**

Contract No.T201680104.01

St. Georges Maintenance Yard Improvements
New Castle County

GENERAL DESCRIPTION

LOCATION

These improvements are located in New Castle County more specifically shown on the Location Map(s) of the enclosed Plans.

DESCRIPTION

The improvements consist of furnishing all labor and materials for this contract. This project involves site improvements and expansion at St. George's Maintenance Yard, including construction of crew operations and maintenance shop buildings, a wash pad, a fuel dispensing station, and associated grading and asphalt paving. As well as other incidental construction in accordance with the location, notes and details shown on the plans and as directed by the Engineer.

COMPLETION TIME

All work on this contract must be complete within 620 Calendar Days. The Contract Time includes an allowance for 60 Weather Days It is the Department's intent to issue a Notice to Proceed such that work starts on or about ~~October 2~~ **December 4**, 2017.

PROSPECTIVE BIDDERS NOTES:

1. BIDDERS MUST BE REGISTERED with DelDOT and request a cd of the official plans and specifications in order to submit a bid. Contact DelDOT at dot-ask@state.de.us, or (302) 760-2031. Bids will be received in the Bidder's Room at the Delaware Department of Transportation's Administration Building, 800 Bay Road, Dover, Delaware until 2:00 P.M. local time August 15, 2017 unless changed via addendum.
2. QUESTIONS regarding this project are to be e-mailed to dot-ask@state.de.us no less than six business days prior to the bid opening date in order to receive a response. Please include T201680104.01 in the subject line. Responses to inquiries are posted on-line at <http://www.bids.delaware.gov>.
3. THE BID PROPOSAL incorporates a cd containing **Expedite, version 5.9a** and its installation file. Bidders are to use the cd provided to enter their bid amounts into the Expedite file. The Expedite bid file must be printed and submitted in paper form along with the cd and other required documents prior to the Bid due date and time.
4. SURETY BOND - Each proposal must be accompanied by a deposit of either surety bond or security for a sum equal to at least 10% of the bid.
5. DRUG TESTING - Regulation 4104; The state Office of Management and Budget has developed regulations that require Contractors and Subcontractors to implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds pursuant to 29 Del.C. §6908(a)(6). **Refer to the full requirements by following the below link:** <http://regulations.delaware.gov/register/september2015/final/19%20DE%20Reg%20207%2009-01-15.htm>

Please note a few of the requirements listed below;

- * At bid submission - submit with the bid a signed affidavit certifying that the Contractor has in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for their Employees that complies with this regulation;
- * Two business days prior to contract execution - The awarded Contractor shall provide to **DelDOT** copies of the Employee Drug Testing Program for the Contractor, and may submit any Subcontractor's Employee Drug Testing Program for approval;
- * Subcontractors - Contractors that employ Subcontractors on the job site may do so only after submitting a copy of the Subcontractor's Employee Drug Testing Program along with the standard required subcontractor information. A Subcontractor shall not commence work until **DelDOT** has approved the subcontractor in writing;
- * Testing Report Forms shall be submitted to DelDOT monthly (forms will be provided).
- * Penalties for non-compliance are specified in the regulation.

6. NO RETAINAGE will be withheld on this contract.
7. EXTERNAL COMPLAINT PROCEDURE can be viewed on DelDOT's Website at: <http://www.deldot.gov/information/business/>, or you may request a copy by calling (302) 760-2555.
8. PLEASE NOTE revisions to 'Equality of Employment Opportunity on Public Works' under General Notices.
9. REMINDER; A copy of your firm's Delaware Business License must be submitted with your bid.
10. **BREAKOUT SHEETS** MUST be submitted either with your bid documents; or within seven (7) calendar days following the bid due date by the lowest apparent bidder. Refer to instructions adjacent to the Breakout Sheets in this document.
11. August 2016 Standard Specifications apply to this contract. The Contractor shall make himself aware of any revisions and corrections (Supplemental Specifications, if any) and apply them to the applicable item(s) of this contract. The 2016 Standard Specifications can be [viewed here](#).
12. **Flatwork Concrete Technician Certification Training:**
Section 501.03, 503.03, 505.03, 610.03, 701.03 and 702.03 of the 2016 Standard Specifications require contractor's to provide an American Concrete Institute (ACI) or National Ready Mix Concrete Association (NRMCA) certified concrete flatwork technician to supervise all finishing of flatwork concrete. Concrete flatwork certification will be effective starting on March 1, 2018.
13. This project incorporates **Appendix A TECHNICAL SPECIFICATIONS**, which is a part of this contract. Appendix A contains additional specifications required for this project.
14. The Contractor shall submit to the Department legible copies of the Bid Documentation as set forth in Section 103.09 Escrow of Bid Documentation.
15. There are various manufactures listed throughout the Technical Specifications in Appendix A. In addition to all listed manufactures, you may submit an "Approved Equal" to the Department for review and approval/disapproval. Your request must list's the page number, paragraph and section of Appendix-A that you want reviewed. Send your "Approved Equal" request to: dot-ask@state.de.us
16. In accordance with 29 Del. C. §6962(d)(10)a, a **Pre-Bid Meeting** will be held to select the subcontractor categories to be included in the bids for performing the work required for this contract. In accordance with Title 29 Del. C. §6962(d)(10)b of the Delaware Code, a penalty of \$2,000.00 will be withheld from the successful bidder for each occurrence for the failure to utilize any or all of the Subcontractors submitted with the bid.

The **Pre-Bid Meeting** will be held Wednesday July 26, 2017 at 2:00 p.m. in the DelDOT Administration Building, 800 Bay Road, Dover, Delaware, 19903.
17. This project incorporates Prevailing Wage Rates for both Building Construction, which will include building renovations, chain link fence & sign, as well as Highway Construction which will include all other work not incidental to building.

STATE OF DELAWARE
DEPARTMENT OF LABOR
DIVISION OF INDUSTRIAL AFFAIRS
OFFICE OF LABOR LAW ENFORCEMENT
PHONE: (302) 451-3423

Mailing Address:
225 CORPORATE BOULEVARD
SUITE 104
NEWARK, DE 19702

Located at:
225 CORPORATE BOULEVARD
SUITE 104
NEWARK, DE 19702

PREVAILING WAGES FOR HIGHWAY CONSTRUCTION EFFECTIVE MARCH 15, 2017

CLASSIFICATION	NEW CASTLE	KENT	SUSSEX
BRICKLAYERS	51.99	51.99	15.17
CARPENTERS	53.48	53.81	42.77
CEMENT FINISHERS	33.91	34.12	27.13
ELECTRICAL LINE WORKERS	23.52	45.39	22.22
ELECTRICIANS	66.85	66.85	66.85
IRON WORKERS	62.35	24.95	26.50
LABORERS	43.30	39.85	39.12
MILLWRIGHTS	16.84	16.34	14.11
PAINTERS	67.07	67.07	67.07
PILEDRIVERS	69.44	24.83	28.17
POWER EQUIPMENT OPERATORS	42.91	41.41	37.92
SHEET METAL WORKERS	23.79	21.23	19.23
TRUCK DRIVERS	35.73	29.51	35.95

CERTIFIED: 06/27/17

BY: 

ADMINISTRATOR, OFFICE OF LABOR LAW ENFORCEMENT

NOTE: THESE RATES ARE PROMULGATED AND ENFORCED PURSUANT TO THE PREVAILING WAGE REGULATIONS ADOPTED BY THE DEPARTMENT OF LABOR ON APRIL 3, 1992.

CLASSIFICATIONS OF WORKERS ARE DETERMINED BY THE DEPARTMENT OF LABOR. FOR ASSISTANCE IN CLASSIFYING WORKERS, OR FOR A COPY OF THE REGULATIONS OR CLASSIFICATIONS, PHONE (302) 451-3423.

NON-REGISTERED APPRENTICES MUST BE PAID THE MECHANIC'S RATE.

PROJECT: T201680104.01 ST. Georges Maintenance Yard Improvements, New Castle County

STATE OF DELAWARE
DEPARTMENT OF LABOR
DIVISION OF INDUSTRIAL AFFAIRS
OFFICE OF LABOR LAW ENFORCEMENT
PHONE: (302) 451-3423

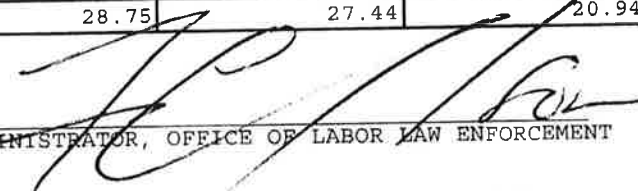
Mailing Address:
225 CORPORATE BOULEVARD
SUITE 104
NEWARK, DE 19702

Located at:
225 CORPORATE BOULEVARD
SUITE 104
NEWARK, DE 19702

PREVAILING WAGES FOR BUILDING CONSTRUCTION EFFECTIVE MARCH 15, 2017

CLASSIFICATION	NEW CASTLE	KENT	SUSSEX
ASBESTOS WORKERS	22.86	28.16	40.98
BOILERMAKERS	68.44	34.72	51.05
BRICKLAYERS	51.99	51.99	51.99
CARPENTERS	53.81	53.81	42.77
CEMENT FINISHERS	72.28	46.71	22.17
ELECTRICAL LINE WORKERS	45.47	38.99	29.73
ELECTRICIANS	66.85	66.85	66.85
ELEVATOR CONSTRUCTORS	90.49	64.49	31.94
GLAZIERS	71.20	71.20	56.66
INSULATORS	55.48	55.48	55.48
IRON WORKERS	62.85	62.85	62.85
LABORERS	44.70	44.70	44.70
MILLWRIGHTS	69.18	69.18	55.75
PAINTERS	48.47	48.47	48.47
PILEDRIVERS	75.27	39.35	31.83
PLASTERERS	29.84	29.84	22.12
PLUMBERS/PIPEFITTERS/STEAMFITTERS	65.95	51.49	57.01
POWER EQUIPMENT OPERATORS	67.29	67.29	43.83
ROOFERS-COMPOSITION	24.01	23.70	21.64
ROOFERS-SHINGLE/SLATE/TILE	18.39	21.86	17.19
SHEET METAL WORKERS	67.03	67.03	67.03
SOFT FLOOR LAYERS	51.12	51.12	51.12
SPRINKLER FITTERS	57.29	57.29	57.29
TERRAZZO/MARBLE/TILE FNRS	57.72	57.72	47.51
TERRAZZO/MARBLE/TILE STRS	66.02	66.02	55.02
TRUCK DRIVERS	28.75	27.44	20.94

CERTIFIED: 8/16/17

BY: 
ADMINISTRATOR, OFFICE OF LABOR LAW ENFORCEMENT

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NON-REGISTERED APPRENTICES MUST BE PAID THE MECHANIC'S RATE.

PROJECT: T201680104.01 ST. Georges Maintenance Yard Improvements - Building Renovations Including Chain Link Fence and Sign, New Castle County

STATE OF DELAWARE
DEPARTMENT OF LABOR
DIVISION OF INDUSTRIAL AFFAIRS
OFFICE OF LABOR LAW ENFORCEMENT
PHONE: (302) 451-3423

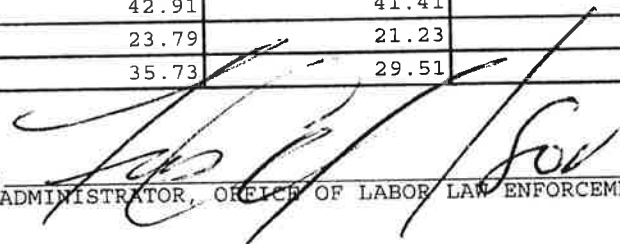
Mailing Address:
225 CORPORATE BOULEVARD
SUITE 104
NEWARK, DE 19702

Located at:
225 CORPORATE BOULEVARD
SUITE 104
NEWARK, DE 19702

PREVAILING WAGES FOR HIGHWAY CONSTRUCTION EFFECTIVE MARCH 15, 2017

CLASSIFICATION	NEW CASTLE	KENT	SUSSEX
BRICKLAYERS	51.99	51.99	15.17
CARPENTERS	53.48	53.81	42.77
CEMENT FINISHERS	33.91	34.12	27.13
ELECTRICAL LINE WORKERS	23.52	45.39	22.22
ELECTRICIANS	66.85	66.85	66.85
IRON WORKERS	62.35	24.95	26.50
LABORERS	43.30	39.85	39.12
MILLWRIGHTS	16.84	16.34	14.11
PAINTERS	67.07	67.07	67.07
FILEDRIVERS	69.44	24.83	28.17
POWER EQUIPMENT OPERATORS	42.91	41.41	37.92
SHEET METAL WORKERS	23.79	21.23	19.23
TRUCK DRIVERS	35.73	29.51	35.95

CERTIFIED: 8/16/17

BY: 
ADMINISTRATOR, OFFICE OF LABOR LAW ENFORCEMENT

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NON-REGISTERED APPRENTICES MUST BE PAID THE MECHANIC'S RATE.

PROJECT: T201680104.01 ST. Georges Maintenance Yard Improvements - all other work not incidental to building, New Castle County

763504 - SITE WORK

Description:

This work consists of performing site work and furnishing the materials necessary to complete the site work including the ~~Masonry Monument Sign, Wash Pad~~, Fuel Dispensing Station, Earthwork, Stormwater Management, Stormwater Management Outfall Modifications, and Electrical Site Work as indicated in the Contract documents and further described in the technical specifications in Appendix A – Technical Specifications for Crew Operations Building, Maintenance Shop Building, and Site Work.

Materials and Construction:

All materials and construction shall conform to the requirements of the Contract drawings, the Delaware Department of Transportation Standard Specifications, and the technical specifications in Appendix A – Technical Specifications for Crew Operations Building, Maintenance Shop Building, and Site Work.

Method of Measurement:

Payment for this item will be made on a lump sum basis wherein no measurement will be made.

Basis of Payment:

The payment for the work under this item shall be made at the contract unit price per Lump Sum bid, which price and payment shall constitute full compensation for performing the work specified and for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the item.

8/16/2017

BREAKOUT SHEET - 3		CONTRACT NO. T201680104.01			
Item 763504 - SITE WORK					
ITEM NO.	APPROX. QTY.	UOM	DESCRIPTION	UNIT PRICE	AMOUNT
1	1	LS	FUEL DISPENSING STATION	\$	\$
2	1	LS	EARTHWORK	\$	\$
3	1	LS	STORMWATER MANAGEMENT AND OUTFALL MODIFICATIONS	\$	\$
4	1	LS	ELECTRIC SITE WORK	\$	\$
TOTAL ITEM 763504 - SITE WORK \$ _____ (LUMP SUM BID PRICE FOR ITEM 763504 - SITE WORK)					

DELAWARE DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

PAGE: 3
DATE:

CONTRACT ID: T201680104.01 PROJECT(S): T201680104

All figures must be typewritten.

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0210	708002 GEOTEXTILES, SEPARATION	209.000 SY				
0220	710500 INSTALLATION OF WATERMAIN AND ACCESSORIES	LUMP	LUMP			
0230	711501 SANITARY SEWER SYSTEM	LUMP	LUMP			
0240	720556 BOLLARD	24.000 EACH				
0250	727000 CHAIN LINK FENCE	2855.000 LF				
0260	727010 CHAIN LINK FENCE GATE	1.000 EACH				
0270	763000 INITIAL EXPENSE/DE-MOBILIZATION	LUMP	LUMP			
0280	763502 SITE FURNISHING	LUMP	LUMP			
0290	763504 SITE WORK	LUMP	LUMP			
0300	763505 SIGN	LUMP	LUMP			

DELAWARE DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

PAGE: 5
DATE:

CONTRACT ID: T201680104.01 PROJECT(S): T201680104

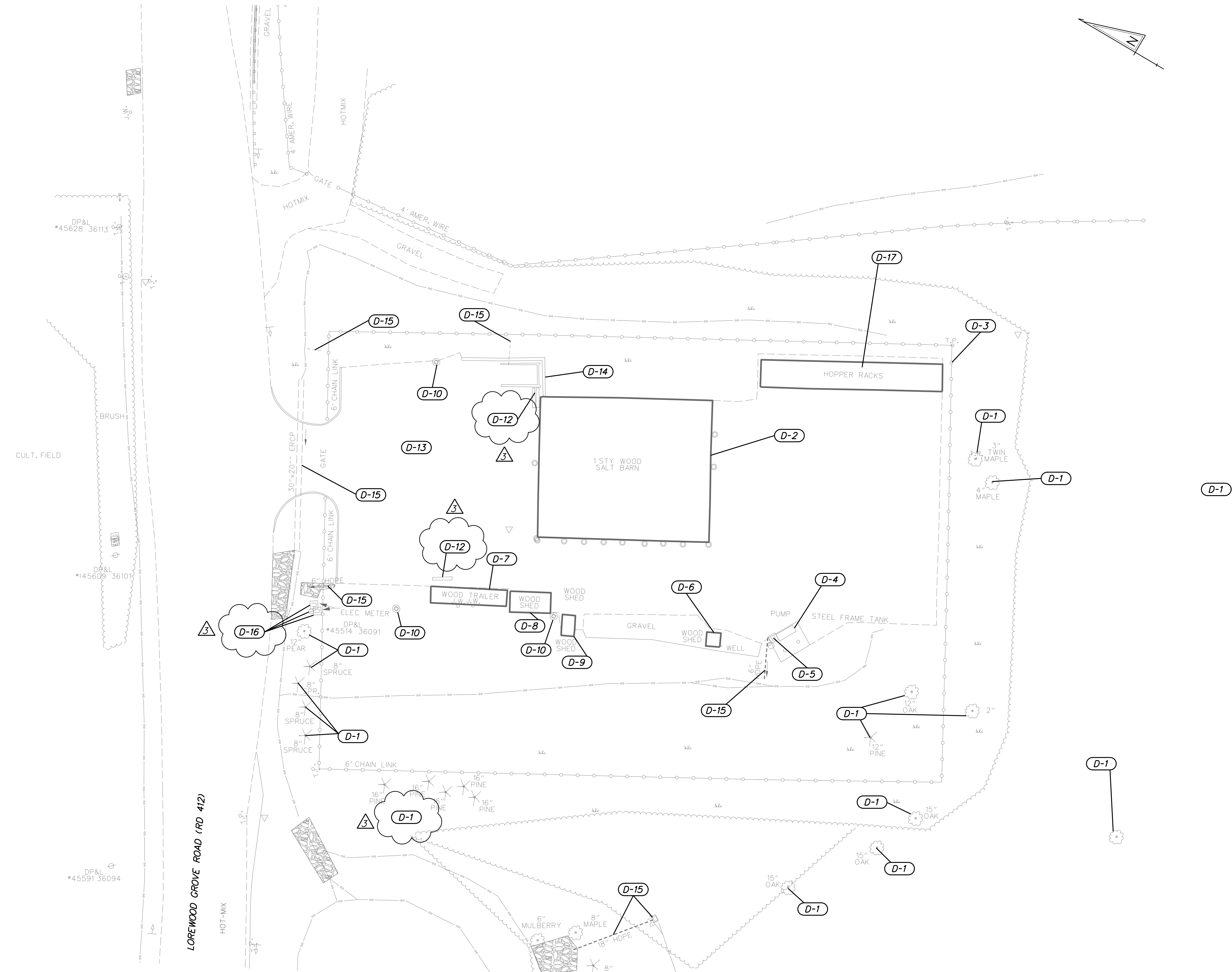
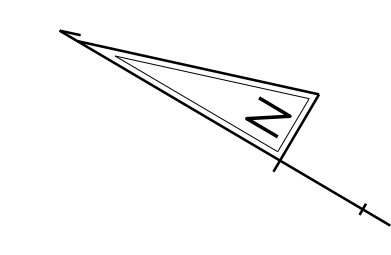
All figures must be typewritten.

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0410	908020 EROSION CONTROL BLANKET MULCH	1163.000 SY				
0420	908023 STABILIZED CONSTRUCTION ENTRANCE	13.000 TON				
0430	911502 DECORATIVE STONE MULCH	105.000 SY				
0440	610009 PORTLAND CEMENT CONCRETE MASONRY, CLASS B	5.000 CY				
0450	701013 P.C.C. CURB, TYPE 1-8	50.000 LF				
	SECTION 0001 TOTAL					
	TOTAL BID					

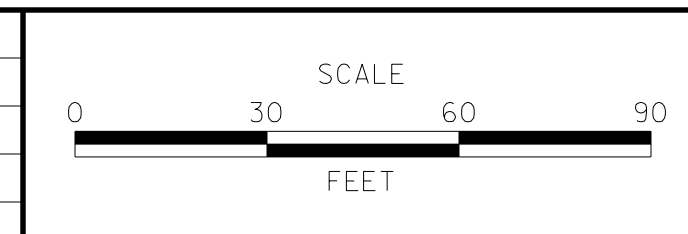
DEMOLITION NOTES

- D-1 CLEAR AND GRUB LIMITS OF LOC
- D-2 1 SY EXISTING SALT BARN TO BE REMOVED (W/ ALL FEATURES)
- D-3 REMOVE EXISTING CHAIN LINK FENCE (SEE CP FOR DETAILS)
- D-4 REMOVE EXISTING CONCRETE PAD. (STEEL FRAME TANK TO BE REMOVED BY OTHERS.)
- D-5 REMOVE EXISTING HYDRANT
- D-6 REMOVE/ABANDON EXISTING WELL AND STRUCTURE
- D-7 REMOVE EXISTING WOOD TRAILER
- D-8 REMOVE EXISTING WOOD SHED
- D-9 REMOVE EXISTING WOOD SHED
- D-10 REMOVE EXISTING LIGHT POLE
- D-11 REMOVE EXISTING UTILITY POLE
- D-12 REMOVE EXISTING CONCRETE (ITEMS)
- D-13 REMOVE EXISTING PAVEMENT/GRAVEL
- D-14 REMOVE EXISTING SALT LOADING AREAS
- D-15 REMOVE EXISTING DRAINAGE SYSTEM
- D-16 RELOCATE UTILITIES (LOCATION TBD)
- D-17 HOPPER RACKS TO REMAIN. DELINEATE AREA WITH CONSTRUCTION SAFETY FENCE (ITEM 727014)



PLOTTED BY: BDOUGHERTY DATE: 8/11/2017
 FILE LOCATION: Q:\INDE\120995_021_ST_GEORGES_MAINTENAN\CADD\SITE_EXISTING_CONDITIONS.DGN [SHEET: EC&DP]

ADDENDUMS / REVISIONS	
3	NOTE AND IDENTIFIERS REVISED WJD - 8/10/2017

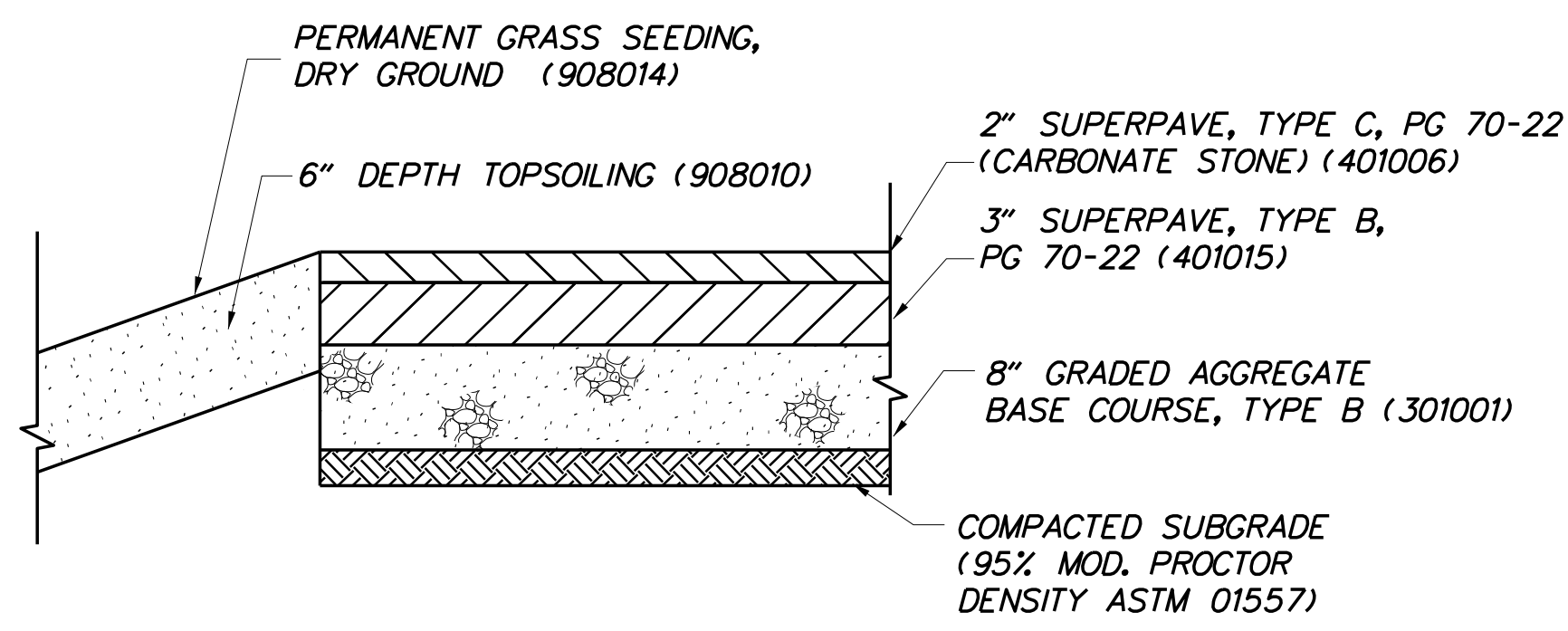
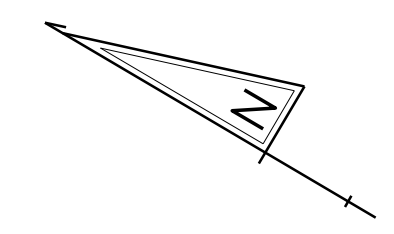


ST. GEORGES MAINTENANCE YARD IMPROVEMENTS

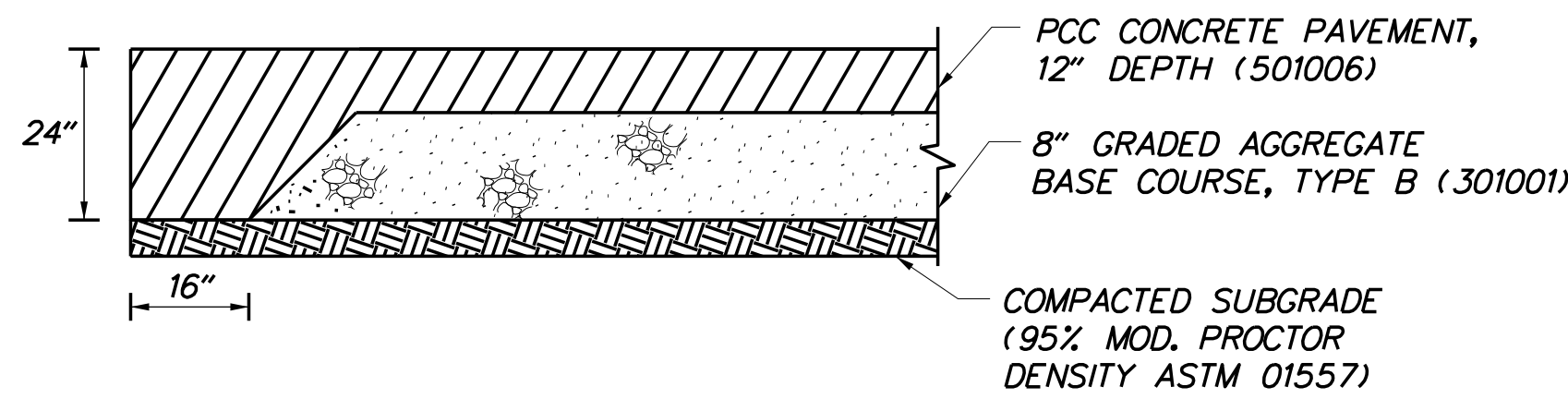
CONTRACT	BRIDGE NO.	NA
T201680104	DESIGNED BY: MM	
COUNTY	CHECKED BY: BH	
NEW CASTLE		

EXISTING CONDITIONS & DEMOLITION PLAN

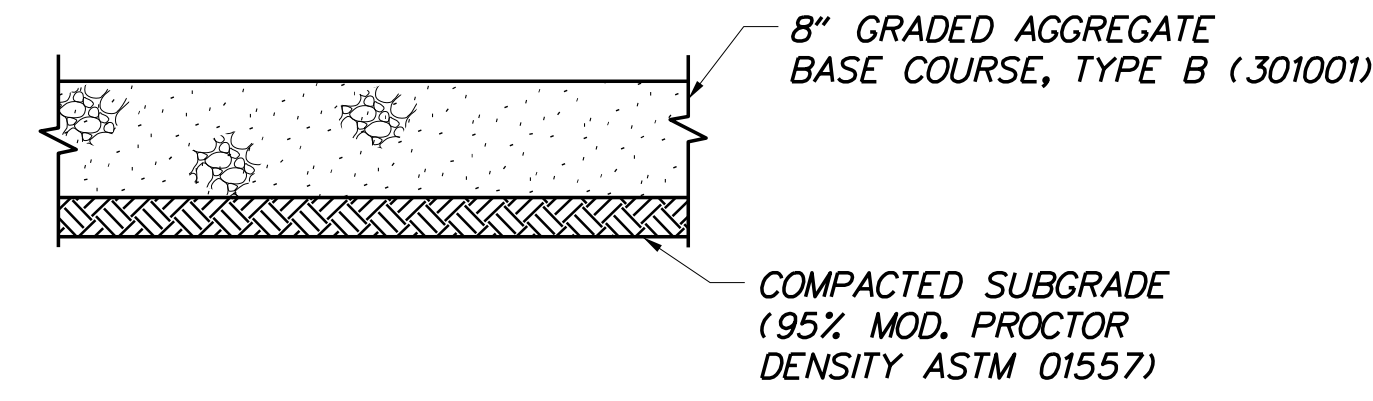
SHEET NO.	4
TOTAL SHTS.	116



PAVING SECTION 'A'
N. T. S.



PAVING SECTION 'B'
N. T. S.



PAVING SECTION 'C'
N. T. S.

RIPRAP STABILIZATION SCHEDULE				
NO.	TYPE	W	L	D
1	R-5	12.0'	20.0'	12"
2	R-5	12.0'	20.0'	12"
3	R-5	12.0'	20.0'	12"

CURB SCHEDULE		
NO.	ITEM DESCRIPTION / TYPE	LENGTH
1	PCC CURB TYPE 1-6	355'
2	PCC CURB & GUTTER TYPE 3-6	417'
3	PCC CURB & GUTTER TYPE 3-6	70'

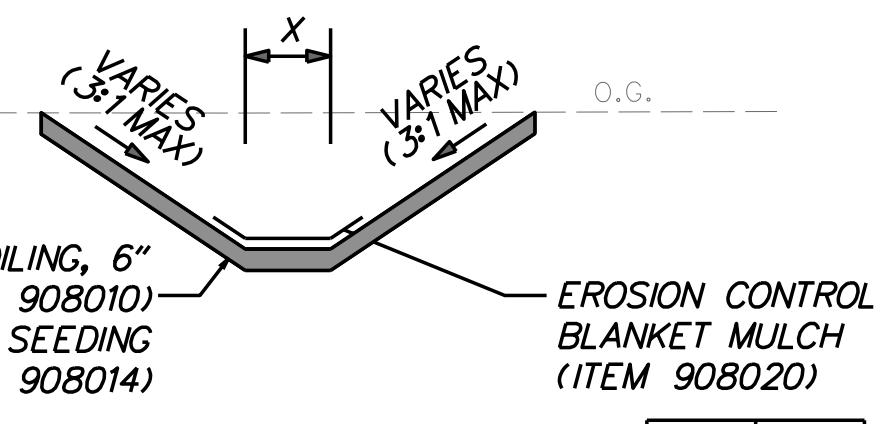
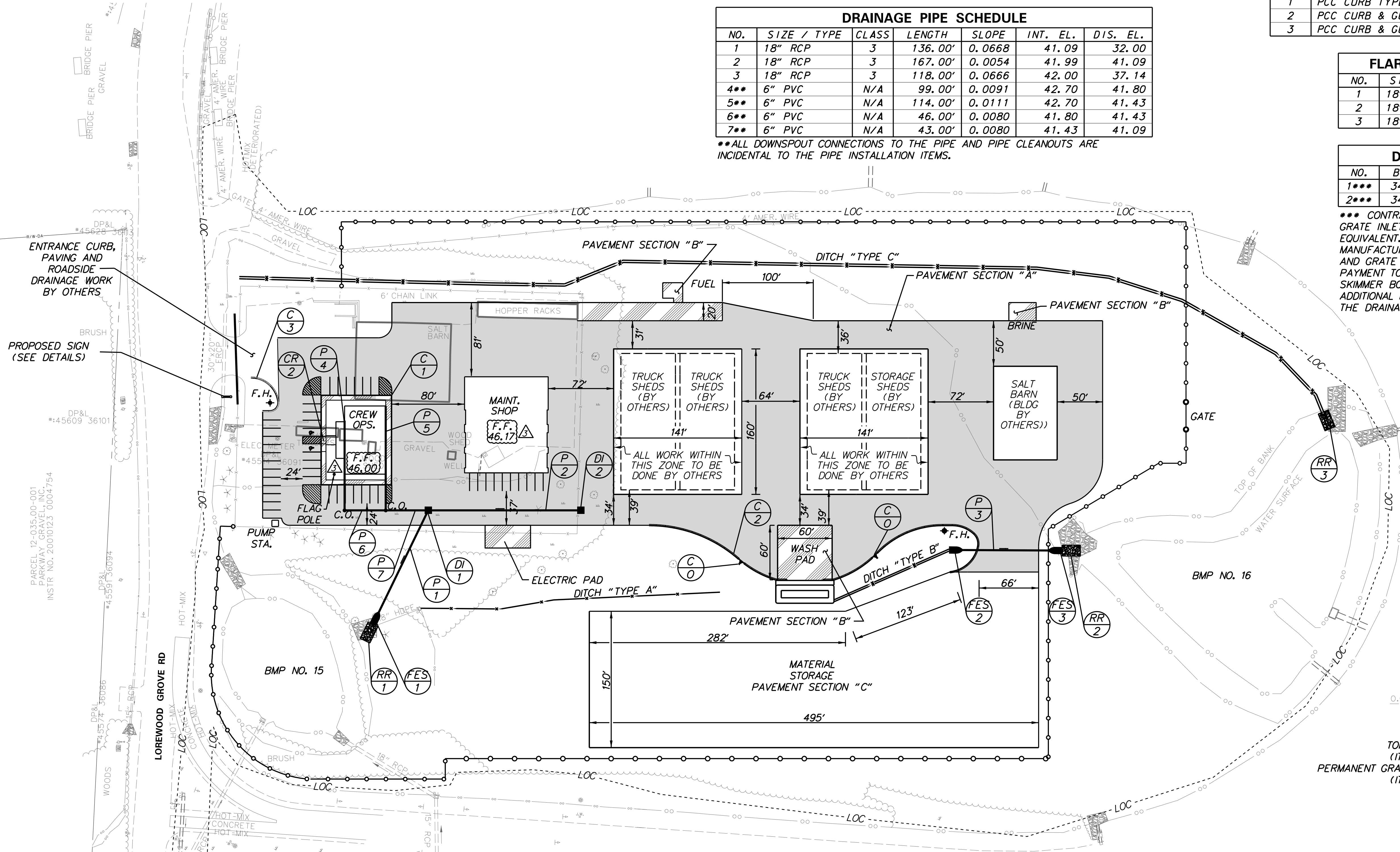
DRAINAGE PIPE SCHEDULE						
NO.	SIZE / TYPE	CLASS	LENGTH	SLOPE	INT. EL.	DIS. EL.
1	18" RCP	3	136.00'	0.0668	41.09	32.00
2	18" RCP	3	167.00'	0.0054	41.99	41.09
3	18" RCP	3	118.00'	0.0666	42.00	37.14
4**	6" PVC	N/A	99.00'	0.0091	42.70	41.80
5**	6" PVC	N/A	114.00'	0.0111	42.70	41.43
6**	6" PVC	N/A	46.00'	0.0080	41.80	41.43
7**	6" PVC	N/A	43.00'	0.0080	41.43	41.09

**ALL DOWNSPOUT CONNECTIONS TO THE PIPE AND PIPE CLEANOUTS ARE INCIDENTAL TO THE PIPE INSTALLATION ITEMS.

FLARED END SECTION SCHEDULE			
NO.	SIZE / TYPE	SLOPE	SAFETY GRATE
1	18" RCP	0.0	NO
2	18" RCP	0.0	NO
3	18" RCP	0.0	NO

DRAINAGE INLET SCHEDULE				
NO.	BOX SIZE	GRATE	T. G. EL.	INV. EL.
1***	34" x 24"	3	43.80	41.09
2***	34" x 24"	3	44.70	41.99

*** CONTRACTOR SHALL INSTALL A SUNTREE TECHNOLOGIES GRATE INLET SKIMMER BOX GISB-20-36-20 OR AN APPROVED EQUIVALENT. THE CONTRACTOR SHALL CONTACT THE MANUFACTURER WITH THE FINAL INTERNAL BOX DIMENSIONS AND GRATE INFORMATION PRIOR TO ORDERING PRODUCT. PAYMENT TO FURNISH AND INSTALL THE GRATE INLET SKIMMER BOX OR APPROVED EQUIVALENT, INCLUDING ALL ADDITIONAL INSTALLATION MATERIALS, SHALL BE INCIDENTAL TO THE DRAINAGE INLET ITEM.

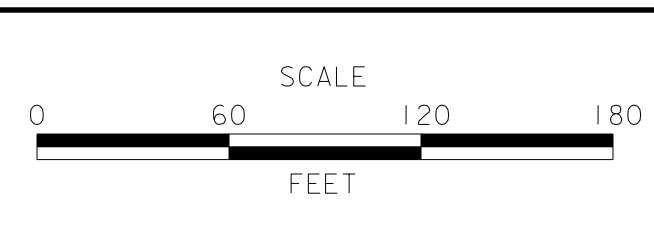


DITCH SECTION
N. T. S.

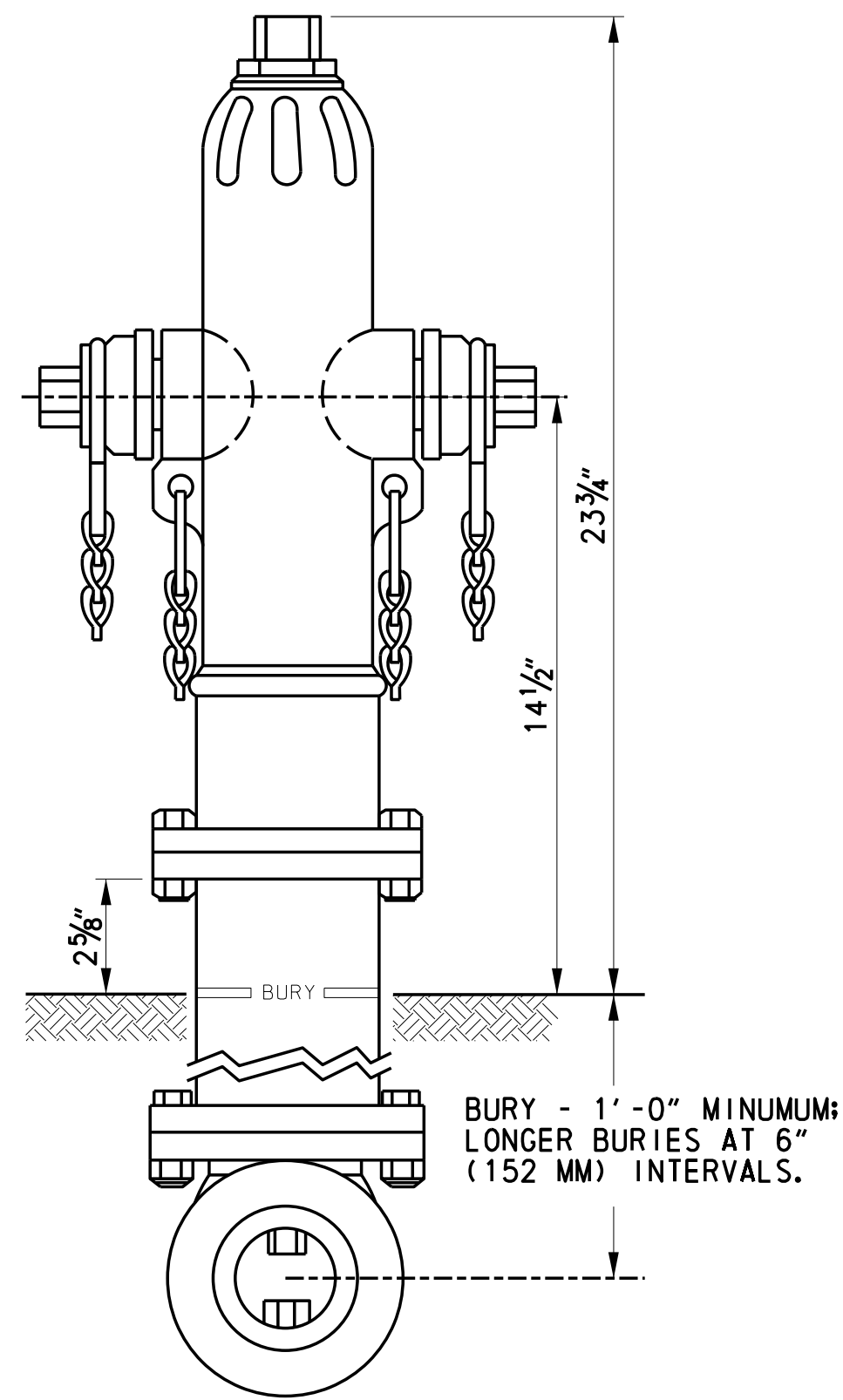
DITCH TYPE	X
A	0'
B	2'
C	2.5'

PLOTTED BY: BDOUGHERTY DATE: 8/11/2017
 FILE LOCATION: Q:\INDE\120995_021_ST_GEORGES_MAINTENANCE\CADD\SITE_VCP.DGN [SHEET: CP01]

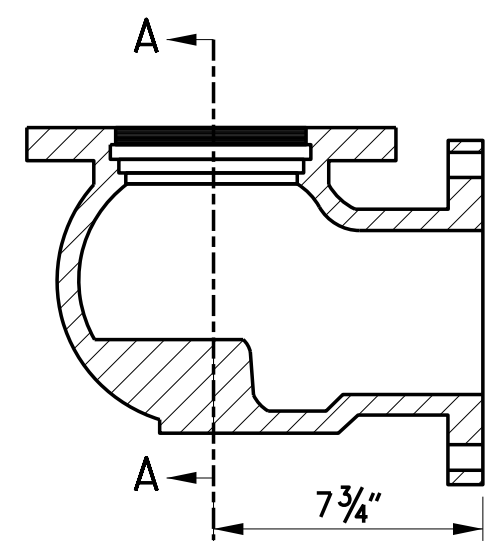
ADDENDUMS / REVISIONS	
▲	ADDED F.F. ELEVATION - WJD -8/11/17



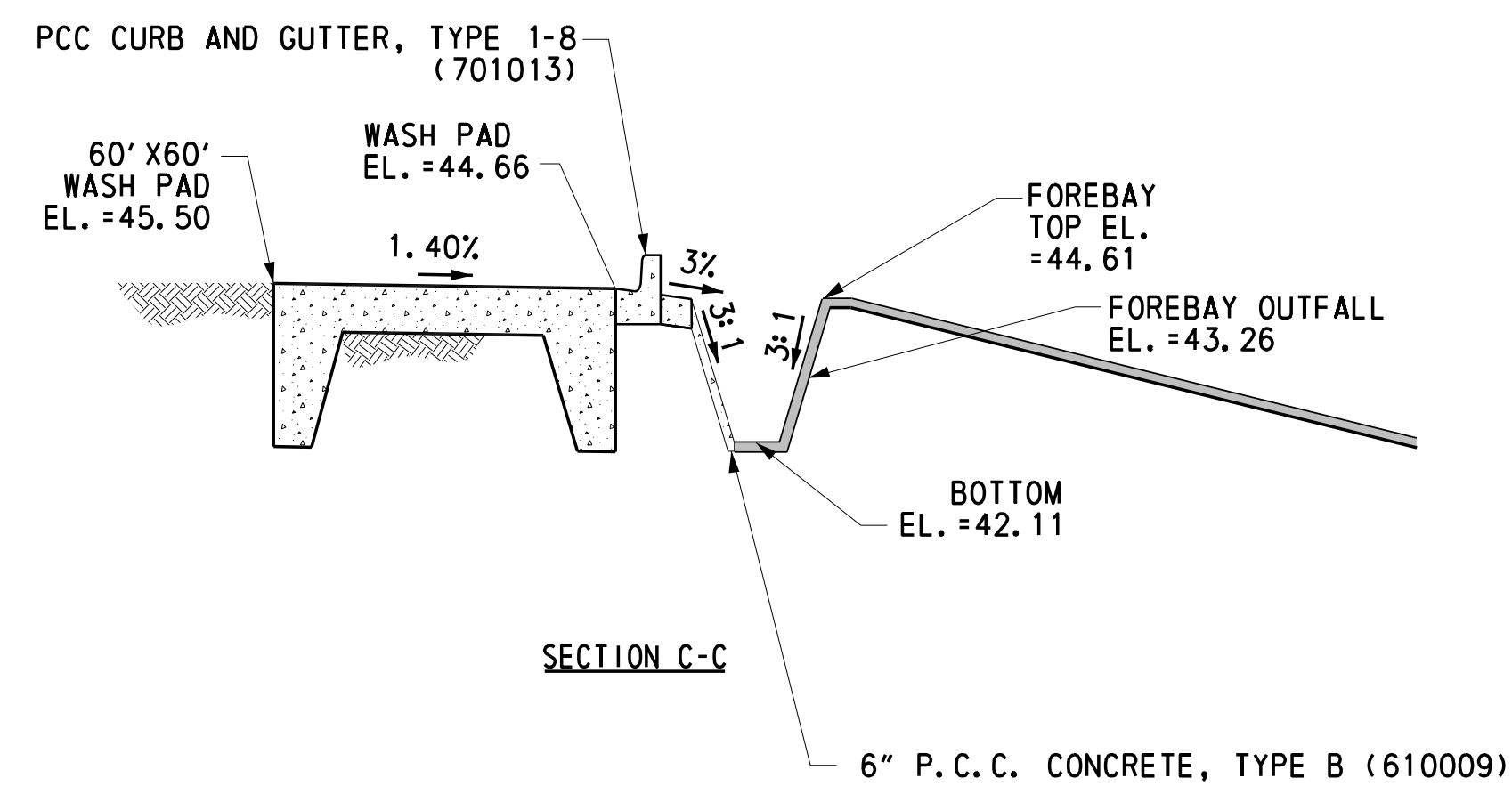
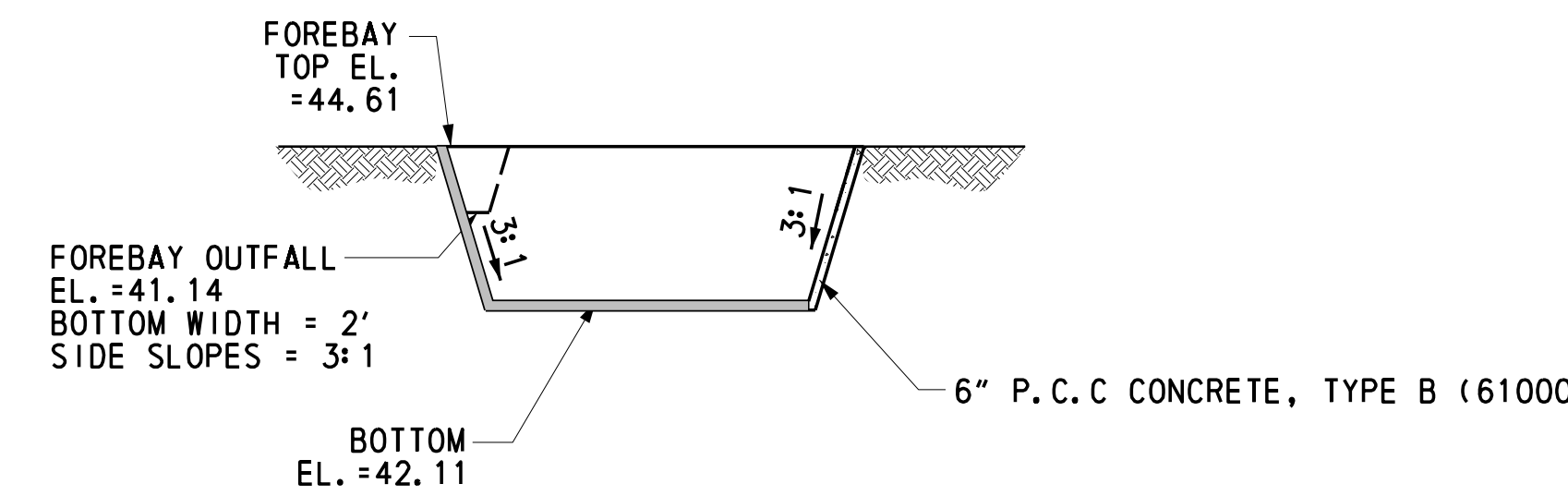
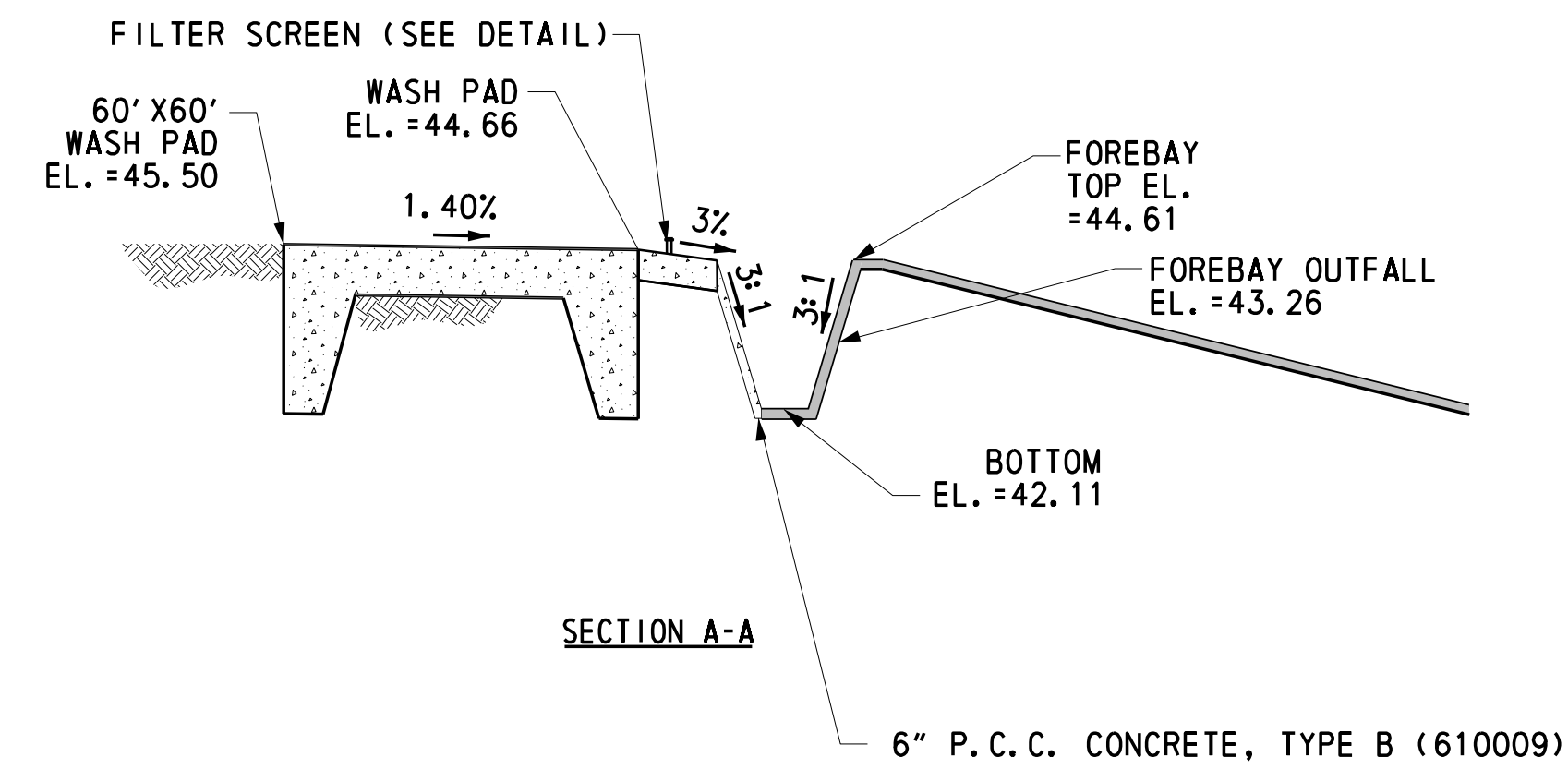
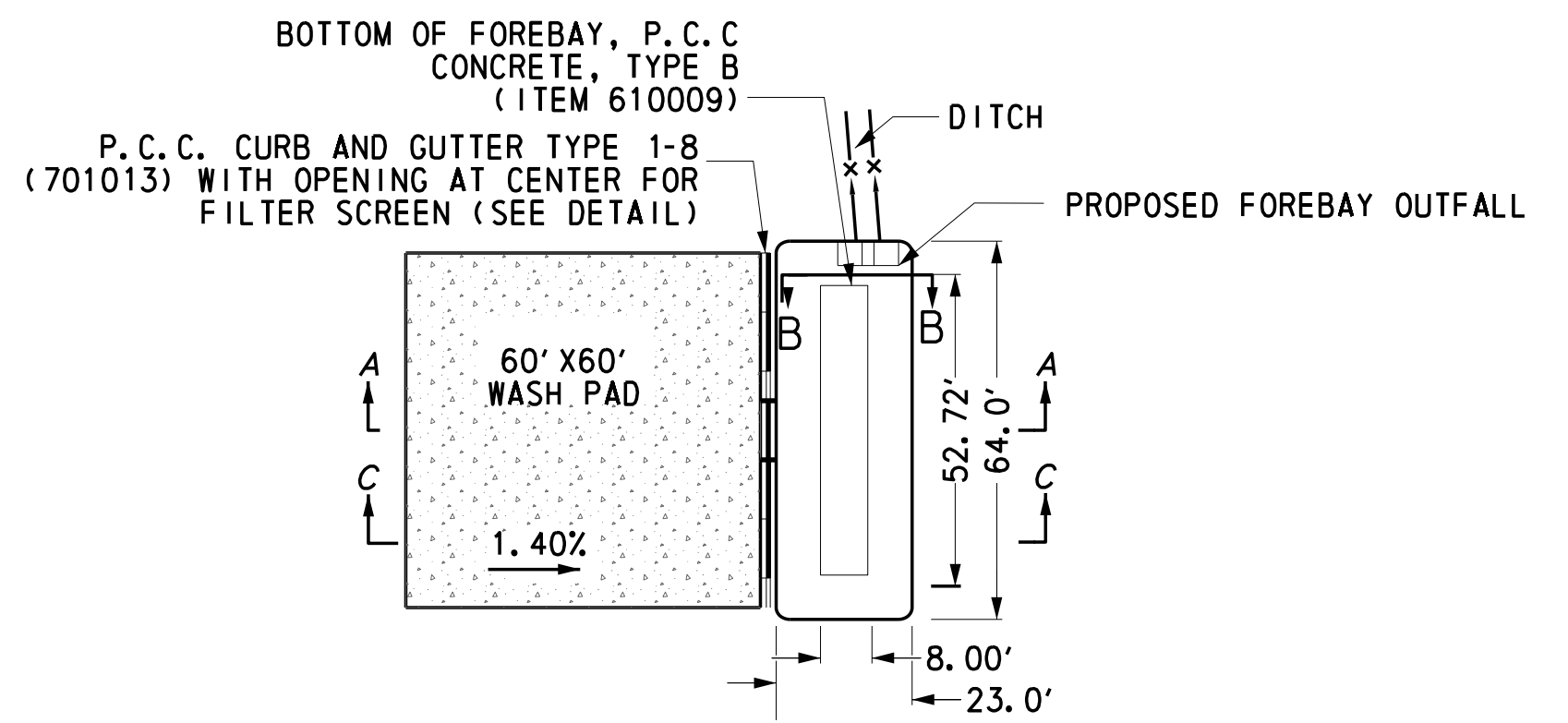
CONTRACT	BRIDGE NO.	N/A
T201680104	DESIGNED BY:	WJD
COUNTY	CHECKED BY:	BH
NEW CASTLE		



POST TYPE TWO-PORT HYDRANT
N. T. S.

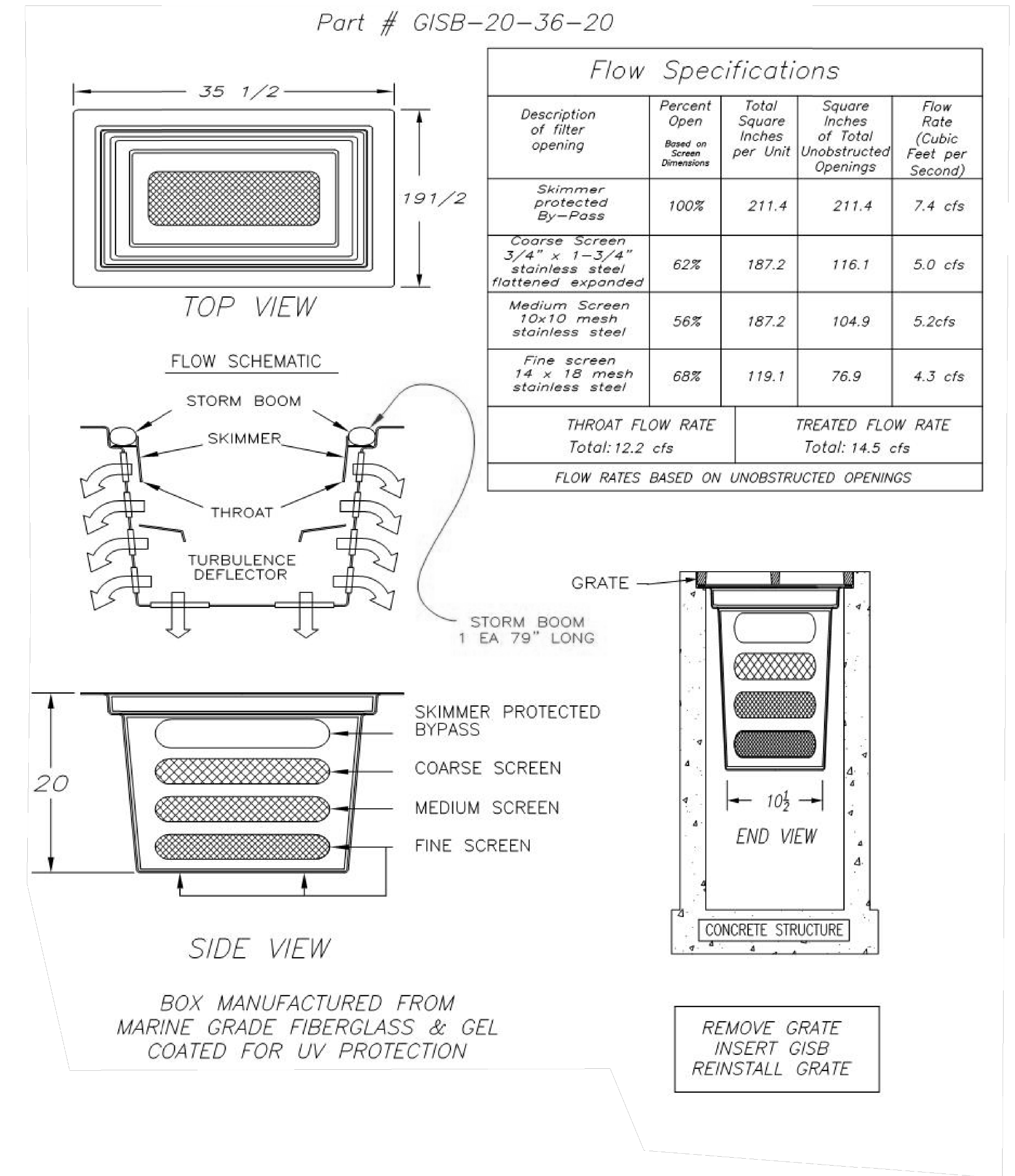


FLANGE
N. T. S.



WASH PAD FOREBAY DETAIL
N. T. S.

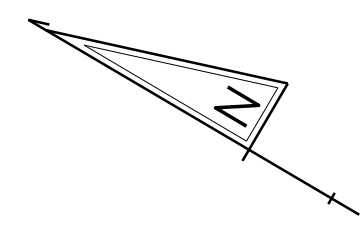
3



GRATE INLET SKIMMER BOX
N. T. S.

NOTE: GRATE INLET SKIMMER BOX TO BE INSTALLED AFTER FINAL STABILIZATION OF ALL DISTURBED AREAS.

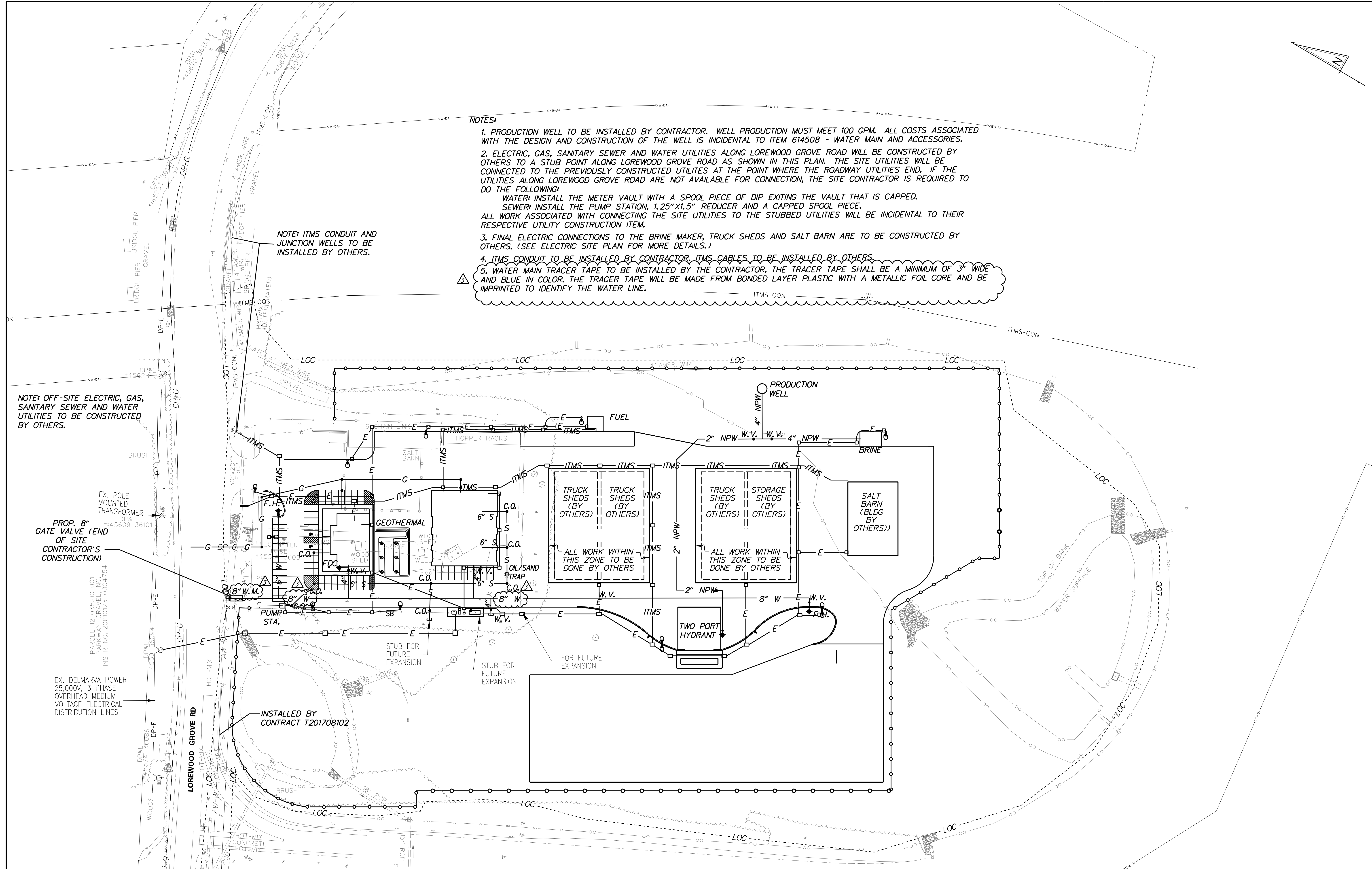
PLOTTED BY: BDOUGHERTY DATE: 8/11/2017 FILE LOCATION: Q:\INDE\120995_021_ST_GEORGES_MAINTENAN\CADD\SITE\DT.DGN [SHEET: DT02]



- NOTES:**
1. PRODUCTION WELL TO BE INSTALLED BY CONTRACTOR. WELL PRODUCTION MUST MEET 100 GPM. ALL COSTS ASSOCIATED WITH THE DESIGN AND CONSTRUCTION OF THE WELL IS INCIDENTAL TO ITEM 614508 - WATER MAIN AND ACCESSORIES.
 2. ELECTRIC, GAS, SANITARY SEWER AND WATER UTILITIES ALONG LOREWOOD GROVE ROAD WILL BE CONSTRUCTED BY OTHERS TO A STUB POINT ALONG LOREWOOD GROVE ROAD AS SHOWN IN THIS PLAN. THE SITE UTILITIES WILL BE CONNECTED TO THE PREVIOUSLY CONSTRUCTED UTILITES AT THE POINT WHERE THE ROADWAY UTILITIES END. IF THE UTILITIES ALONG LOREWOOD GROVE ROAD ARE NOT AVAILABLE FOR CONNECTION, THE SITE CONTRACTOR IS REQUIRED TO DO THE FOLLOWING:
 WATER: INSTALL THE METER VAULT WITH A SPOOL PIECE OF DIP EXITING THE VAULT THAT IS CAPPED.
 SEWER: INSTALL THE PUMP STATION, 1.25"X1.5" REDUCER AND A CAPPED SPOOL PIECE.
 ALL WORK ASSOCIATED WITH CONNECTING THE SITE UTILITIES TO THE STUBBED UTILITIES WILL BE INCIDENTAL TO THEIR RESPECTIVE UTILITY CONSTRUCTION ITEM.
 3. FINAL ELECTRIC CONNECTIONS TO THE BRINE MAKER, TRUCK SHEDS AND SALT BARN ARE TO BE CONSTRUCTED BY OTHERS. (SEE ELECTRIC SITE PLAN FOR MORE DETAILS.)
 4. ITMS CONDUIT TO BE INSTALLED BY CONTRACTOR. ITMS CABLES TO BE INSTALLED BY OTHERS.
 5. WATER MAIN TRACER TAPE TO BE INSTALLED BY THE CONTRACTOR. THE TRACER TAPE SHALL BE A MINIMUM OF 3" WIDE AND BLUE IN COLOR. THE TRACER TAPE WILL BE MADE FROM BONDED LAYER PLASTIC WITH A METALLIC FOIL CORE AND BE IMPRINTED TO IDENTIFY THE WATER LINE.

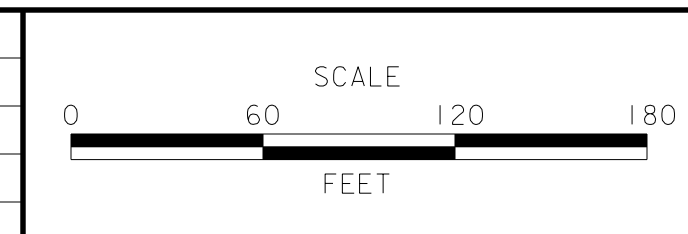
NOTE: ITMS CONDUIT AND JUNCTION WELLS TO BE INSTALLED BY OTHERS.

NOTE: OFF-SITE ELECTRIC, GAS, SANITARY SEWER AND WATER UTILITIES TO BE CONSTRUCTED BY OTHERS.



PLOTTED BY: BDOUGHERTY DATE: 8/11/2017
 FILE LOCATION: Q:\INDE\120995_021_ST_GEORGES_MAINTENANCE\CAD\SITE\UT.DGN [SHEET: UT01]

ADDENDUMS / REVISIONS
3 UPDATED WATER LINE TO 8" AND ADDED NOTE - WJD - 8/10/2017



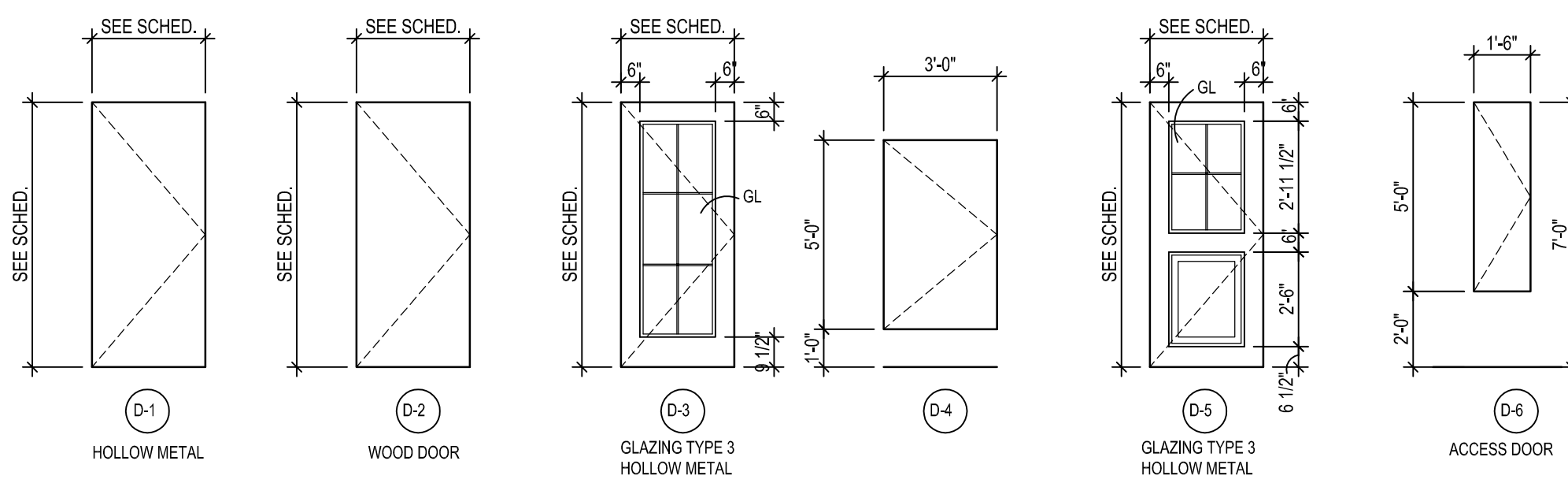
ST. GEORGES MAINTENANCE YARD IMPROVEMENTS

CONTRACT	BRIDGE NO.	N/A
T201680104	DESIGNED BY: WJD	
COUNTY	CHECKED BY: BH	
NEW CASTLE		

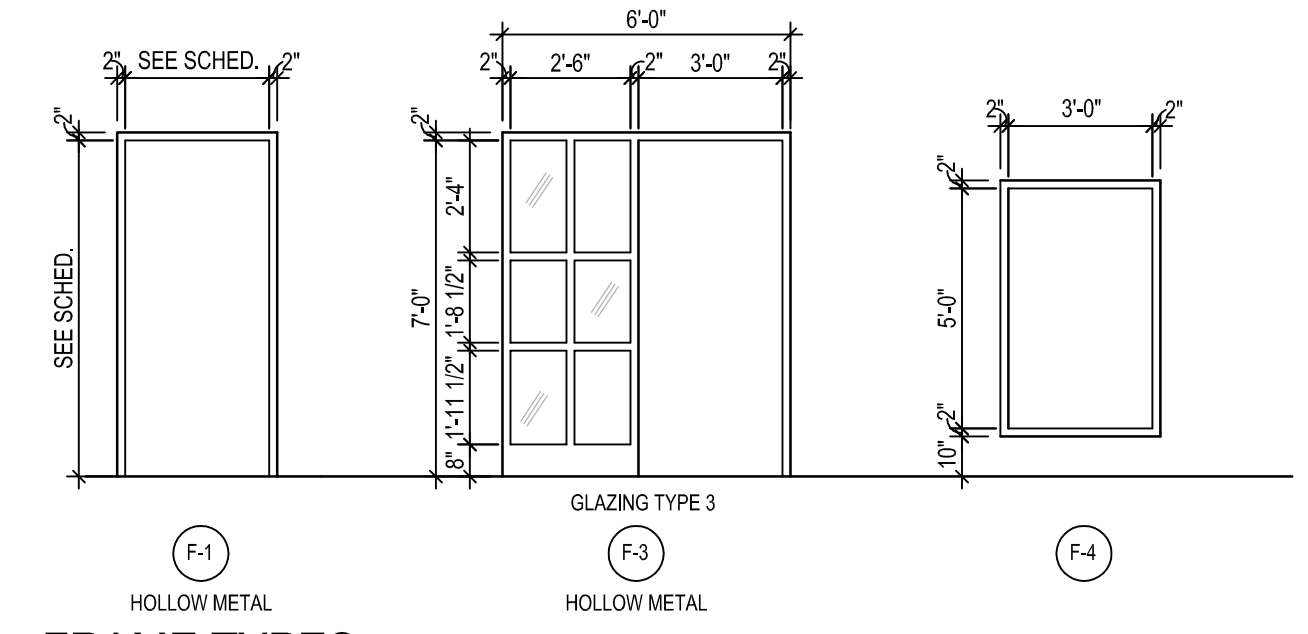
UTILITY PLAN	
SHEET NO.	18
TOTAL SHTS.	116

C:\NDEI20965_01_31_Georgia_Maintenn\CADD\Architectural\901 CREW OPERATION BUILDING SCHEDULES - WINDOW AND DOOR TYPES.dwg

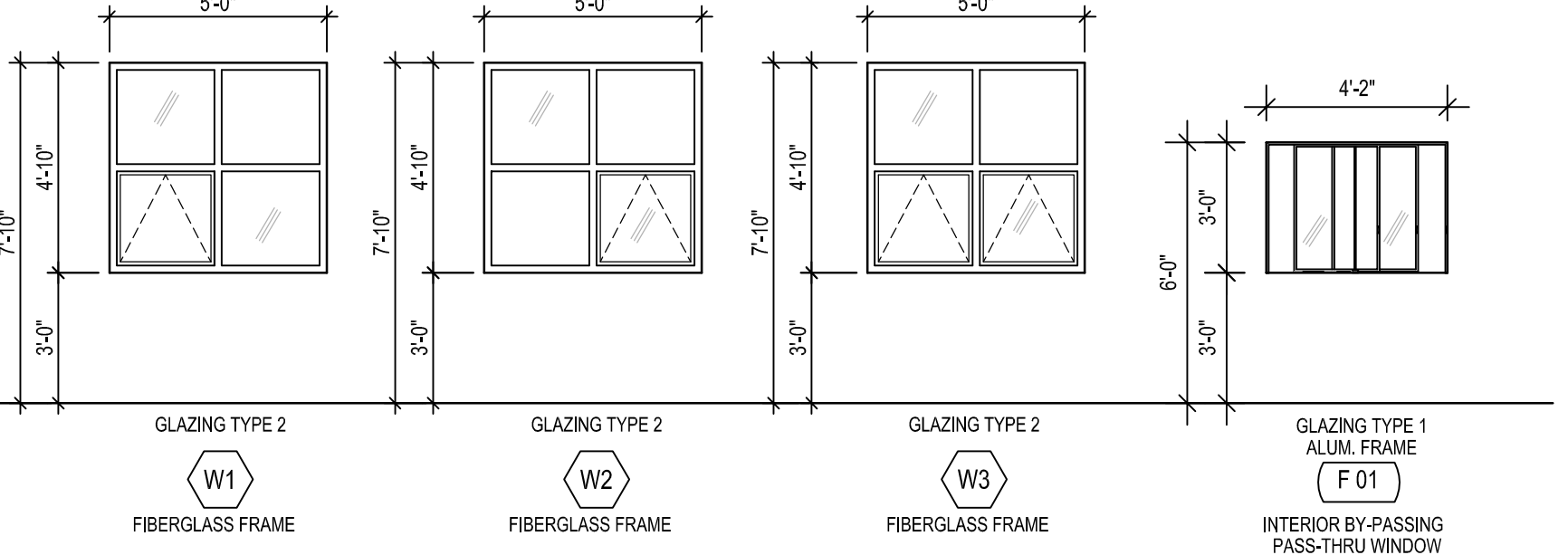
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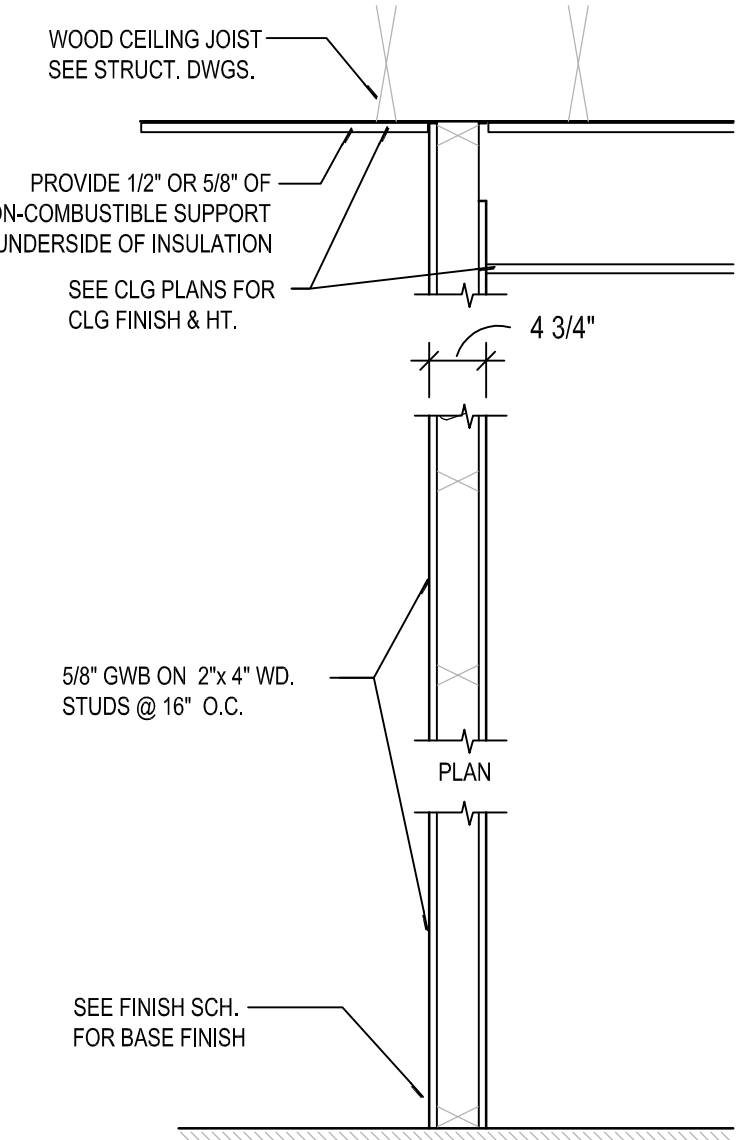
DOOR TYPES
SCALE: 1/4" = 1'-0"



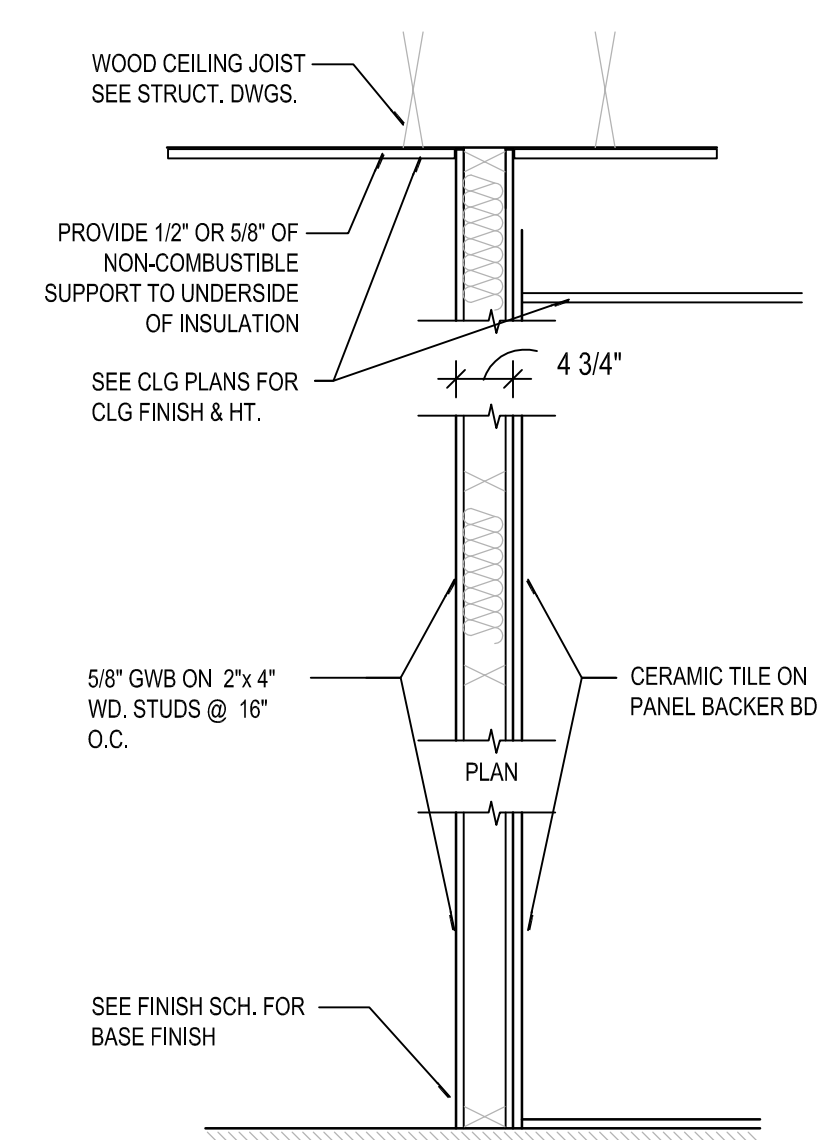
FRAME TYPES
SCALE: 1/4" = 1'-0"



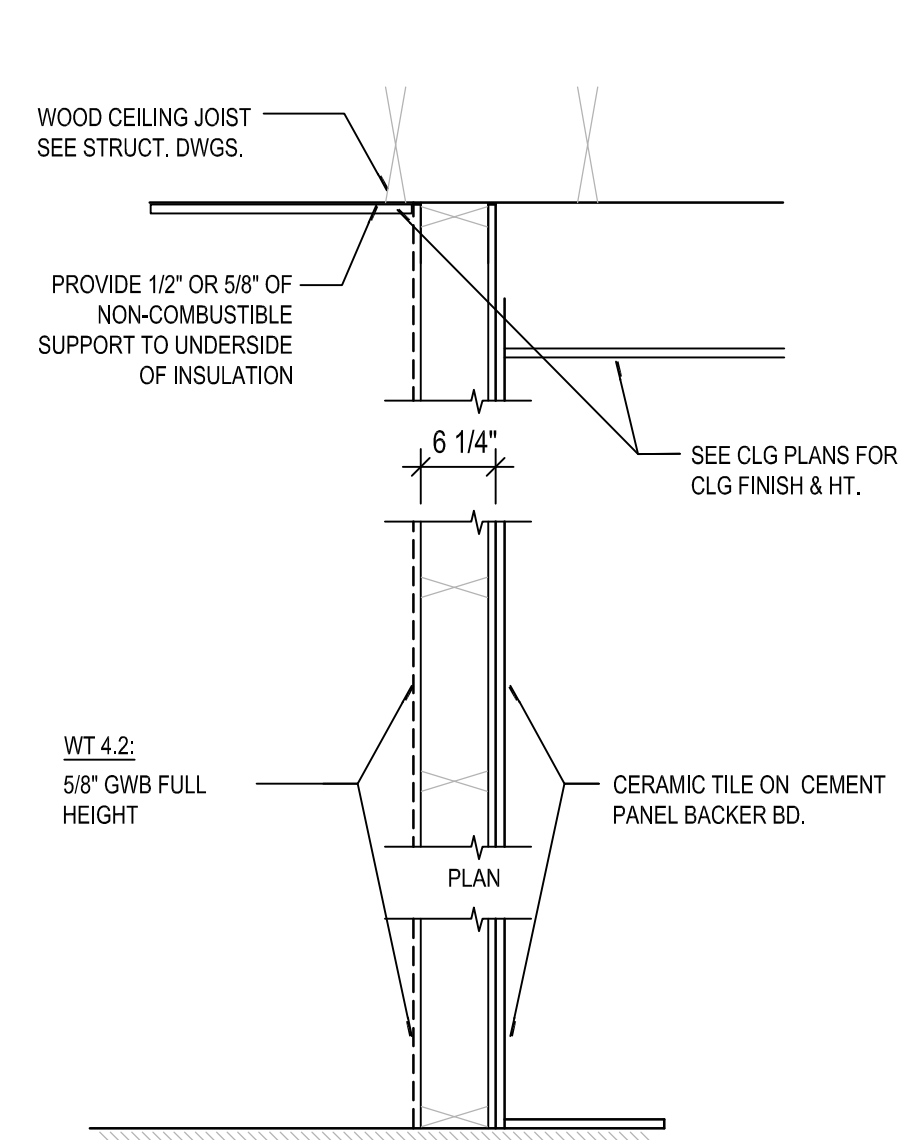
WINDOW TYPES
SCALE: 1/4" = 1'-0"



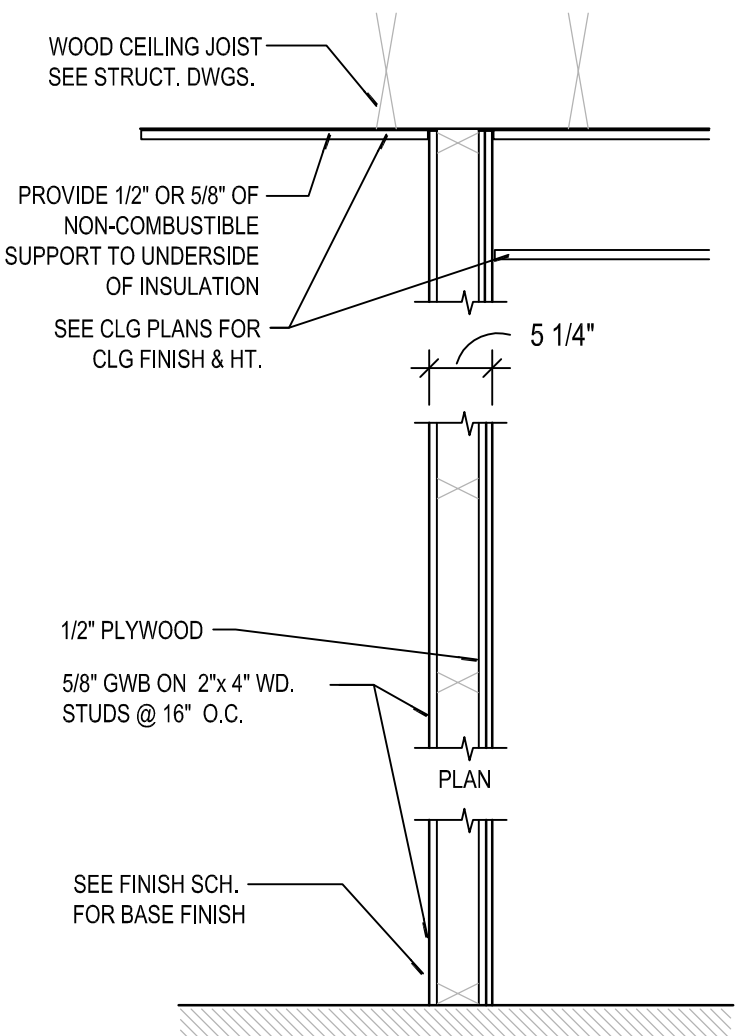
- WT1.1 2" x 4" WD. STUDS @ 16" O.C. W/ 5/8" GWB BOTH SIDES. HT. OF STUDS: 10'-0". WALL THICKNESS: 4 3/4"
- WT1.2 SAME AS WT1.1 W/ ACOUSTIC BATT INSUL. FULL HT.
- WT1.3 2" x 4" WD. STUDS @ 16" O.C. W/ 5/8" GWB ONE SIDE HT. OF STUDS: 10'-0". WALL THICKNESS: 4 1/8"
- WT1.4 NOT USED
- WT1.5 2" x 4" WD. STUDS @ 16" O.C. SHOWER WALL ONE SIDE, NOTHING ON OTHER SIDE HT. OF STUDS: 10'-0". WALL THICKNESS: 3 1/2"



- WT3.1 2" x 4" WD. STUDS @ 16" O.C. 5/8" GWB ONE SIDE, ON OTHER SIDE 1/4" CERAMIC TILE, 1/2" CEMENT PANEL BACKER BD. HT. OF STUDS: 10'-0". WALL THICKNESS: 5"
- WT3.2 2" x 4" WD. STUDS @ 16" O.C. W/ CEMENT PANEL BACKER BD. & CERAMIC TILE, BOTH SIDES. NO BATTS HT. OF STUDS: 10'-0". WALL THICKNESS: 5 1/4"
- WT3.3 NOT USED
- WT3.4 2" x 4" WD. STUDS @ 16" O.C. W/ CEMENT PANEL BACKER BD. & CERAMIC TILE ON ONE SIDE & NOTHING ON THE OTHER SIDE. HT. OF STUDS: 10'-0". WALL THICKNESS: 4 1/4"



- WT4.1 2" x 6" WD. STUDS @ 16" O.C. W/ CEMENT PANEL BACKER BD. & CERAMIC TILE ON ONE SIDE & NOTHING ON THE OTHER SIDE. HT. OF WALL: 10'-0". WALL THICKNESS: 6 1/2"
- WT4.2 2" x 6" WD. STUDS @ 16" O.C. CEMENT PANEL BACKER BD. & 1/4" CERAMIC TILE ON ONE SIDE & 5/8" GWB ON THE OTHER SIDE. HT. OF WALL: 10'-0". WALL THICKNESS: 7"
- WT4.3 2" x 6" WD. STUDS @ 16" O.C. W/ SHOWER WALL ONE SIDE, NOTHING ON OTHER SIDE HT. OF STUDS: 10'-0". WALL THICKNESS: 6 3/4"
- WT4.4 2" x 6" WD. STUDS @ 16" O.C. W/ CERAMIC TILE ON 1/2" CEMENT PANEL BACKER BD. ON BOTH SIDES HT. OF WALL: 10'-0". WALL THICKNESS: 7 1/4"
- WT4.5 2" x 6" WD. STUDS @ 16" O.C. W/ CERAMIC TILE ON 1/2" CEMENT PANEL BACKER BD. NOTHING ON OTHER SIDE.



- WT5.1 2" x 4" WD. STUDS @ 16" O.C. W/ 5/8" GWB BOTH SIDES. 1/2" PLYWOOD ON SIDE(S) INDICATED HT. OF STUDS: 10'-0". WALL THICKNESS: 5 1/4"
- WT5.2 SAME AS WT1.1 W/ ACOUSTIC BATT INSUL. FULL HT.

2 WALL TYPES
SCALE: 3/4" = 1'-0"

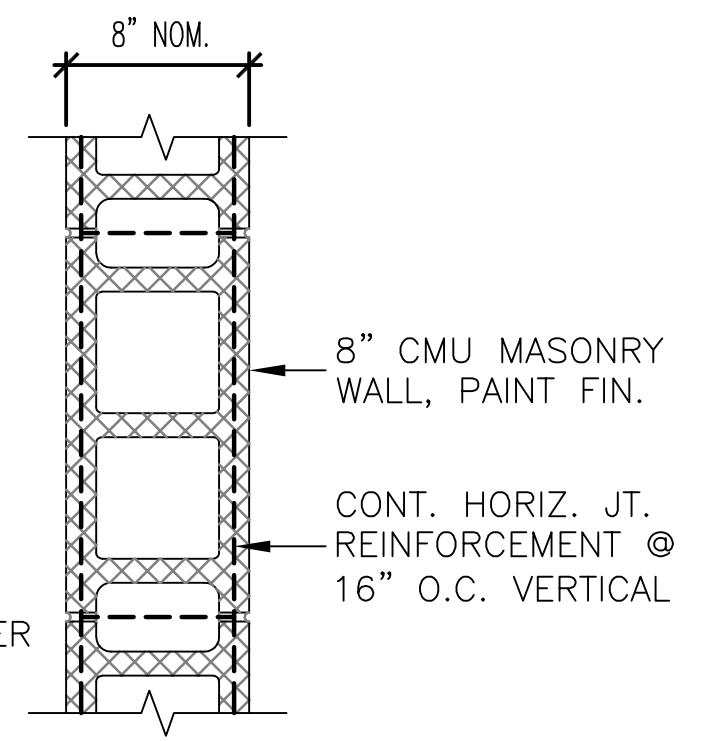
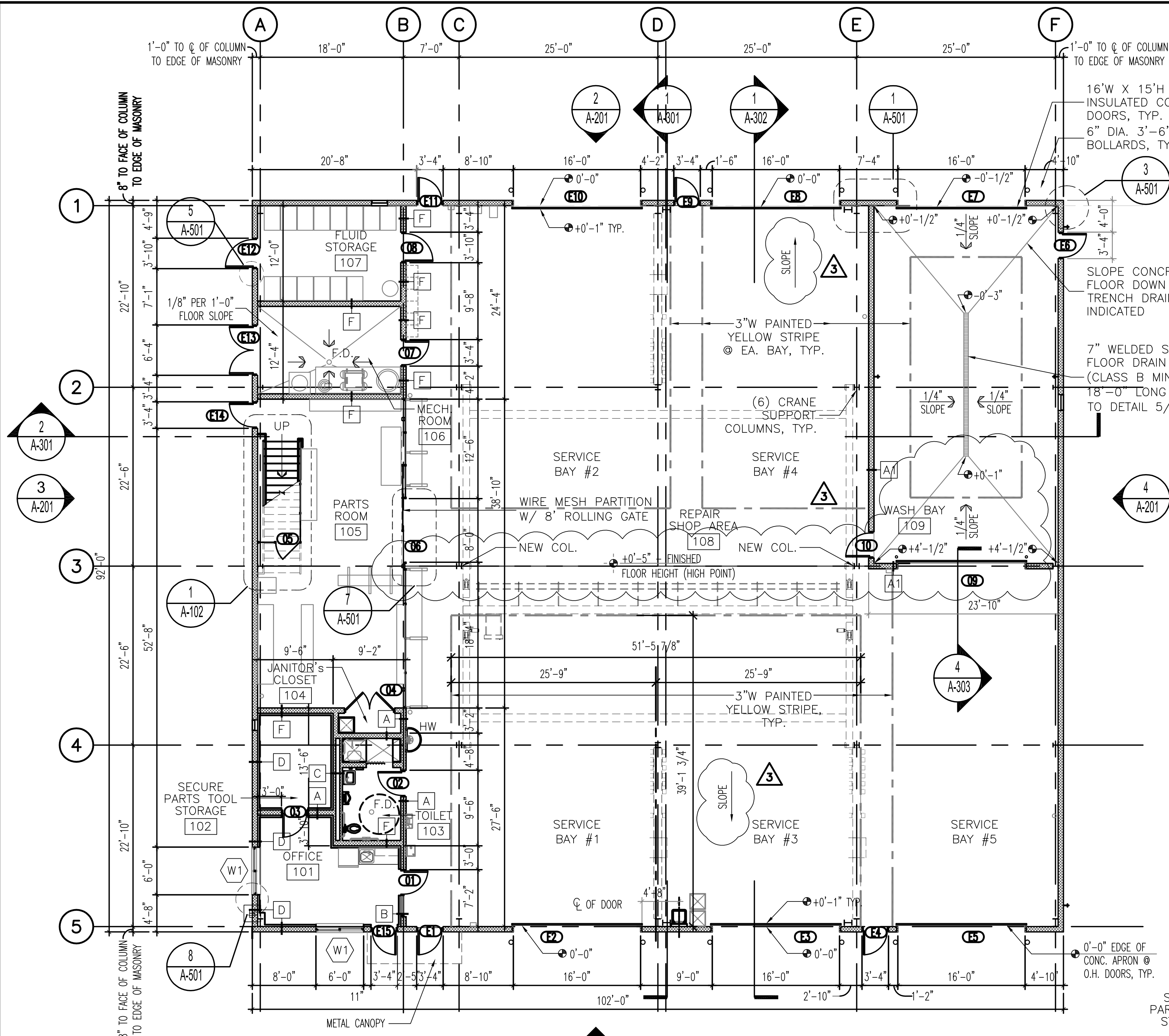
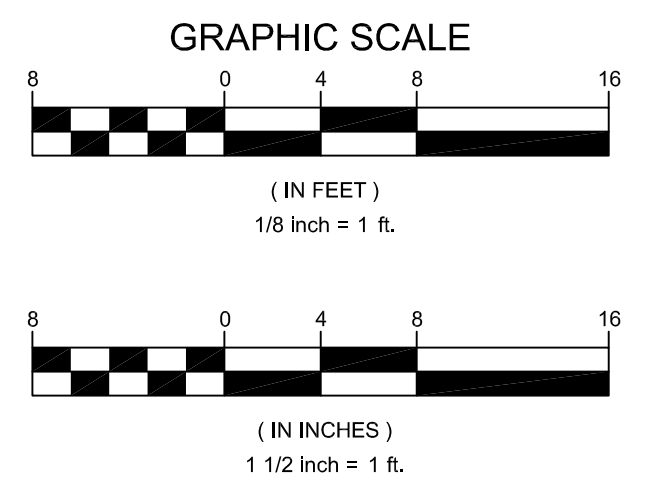
GLAZING SCHEDULE	
TYPE NO.	DESCRIPTION
1	1/4" CLEAR GLASS, FULLY TEMPERED
2	1" INSULATED UNIT W/ 1/4" CLEAR INNER LITE, 1/2" ARGON GAS FILLED, & 1/4" "LOW E" GLAZING
3	1/4" CLEAR LEXAN - 9034

DOOR SCHEDULE-														
EXTERIOR DOOR	MARK	SIZE		TYPE			DETAILS			GLAZING TYPE	HARDWARE SET	FIRE RATING	REMARKS	
		WIDTH	HEIGHT	THK.	DOOR TYPE	FRAME MTL.	FRAME TYPE	H	J					S
●	100A	(2) 3-0	7-0	1-3/4	D5	16 GA. HM.	F1	14 GA. HM.	H5	J6	S3	3	H12	
	100B	3-0	7-0	1-3/4	D2	WD	F1	16 GA. HM.	H1	J1	-	-	H1	
●	100C	3-0	7-0	1-3/4	D3	16 GA. HM.	F3	14 GA. HM.	H5	J6	S3	3	H11	
	102	3-0	7-0	1-3/4	D2	WD	F1	16 GA. HM.	H7	J7	-	-	H3	
	102A	3-0	7-0	1-3/4	D2	WD	F1	16 GA. HM.	H7	J7	-	-	H3	
	102B	3-0	7-0	1-3/4	D2	WD	F1	16 GA. HM.	H7	J7	-	-	H3	
	103	3-0	7-0	1-3/4	D2	WD	F1	16 GA. HM.	H1	J1	S1	-	H2	
	104	3-0	7-0	1-3/4	D2	WD	F1	16 GA. HM.	H1	J1	S1	-	H2	
●	105A	3-0	7-0	1-3/4	D1	16 GA. HM.	F1	14 GA. HM.	H5	J6	S3	-	H11	
	105B	3-0	7-0	1-3/4	D1	18 GA. HM.	F1	16 GA. HM.	H1	J2	S1	-	H2	
●	106A	3-0	7-0	1-3/4	D5	16 GA. HM.	F1	14 GA. HM.	H5	J6	S3	3	H11	
	106B	3-0	7-0	1-3/4	D2	WD	F1	16 GA. HM.	H1	J1	-	-	H1	
	107	(2) 3-0	7-0	1-3/4	D2	WD	F1	16 GA. HM.	H1	J1	-	-	H4	
●	108	3-0	7-0	1-3/4	D3	16 GA. HM.	F3	14 GA. HM.	H5	J6	S3	3	H11	
	109	3-0	7-0	1-3/4	D2	WD	F1	16 GA. HM.	H1	J1	-	-	H1	
	110	(2) 3-0	7-0	1-3/4	D2	WD	F1	16 GA. HM.	H1	J1	-	-	H4	
	111	3-0	7-0	1-3/4	D2	WD	F1	16 GA. HM.	H1	J1	-	-	H1	
	112A	3-0	7-0	1-3/4	D2	WD	F1	16 GA. HM.	H1	J1	S1	-	H2	
	112B	1'-6"	5'-0"	-	D6	-	F4	-	H4	J5	-	-	-	REFER TO SECTION 083113
	113	3-0	7-0	1-3/4	D2	WD	F1	16 GA. HM.	H1	J1	-	-	H5	

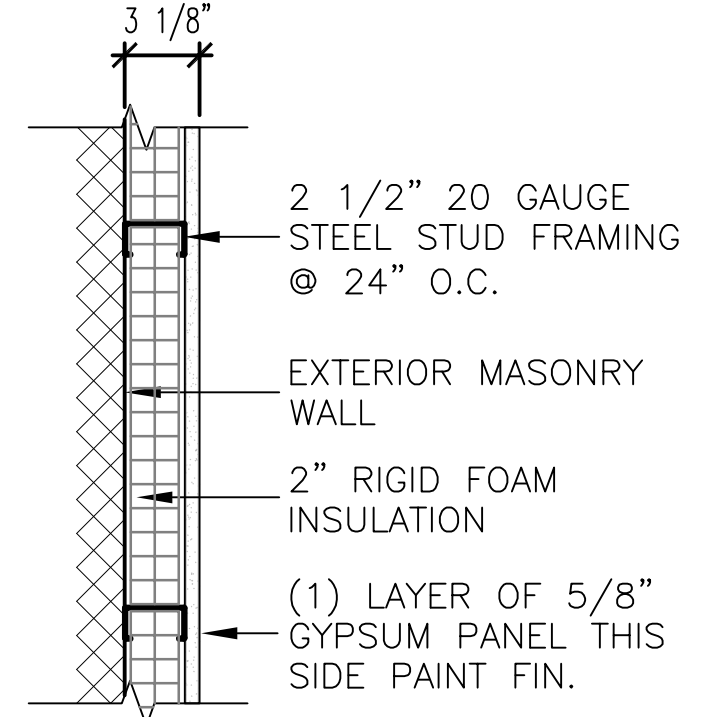
ADDENDUMS / REVISIONS	
3	8/8/17 ADDENDUM 3

CONTRACT	BRIDGE NO.
T201280103	
COUNTY	DESIGNED BY: DCH
NEW CASTLE	CHECKED BY: KNM

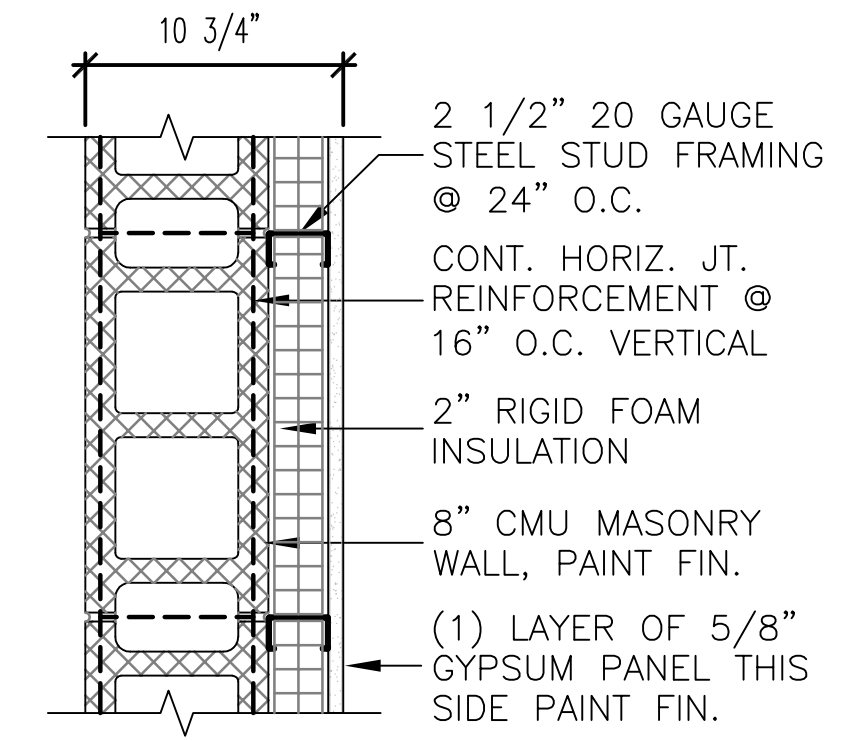
CO-A-901



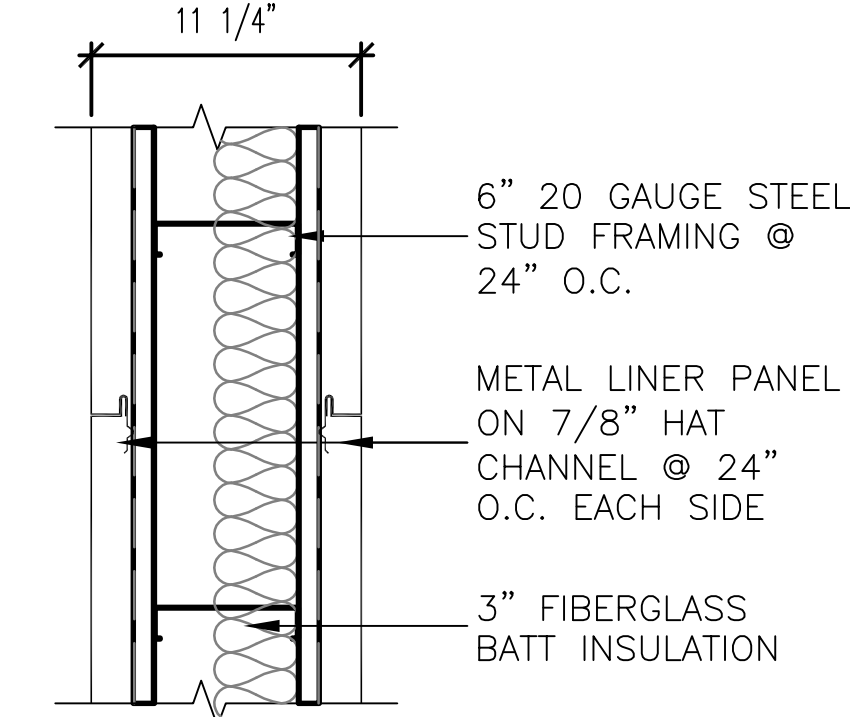
A 8" CMU MASONRY WALL TO UNDERSIDE OF MEZZANINE
A1 8" CMU MASONRY WALL @ 10'-8" HEIGHT



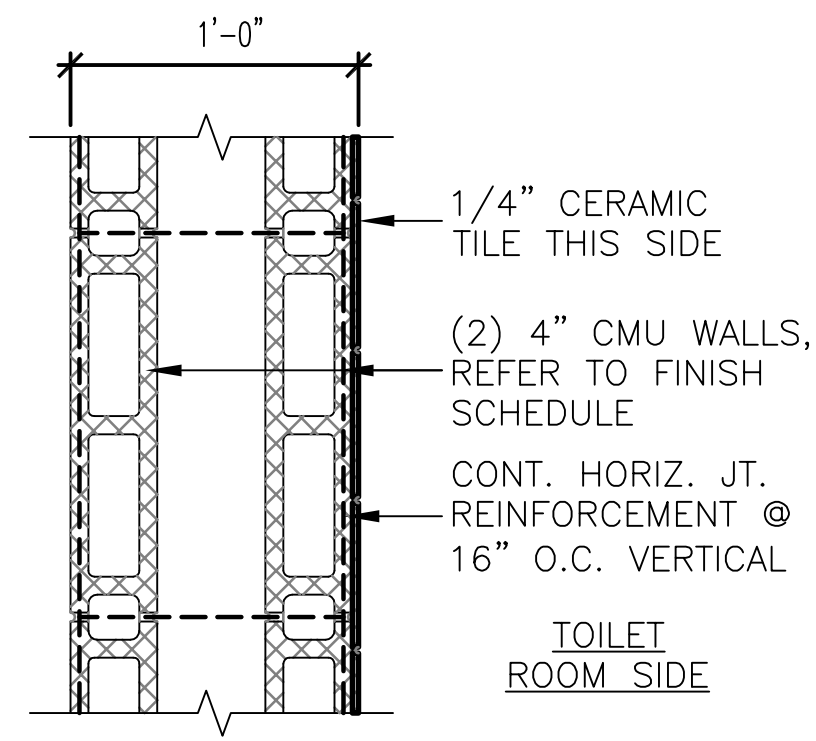
D STEEL STUD & GYPSUM BOARD WALL FURRING



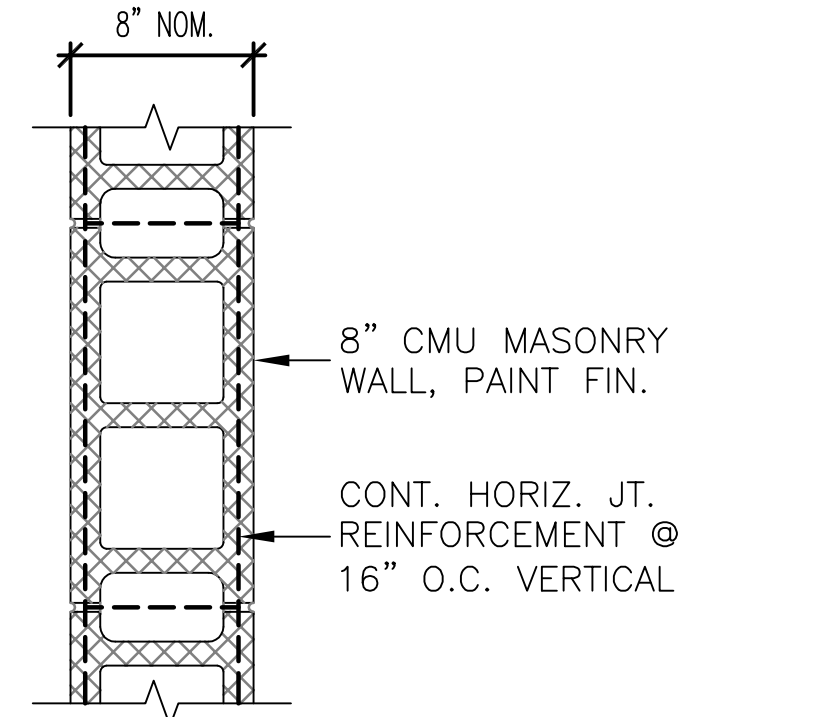
B 8" CMU MASONRY WALL W/ FURRING



E WASH BAY STEEL STUD HIGH PARTITION

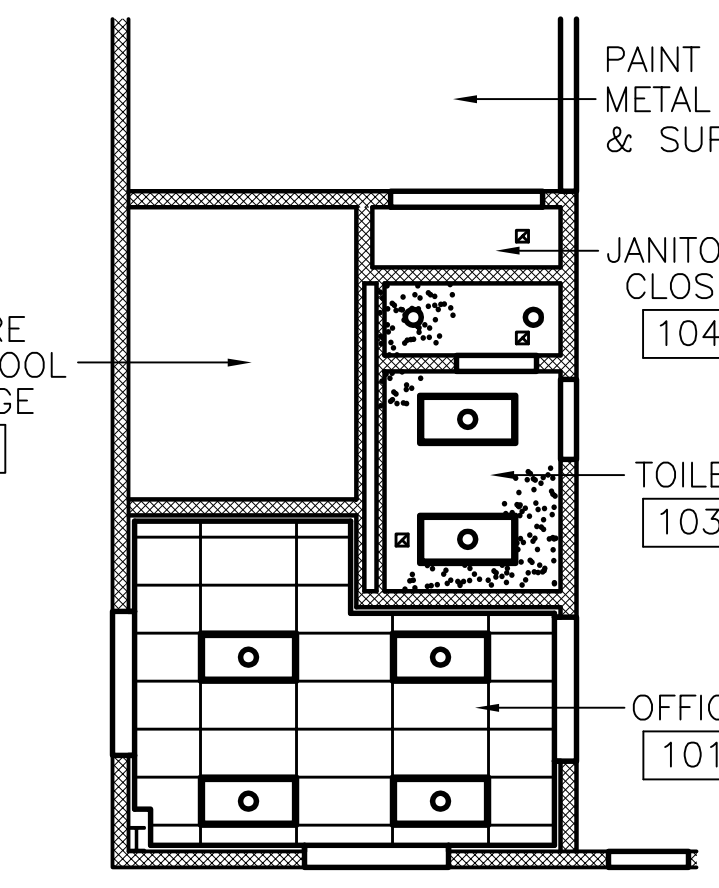


C MASONRY PLUMBING WALL W/ WAINSCOT



F 8" CMU MASONRY WALL - 2 HOUR FIRE RATING (UL DESIGN NO. U905)

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



3 PARTIAL CEILING PLAN
 SCALE: 1/4" = 1'-0"

TRUE NORTH
 PLAN NORTH
3 GROUND FLOOR PLAN
 SCALE: 1/8" = 1'-0"

GENERAL NOTE:
 ALL METAL BUILDING ENGINEERING & CONSTRUCTION BY METAL BUILDING MANUFACTURER.

NEW COLUMNS ASSUMED TO BE CRANE COLUMNS (NOT PART OF THE BUILDING FRAME) COLUMN CONNECTIONS MUST BE DESIGNED FOR CRANE LATERAL LOADS AND STRUCTURE MUST BE DESIGNED TO RESIST THESE LOADS. FOUNDATION DESIGN LOADS REMAIN THE SAME.

CEILING LEGEND

- 1/2" MOISTURE RESISTANT GYPSUM BOARD CEILING METAL STUD FRAMING.
- 2 X 4 SUSPENDED ACOUSTICAL TILE CEILING SYSTEM.
- 2 X 4 LED LIGHT FIXTURES REFER TO ELECTRICAL DRAWINGS FOR EXACT LOCATIONS & VERIFICATION OF FIXTURE QUANTITIES.
- 6" LED DOWNLIGHT
- EXHAUST FAN, REFER TO MECHANICAL

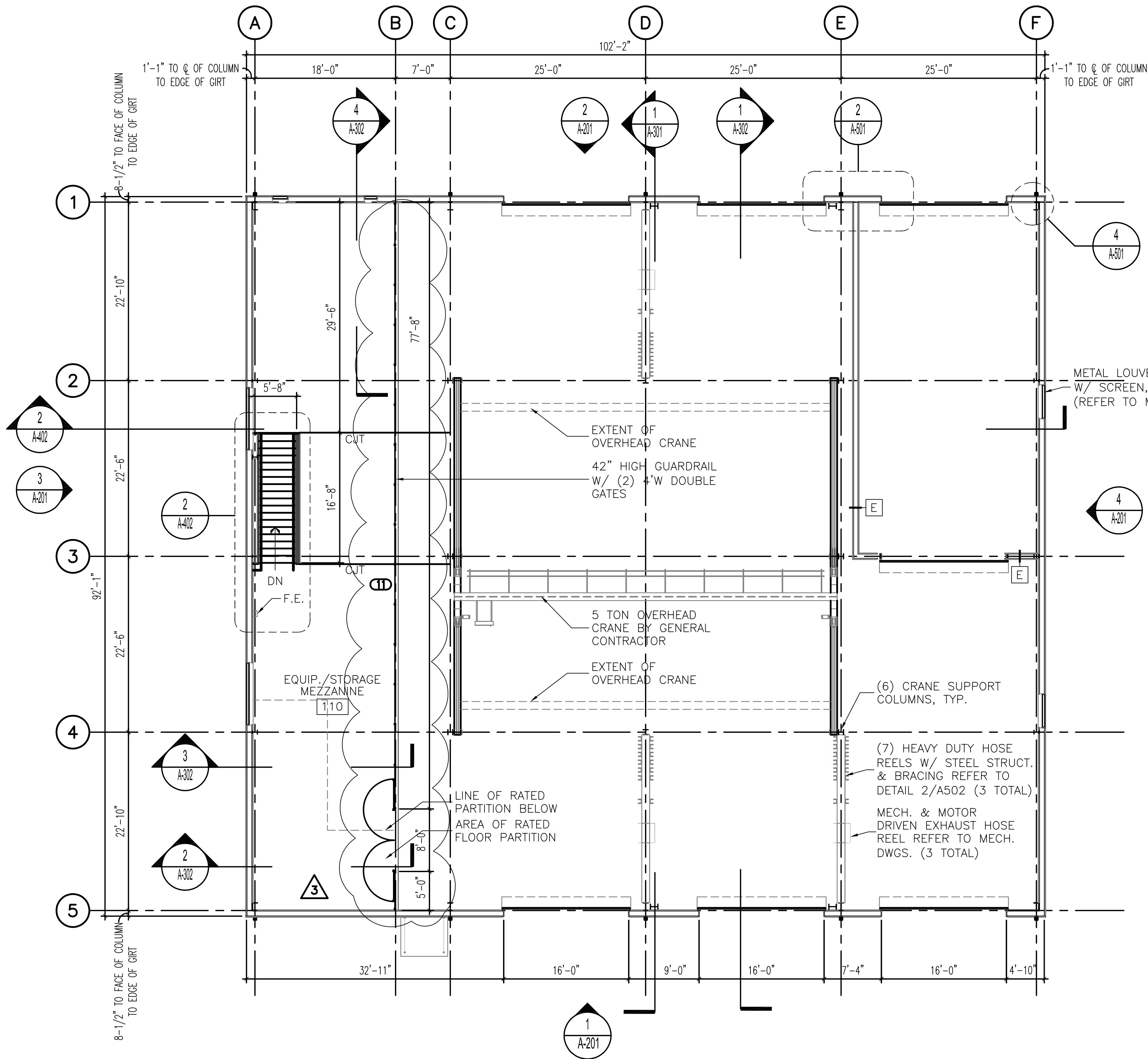
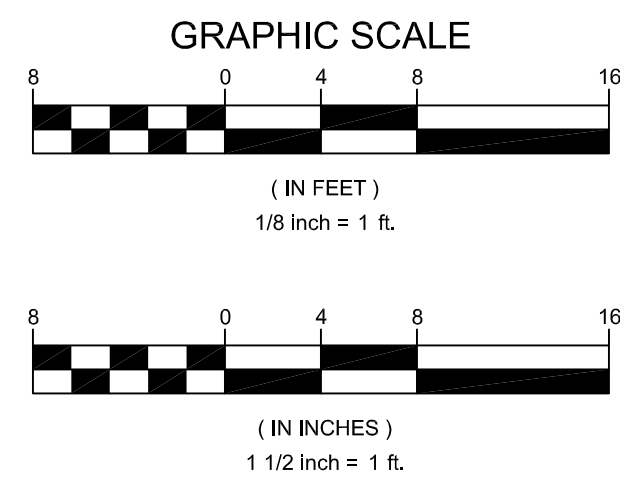
GENERAL CEILING NOTE:

- FOR EXIT & EMERGENCY LIGHTING REFER TO ELECTRICAL DRAWINGS & SPECIFICATIONS.
- FOR SWITCHING & WIRING REFER TO ELECTRICAL DRAWINGS & SPECIFICATIONS.
- FIRE ALARM SYSTEM SHALL BE COORDINATED ON THE ELECTRICAL DRAWINGS & SPECIFICATIONS. FLOOR CONSTRUCTION ABOVE ROOMS 101 AND 102 TO HAVE 2-HR RATING COMPLYING WITH UL#D716.

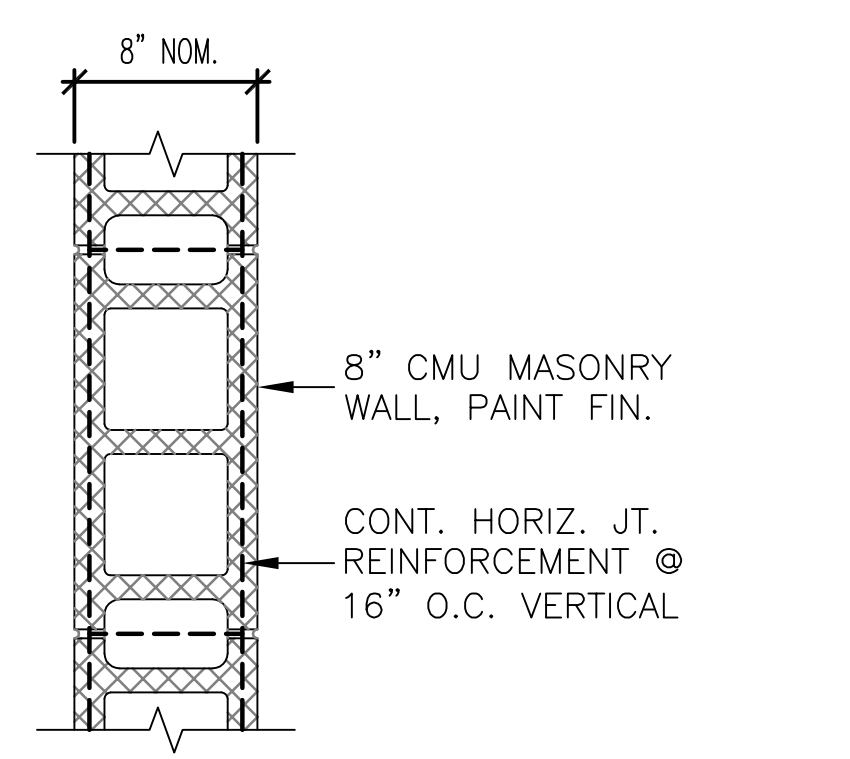
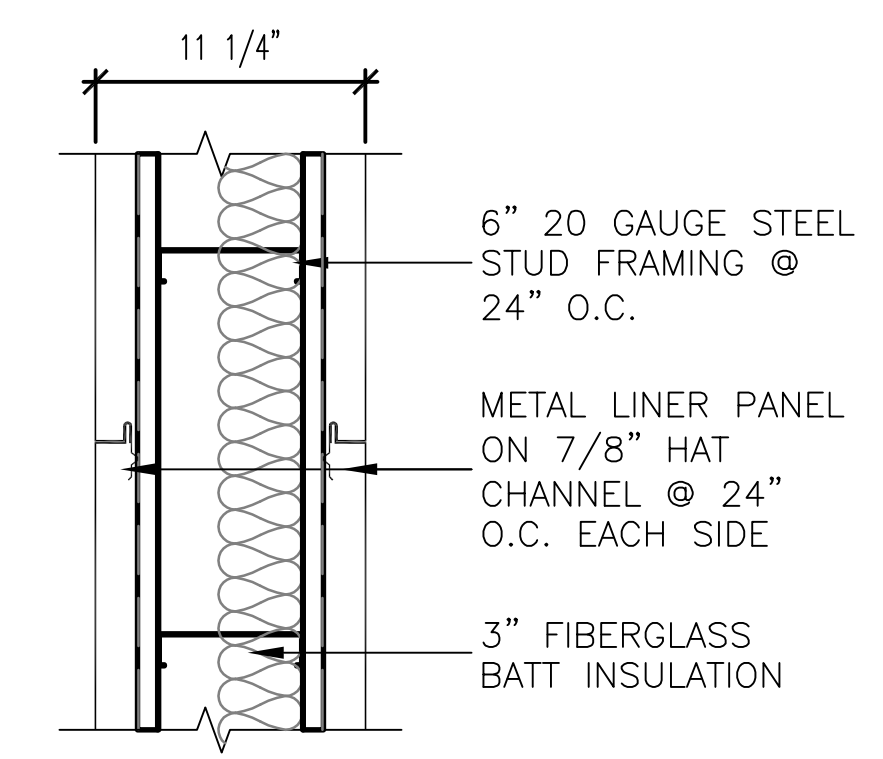
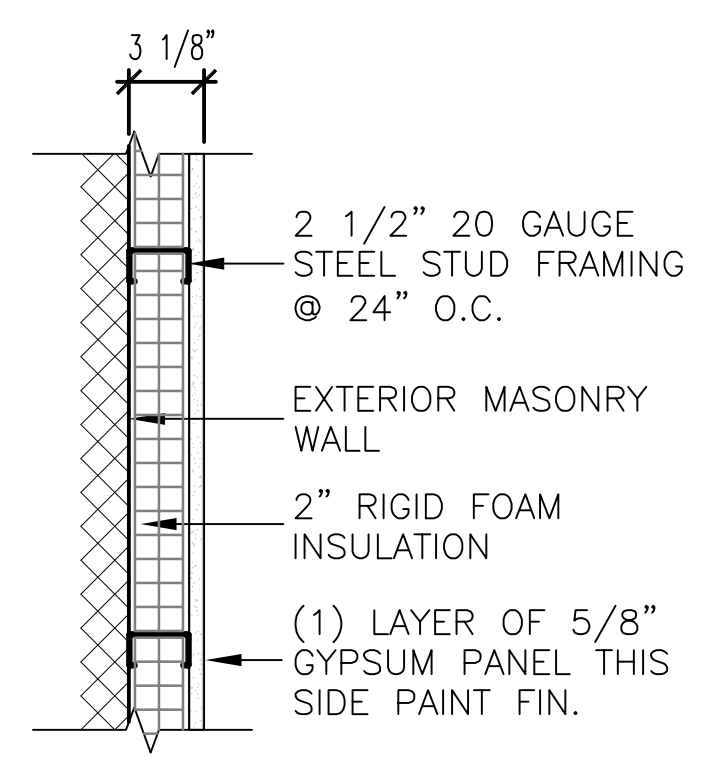
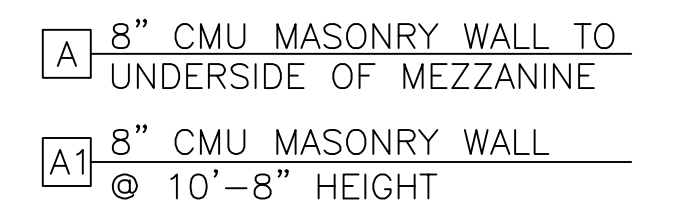
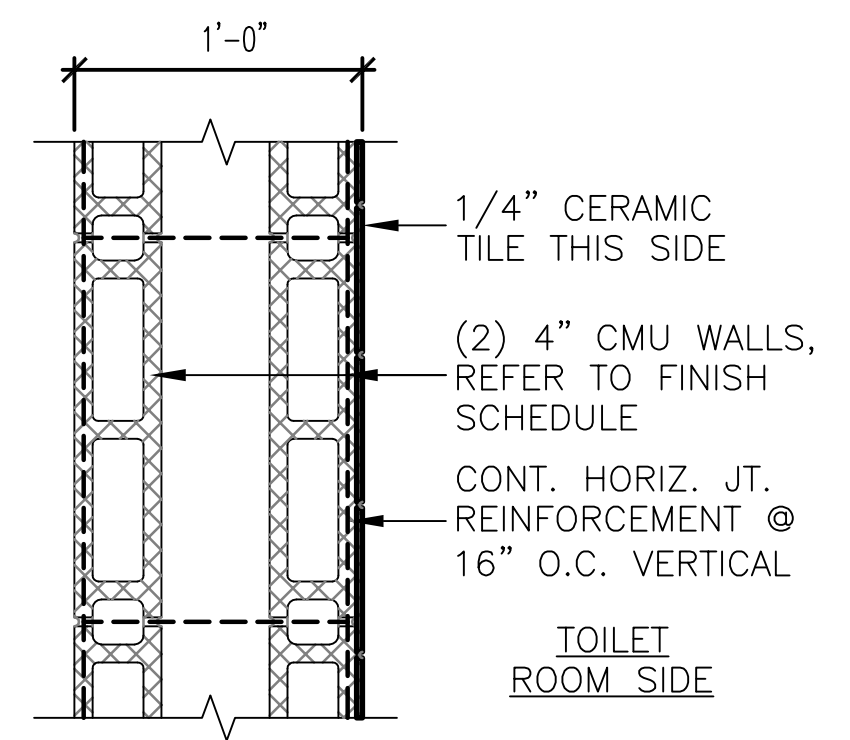
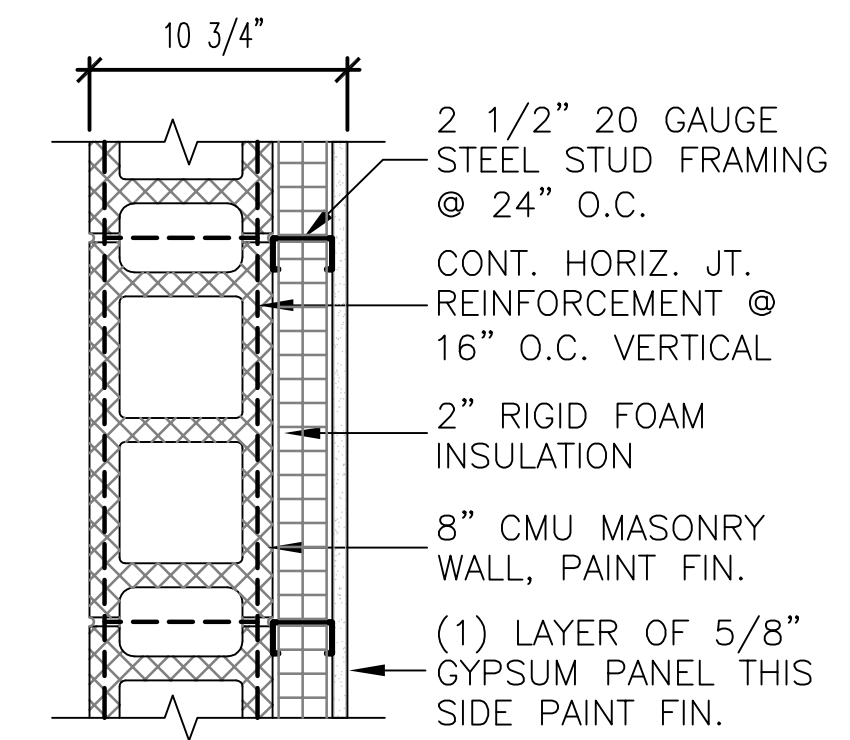
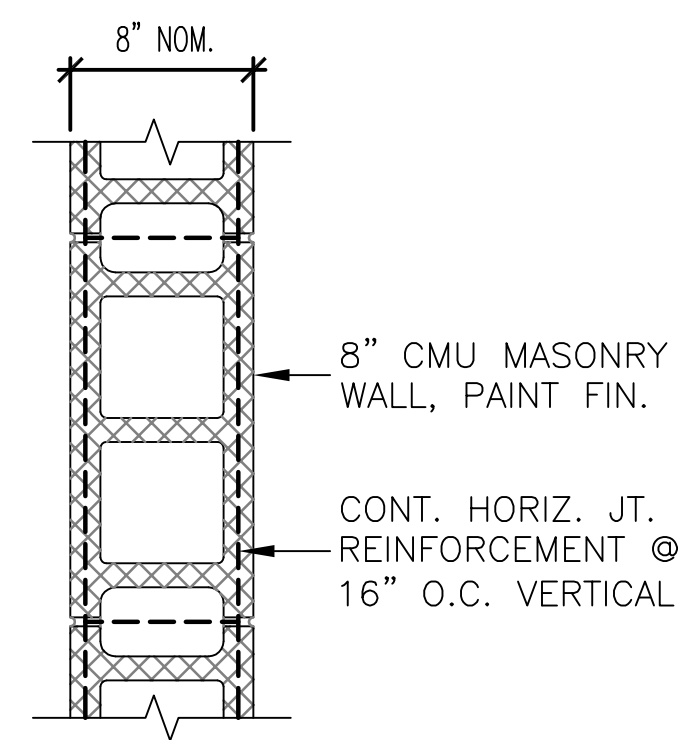
Q:\NOE\120995_021_S1_Georges_Maintenance\CADD\Architectural\Maintenance Building_CAD\A11_GROUND LEVEL.dwg

ADDENDUMS / REVISIONS	
3	8/8/17 ADDENDUM 3

CONTRACT	BRIDGE NO.	N/A
T201680104	DESIGNED BY:	DCH
COUNTY	CHECKED BY:	KNM
NEW CASTLE		



METAL LOUVER UNIT W/ SCREEN, TYP. (REFER TO MECH. DWGS.)



TRUE NORTH PLAN NORTH

1 MEZZANINE FLOOR PLAN SCALE: 1/8" = 1'-0"

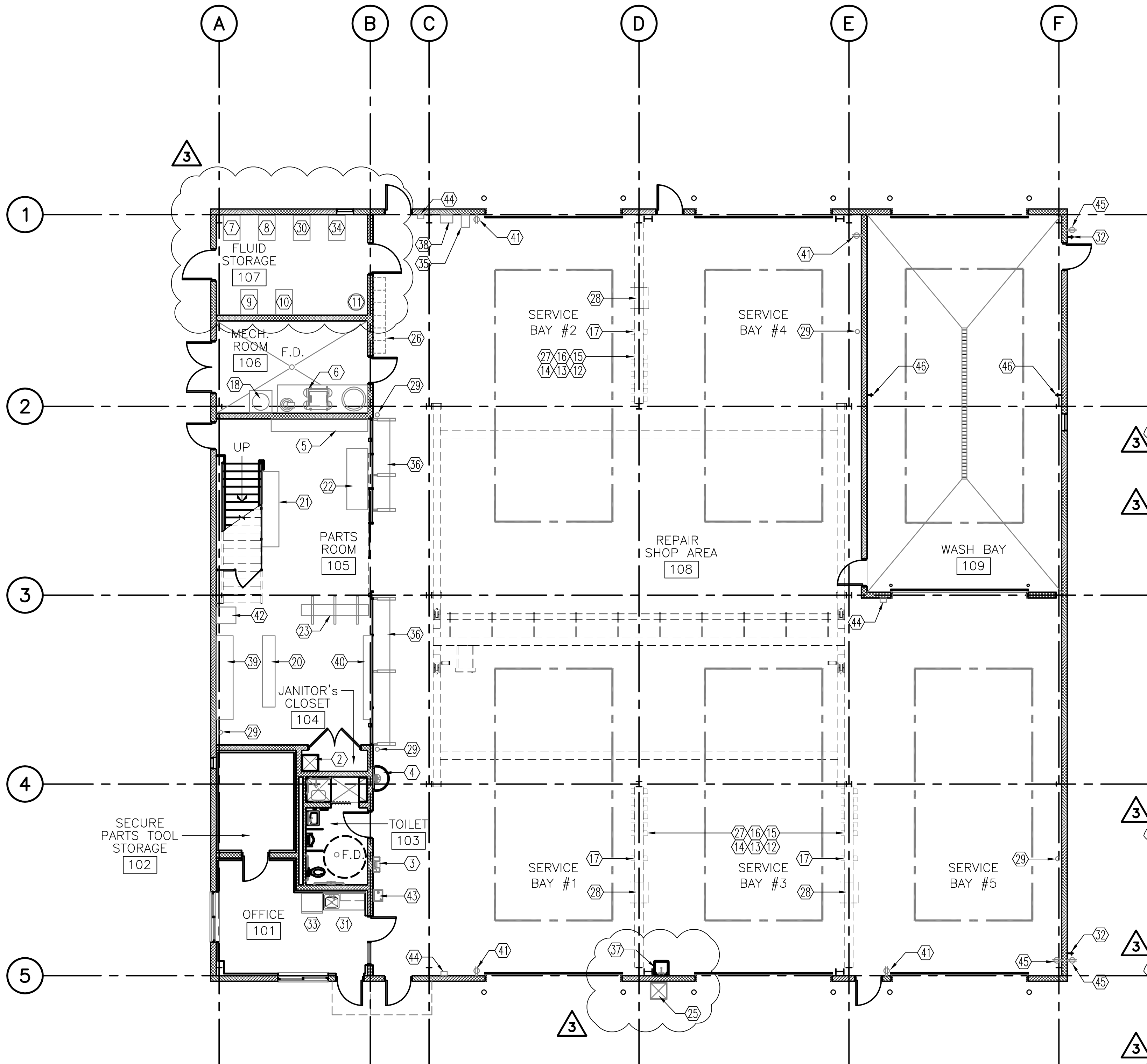
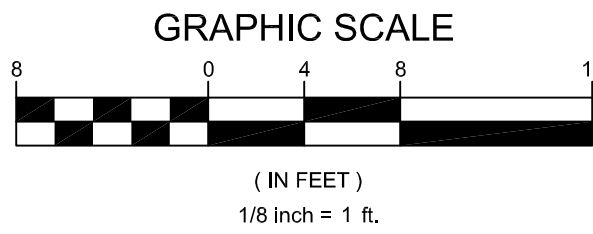
NOTE:
1. FLOOR AREA INDICATED ON PLAN TO BE FIRE RATED SHALL COMPLY WITH UL#D716-2HOUR ASSEMBLY

GENERAL NOTE:
ALL METAL BUILDING ENGINEERING & CONSTRUCTION BY METAL BUILDING MANUFACTURER.

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

ADDENDUMS / REVISIONS	
3	8/8/17 ADDENDUM 3

CONTRACT	BRIDGE NO.	N/A
T201680104	DESIGNED BY:	DCH
COUNTY	CHECKED BY:	KNM
NEW CASTLE		



TRUE NORTH
 PLAN NORTH
 1 GROUND FLOOR PLAN
 SCALE: 1/8" = 1'-0"

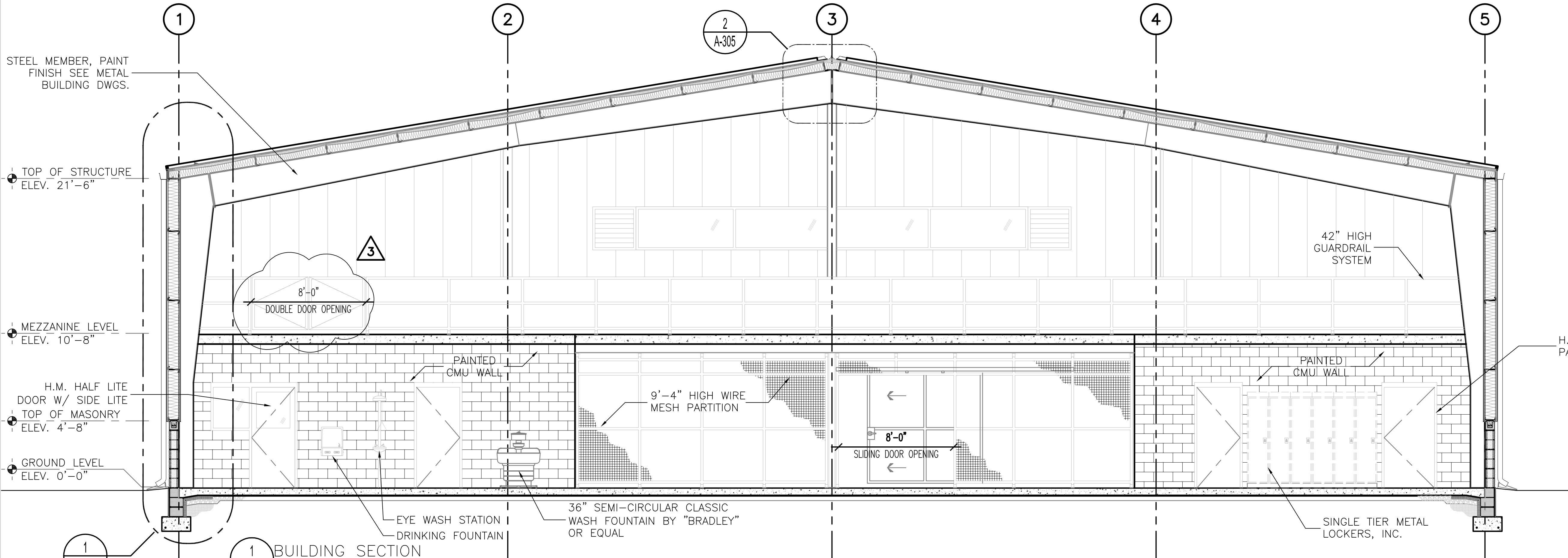
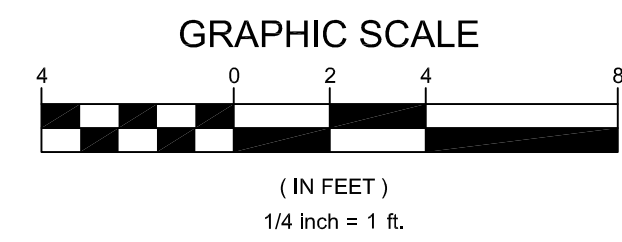
GENERAL NOTES:
 ALL HOSE REEL LENGTHS TO EXTEND A MINIMUM OF 15'-0" BEYOND THE EXTERIOR FACE OF THE BUILDING FOR OUTSIDE SERVICE OF TRUCKS. HEAVY DUTY HOSE REELS TO ACCOMMODATE 75 FOOT HOSE.
 THE (5) HEAVY DUTY SERIES HOSE REELS SHALL BE PROVIDED AND GROUPED TOGETHER FOR THE FLUIDS LISTED IN THE EQUIPMENT SCHEDULE. (4) OF THE (5) HOSE REEL FLUIDS TO BE PROVIDED WITH STEEL PIPE, THE REEL CONTAINING ANTI-FREEZE SHALL USE COPPER PIPING. PROVIDE HOSE REELS FOR COMPRESSED AIR AND ELECTRIC AT SAME LOCATION.
 ALL EQUIPMENT SHOWN DIAGRAMMATICALLY, COORDINATE EXACT LOCATION WITH OWNER BEFORE INSTALLATION.
 ALL METAL BUILDING ENGINEERING & CONSTRUCTION BY METAL BUILDING MANUFACTURER.

XX EQUIPMENT SCHEDULE

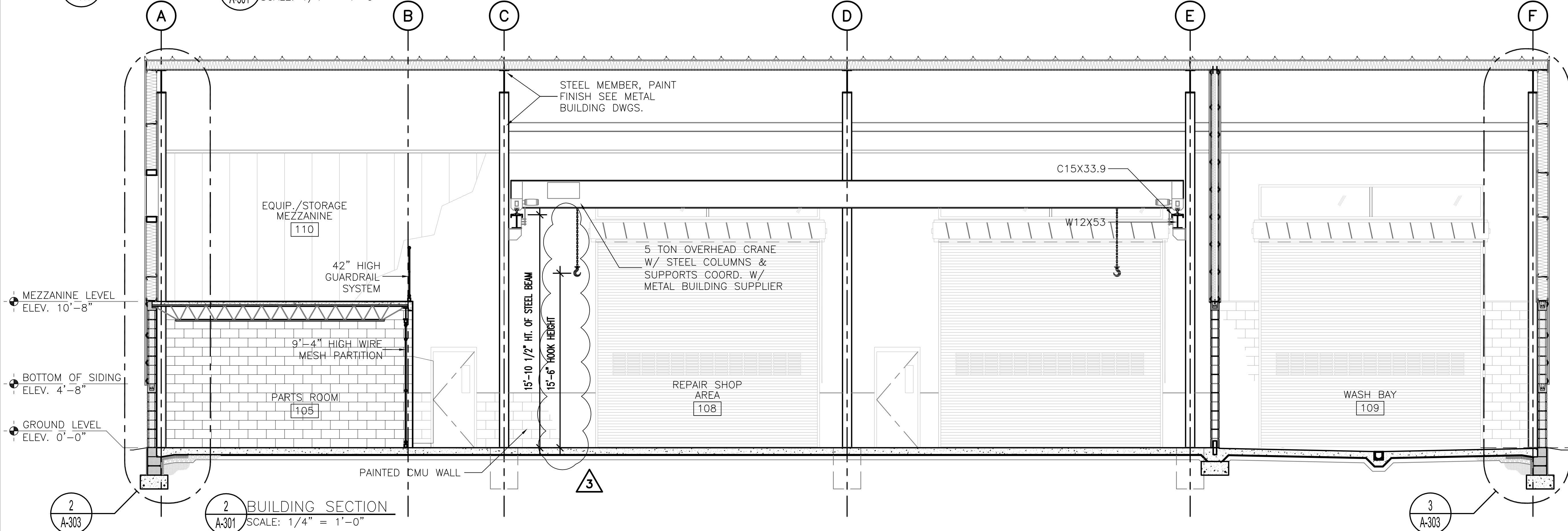
EQUIP. NO.	EQUIPMENT DESCRIPTION	EQUIP. QUANT.	FURNISHED BY	SIZE (DxHxL)
01	FOUR HOSE HEAVY DUTY MOBILE VEHICLE LIFT SYSTEM - 64,000 LBS. CAPACITY - 208V 3-PHASE 30A TWIST LOCK PLUG IN DEVICE	2	NIC - BY OWNER	-
02	MOP SINK	1	BY GENERAL CONTRACTOR	18" x 18"
03	EYE WASH	1	BY GENERAL CONTRACTOR	-
04	HALF ROUND HAND SINK	1	BY GENERAL CONTRACTOR	-
05	PARTS CABINET	1	NIC - BY OWNER	1'-6" x 11'-6"
06	AIR COMPRESSOR - 110 GALLON TANK REFER TO MECHANICAL DRAWINGS	1	BY GENERAL CONTRACTOR	-
07	15-40 MOTOR OIL PUMP ASSEMBLY AND 250 GAL. BULK STORAGE CUBE	1	BY GENERAL CONTRACTOR	-
08	10-30 MOTOR OIL PUMP ASSEMBLY AND 60 GAL. BULK STORAGE CUBE	1	BY GENERAL CONTRACTOR	-
09	HYDRAULIC OIL PUMP ASSEMBLY AND STATIONARY 250 GAL. CUBE	1	BY GENERAL CONTRACTOR	-
10	TRANSMISSION FLUID PUMP ASSEMBLY AND STATIONARY 120 GAL. CUBE	1	BY GENERAL CONTRACTOR	-
11	GREASE PUMP ASSEMBLY AND 55 GAL. DRUM WITH MOUNTING BRACKETS, PUMP, AND FLANGE FOR CONNECTION	1	BY GENERAL CONTRACTOR	-
12	CLG. MOUNTED HEAVY DUTY SERIES HOSE REEL - MOTOR OIL 15-40	3	BY GENERAL CONTRACTOR	-
13	CLG. MOUNTED HEAVY DUTY SERIES HOSE REEL - ANTI-FREEZE (PIPED IN COPPER)	3	BY GENERAL CONTRACTOR	-
14	CLG. MOUNTED HEAVY DUTY SERIES HOSE REEL - GREASE	3	BY GENERAL CONTRACTOR	-
15	CLG. MOUNTED HEAVY DUTY SERIES HOSE REEL - HYDRAULIC FLUID	3	BY GENERAL CONTRACTOR	-
16	CLG. MOUNTED HEAVY DUTY SERIES HOSE REEL - TRANSMISSION FLUID	3	BY GENERAL CONTRACTOR	-
17	CLG. MOUNTED HEAVY DUTY SERIES HOSE REEL - COMPRESSED AIR LINES	3	BY GENERAL CONTRACTOR	-
18	NATURAL GAS FIRED 50 GAL. HOT WATER HEATER REFER TO MECH. DRAWINGS	1	BY GENERAL CONTRACTOR	-
19	PORTABLE WELDER - 220V 1-PHASE 50A TWIST LOCK PLUG IN DEVICE, 3 OUTLETS TO BE PROVIDED AROUND SHOP	1	NIC - BY OWNER	-
20	RACK	1	NIC - BY OWNER	1'-6" x 8'-6"
21	PART CABINET	1	NIC - BY OWNER	2'-0" x 9'-0"
22	PARTS CASE	1	NIC - BY OWNER	2'-6" x 7'-4"
23	PARTS RACK	1	NIC - BY OWNER	1'-4" x 8'-4"
24	NOT USED	-	-	-
25	500 GAL. DOUBLE WALLED WASTE HYDRAULIC RECOVERY OIL TANK WITH INTERIOR BASIN	1	BY GENERAL CONTRACTOR	-
26	SINGLE TIER FULL HEIGHT FLOOR MOUNTED METAL LOCKER	6	NIC - BY OWNER	18" x 18" x 7'-0"
27	CEILING MOUNTED HEAVY DUTY SERIES REEL - ELECTRIC LINE	3	BY GENERAL CONTRACTOR	-
28	OVERHEAD EXHAUST REMOVAL SYSTEM HOSE REEL W/ Y ADAPTER & ADD'L HOSE	3	BY GENERAL CONTRACTOR	-
29	WALL MOUNTED COMPRESSED AIR DROPS STATIONS AT 48" AFF.	4	BY GENERAL CONTRACTOR	-
30	ANTI-FREEZE PUMP ASSEMBLY AND 120 GAL. BULK STORAGE CUBE	1	BY GENERAL CONTRACTOR	-
31	BASE CABINETS, COUNTER AND SINK W/ (2) 110 V. ELEC. OUTLETS AT 48" AFF.	1	BY GENERAL CONTRACTOR	2'-0" x 5'-0"
32	FROST-PROOF HOSE BIB W/ WALL MTD. HOSE RACK FOR 75' LG. X 3/4" WATER HOSE	2	NIC - BY OWNER	75' LG. X 3/4" WATER HOSE N.I.C.
33	REFRIGERATOR - DO NOT PROVIDE WATER LINE	1	NIC - BY OWNER	-
34	LUBE OIL 55 GAL. BULK STORAGE CUBE	1	BY GENERAL CONTRACTOR	-
35	DRILL PRESS - 208V 3-PHASE 20A PLUG IN DEVICE ON A DEDICATED CIRCUIT	1	NIC - BY OWNER	-
36	WORK BENCH W/ (2) 110 V. ELEC. OUTLETS AT 48" AFF.	2	NIC - BY OWNER	-
37	ENAMELED CAST IRON WALL MOUNTED UTILITY SINK	1	BY GENERAL CONTRACTOR	22" x 18"
38	PEDESTAL GRINDER - 120V 1-PHASE 20A PLUG IN DEVICE ON A DEDICATED CIRCUIT	1	NIC - BY OWNER	-
39	TOOL CABINET W/ (2) 110 V. ELEC. OUTLETS AT 48" AFF.	1	NIC - BY OWNER	2'-0" x 10'-0"
40	FREESTANDING BOOKCASE	1	NIC - BY OWNER	1'-0" x 10'-0"
41	OUTLET FOR PORTABLE WELDER	3	NIC - BY OWNER	-
42	MANUAL 20 TON HYDRAULIC PRESS	1	NIC - BY OWNER	-
43	WALL MOUNTED ELECTRIC DRINKING FOUNTAIN	1	BY GENERAL CONTRACTOR	-
44	FIRE EXTINGUISHERS - WALL MOUNTED	4	BY GENERAL CONTRACTOR	-
45	ELECTRICAL OUTLET 48" AFF.	3	BY GENERAL CONTRACTOR	-
46	STANDARD HOSE BIB & W.P. ELECTRICAL OUTLET FOR WASH EQUIPMENT	2	BY GENERAL CONTRACTOR	-

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 8/8/17 ADDENDUM 3

ADDENDUMS / REVISIONS	
3	8/8/17 ADDENDUM 3



1 BUILDING SECTION
SCALE: 1/4" = 1'-0"



2 BUILDING SECTION
SCALE: 1/4" = 1'-0"

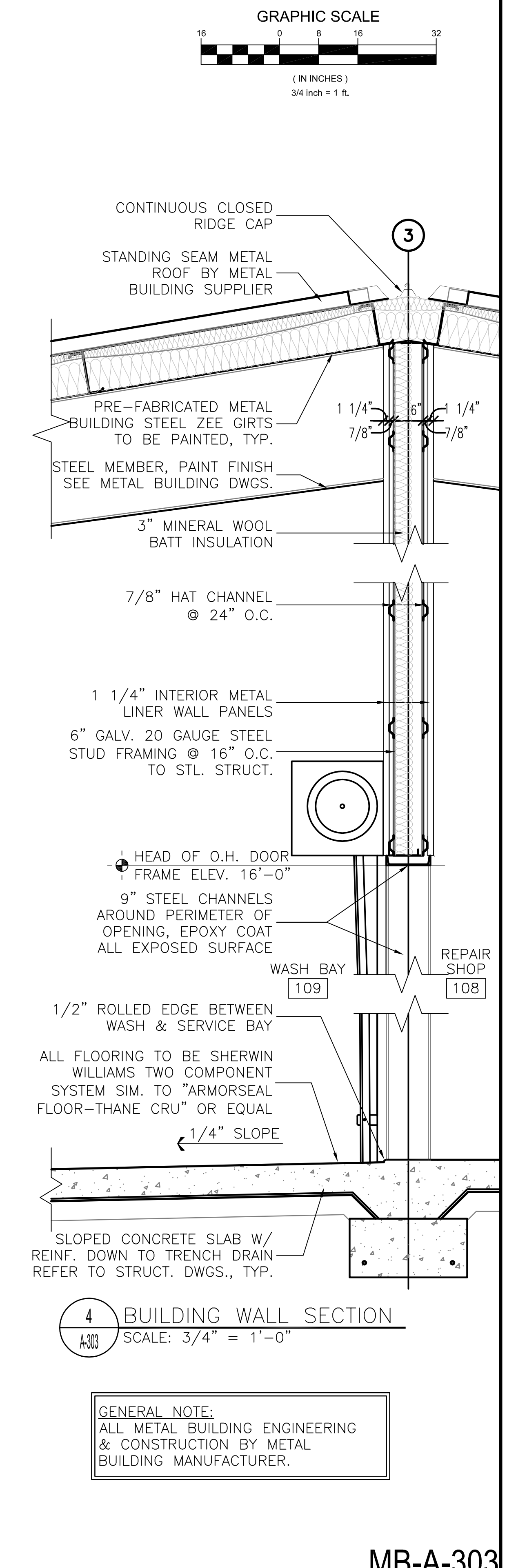
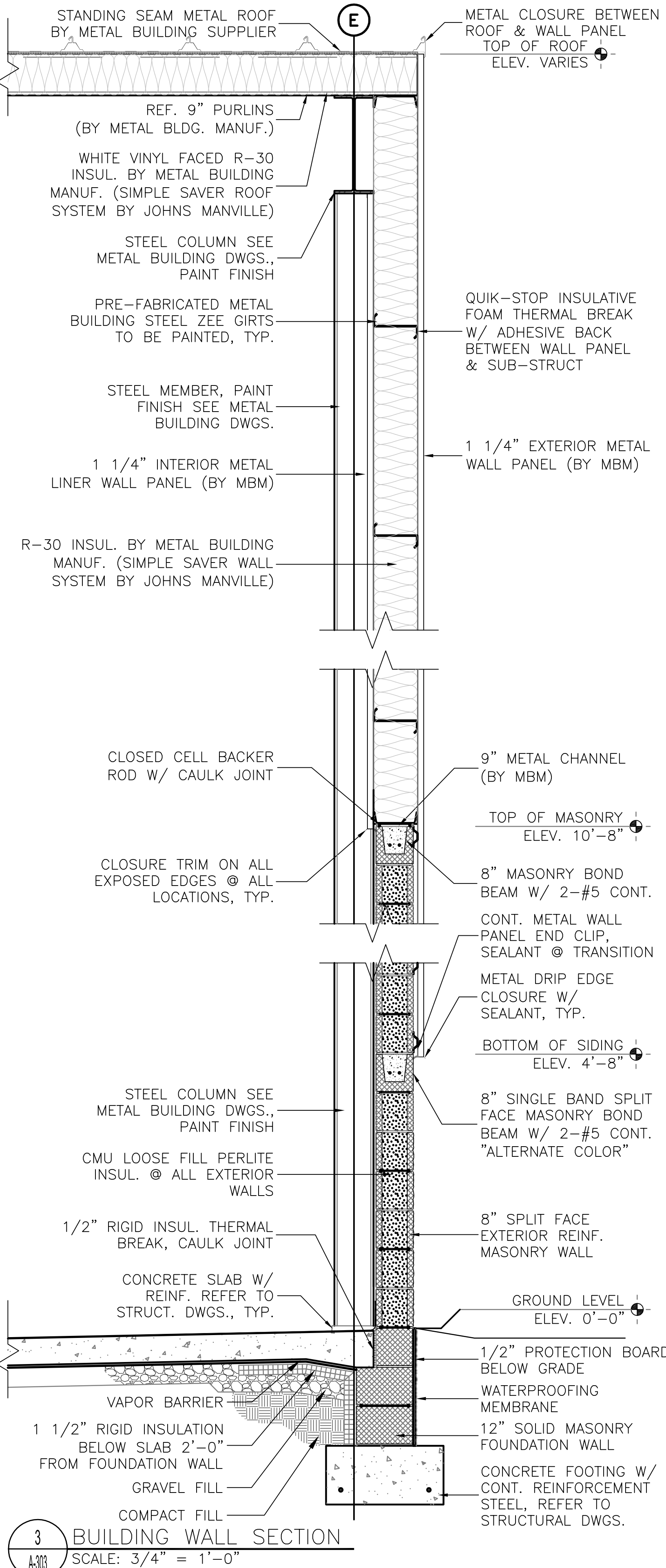
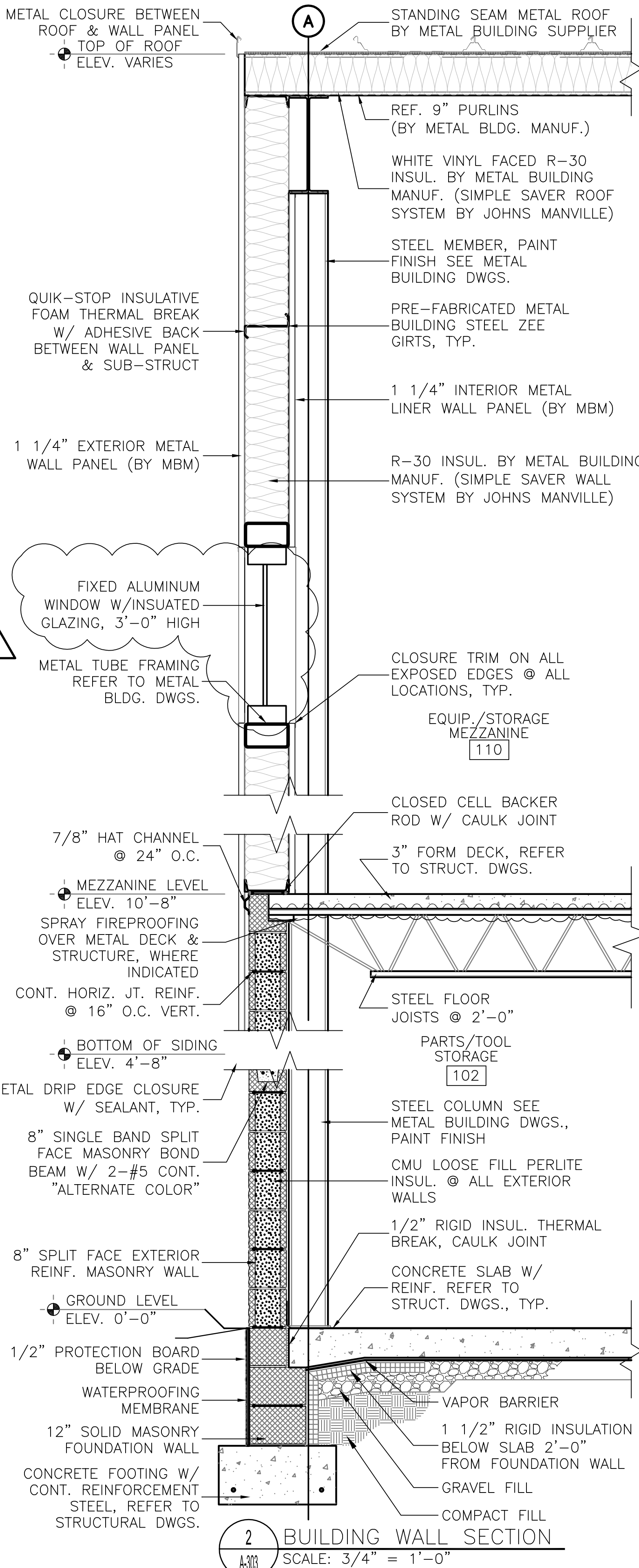
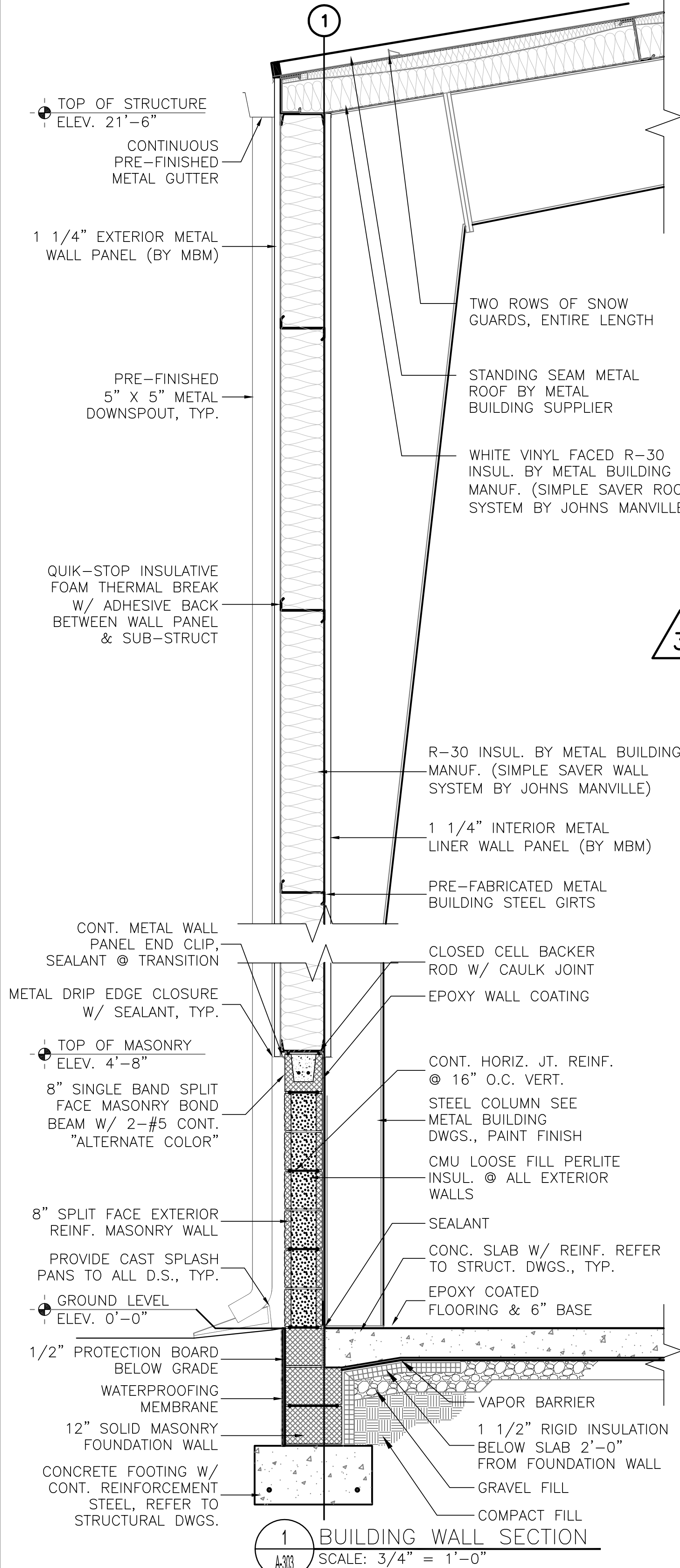
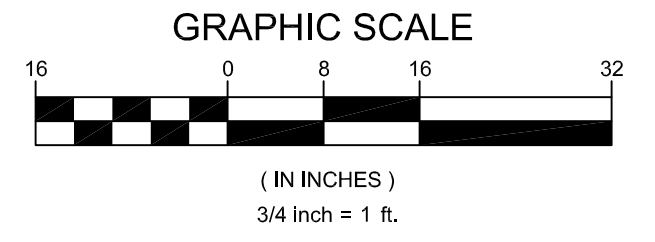
GENERAL NOTE:
ALL METAL BUILDING ENGINEERING
& CONSTRUCTION BY METAL
BUILDING MANUFACTURER.

MB-A-301

ADDENDUMS / REVISIONS	
3	8/8/17 ADDENDUM 3

CONTRACT	BRIDGE NO.	N/A
T201680104	DESIGNED BY:	DCH
COUNTY	CHECKED BY:	KNM
NEW CASTLE		

SHEET NO.	76
TOTAL SHTS.	116



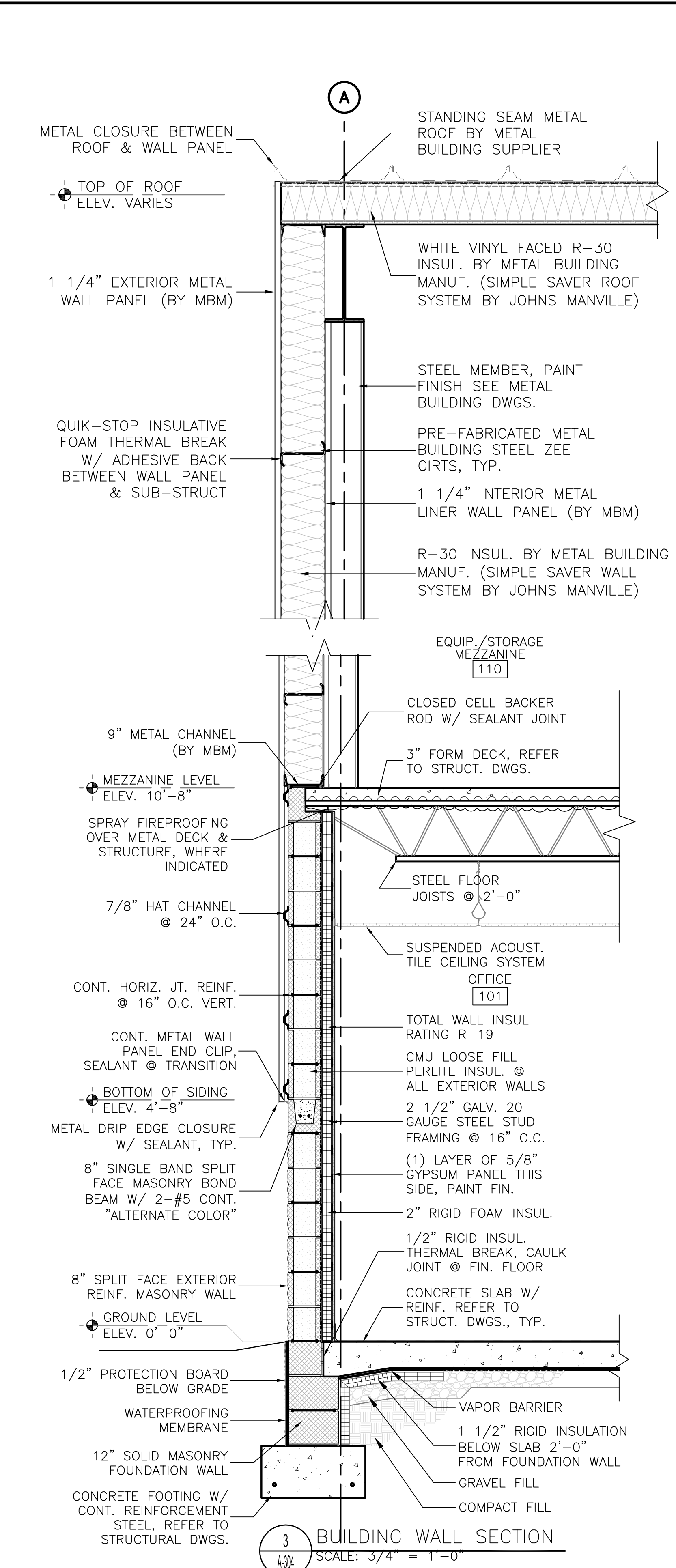
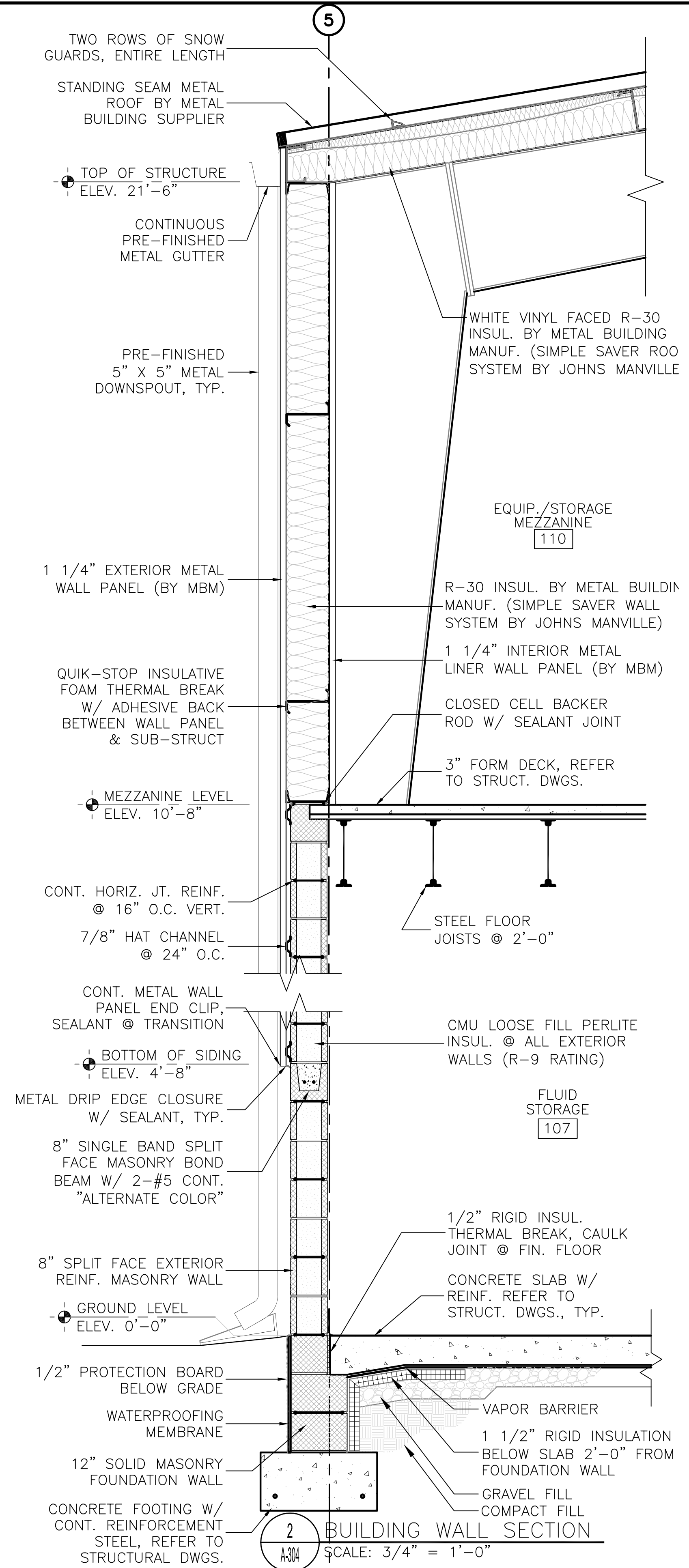
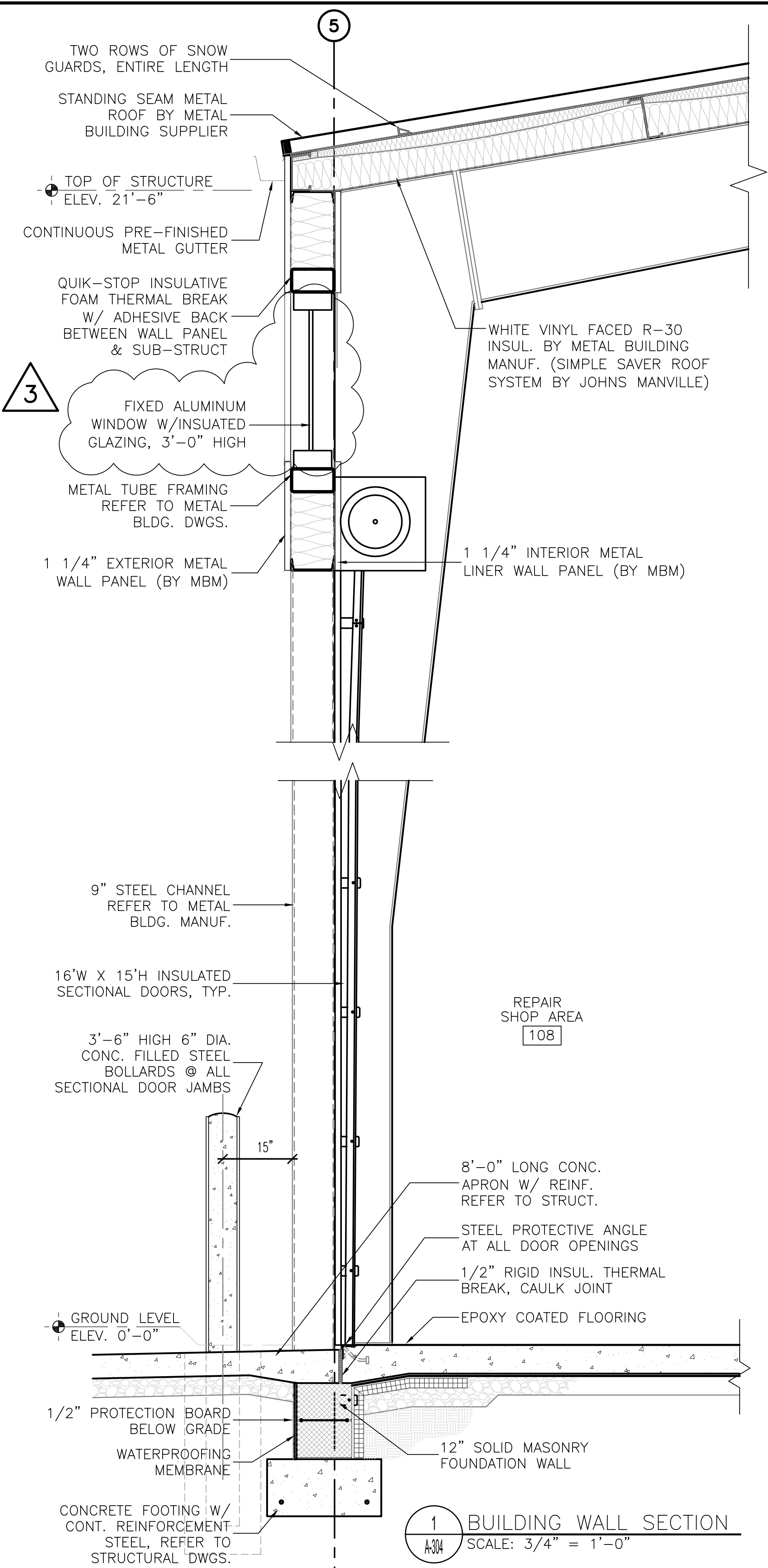
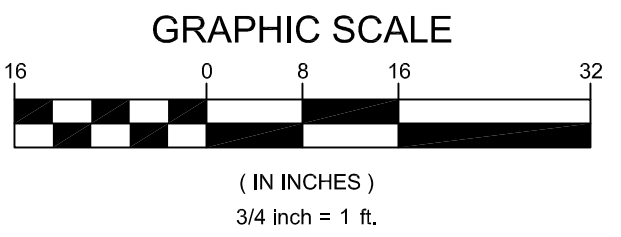
GENERAL NOTE:
ALL METAL BUILDING ENGINEERING & CONSTRUCTION BY METAL BUILDING MANUFACTURER.

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ADDENDUMS / REVISIONS	
8/8/17	ADDENDUM 3

CONTRACT	BRIDGE NO.	N/A
T201680104	DESIGNED BY:	DCH
COUNTY	CHECKED BY:	KNM
NEW CASTLE		

MAINTENANCE BUILDING WALL SECTIONS	SHEET NO.	78
	TOTAL SHTS.	116



1 BUILDING WALL SECTION
SCALE: 3/4" = 1'-0"

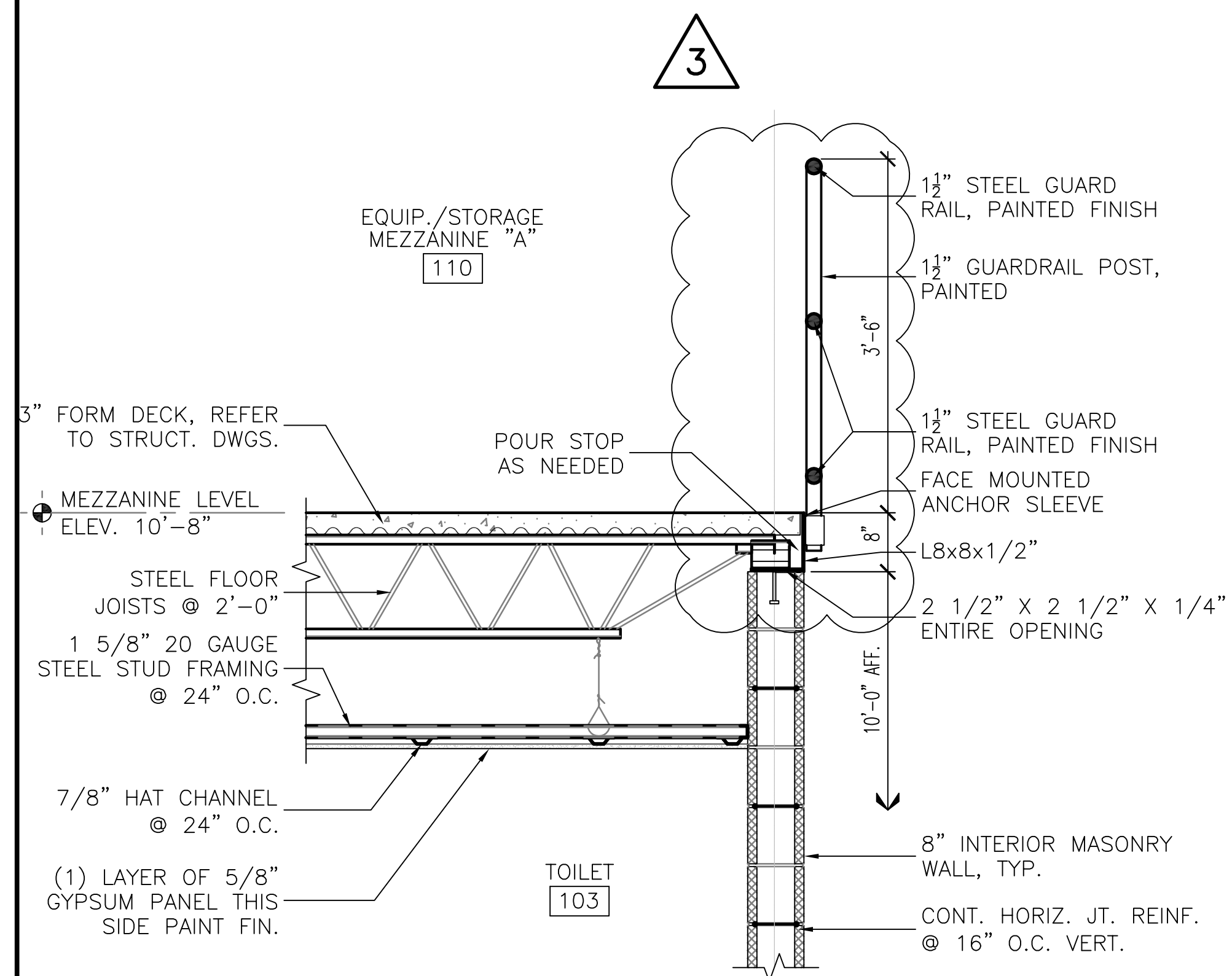
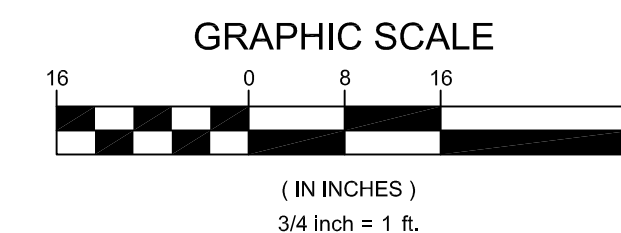
2 BUILDING WALL SECTION
SCALE: 3/4" = 1'-0"

3 BUILDING WALL SECTION
SCALE: 3/4" = 1'-0"

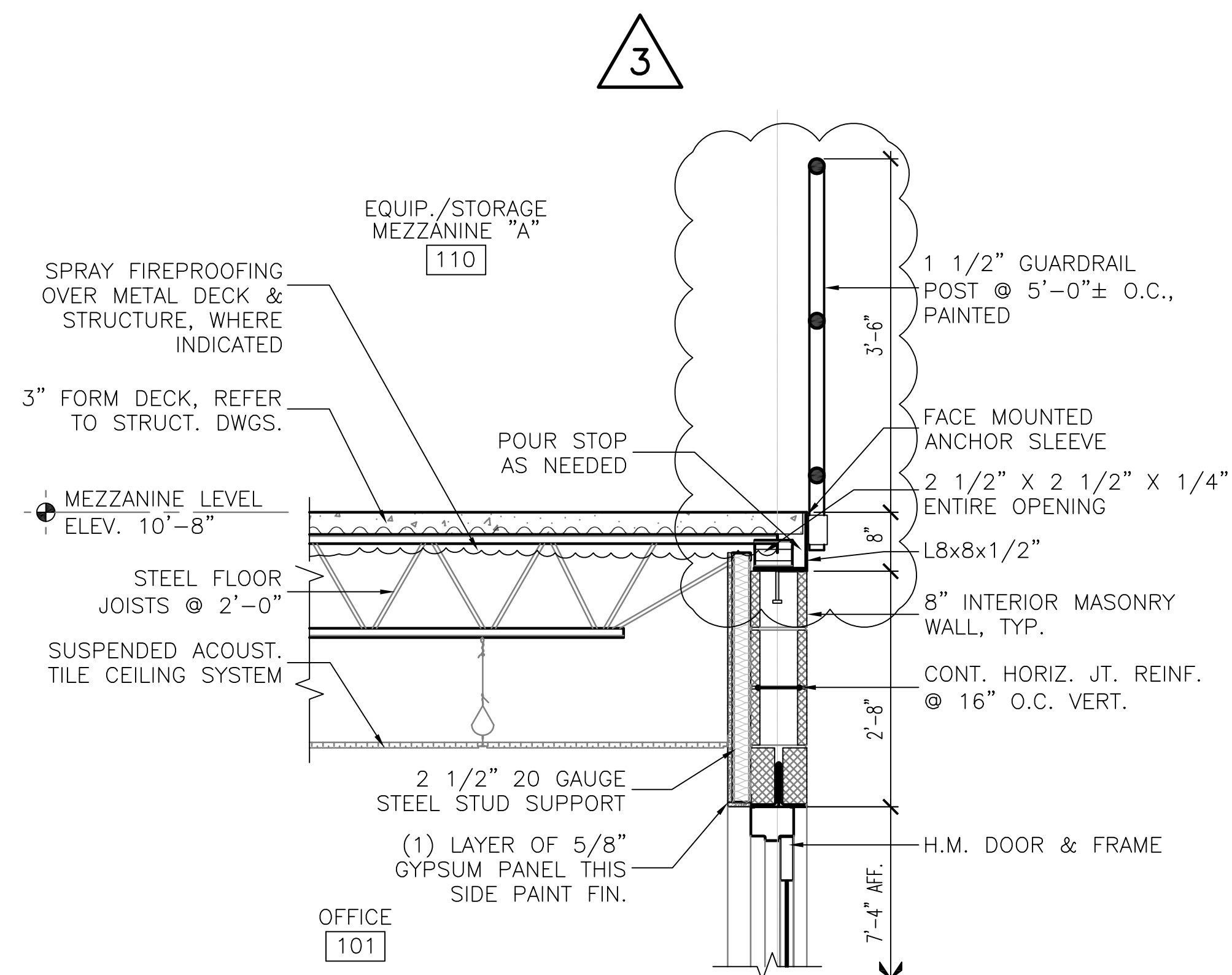
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ADDENDUMS / REVISIONS	
3	8/8/17 ADDENDUM 3

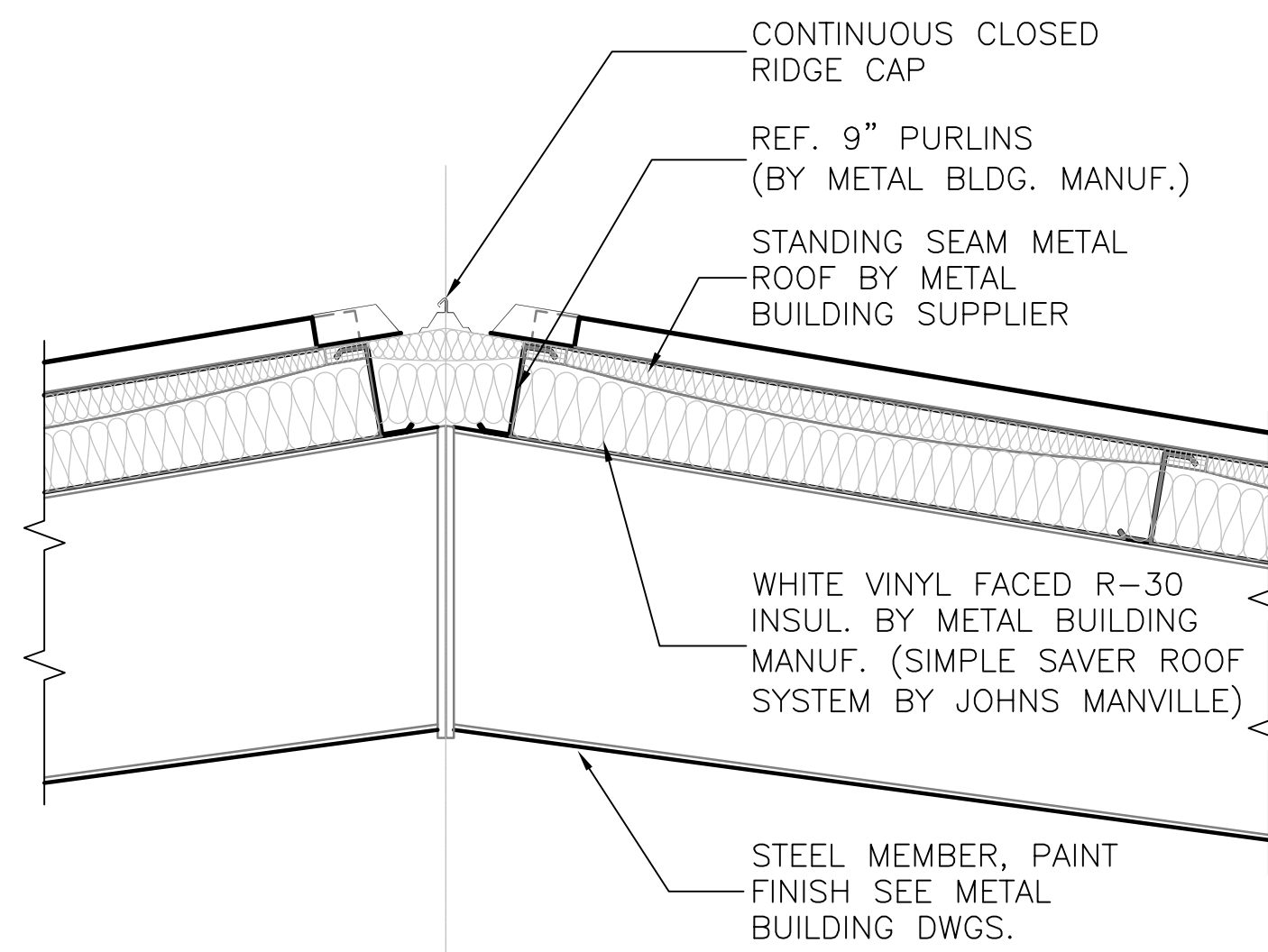
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T201680104	DESIGNED BY: DCH	
COUNTY	CHECKED BY: KNM	
NEW CASTLE		



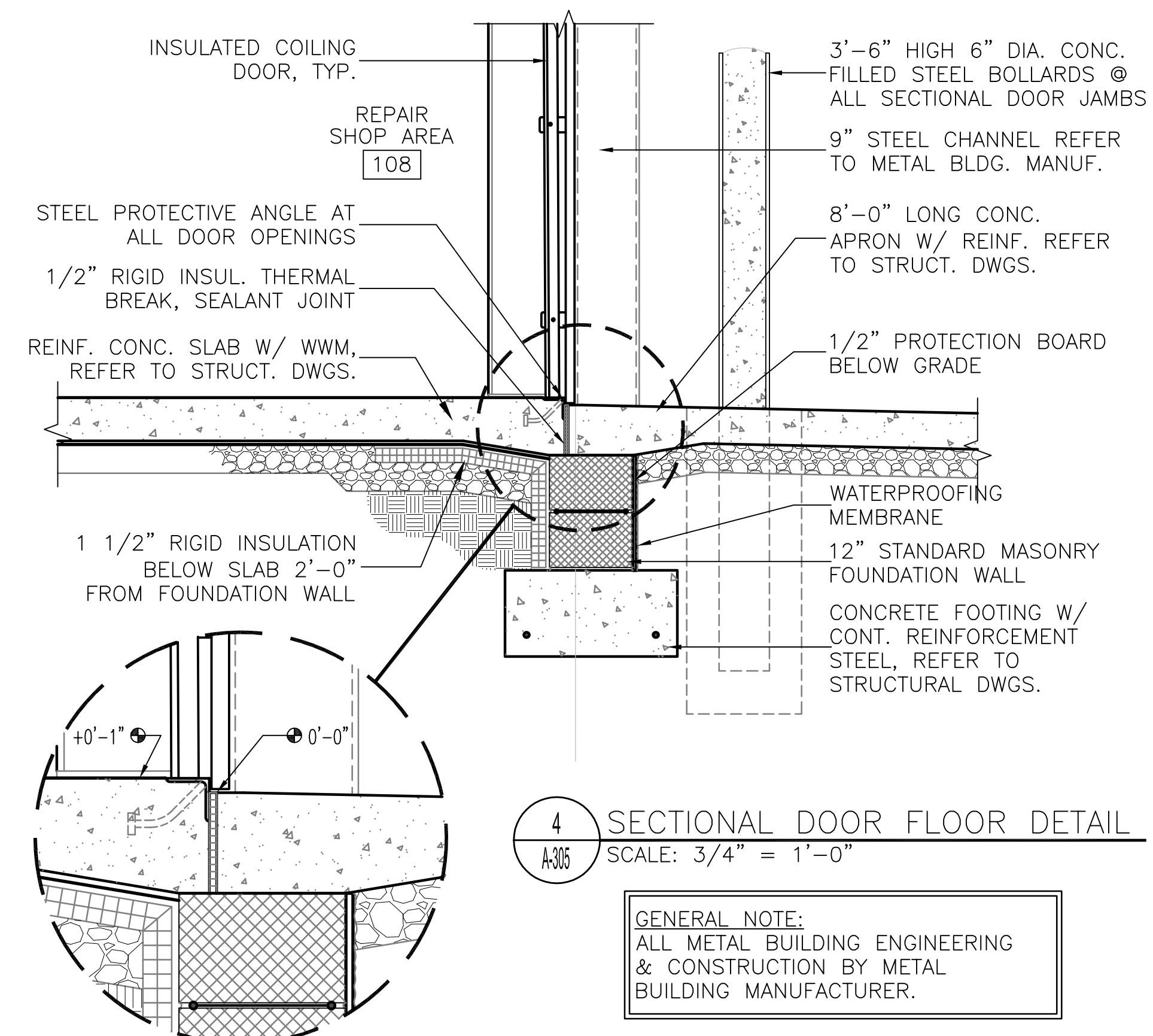
1 MEZZANINE RAIL DETAIL
A-305 SCALE: 3/4" = 1'-0"



2 SOFFIT DETAIL @ OFFICE
A-305 SCALE: 3/4" = 1'-0"

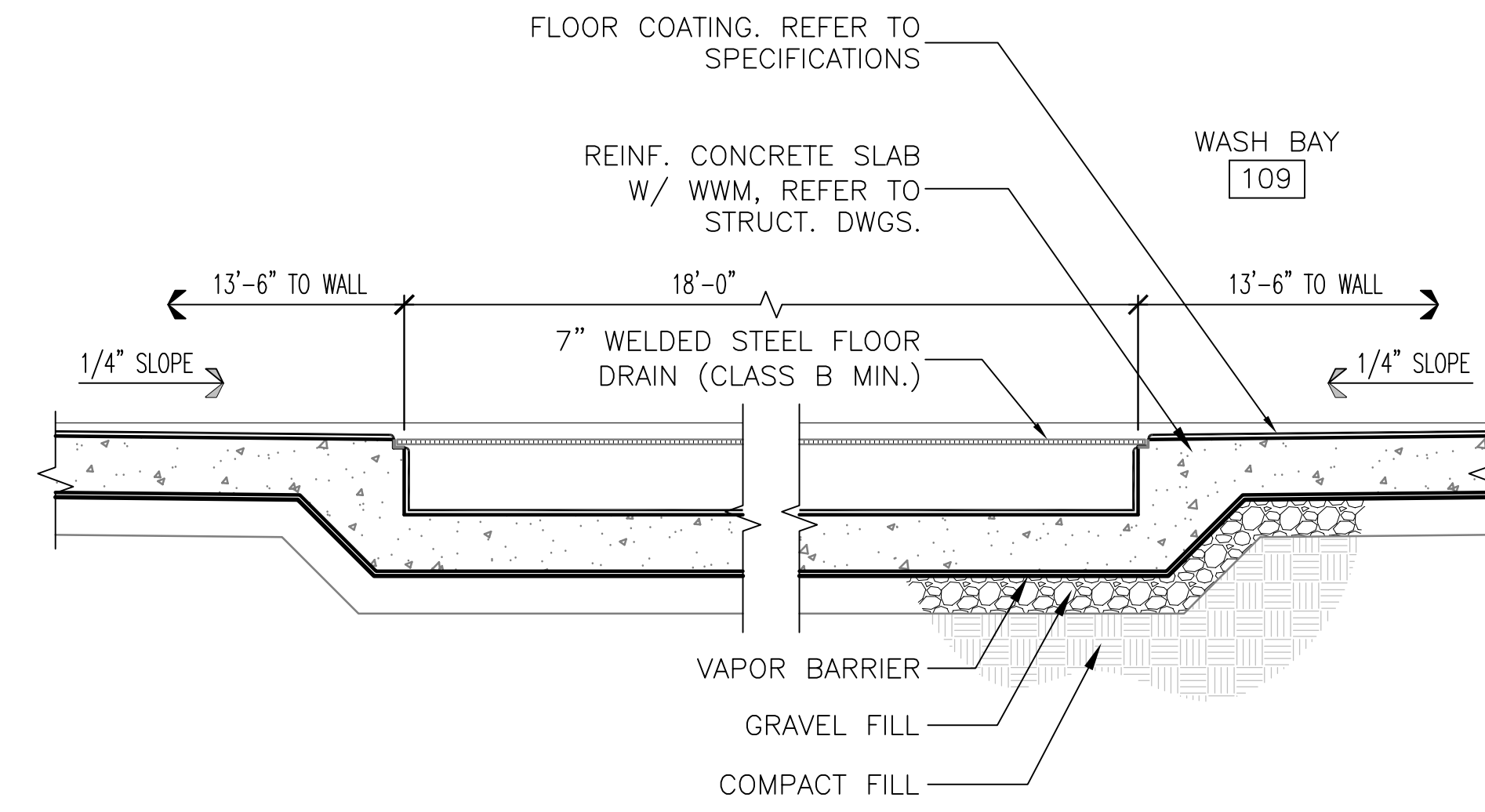


3 ROOF RIDGE DETAIL
A-305 SCALE: 3/4" = 1'-0"



4 SECTIONAL DOOR FLOOR DETAIL
A-305 SCALE: 3/4" = 1'-0"

GENERAL NOTE:
ALL METAL BUILDING ENGINEERING
& CONSTRUCTION BY METAL
BUILDING MANUFACTURER.



5 WASH BAY TRENCH DETAIL
A-305 SCALE: 3/4" = 1'-0"

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ADDENDUMS / REVISIONS	
3	8/8/17 ADDENDUM 3

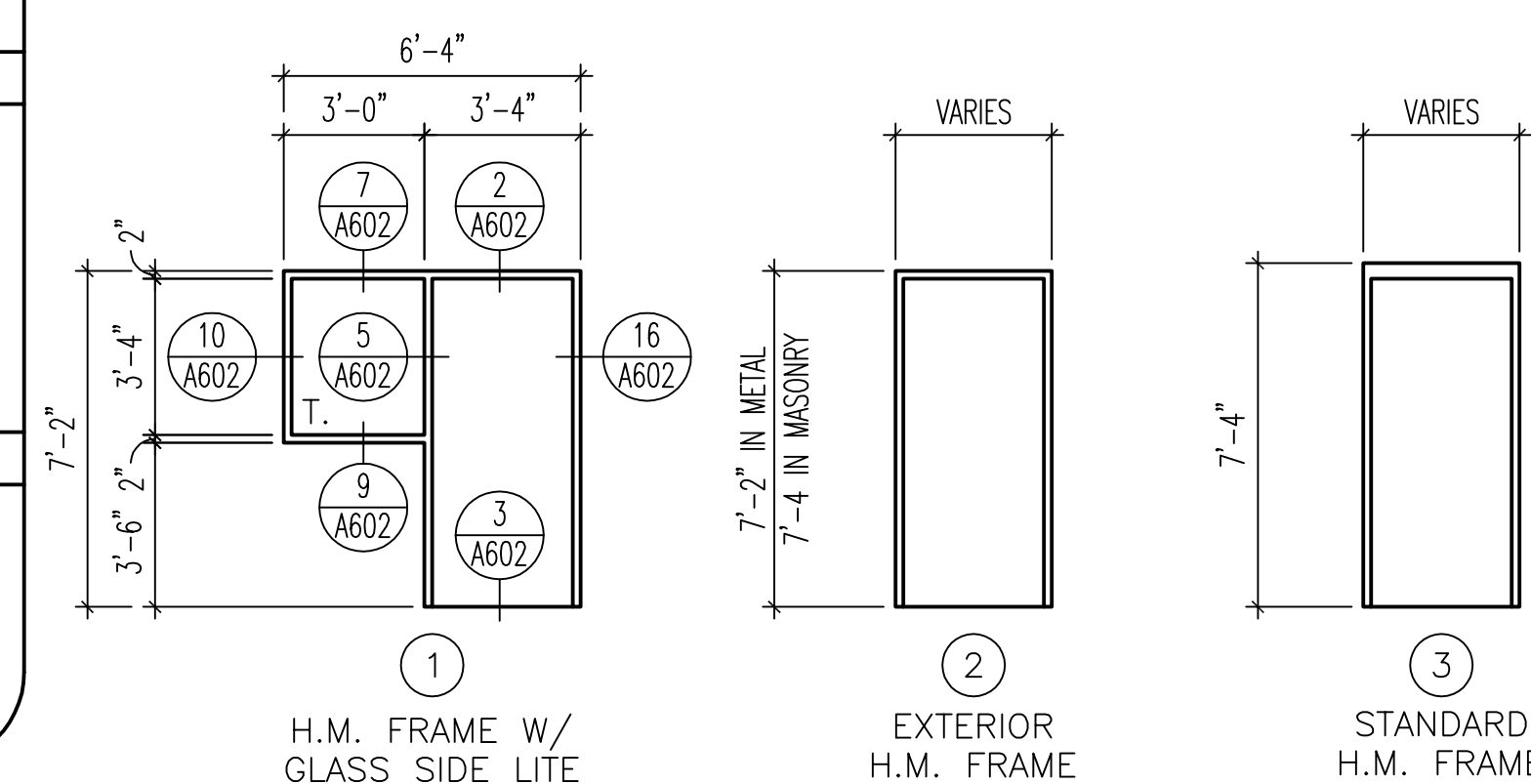
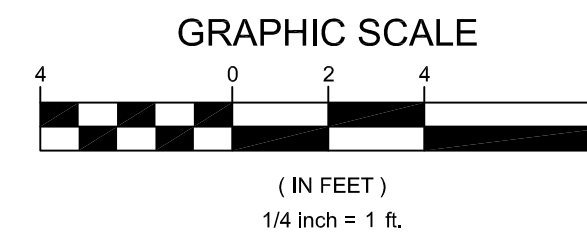
CONTRACT	BRIDGE NO.	N/A
T201680104	DESIGNED BY:	DCH
COUNTY	CHECKED BY:	KNM
NEW CASTLE		

DOOR SCHEDULE

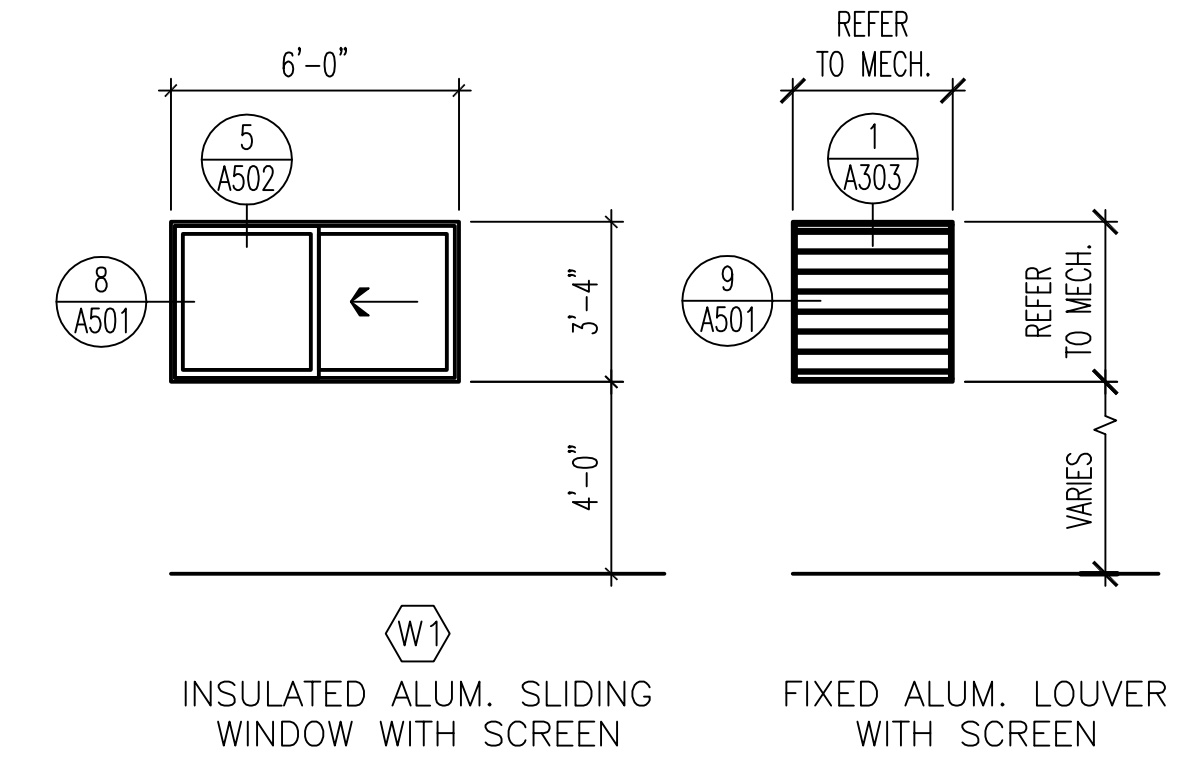
DOOR #	DOOR TYPE	DOOR MATERIAL	SIZE	FRAME TYPE	FRAME MATERIAL	FIRE RATING	HEAD	JAMB	SILL	HDW. SET	REMARKS
E1	B	H.M./GL.	3'-0" x 7'-0" x 1 3/4"	2	H.M.	N/A	1/A502	5/A501 13/A602	17/A602	ENT.	OH., EL., CARD READER
E2	A	STL.	16'-0" x 15'-0"	---	STL.	N/A	15/A602	1/A501 2/A501	4/A305	COD.	COD.
E3	A	STL.	16'-0" x 15'-0"	---	STL.	N/A	15/A602	1/A501 2/A501	4/A305	COD.	COD.
E4	C	H.M./GL.	3'-0" x 7'-0" x 1 3/4"	2	H.M.	N/A	1/A502	5/A501 13/A602	17/A602	ENT.	OH., EL., CARD READER
E5	A	STL.	16'-0" x 15'-0"	---	STL.	N/A	15/A602	1/A501 2/A501	4/A305	COD.	COD.
E6	C	H.M./GL.	3'-0" x 7'-0" x 1 3/4"	2	H.M.	N/A	6/A602	5/A501 6/A501	17/A602	ENT.	OH., CL.
E7	A	STL.	16'-0" x 15'-0"	---	STL.	N/A	15/A602	1/A501 2/A501	4/A305	COD.	COD.
E8	A	STL.	16'-0" x 15'-0"	---	STL.	N/A	15/A602	1/A501 2/A501	4/A305	COD.	COD.
E9	C	H.M./GL.	3'-0" x 7'-0" x 1 3/4"	2	H.M.	N/A	1/A502	5/A501 13/A602	17/A602	ENT.	OH., CL.
E10	A	STL.	16'-0" x 15'-0"	---	STL.	N/A	15/A602	1/A501 2/A501	4/A305	COD.	COD.
E11	C	H.M./GL.	3'-0" x 7'-0" x 1 3/4"	2	H.M.	N/A	1/A502	5/A501 13/A602	17/A602	ENT.	OH., EL., CARD READER
E12	D	H.M.	3'-6" x 7'-0" x 1 3/4"	2	H.M.	N/A	6/A602	5/A501 6/A501	17/A602	ENT.	OH., CL.
E13	E	H.M.	(2) 3'-0" x 7'-0" x 1 3/4"	2	H.M.	N/A	6/A602	5/A501 6/A501	17/A602	ENT.	OH., CL.
E14	C	H.M./GL.	3'-0" x 7'-0" x 1 3/4"	2	H.M.	N/A	6/A602	5/A501 6/A501	17/A602	ENT.	OH., CL.
E15	B	H.M./GL.	3'-0" x 7'-0" x 1 3/4"	2	H.M.	N/A	1/A502	5/A501 13/A602	17/A602	ENT.	OH., EL., CARD READER
01	B	H.M./GL.	3'-0" x 7'-0" x 1 3/4"	1	H.M.	N/A	2/A602	7/A501	3/A602	OFF.	OH. SINGLE GLAZE (T)
02	F	H.M.	3'-0" x 7'-0" x 1 3/4"	3	H.M.	N/A	11/A602	14/A602	4/A602	PR.	
03	F	H.M.	3'-0" x 7'-0" x 1 3/4"	3	H.M.	N/A	11/A602	14/A602	4/A602	CLO.	
04	F	H.M.	(2) 3'-0" x 7'-0" x 1 3/4"	3	H.M.	N/A	11/A602	14/A602	8/A602	CLO.	OH., W/ DOOR ASTRAGAL
05	G	STL.	(2) 3'-0" x 4'-0"	---	STL.	N/A	---	---	---	CLO.	WIRE MESH PARTITION REFER TO 5/A601
06	J	STL.	8'-0" x 8'-0"	---	STL.	N/A	---	7/A501	---	CLO.	WIRE MESH PARTITION REFER TO 4/601
07	F	H.M.	3'-0" x 7'-0" x 1 3/4"	3	H.M.	3/4 HR.	11/A602	14/A602	8/A602	CLO.	OH.
08	F	H.M.	3'-6" x 7'-0" x 1 3/4"	3	H.M.	3/4 HR.	11/A602	14/A602	8/A602	PA.	
09	A	STL.	16'-0" x 15'-0"	---	STL.	N/A	4/A303	---	4/A303	PA.	INTERIOR SECTIONAL DOOR UNINSULATED
10	F	H.M.	3'-0" x 7'-0" x 1 3/4"	3	H.M.	N/A	11/A602	14/A602	12/A602	PA.	
11	K	STL.	(2) 4'-0" x 4'-0"	---	STL.	N/A	---	---	---	PA.	MEZZARAIL RAIL SYSTEM REFER TO 6/601

LEGEND:

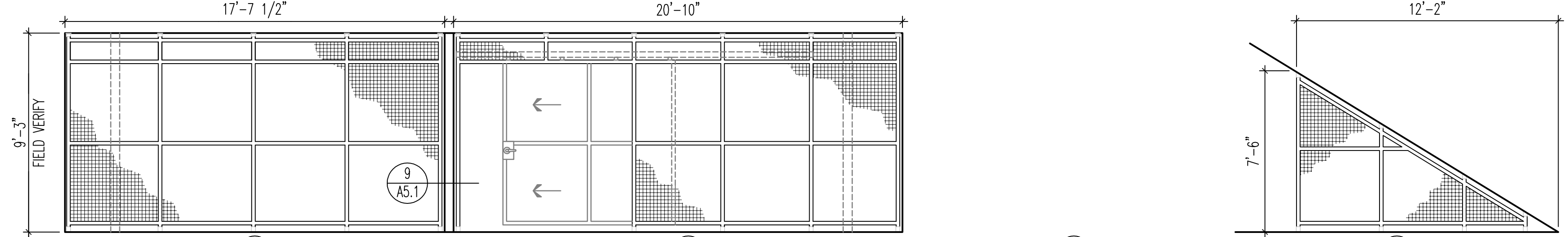
ABBREVIATIONS:	
1. H.M.	HOLLOW METAL
2. STL.	STEEL
3. GL.	GLASS
4. T.	TEMPERED GLASS
HARDWARE TYPES BY FUNCTION:	
1. OFF.	OFFICE FUNCTION
2. CLO.	CLOSET FUNCTION
3. PR.	PRIVACY FUNCTION
4. ENT.	ENTRANCE FUNCTION
5. PA.	PASSAGE FUNCTION
6. COD.	COILING OVERHEAD DOOR
REMARKS:	
1. OH.	OVER HEAD DOOR CLOSURE.
2. PD.	PANIC DEVICE.
3. EL.	ELECTRIC LOCK.
4. DP.	DOOR PULLS.
5. CL.	CYLINDER LOCK.



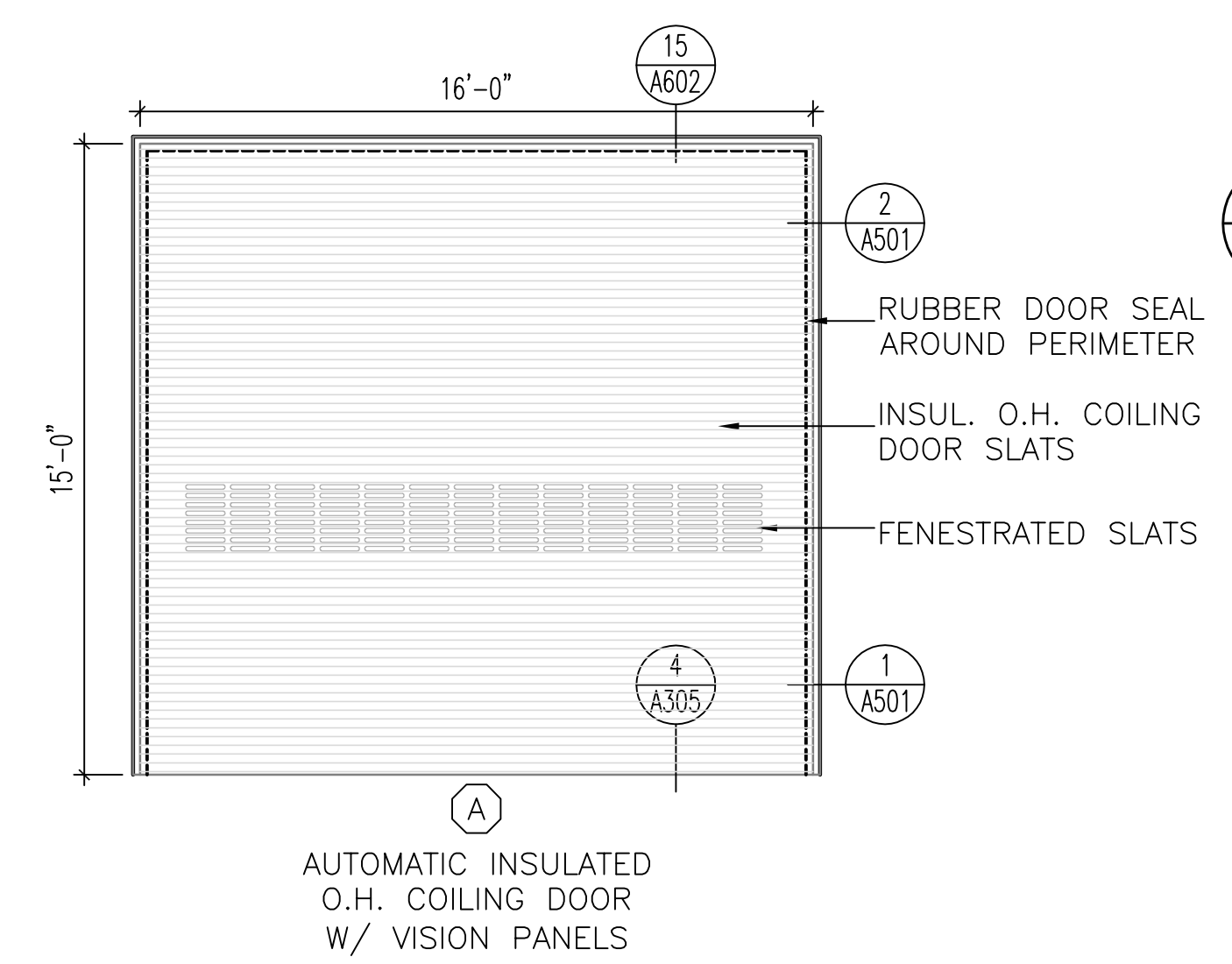
1 FRAME ELEVATIONS
SCALE: 1/4" = 1'-0"



2 WINDOW / LOUVER ELEVATIONS
SCALE: 1/4" = 1'-0"

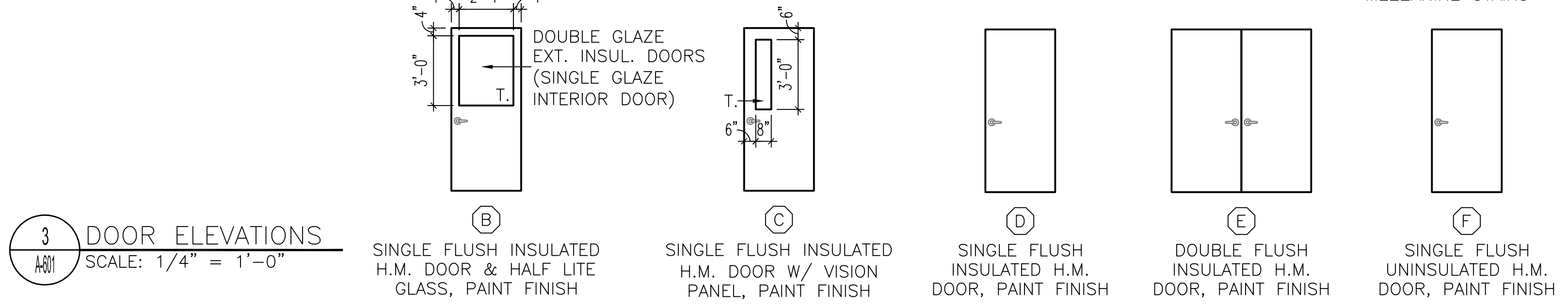
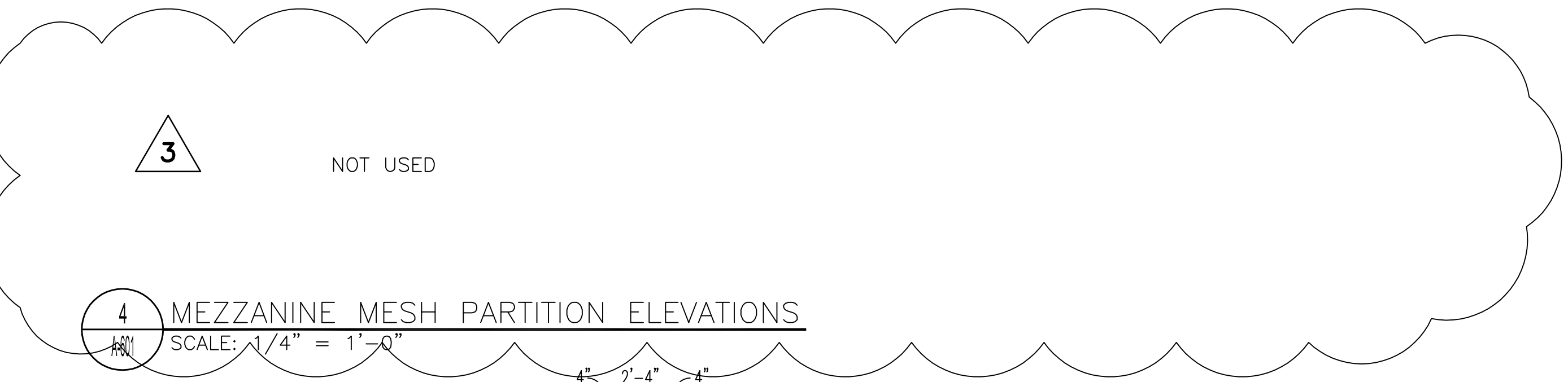


4 MEZZANINE MESH PARTITION ELEVATIONS
SCALE: 1/4" = 1'-0"

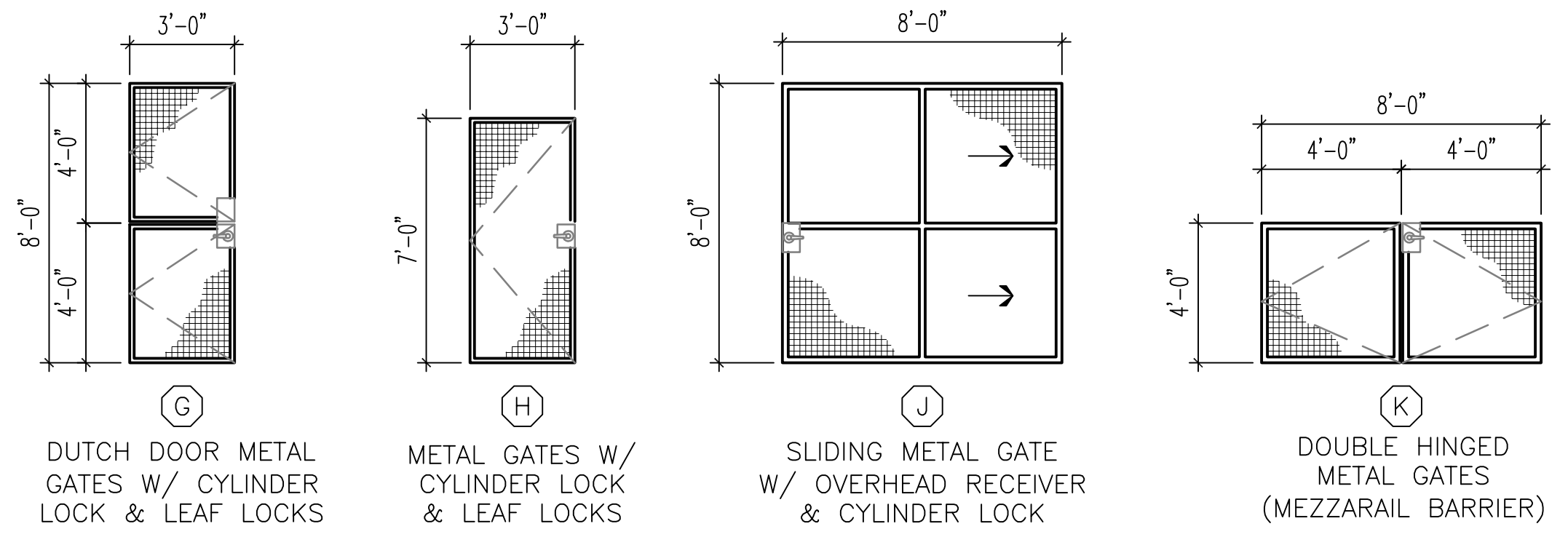


A AUTOMATIC INSULATED O.H. COILING DOOR W/ VISION PANELS

GENERAL NOTE:
1/4" TEMPERED GLASS GLAZING NOTED ON THE ELEVATION WITH "T." ON THE GLASS PANEL REQUIRED.

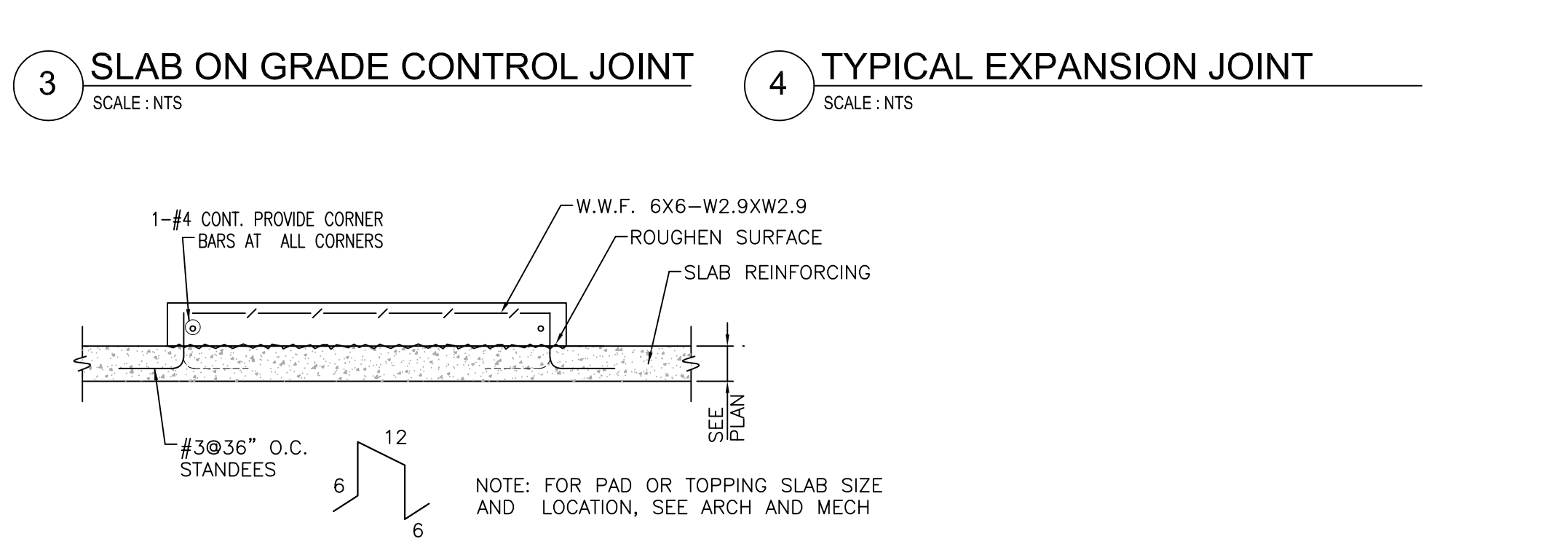
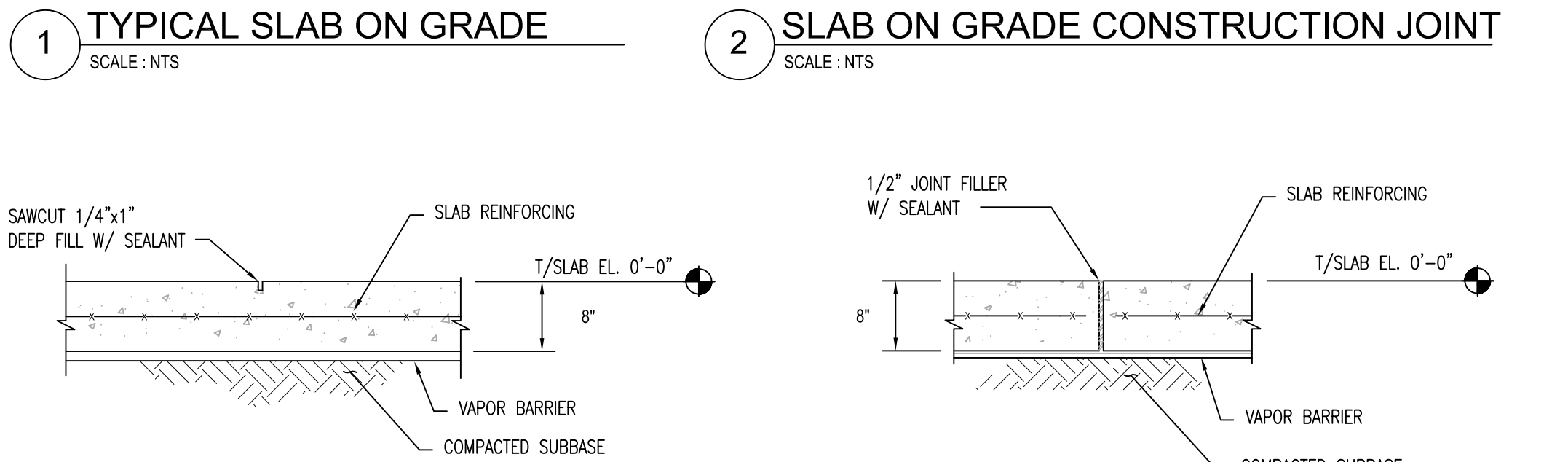
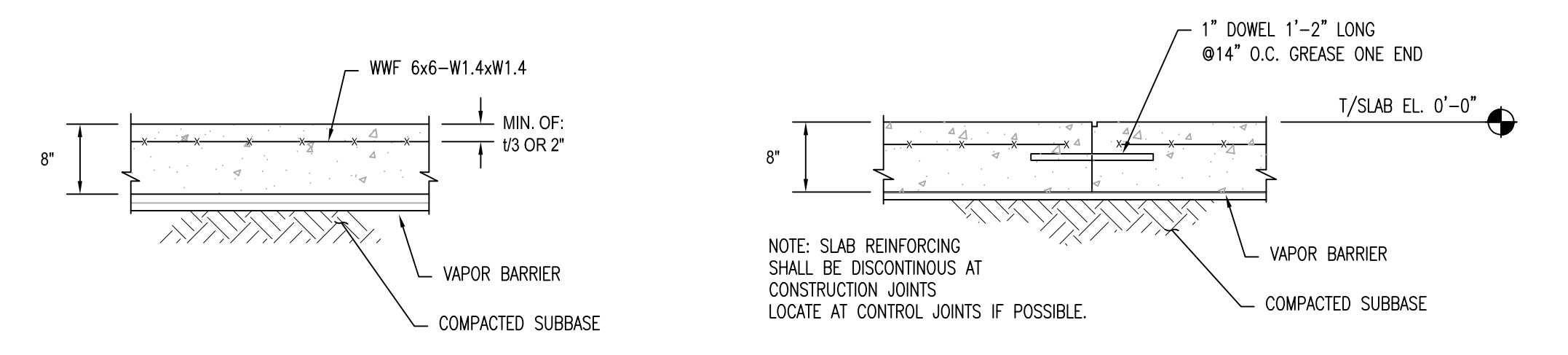
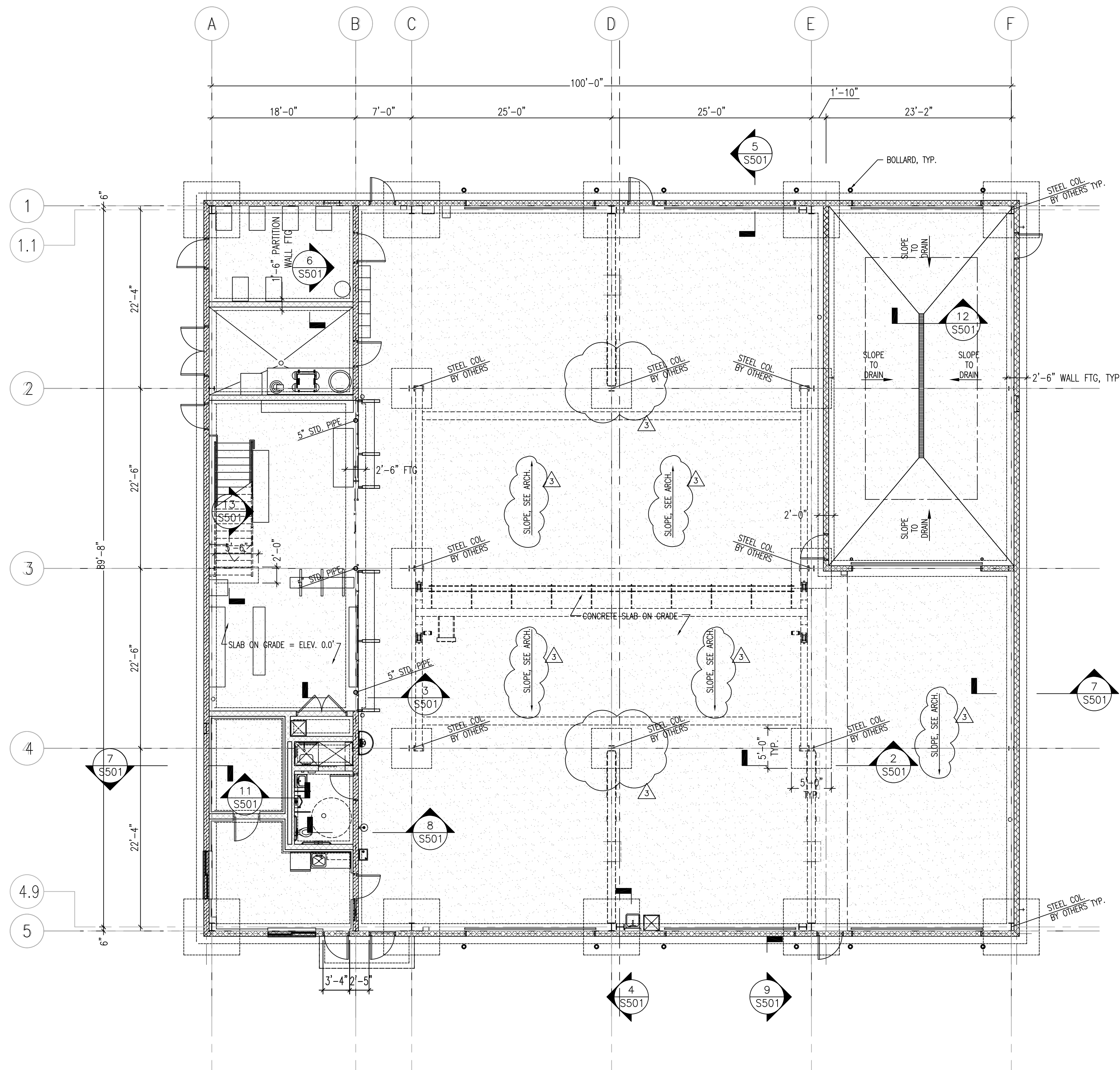


3 DOOR ELEVATIONS
SCALE: 1/4" = 1'-0"

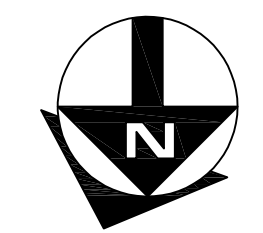


G DUTCH DOOR METAL GATES W/ CYLINDER LOCK & LEAF LOCKS
H METAL GATES W/ CYLINDER LOCK & LEAF LOCKS
J SLIDING METAL GATE W/ OVERHEAD RECEIVER & CYLINDER LOCK
K DOUBLE HINGED METAL GATES (MEZZARAIL BARRIER)

MB-A-601



1 FOUNDATION PLAN
SCALE: 1/8" = 1'-0"



DRAWING NOTES:
 1. COORDINATE DIMENSIONS WITH ARCHITECTURAL AND METAL BUILDING MANUFACTURER
 2. COORDINATE FLOOR SLOPE WITH ARCH AND MECHANICAL PLANS

MB-S-101

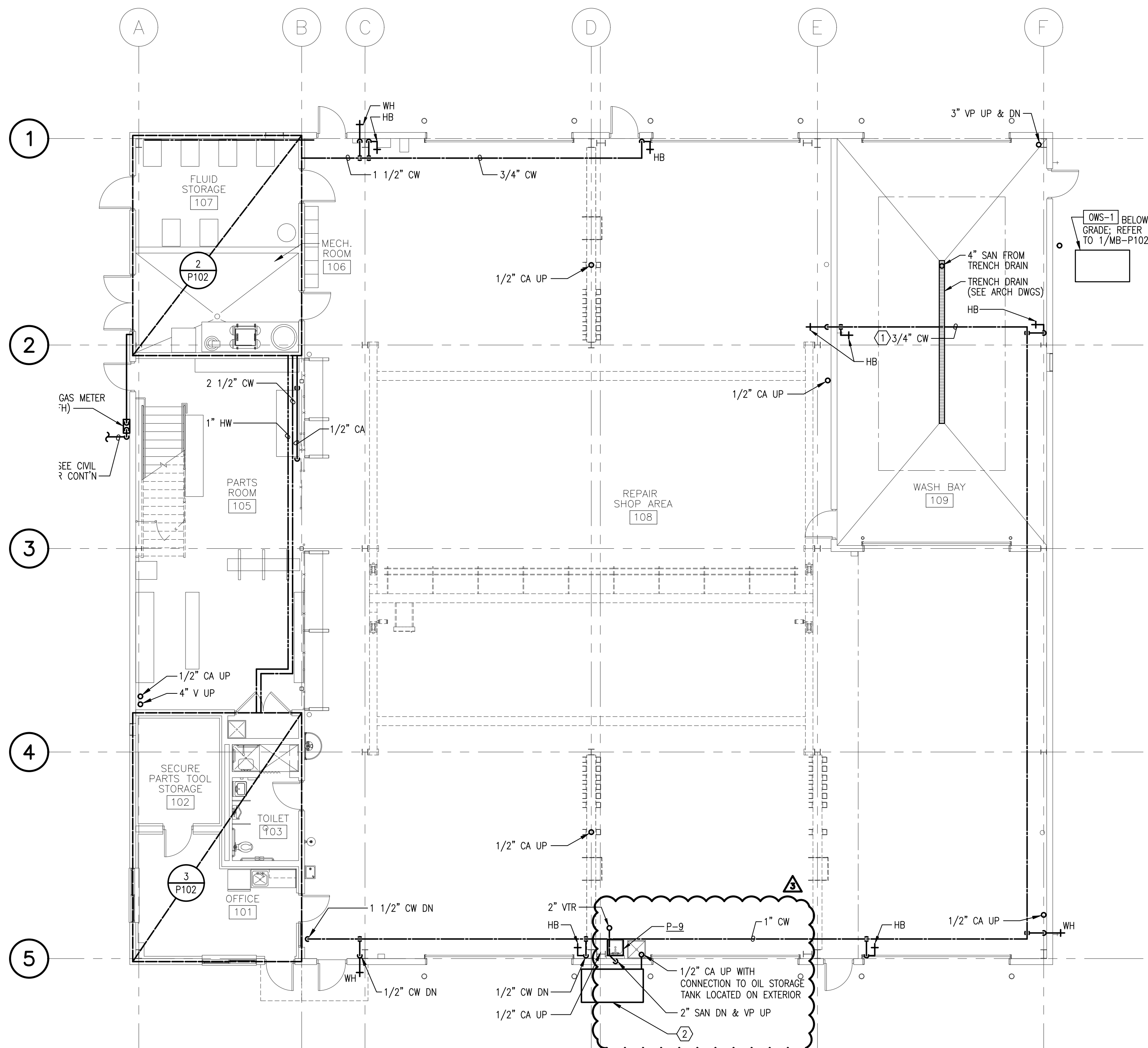
	DELAWARE DEPARTMENT OF TRANSPORTATION		ADDENDUMS / REVISIONS		ST. GEORGES MAINTENANCE YARD IMPROVEMENTS	CONTRACT T201680104	BRIDGE NO. N/A	MAINTENANCE BUILDING FOUNDATION PLAN	SHEET NO. 90
	8/8/17 ADDENDUM 2					COUNTY NEW CASTLE	DESIGNED BY: DJO		TOTAL SHTS. 116
						CHECKED BY: SLB			

GENERAL SHEET NOTES:

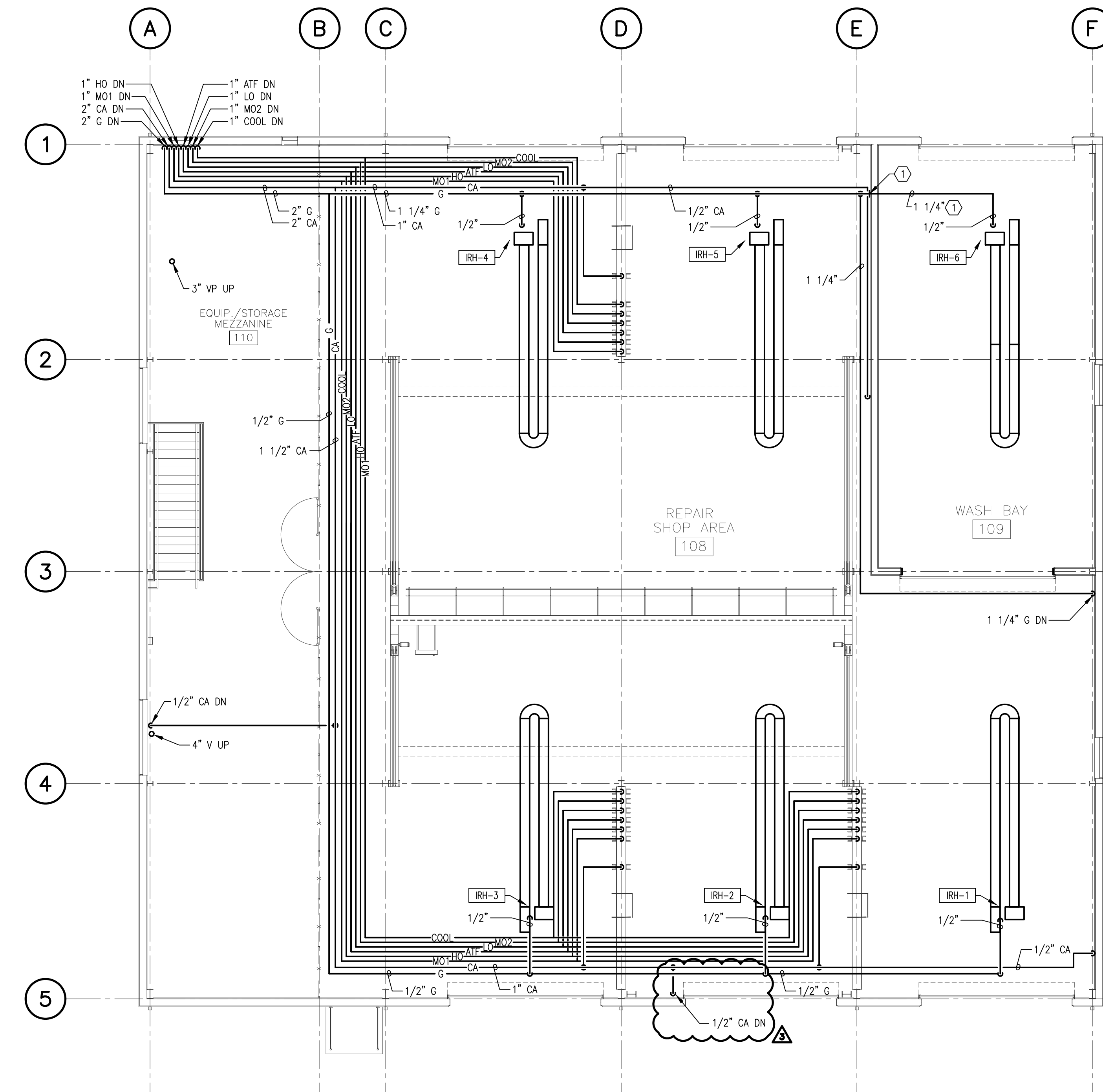
1. INFORMATION SHOWN ON THIS DRAWING PERTAINING TO EXISTING CONDITIONS HAS BEEN OBTAINED FROM AVAILABLE BUILDING DRAWINGS OR GENERAL FIELD OBSERVATIONS AND MAY NOT INDICATE ACTUAL EXISTING CONDITIONS IN DETAIL OR DIMENSION. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE ACTUAL EXISTING CONDITIONS PRIOR TO FABRICATION OR PERFORMANCE OF ANY WORK. SHOULD CONDITIONS BE DISCOVERED THAT PREVENT EXECUTION OF THE WORK AS INDICATED, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ARCHITECT IN WRITING AND AWAIT DIRECTION BEFORE PROCEEDING WITH THE WORK.
2. UNLESS OTHERWISE NOTED, MECHANICAL/PLUMBING ITEMS SHOWN HEAVY SOLID (——) SHALL BE NEW WORK AND MECHANICAL/PLUMBING ITEMS SHOWN LIGHT SOLID (—) SHALL BE EXISTING.
3. DO NOT LOCATE DUCTWORK OR PIPING ABOVE ELECTRICAL PANELS OR EQUIPMENT.

SHEET KEYNOTES:

- ① PIPING IN WASHBAY SHALL BE STAINLESS STEEL.
- ② 500 GALLON WASTE OIL STORAGE TANK WITH INTEGRAL AIR DIAPHRAGM PUMP (TO MATCH SAFEWASTE). COORDINATE ORIENTATION AND LOCATION WITH OWNER.



1 DOMESTIC PLUMBING - GROUND FLOOR PLAN
 P101 SCALE: 1/8" = 1'-0"



2 DOMESTIC PLUMBING - MEZZANINE PLAN
 P101 SCALE: 1/8" = 1'-0"

JMT \\jmt.corp\local\jmt\itids\WDE\220995_021_SL_Georges_Maintenance\CADD\Plumbing\Maintenance Building\220995-021_MB_P-101.dwg

ADDENDUMS / REVISIONS
① 8/8/17 ADDENDUM 3

CONTRACT	BRIDGE NO.	N/A
T201680104	DESIGNED BY:	CHB T GK
COUNTY	CHECKED BY:	MAS N/A
NEW CASTLE		

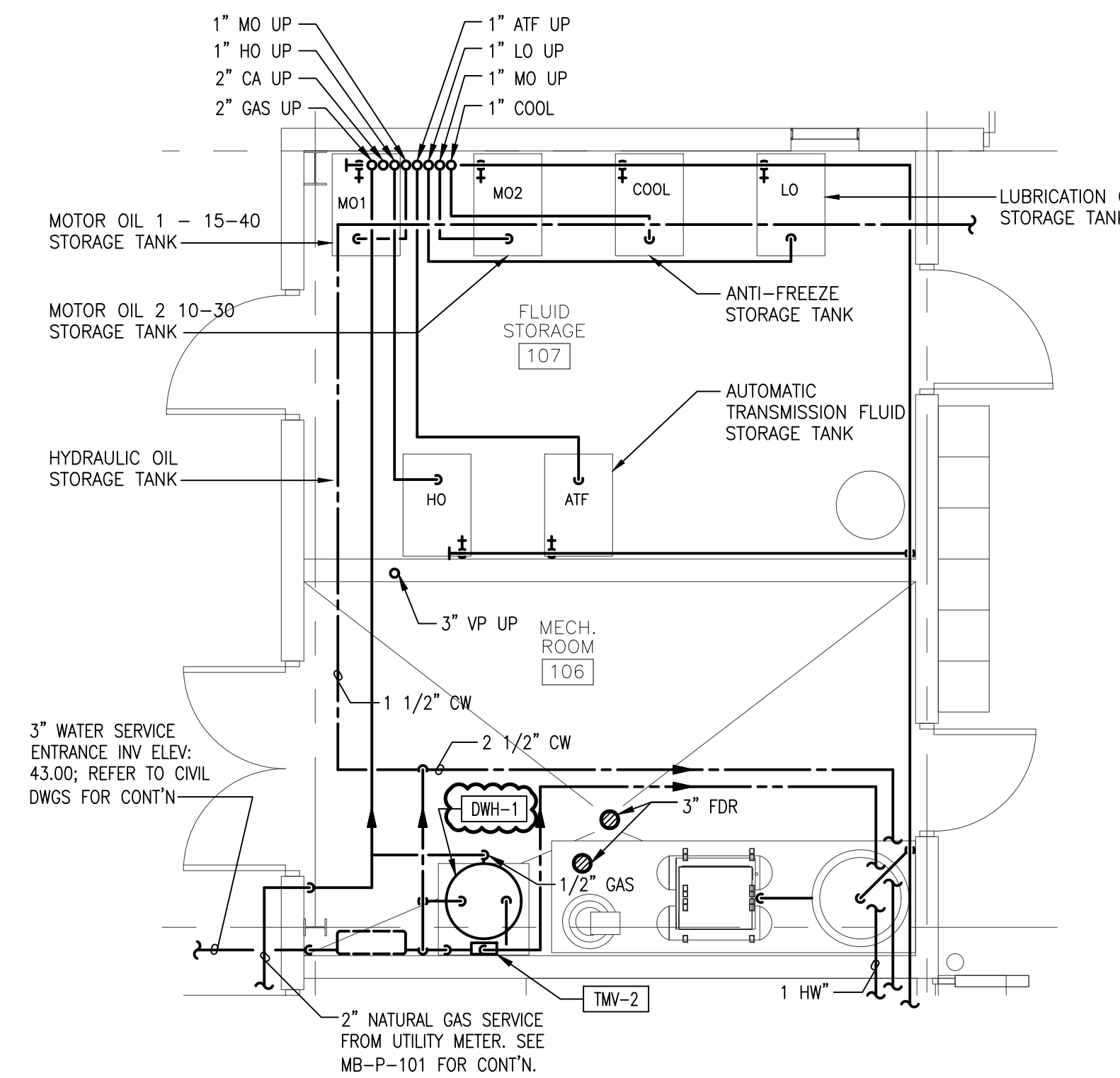
SHEET NO.	103
TOTAL SHTS.	116

GENERAL SHEET NOTES:

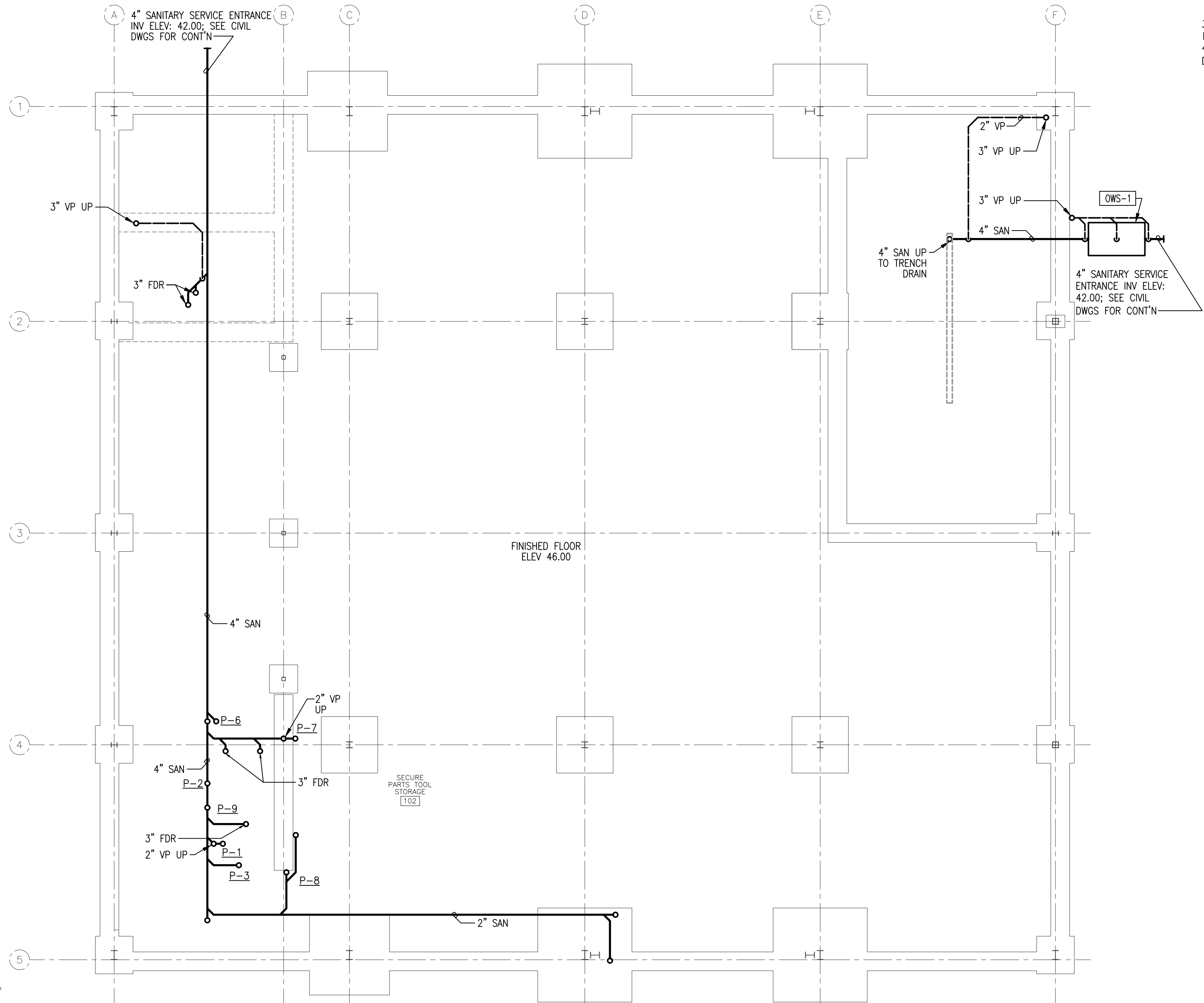
1. INFORMATION SHOWN ON THIS DRAWING PERTAINING TO EXISTING CONDITIONS HAS BEEN OBTAINED FROM AVAILABLE BUILDING DRAWINGS OR GENERAL FIELD OBSERVATIONS AND MAY NOT INDICATE ACTUAL EXISTING CONDITIONS IN DETAIL OR DIMENSION. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE ACTUAL EXISTING CONDITIONS PRIOR TO FABRICATION OR PERFORMANCE OF ANY WORK. SHOULD CONDITIONS BE DISCOVERED THAT PREVENT EXECUTION OF THE WORK AS INDICATED, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ARCHITECT IN WRITING AND AWAIT DIRECTION BEFORE PROCEEDING WITH THE WORK.
2. UNLESS OTHERWISE NOTED, MECHANICAL/PLUMBING ITEMS SHOWN HEAVY SOLID (——) SHALL BE NEW WORK AND MECHANICAL/PLUMBING ITEMS SHOWN LIGHT SOLID (—) SHALL BE EXISTING.
3. DO NOT LOCATE DUCTWORK OR PIPING ABOVE ELECTRICAL PANELS OR EQUIPMENT.

SHEET KEYNOTES:

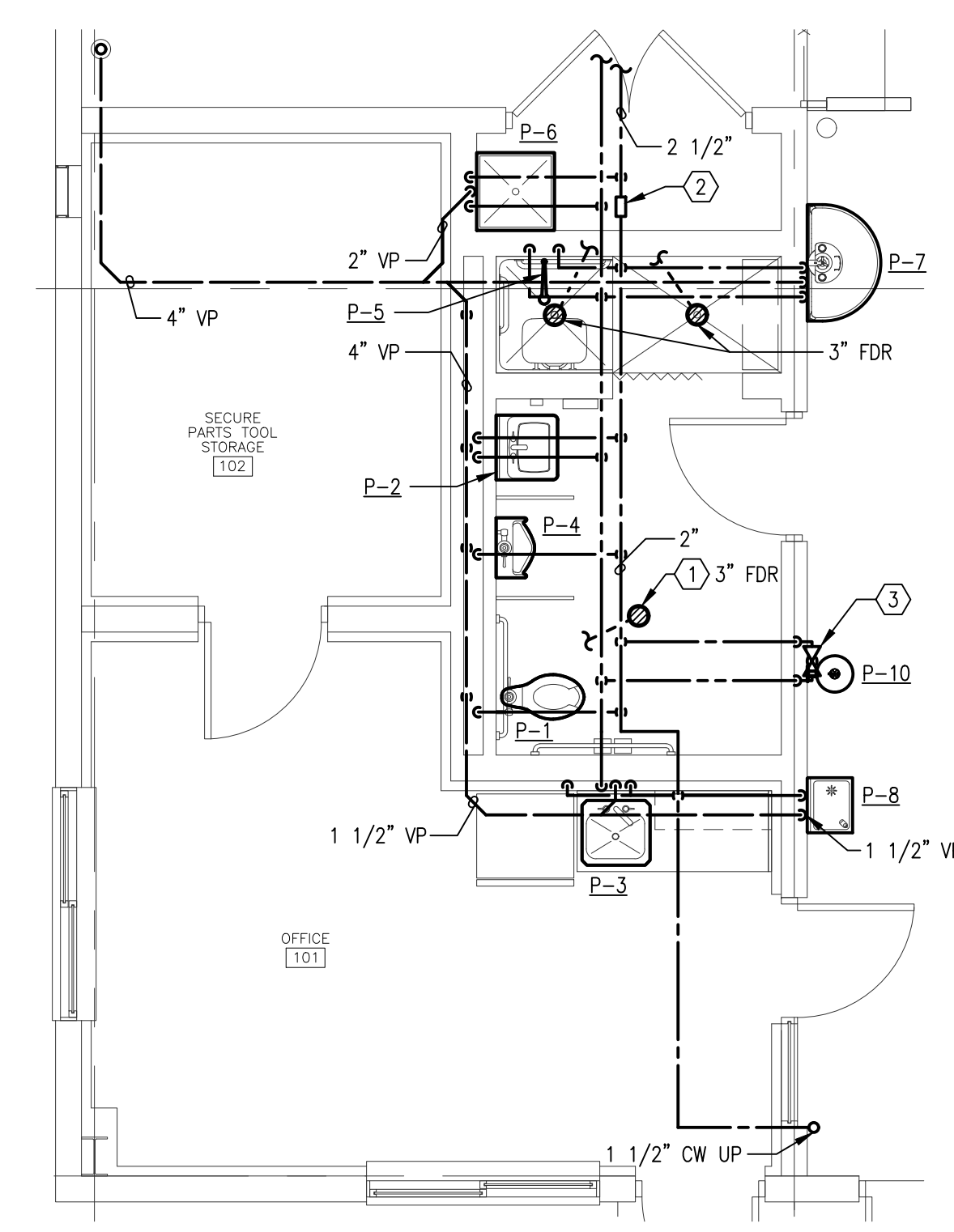
- ① TRAP PRIMING LINE FROM TOILET FLUSH VALVE.
- ② TRAP PRIMING VALVE SERVING TWO FLOOR DRAINS.
- ③ THERMOSTATIC MIXING VALVE SET TO 85°F.



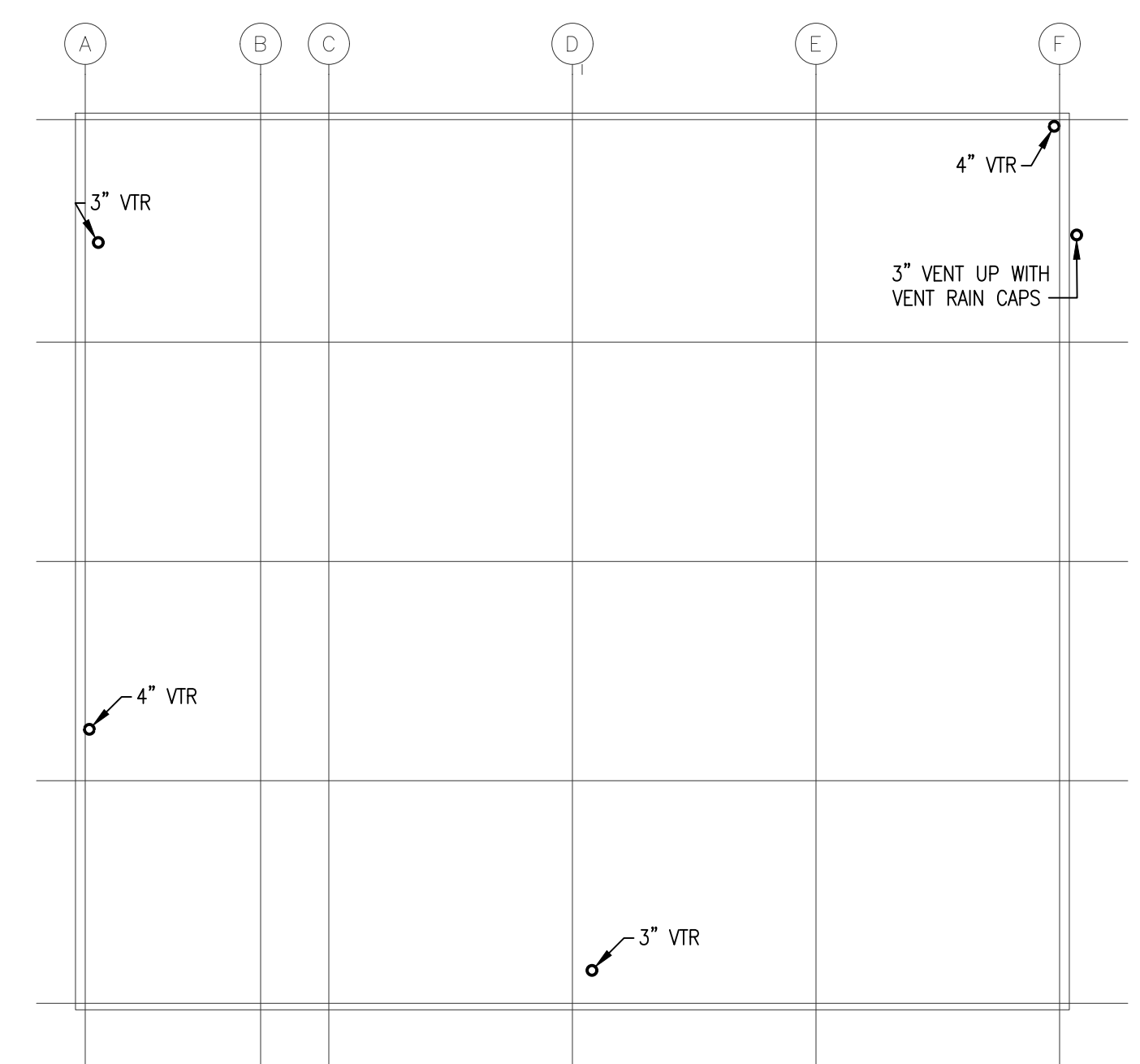
2 DOMESTIC PLUMBING – PARTIAL PLAN – MECH AND FLUID STORAGE
 P102 SCALE: 1/4" = 1'-0"



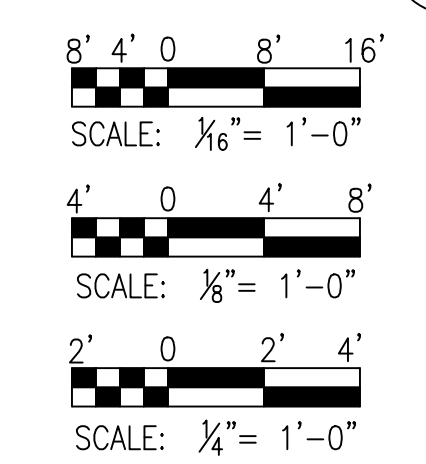
1 SANITARY PLUMBING – FOUNDATION PLAN
 P102 SCALE: 1/8" = 1'-0"



3 DOMESTIC PLUMBING – PARTIAL PLAN – OFFICE
 P102 SCALE: 1/4" = 1'-0"



4 PLUMBING NEW WORK – ROOF PLAN
 P102 SCALE: 1/16" = 1'-0"



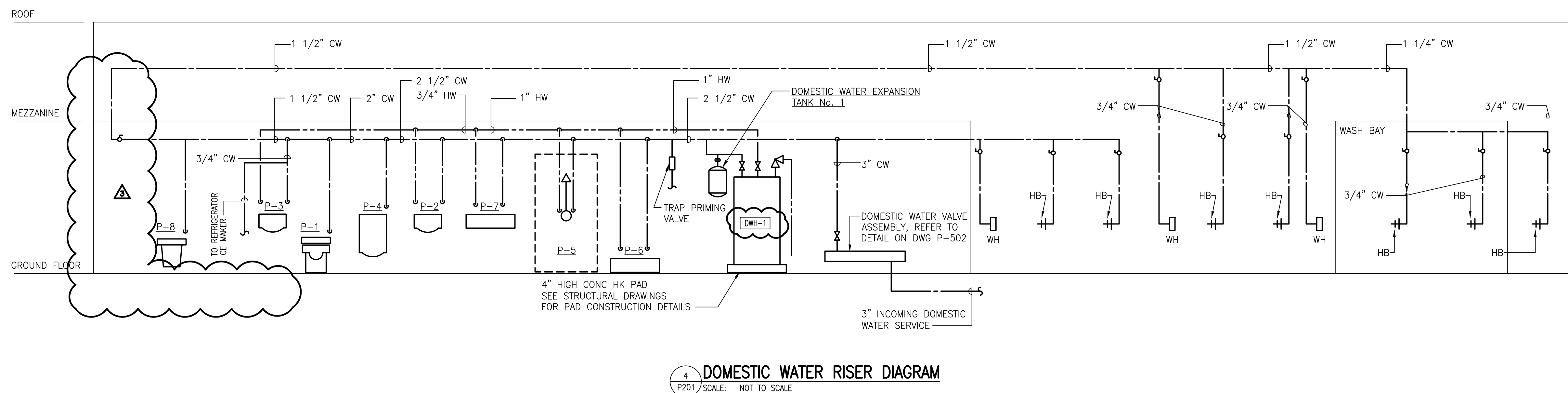
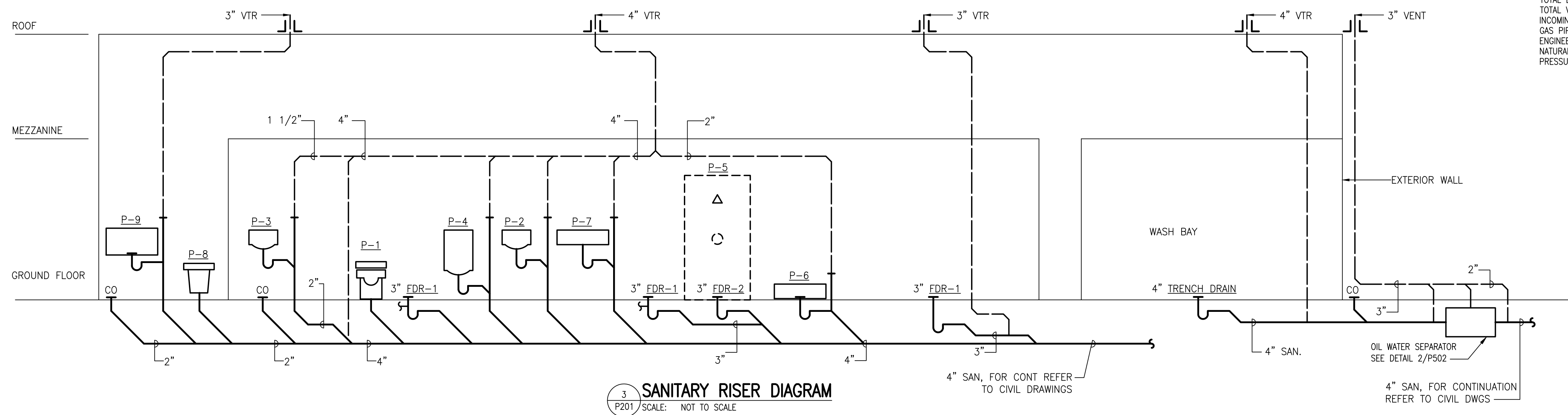
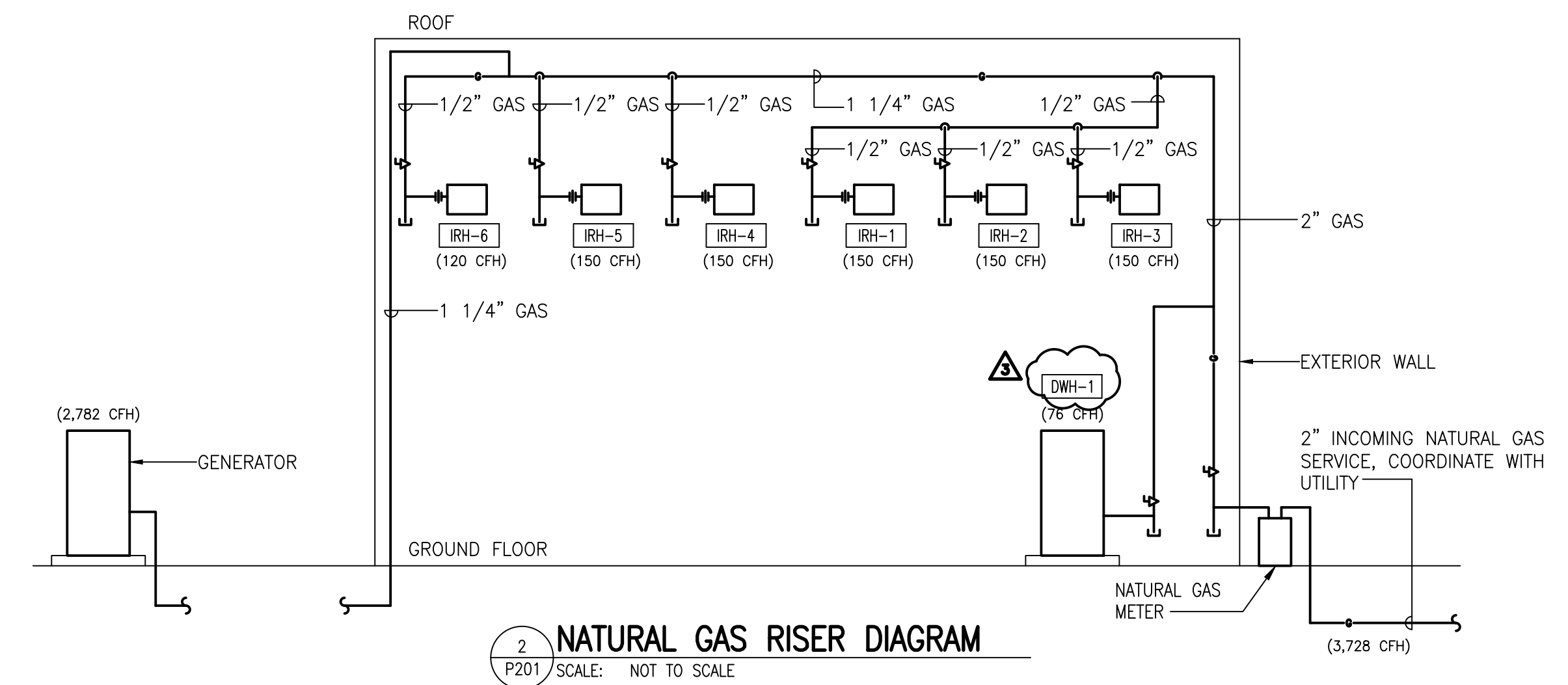
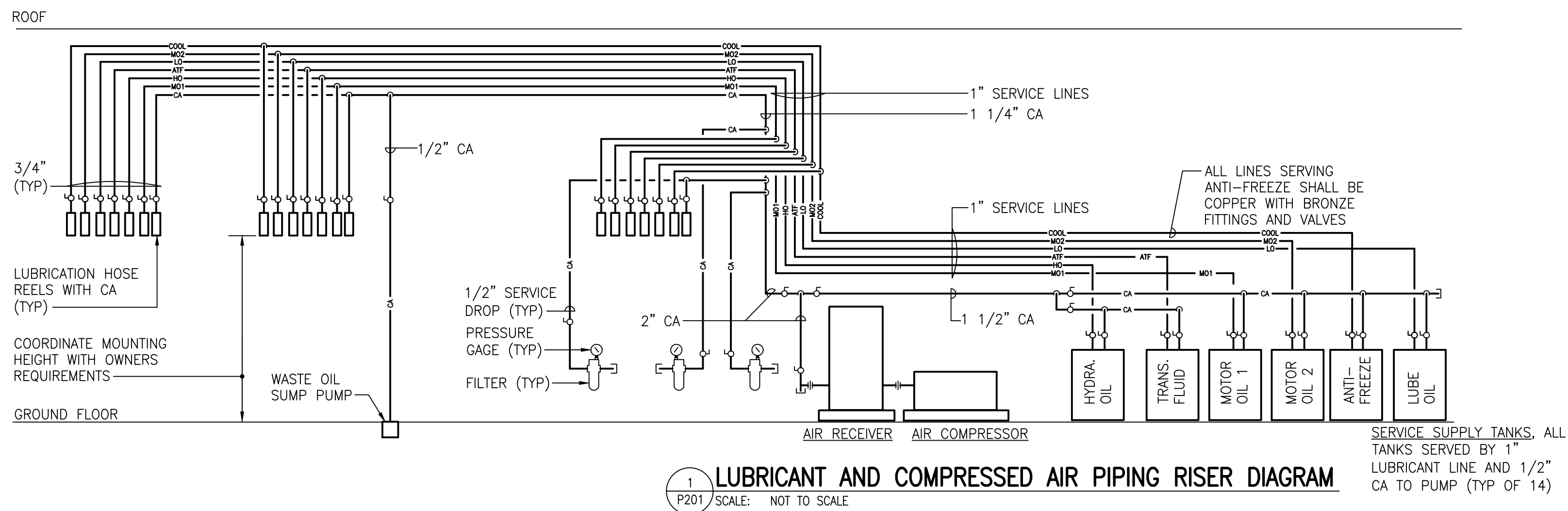
MB-P-102

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ADDENDUMS / REVISIONS
8/8/17 ADDENDUM 3

CONTRACT	BRIDGE NO.	N/A
T201680104	DESIGNED BY:	CHB TGK
COUNTY	CHECKED BY:	MAS N/A
NEW CASTLE		

SHEET NO.	104
TOTAL SHTS.	116



ADDENDUMS / REVISIONS	
8/8/17	ADDENDUM 3

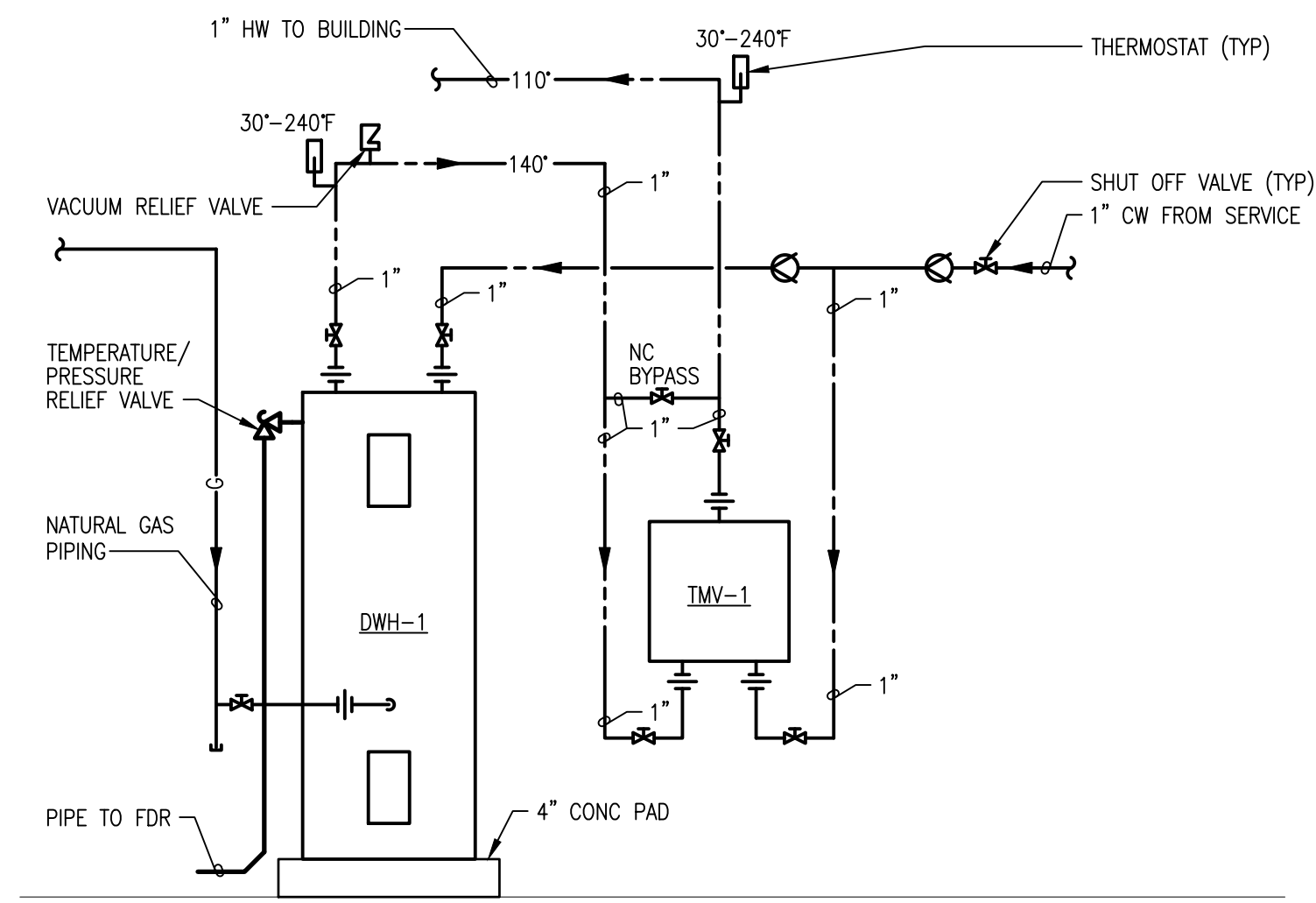
**ST. GEORGES
 MAINTENANCE YARD IMPROVEMENTS**

CONTRACT	BRIDGE NO.	N/A
T201680104	DESIGNED BY:	BWC
COUNTY	CHECKED BY:	WWR
NEW CASTLE		

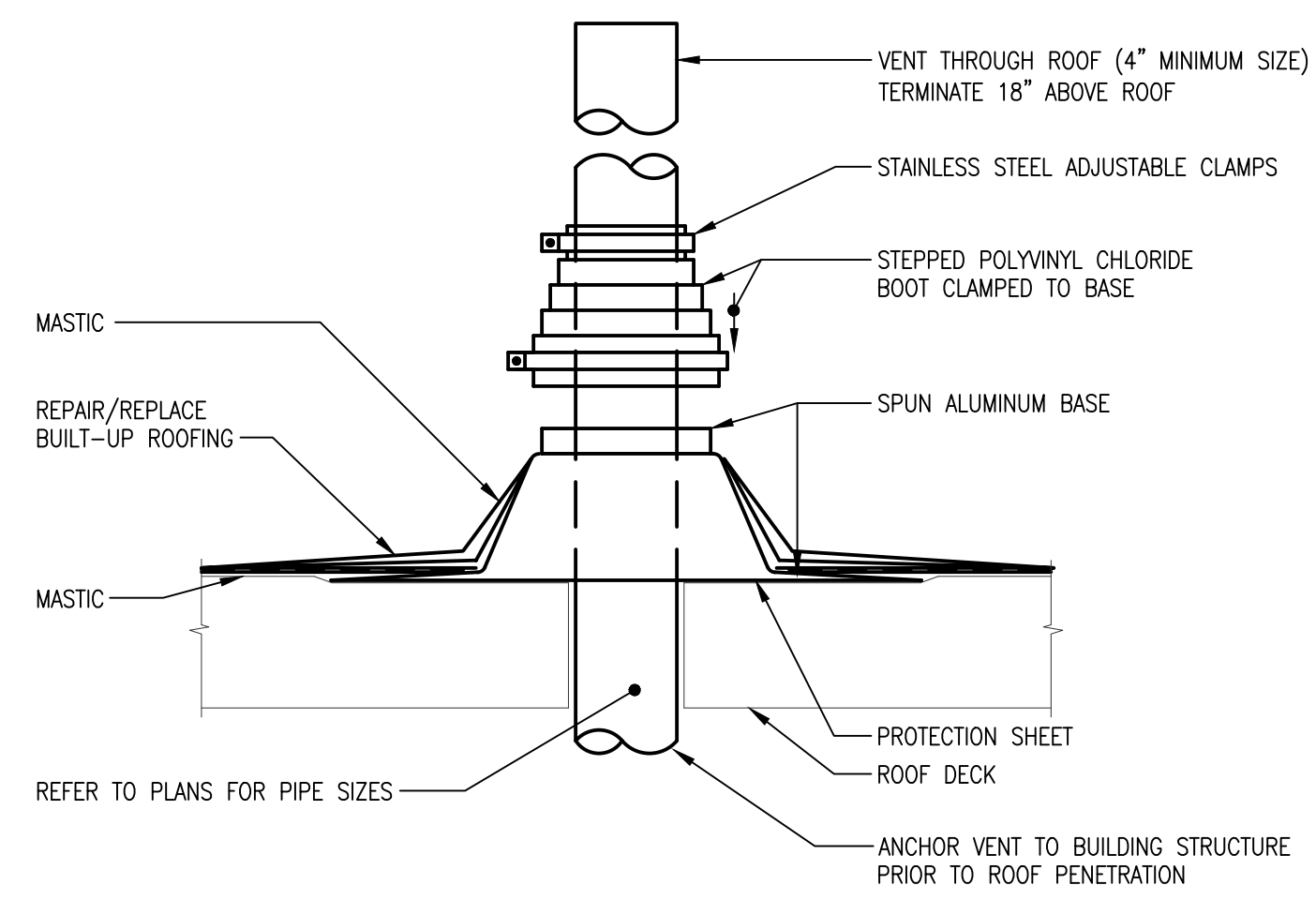
PLUMBING RISER DIAGRAMS

SHEET NO.	
105	
TOTAL SHTS.	
116	

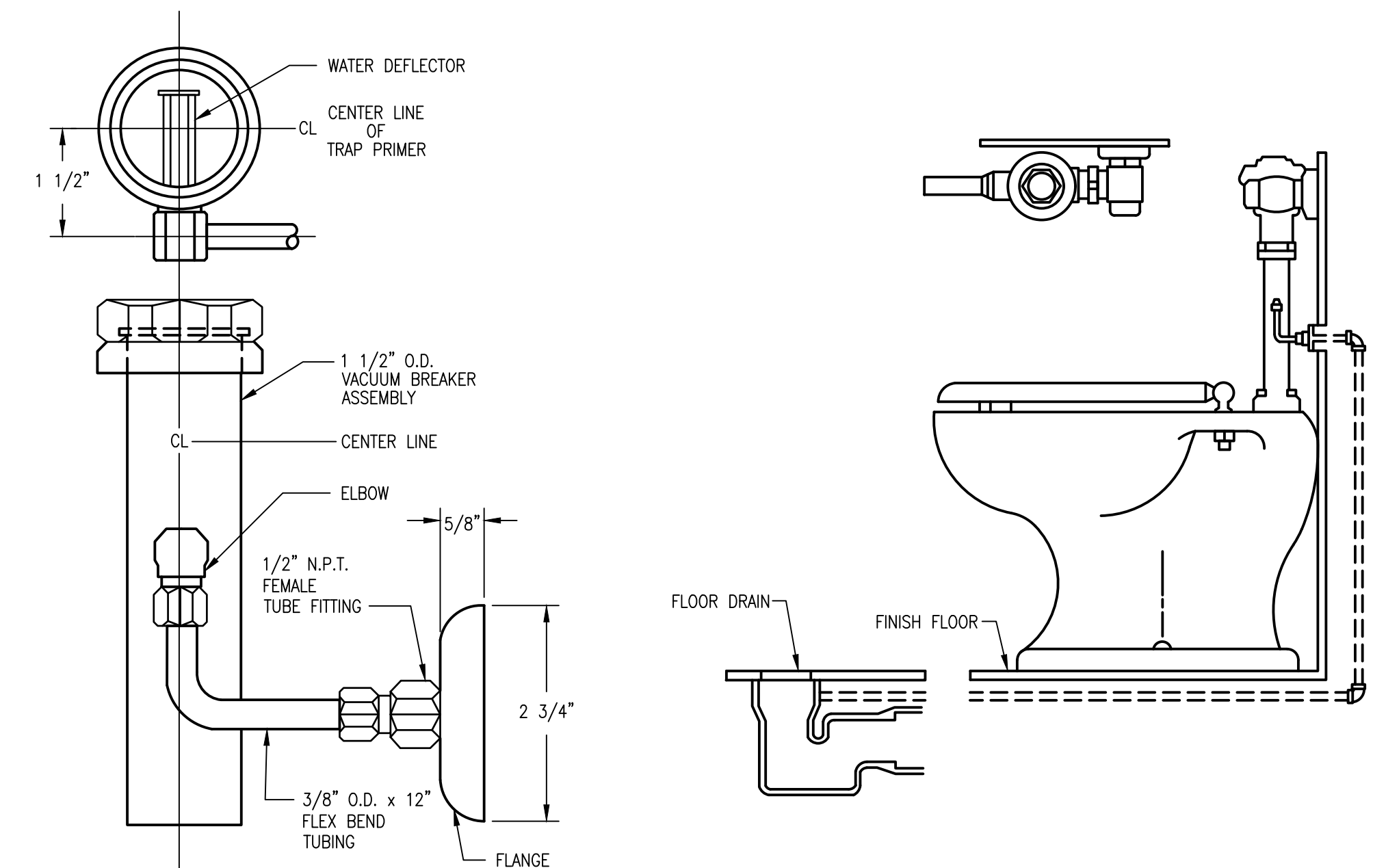
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 Building\20095-021-MB-B-200.dwg



1 GAS-FIRED DOMESTIC WATER HEATER
P501 SCALE: NONE

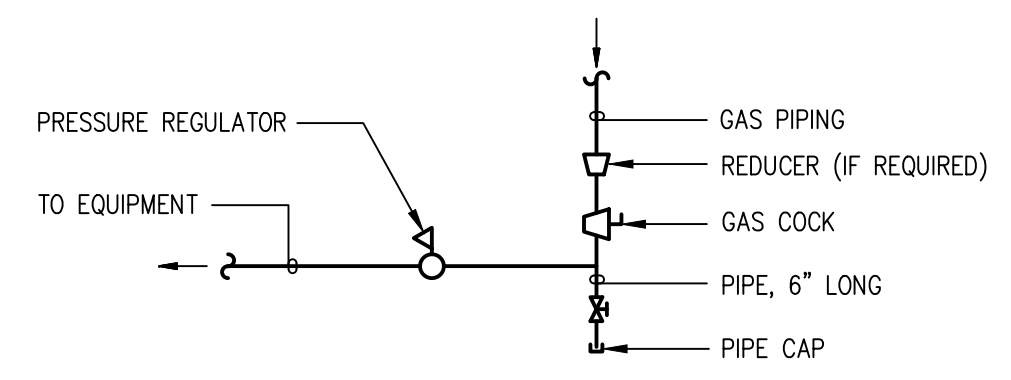
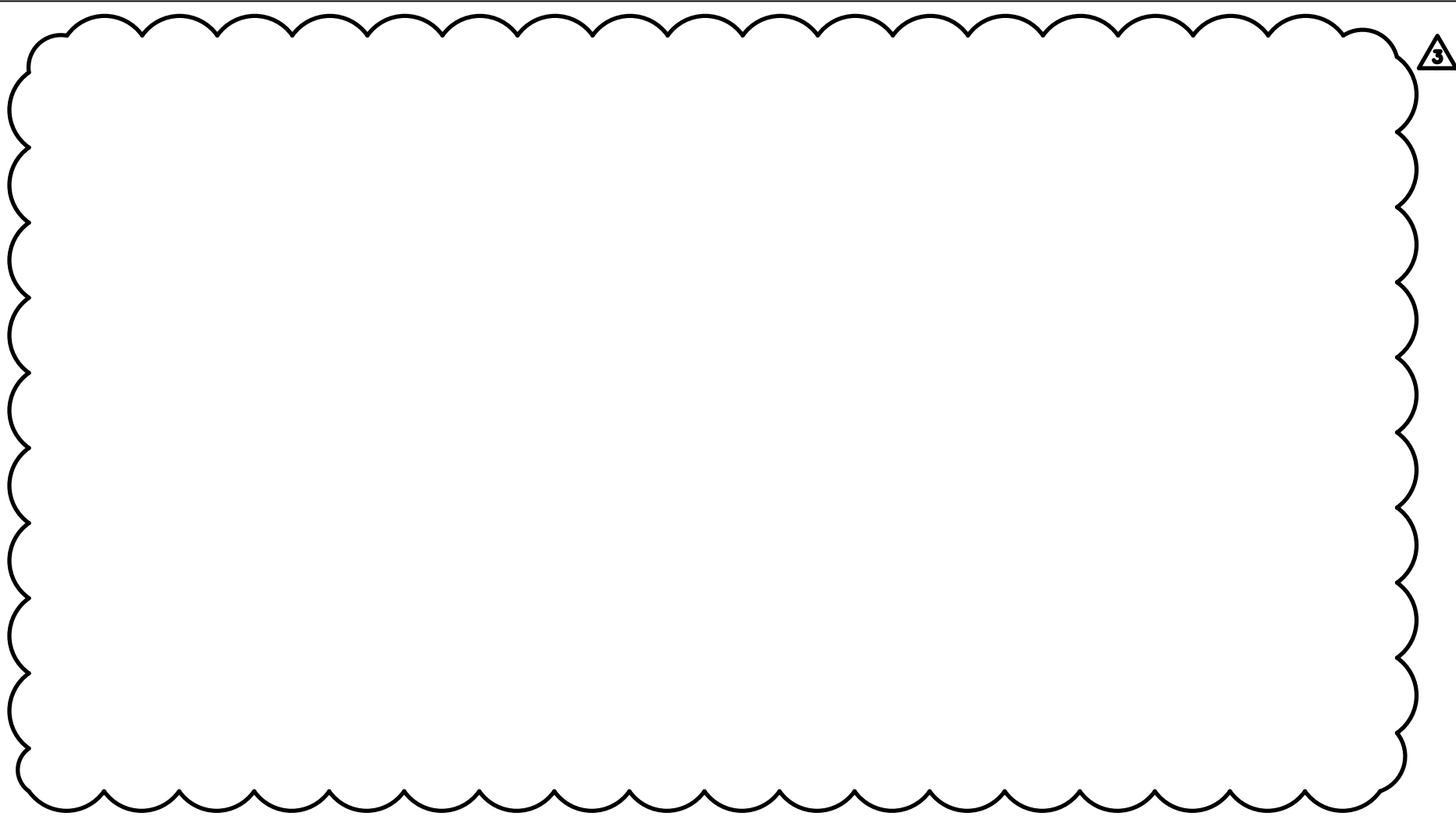


2 SANITARY VENT THRU ROOF
P501 SCALE: NONE

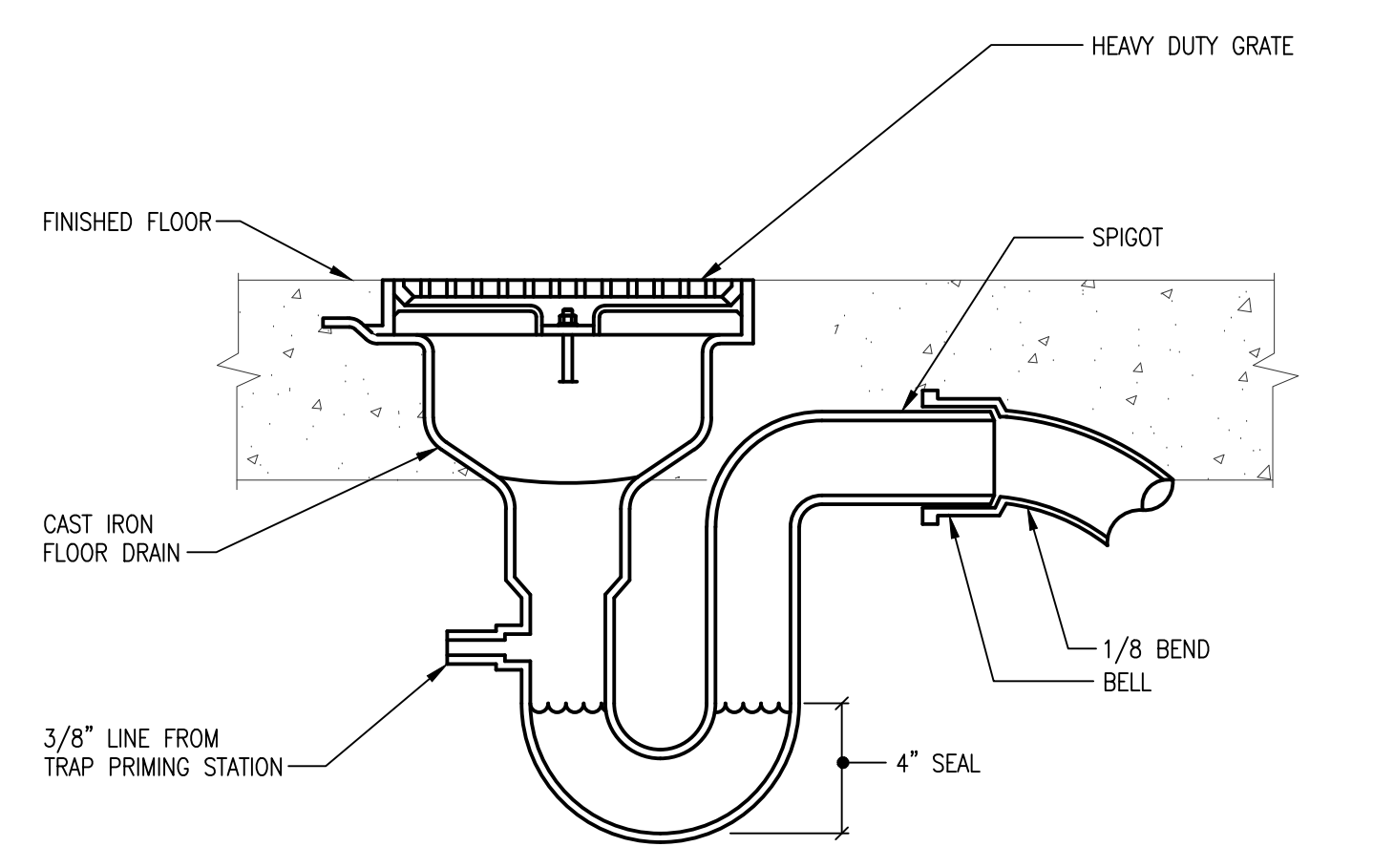


NOTES:
TRAP PRIMER SHALL CONNECT TO NEAREST WATER CLOSET OR URINAL FLUSH VALVE.

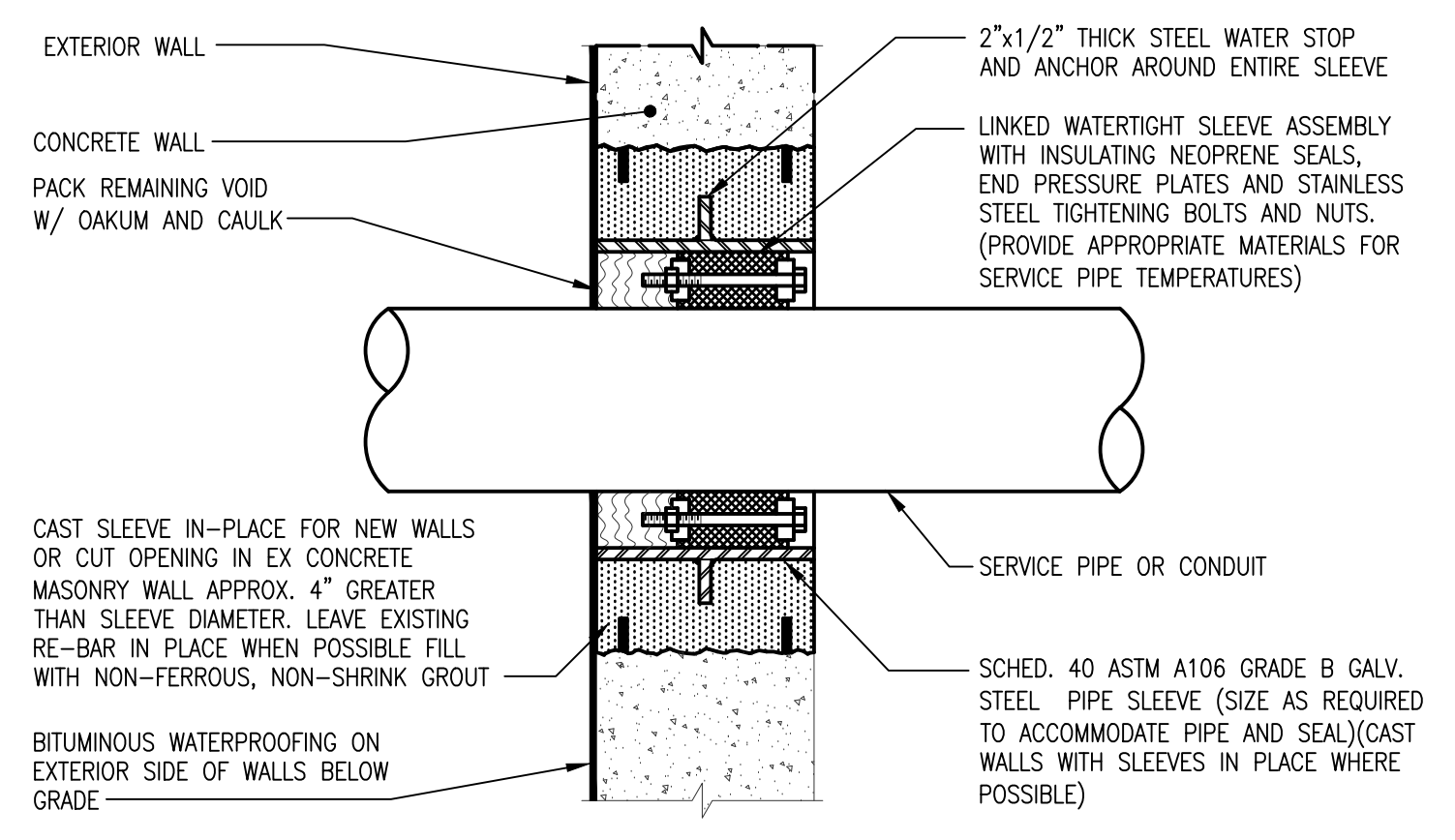
3 TRAP PRIMER
P501 SCALE: NOT TO SCALE



5 TYPICAL GAS PIPING CONNECTION
P501 SCALE: NONE

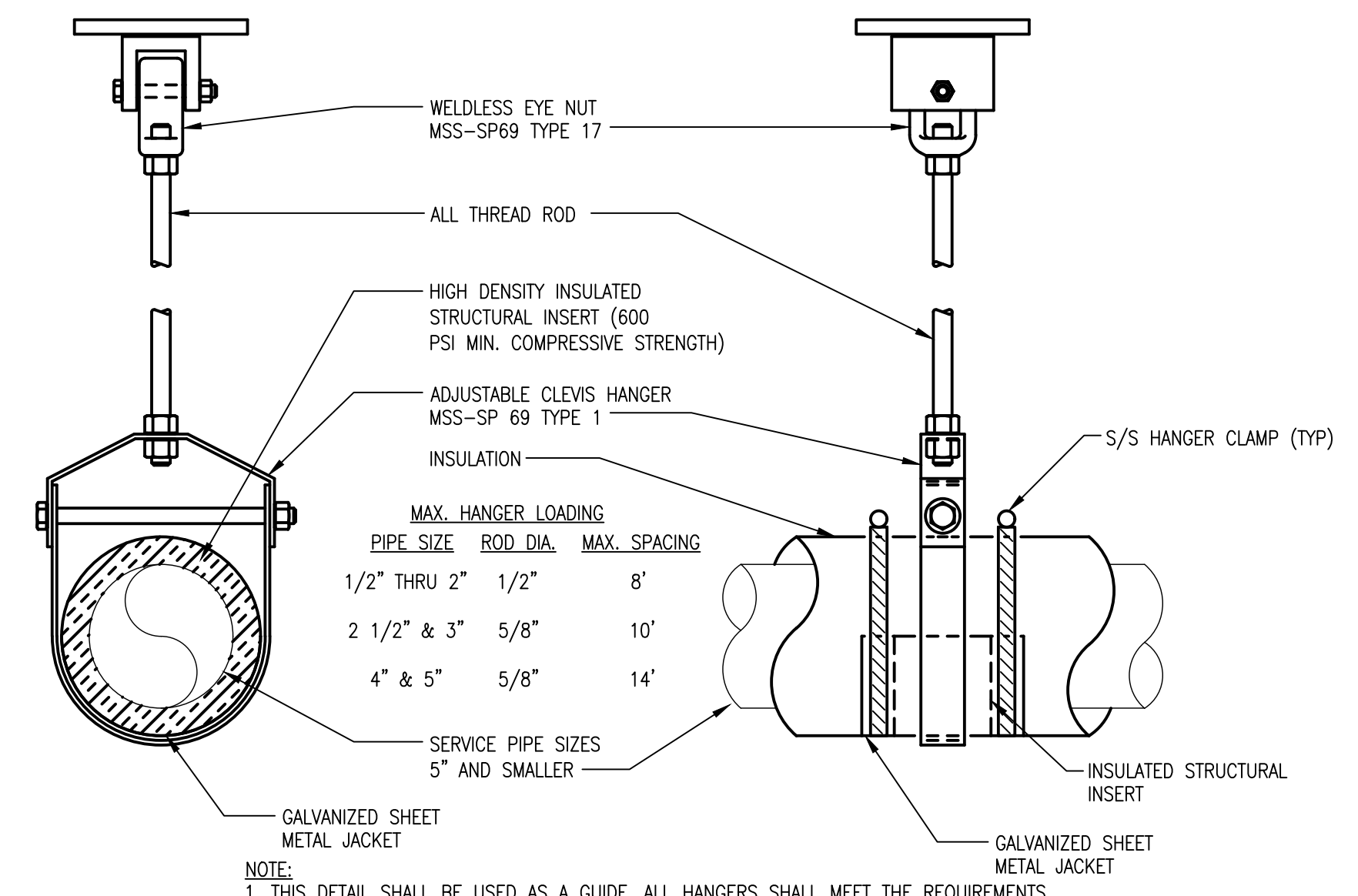


6 FLOOR DRAIN
P501 SCALE: NONE



NOTE:
1. WHERE DRAWINGS INDICATE A WATERTIGHT SLEEVE, WATERTIGHT ASSEMBLY SHALL BE INSTALLED ON ACCESSIBLE SIDE OF SLEEVE INSTALLATION.
2. MASONRY WALLS TO BE DONE IN A SIMILAR MANNER.

7 WATERTIGHT SLEEVE ASSEMBLY
P501 SCALE: NONE



NOTE:
1. THIS DETAIL SHALL BE USED AS A GUIDE. ALL HANGERS SHALL MEET THE REQUIREMENTS OF SPECIFICATION.

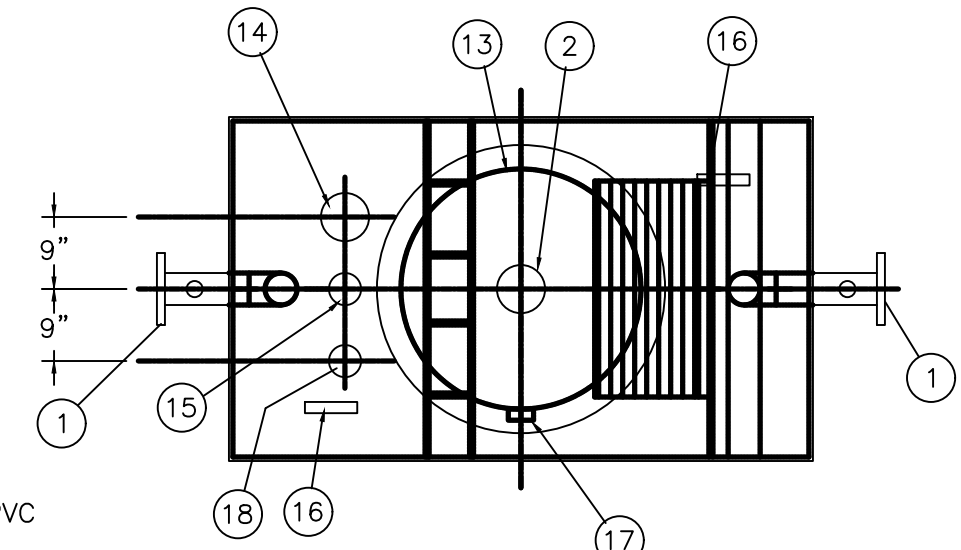
8 HANGER SUPPORT
P501 SCALE: NONE

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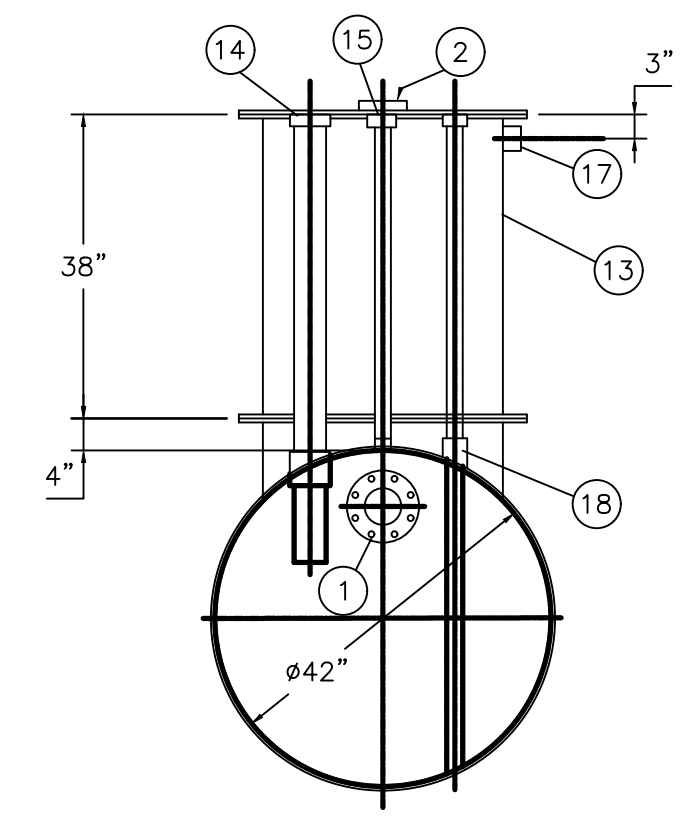
ADDENDUMS / REVISIONS
8/8/17 ADDENDUM 3

CONTRACT	BRIDGE NO.	N/A
T201680104	DESIGNED BY:	BWC
COUNTY	CHECKED BY:	WWR
NEW CASTLE		

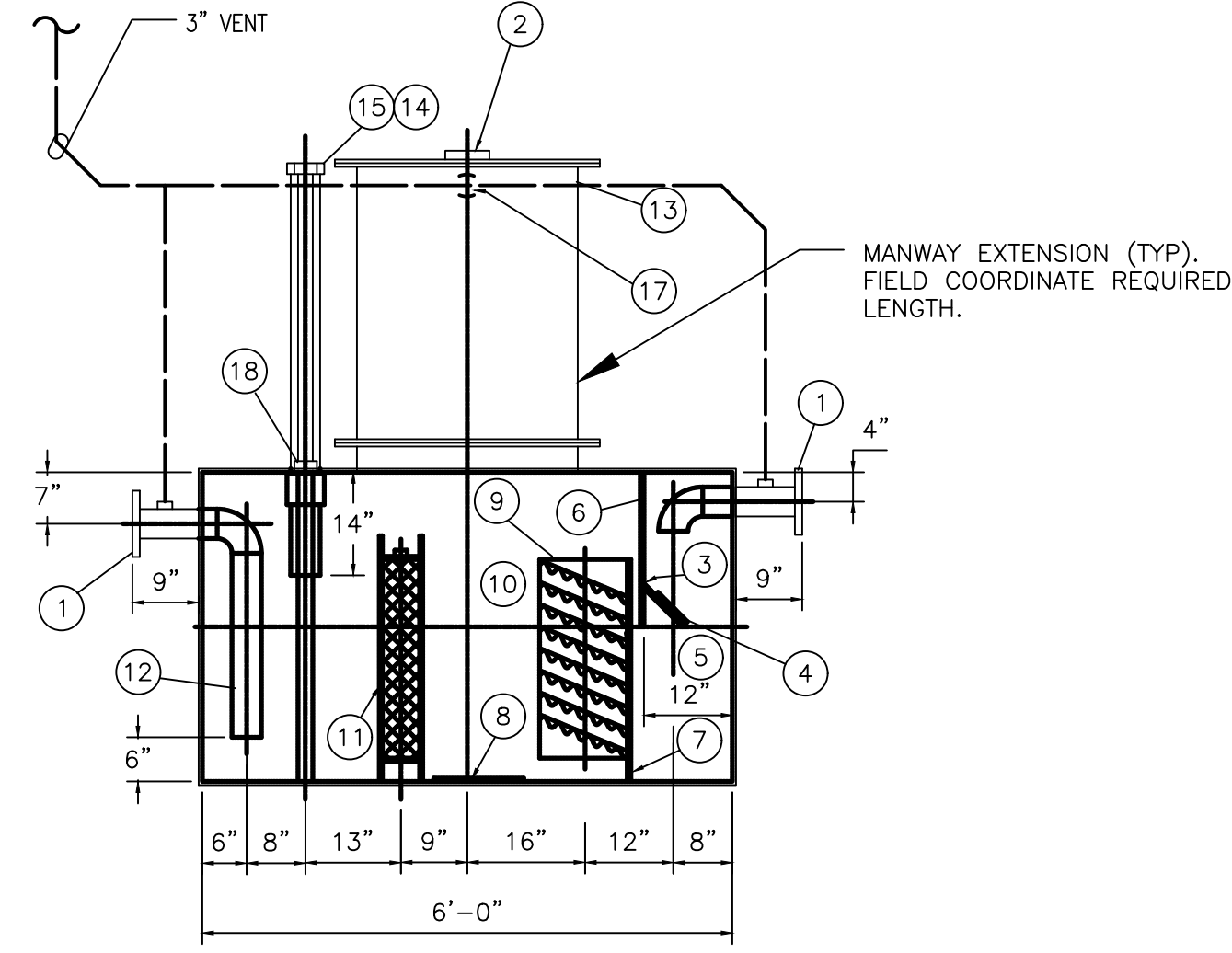
- PROVIDED EQUIPMENT**
- 150# R.F.S.O. FLANGE W/ 2" FNPT FOR VENT
 - 4" FNPT FOR GAUGE WITH PLUG
 - VELOCITY HEAD DIFFUSION BAFFLE
 - WEAR PLATE
 - SEDIMENT CHAMBER
 - UNDERFLOW BAFFLE (REMOVABLE)
 - SLUDGE BAFFLE
 - STRIKER PLATES
 - PARALLEL CORRUGATED PLATE COALESCER, CORELLA PVC PLATES (3" PLATE SPACING)
 - OIL/WATER SEPARATOR CHAMBER
 - 6" THICK PETROSREEN COALESCER MATERIAL INSTALLED W/ PULL ROD SHIPPED LOOSE
 - STEEL OUTLET DOWNCOMER
 - 30" Ø MANWAY WITH NEO-CORK GASKET, BOLT-ON EXTENSION SHIPPED LOOSE
 - 4" FNPT FOR OIL PUMP-OUT WITH INTERNAL PVC PIPE INSTALLED & RISER PIPE SHIPPED LOOSE
 - 2" FNPT FOR LEVEL SENSOR WITH RISER PIPE SHIPPED LOOSE
 - LIFTING LUG
 - 2" FNPT FOR VENT
 - 2" FNPT FOR LEAK SENSOR WITH RISER PIPE SHIPPED LOOSE



PLAN

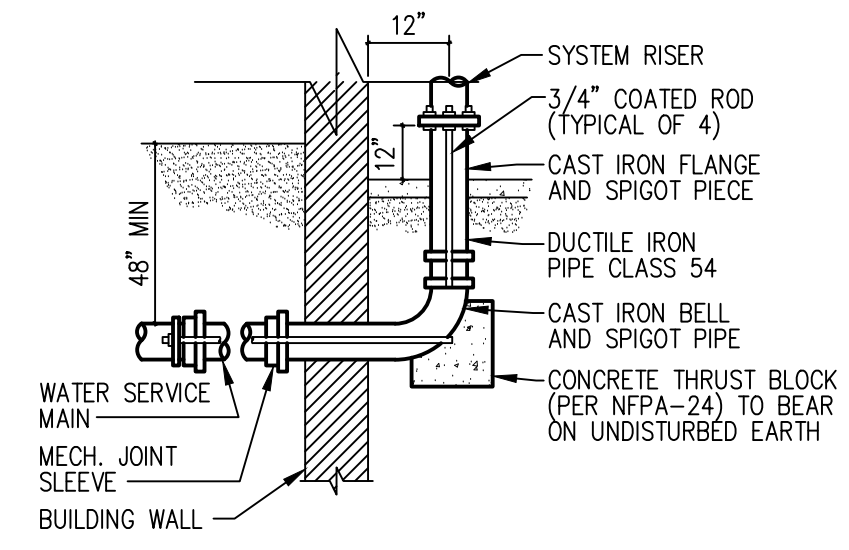


END VIEW

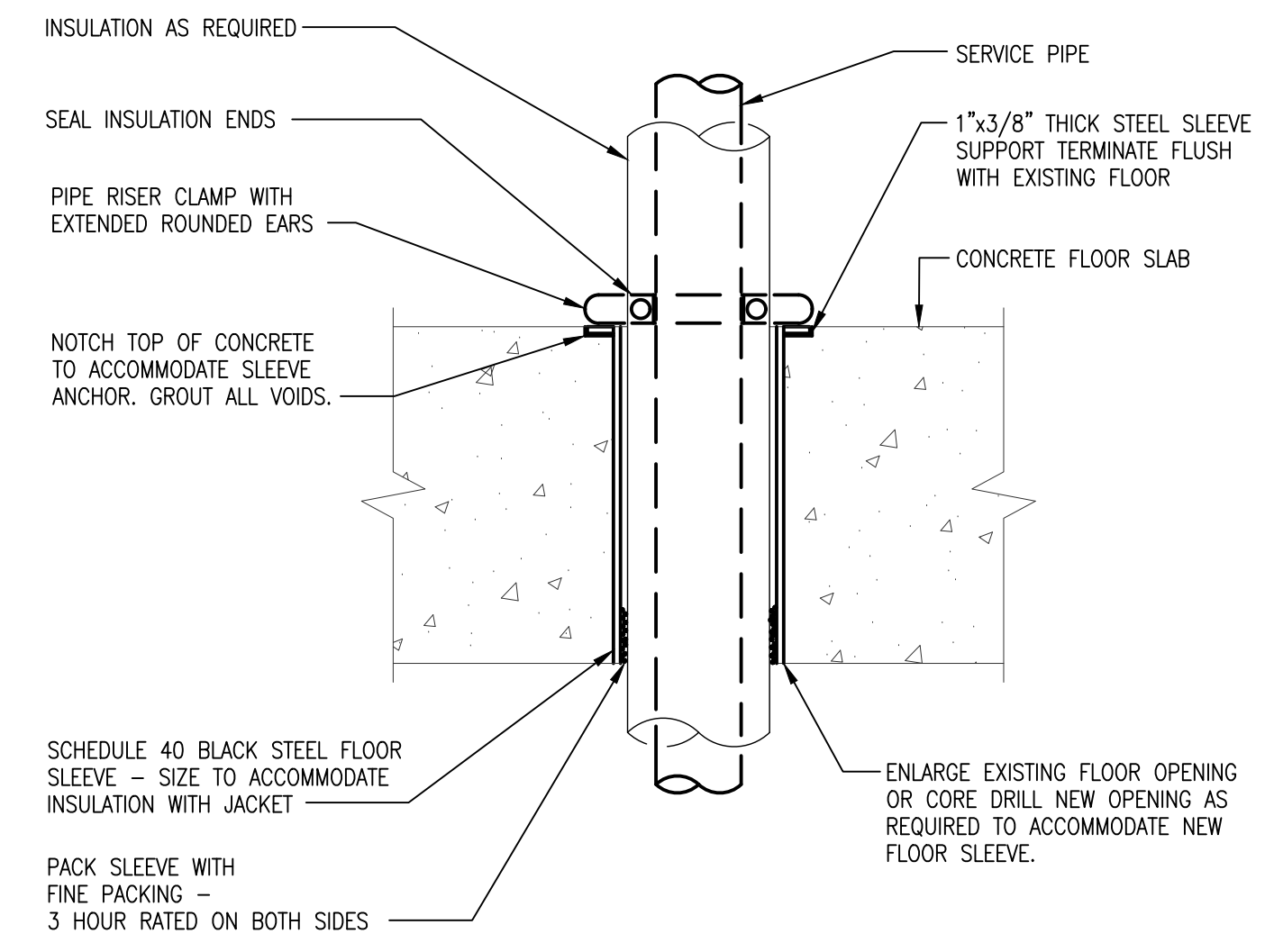


ELEVATION

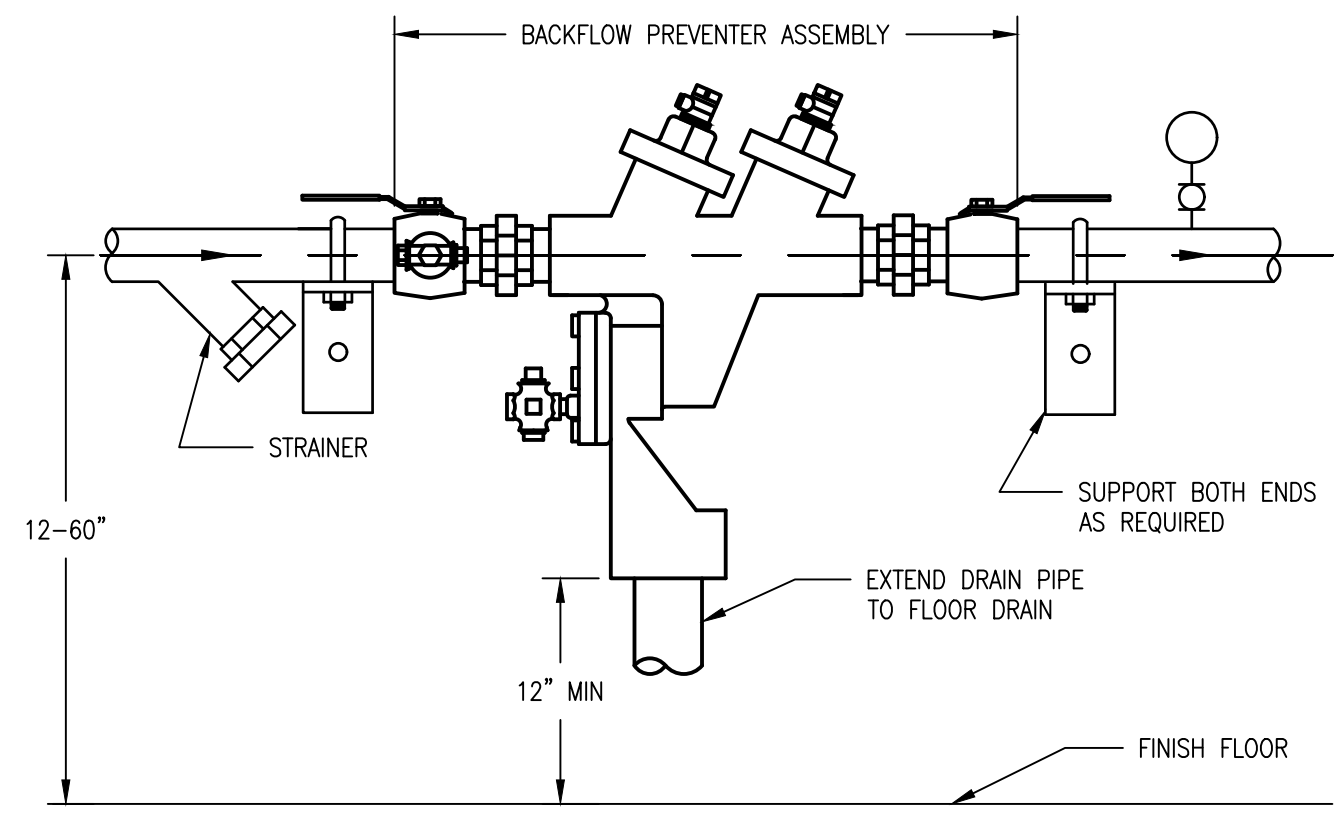
1 350 GALLON OIL WATER SEPARATOR
P502 SCALE: NOT TO SCALE



2 FIRE SERVICE DETAIL
P502 SCALE: NOT TO SCALE

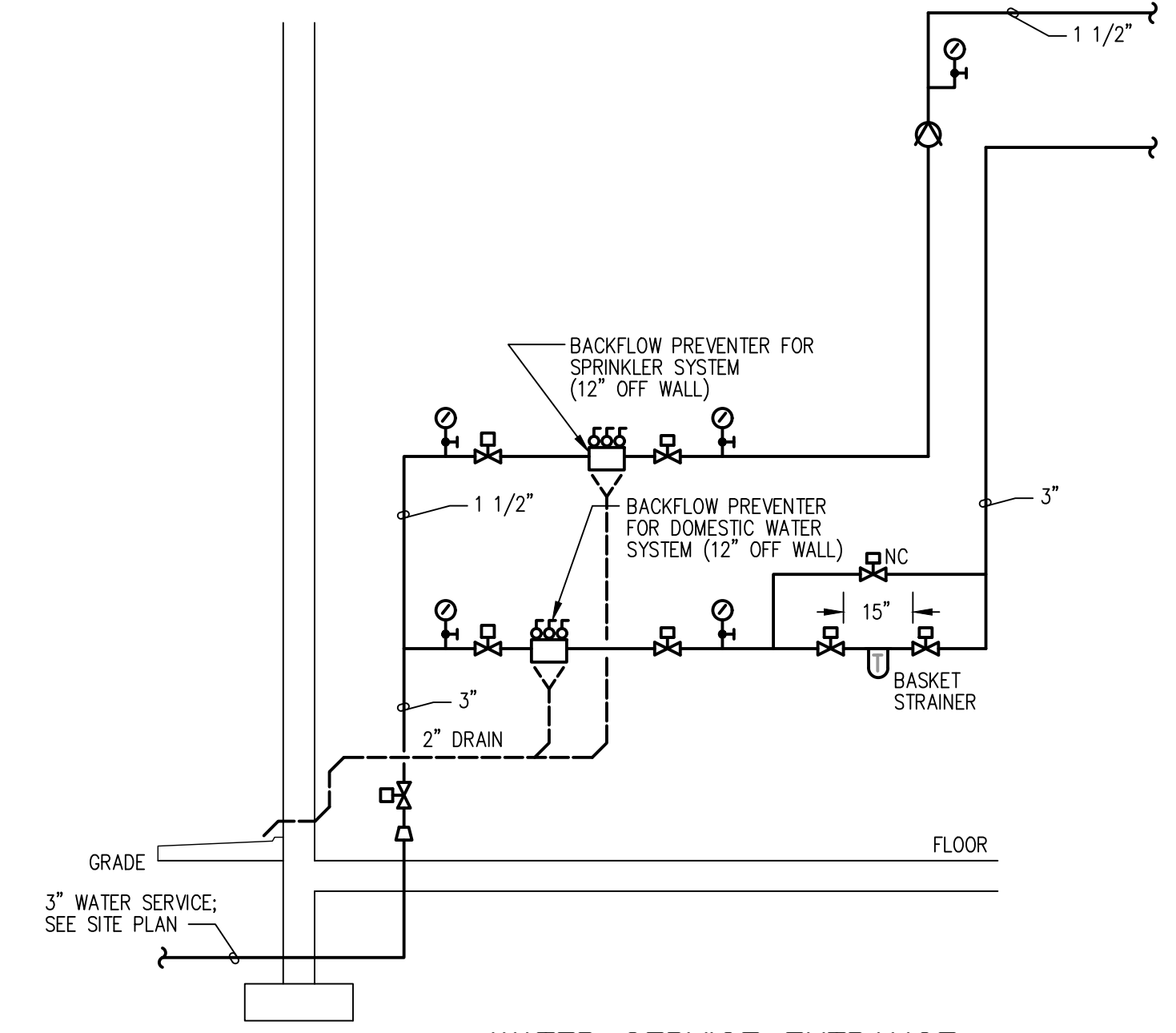


3 PIPE FLOOR PENETRATIONS
P502 SCALE: NONE



NOTES:
BACKFLOW PREVENTER SHALL BE 48" ABOVE FINISH FLOOR AND 12" CLEAR ON ALL SIDES.

4 BACKFLOW PREVENTER
P502 SCALE: NOT TO SCALE



5 WATER SERVICE ENTRANCE
P502 SCALE: NOT TO SCALE

WATER HEATER SCHEDULE										
DESIG	LOCATION	GAS		ELECTRIC		WATER		SHIPPING WEIGHT (LBS)	BASIS	NOTES
		INPUT (MBH)	INPUT (KW)	VOL/PH	TEMP RISE (°F)	GPH	CAPACITY (GAL)			
DWH-1	MECH ROOM	76	--	208/1ø	100	74	75.0	277.0	AO SMITH MODEL BTF-80	1

NOTES:
1) DISCONNECT SHALL BE PROVIDED UNDER DIVISION 26

MISCELLANEOUS EQUIPMENT SCHEDULE		
DESIG.	DESCRIPTION	BASIS
THERMOSTATIC MIXING VALVE <u>TMV-1</u>	THERMOSTATIC MIXING VALVE, DUAL VALVE ASSEMBLY COMPLETE WITH TEMPERATURE AND PRESSURE GAUGES AND BALL VALVES, DISCHARGE TEMPERATURE ADJUSTMENT RANGE: 65°F-95°F, 12 GPM CAPACITY, 3/4" INLETS, 3/4" OUTLET.	LAWLER MODEL 570
THERMOSTATIC MIXING VALVE <u>TMV-2</u>	THERMOSTATIC MIXING VALVE, DUAL VALVE ASSEMBLY COMPLETE WITH TEMPERATURE AND PRESSURE GAUGES AND BALL VALVES, DISCHARGE TEMPERATURE ADJUSTMENT RANGE: 70°F-90°F, 2 GPM CAPACITY, 1 GPM CW BYPASS ON FAILURE, 1/2" INLETS, 1/2" OUTLET; DESIGNED FOR EMERGENCY FIXTURE APPLICATIONS.	LAWLER MODEL 911
EXPANSION TANK <u>ET-1</u>	VERTICAL BLADDER (MOUNT VERTICALLY) EXPANSION TANK, DOMESTIC WATER SYSTEM, 150 PSI MAXIMUM DESIGN PRESSURE, 4.4 GALLON CAPACITY, 3.2 GALLON ACCEPTANCE VOLUME	BELL & GOSSETT SERIES PT

PLUMBING FIXTURE ROUGH-IN SCHEDULE						
DESIG.	FIXTURE	ROUGH-IN CONNECTION				REMARKS
		TW	CW	HW	SAN	
P-1	WATER CLOSET (ADA)	--	1 1/4"	--	4"	ADA FLOOR MOUNTED
P-2	LAVATORY SINK	--	1/2"	1/2"	1 1/4"	WALL MOUNTED
P-3	KITCHEN SINK	--	1/2"	1/2"	1 1/2"	COUNTERTOP
P-4	URINAL (ADA)	--	1"	--	2"	ADA WALL MOUNTED
P-5	SHOWER	--	1/2"	1/2"	--	ADA COMPLIANT, 3" FDR
P-6	MOP SINK	--	1/2"	1/2"	1 1/2"	FLOOR MOUNTED
P-7	WASH FOUNTAIN	--	1/2"	1/2"	1 1/2"	SEMI-CIRCULAR FLOOR MTD
P-8	DRINKING FOUNTAIN	--	1/2"	--	--	ADA WALL MOUNTED
P-9	SERVICE SINK	--	--	--	3"	WALL MOUNTED
P-10	EYE WASH	1/2"	--	--	1 1/2"	WALL MOUNTED
HB	HOSE BIBB	--	1/2"	--	--	
WH	WALL HYDRANT	--	1/2"	--	--	EXTERIOR
FDR	FLOOR DRAIN	--	--	--	3"	

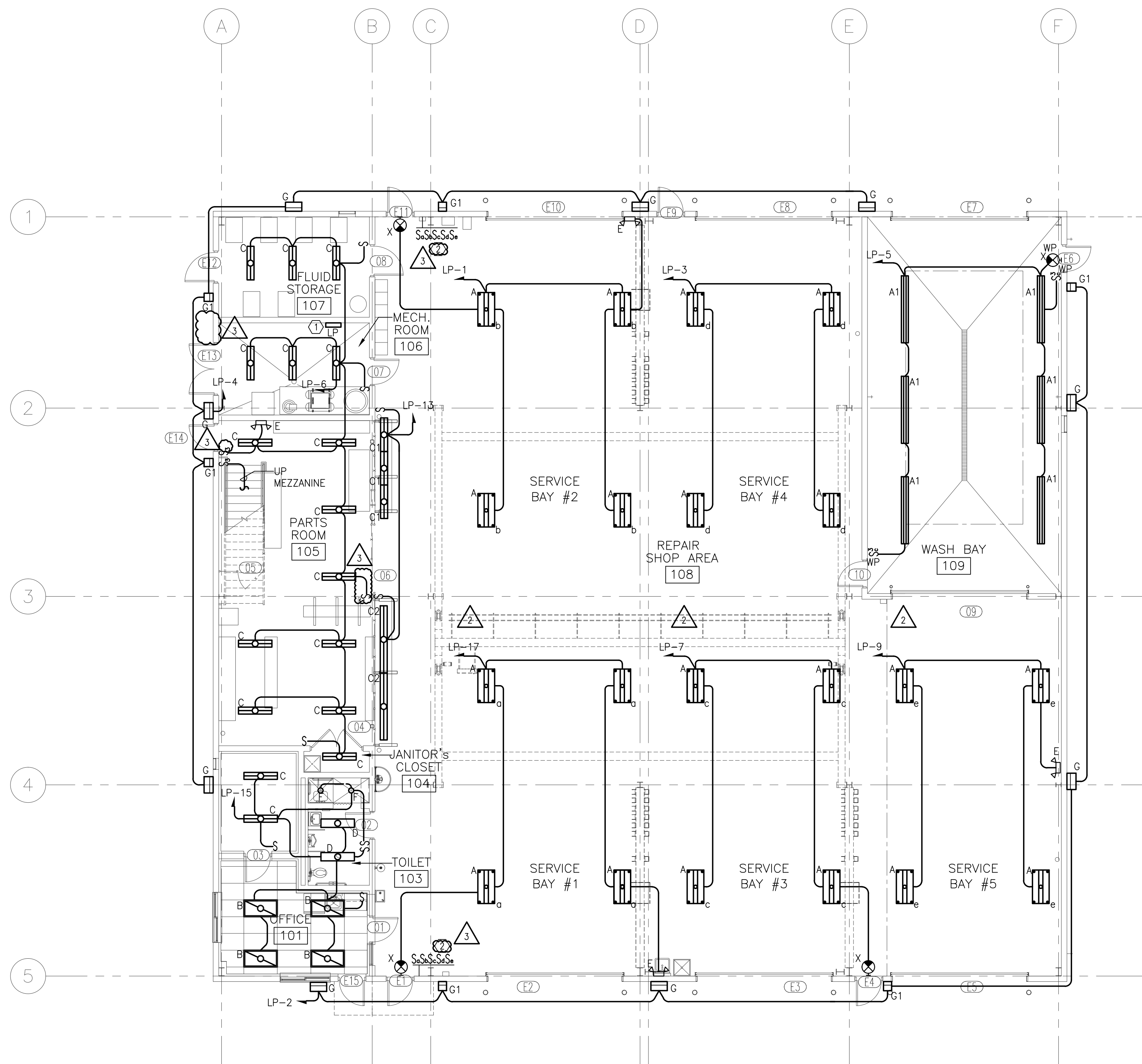
JMT \\jmt.corp.local\jmt\itd\WDE\220995_021_S1_Georges_Maintenan\CAD\Plumbing\Maintenance Building\220995-021-MB-B-500.dwg

ADDENDUMS / REVISIONS
8/8/17 ADDENDUM 3

CONTRACT	BRIDGE NO.	N/A
T201680104	DESIGNED BY:	BWC
COUNTY	CHECKED BY:	WWR
NEW CASTLE		

SHEET NO.	107
TOTAL SHTS.	116

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1 LIGHTING - GROUND FLOOR PLAN
 WBE101 SCALE: 1/8" = 1'-0"

SHEET GENERAL NOTES

1. SEE ARCHITECTURAL PLANS, ELEVATIONS, DETAILS AND SPECIFICATION FOR ELECTRICAL EQUIPMENT LOCATIONS AND HEIGHTS. COORDINATE EXACT LOCATION IN FIELD PRIOR TO INSTALLATION.
2. NO ELECTRICAL CORDS ARE ALLOWED TO PENETRATE WALLS, MILLWORK, OR CEILING PANELS. ALL ELECTRICAL OUTLETS MUST BE READILY ACCESSIBLE.
3. ALL WIRING SHALL BE INSTALLED IN CONDUIT, INCLUSIVE OF LOW VOLTAGE/CONTROL WIRING.
4. LIGHTING FIXTURES MOUNTED ON SUSPENDED CEILINGS SHALL BE SUPPORTED FROM THE FLOOR CONSTRUCTION ABOVE BY MEANS OF A MINIMUM OF FOUR SEPARATE GALVANIZED CHAINS OR WIRES PER FIXTURE ONE AT EACH CORNER OF THE FIXTURE. EACH CHAIN SHALL BE CAPABLE OF SUPPORTING 100 LBS AND EACH WIRE SHALL BE A MINIMUM OF 12 AWG MILD STEEL.
5. SEE LIGHTING FIXTURE SCHEDULE ON DWG MB-E-501.
6. LIGHTING SWITCHES TO BE TOGGLE SWITCH WITH PILOT LIGHT ONLY FOR JANITOR CLOSET LIGHTING.
7. COORDINATE TYPE A FIXTURE MOUNTING HEIGHT ON SERVICE BAY WITH CRANE AND HEATERS.

SHEET KEY NOTES:

- ① PROVIDE LIGHTING PANEL BOARD "LP". SEE DRAWING MB-E-501 FOR PANEL BOARD SCHEDULE.
- ② PROVIDE LIGHTING CONTROL SWITCHES SIMILAR TO HUBBELL HBL EXTRA HEAVY DUTY INDUSTRIAL SERIES PILOT LIGHT SWITCH HBL1223PL OR APPROVED EQUAL WITH ALL NECESSARY ACCESSORIES FOR A COMPLETE AND FUNCTIONAL SYSTEM.
- ③

ADDENDUMS / REVISIONS	
②	7/31/17 ADDENDUM 2
③	8/8/17 ADDENDUM 3

CONTRACT	BRIDGE NO.	N/A
T201680104	DESIGNED BY:	DT
COUNTY	CHECKED BY:	IL
NEW CASTLE		

SHEET NO.	111
TOTAL SHTS.	116

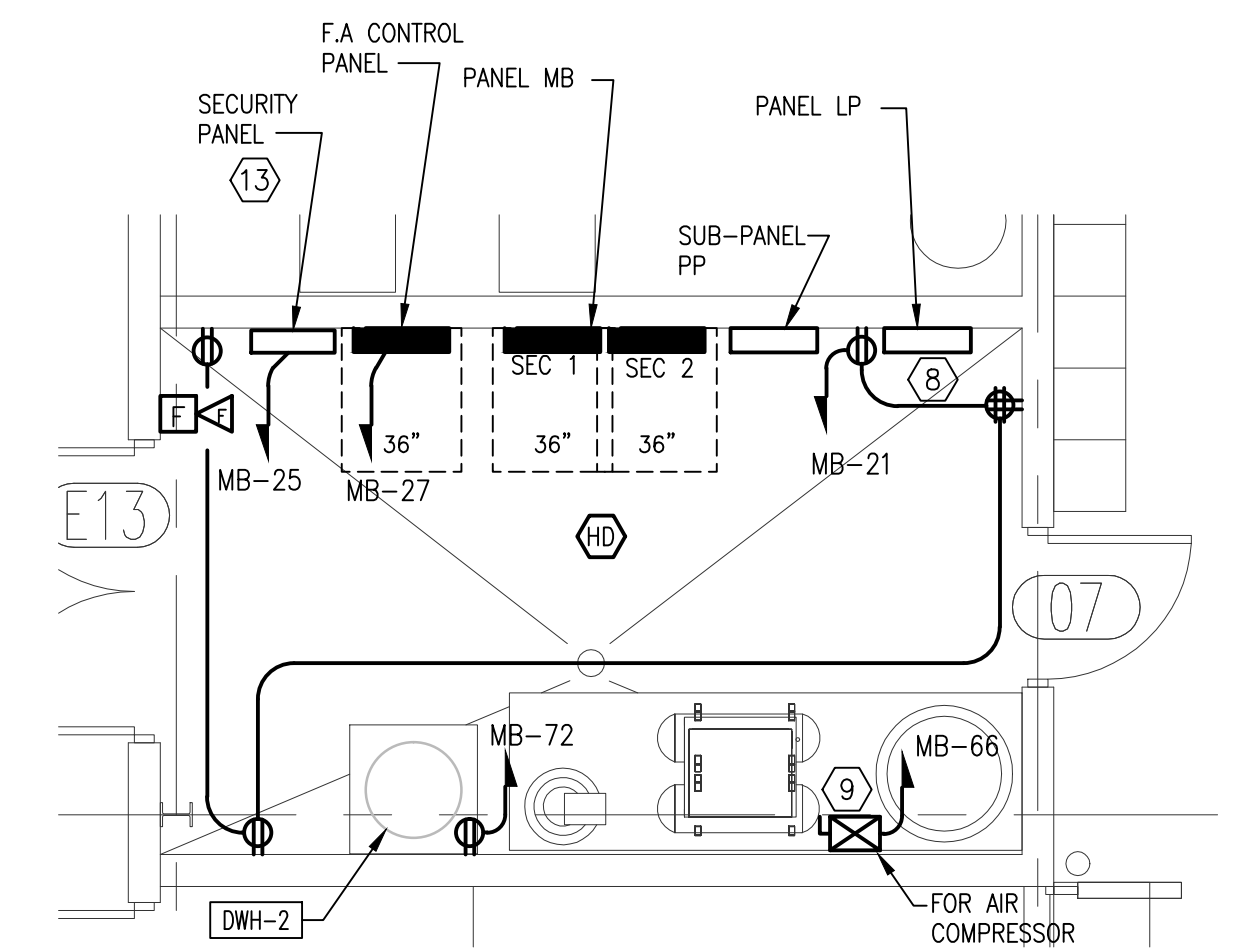
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SHEET GENERAL NOTES

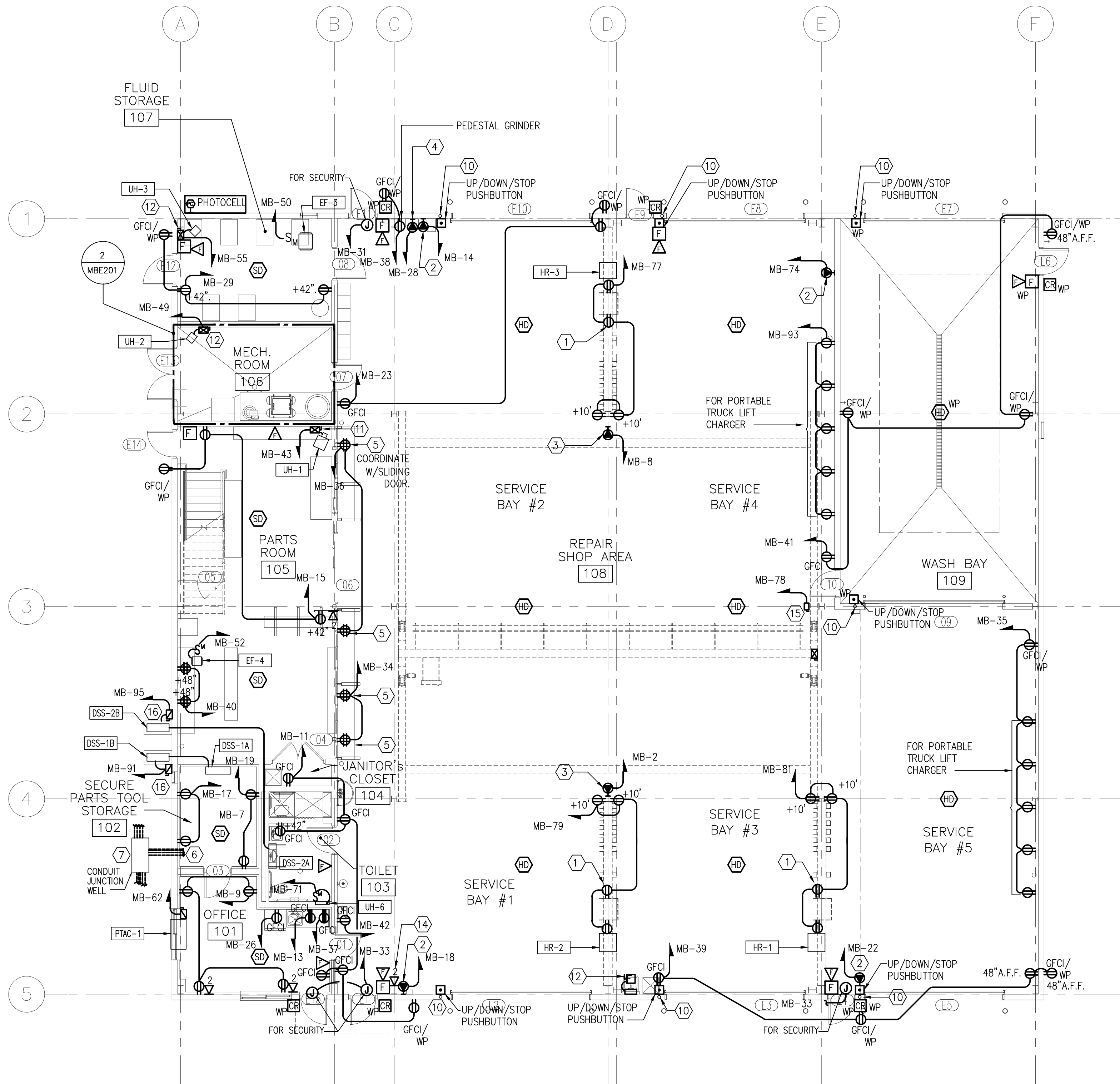
- SEE ARCHITECTURAL PLANS, ELEVATIONS, DETAILS AND SPECIFICATION FOR ELECTRICAL EQUIPMENT LOCATIONS AND HEIGHTS. COORDINATE EXACT LOCATION IN FIELD PRIOR TO INSTALLATION.
- LOCATION AND INSTALLATION HEIGHT OF ALL WALL DEVICES TO BE COORDINATE WITH MILLWORK IN ALL LOCATIONS.
- ALL WIRING SHALL BE INSTALLED IN CONDUIT, INCLUSIVE OF LOW VOLTAGE/CONTROL WIRING (I.E. THERMOSTATS, AUDIO, VISUAL, COMM. ETC.)
- ALL COMMUNICATIONS DEVICES SHALL RETURN TO THE COMMUNICATIONS DEMARCATION IN MINIMUM 1" CONDUIT.
- ALL OUTDOOR RECEPTACLES SHALL BE WATER RESISTANT AND GROUND FAULT CIRCUIT INTERRUPTER (GFCI) WITH WEATHER PROOF OUTDOOR RATED WHILE IN USE METALLIC COVER.
- ALL PUSHBUTTON FOR OVERHEAD DOORS SHALL BE INSTALLED INDOORS.
- CONTRACTOR SHALL FURNISH AND INSTALL ALL DOOR HARDWARE IN ACCORDANCE TO D&D SPECIFICATIONS. AS WELL AS ALL CONDUITS, BACKBOXES AND REQUIRED ACCESSORIES AS NECESSARY TO SUPPORT THE COMPLETE INSTALLATION OF ALL ACCESS CONTROLLED DOORS. THE CONTRACTOR SHALL COORDINATE WITH THE D&D INTEGRATOR TO DETERMINE ALL CONDUIT REQUIREMENTS PRIOR TO THE COMMENCEMENT OF ANY WORK. (TYPICAL ALL LOCATIONS).
- CONTRACTOR SHALL FURNISH AND INSTALL ALL CONDUITS, BACKBOXES AND REQUIRED ACCESSORIES AS NECESSARY TO SUPPORT THE COMPLETE INSTALLATION OF ALL FIXED VIDEO SURVEILLANCE CAMERAS. THE CONTRACTOR SHALL COORDINATE WITH THE D&D INTEGRATOR TO DETERMINE ALL CONDUIT REQUIREMENTS PRIOR TO THE COMMENCEMENT OF ANY WORK. (TYPICAL ALL LOCATIONS).

SHEET KEY NOTES:

- PROVIDE RECEPTACLE MOUNTED ON THE STRUCTURAL BEAM FOR HEAVY DUTY SERIES ELECTRIC CORD REEL. COORDINATE EXACT LOCATION IN FIELD WITH OWNER.
- PROVIDE SPECIAL RECEPTACLE NEMA 6-50R (208V,1Ø,50A), FOR PORTABLE WELDER.
- PROVIDE SPECIAL RECEPTACLE NEMA L15-30R (208V,3Ø,30A TWIST LOCK) FOR VEHICLE LIFT SYSTEM OR PLASMA CUTTER.
- PROVIDE SPECIAL RECEPTACLE NEMA 15-20R (208V,3Ø,20A), FOR DRILL PRESS.
- PROVIDE SUPPORTS FOR CONDUIT AND SURFACE MOUNTED RECEPTACLE AGAINST WIRE MESH FENCE, MOUNT AT 42" AFF.
- PROVIDE (2) 4" + (1) 2" + (1) 1" CONDUITS, STUB UP CONDUITS 3" ABOVE FINISHED FLOOR. COORDINATE EXACT LOCATION IN FIELD.
- SEE DRAWING S-E-201 FOR SITE PLAN AND CONDUIT INFORMATION. SEE DETAIL "5" ON DWG S-E-205 FOR JUNCTION WELL TYPE 4.
- PROVIDE LIGHTING PANELBOARD. SEE DRAWING MB-E-501 FOR SCHEDULE.
- PROVIDE 3P-60A F/SS (FUSED PER MANUFACTURER RECOMMENDATIONS) AND NEMA SIZE 2 COMBINATION STARTER WITH HOA SWITCH IN NEMA 4X ENCLOSURE. MOUNT AT UNIT AND MAKE ALL CONNECTIONS.
- PROVIDE CONCEALED 3/4" CONDUIT DOWN FROM DOOR UP/DOWN/STOP PUSHBUTTON TO OVERHEAD DRIVE DOOR OPERATOR. COORDINATE EXACT LOCATION WITH DOOR MANUFACTURER. PROVIDE ALL NECESSARY ACCESSORIES FOR A COMPLETE AND FUNCTIONAL SYSTEM. SEE DRAWING MB-E-202 FOR CONTINUATION.
- PROVIDE 3P-30A F/SS (FUSED PER MANUFACTURER RECOMMENDATIONS) AND NEMA SIZE 1 COMBINATION STARTER WITH HOA SWITCH IN NEMA 4X ENCLOSURE. PROVIDE ALL CONNECTIONS AND ALL NECESSARY ACCESSORIES FOR A COMPLETE AND FUNCTIONAL SYSTEM.
- PROVIDE 2P-30A F/SS (FUSED PER MANUFACTURER RECOMMENDATIONS) AND NEMA SIZE 1 COMBINATION STARTER WITH HOA SWITCH IN NEMA 4X ENCLOSURE. PROVIDE ALL CONNECTIONS AND ALL NECESSARY ACCESSORIES FOR A COMPLETE AND FUNCTIONAL SYSTEM.
- PROPOSED LOCATION FOR SECURITY ACCESS PANEL. COORDINATE EXACT LOCATION IN FIELD WITH OWNER'S REPRESENTATIVE. CONDUITS FROM ALL ACCESS CONTROLLED DOORS (CARD READERS) SHALL RUN TO THE FINAL LOCATION OF THE SECURITY PANEL. SEE SCHEMATIC ACCESS CONTROL SYSTEM RISER DIAGRAM ON DWG. MB-E-401.
- PROVIDE DATA CONFECTION OUTLET MOUNTED AT 12 FEET FOR WIRELESS INTERNET ROUTER SUPPLIED BY OTHERS.
- PROVIDE 3ØA, 2Ø8V, 3 PHASE, HEAVY DUTY DISCONNECT SWITCH FOR CRANE. COORDINATE EXACT LOCATION AND INSTALLATION HEIGHT WITH CRANE MANUFACTURER. PROVIDE ALL NECESSARY ACCESSORIES FOR A COMPLETE AND FUNCTIONAL SYSTEM.
- PROVIDE 2Ø8, 3ØA, 2 POLE, NEMA 4X FUSIBLE DISCONNECT SWITCH FUSED AT 15A, FOR SPLIT SYSTEM, SINGLE POINT OF CONNECTION. CONTRACTOR TO PROVIDE ALL WIRE/CONDUIT AND ACCESSORIES AS REQUIRED FOR CONNECTION WITH INDOOR UNIT.



2 POWER - ENLARGED MECH. ROOM 106
 MBE201 SCALE: 1/4" = 1'-0"



1 POWER - GROUND FLOOR PLAN
 MBE201 SCALE: 1/8" = 1'-0"

ADDENDUMS / REVISIONS	
8/8/17	ADDENDUM 3

CONTRACT	BRIDGE NO.	N/A
T201680104	DESIGNED BY:	DT
COUNTY	CHECKED BY:	IL
NEW CASTLE		

MAINTENANCE BUILDING LIGHTING FIXTURE SCHEDULE

Main fixture schedule table with columns: TYPE, SYMBOL, DESCRIPTION, MANUFACTURER, CATALOG NO., QTY., LAMP (TYPE, COLOR, CRI, LIFE), FIXTURE VOLTAGE, FIXTURE WATTS, FINISH, MOUNTING, NOTES.

FIXTURE SCHEDULE NOTES:

- 1. COORDINATE ALL FIXTURE QUANTITIES AND PLACEMENT REQUIREMENTS.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR ORDERING AND COORDINATING ALL FIXTURE OPTIONS AND ACCESSORIES TO ENSURE A COMPLETE QUALITY INSTALLATION.
3. FOR ALL LIGHT FIXTURES, FINISH SHOULD BE COORDINATED WITH ARCHITECT.
4. FOR ALL LIGHT FIXTURES, COORDINATE EXACT LOCATIONS AND MOUNTING HEIGHT.
5. ALL LIGHTING FIXTURES SHALL BE APPROVED BY THE OWNER / ARCHITECT PRIOR TO ORDERING AND INSTALLING.
6. COORDINATE MOUNTING HEIGHT OF THE MEZZANINE LIGHTS TO BE EQUAL WITH THE BAY FIXTURES.
7. FOR EXIT LIGHTS PROVIDE SINGLE OR DOUBLE FACE AS INDICATED ON FLOOR PLANS ALSO PROVIDE INTEGRAL BATTERY BACK-UP.

PANEL: MB SECTION 1

MOUNTING: SURFACE

MAIN: 400 MCB

AMP: 400 VOLT: 208Y/120
PHASE: 3 4 WRE + GND
AIC: 22K AMPS RMS SYM

Panel MB Section 1 load schedule table with columns: Branch Circuit Load Description, KVA Load (A, B, C), Trip Poles, Circuit Wiring (NO, Size, GND, C), Ckt. No., Phase, Ckt. No., Trip Poles, KVA Load (A, B, C), Branch Circuit Load Description.

PHASE A 23.15 kVA
PHASE B 23.35 kVA
PHASE C 24.60 kVA

61.40 kVA CONNECTED LOAD (SECTION 1)
53.10 kVA CONNECTED LOAD (SECTION 2)
120.50 kVA TOTAL CONNECTED LOAD
82.83 kVA TOTAL DEMAND LOAD

PROVIDE THE FOLLOWING:

PANEL: MB SECTION 2

MOUNTING: SURFACE

MAIN: MLO

AMP: 400 VOLT: 208Y/120
PHASE: 3 4 WRE + GND
AIC: 22K AMPS RMS SYM

Panel MB Section 2 load schedule table with columns: Branch Circuit Load Description, KVA Load (A, B, C), Trip Poles, Circuit Wiring (NO, Size, GND, C), Ckt. No., Phase, Ckt. No., Trip Poles, KVA Load (A, B, C), Branch Circuit Load Description.

PHASE A 19.95 kVA
PHASE B 16.95 kVA
PHASE C 16.20 kVA

50.60 kVA TOTAL CONNECTED LOAD
0.00 kVA TOTAL DEMAND LOAD

PROVIDE THE FOLLOWING:

PANEL: LP

MOUNTING: SURFACE

MAIN: MLO

AMP: 100 VOLT: 208Y/120
PHASE: 3 4 WRE + GND
AIC: 22K AMPS RMS SYM

Panel LP load schedule table with columns: Branch Circuit Load Description, KVA Load (A, B, C), Trip Poles, Circuit Wiring (NO, Size, GND, C), Ckt. No., Phase, Ckt. No., Trip Poles, KVA Load (A, B, C), Branch Circuit Load Description.

PHASE A 4.00 kVA
PHASE B 3.50 kVA
PHASE C 3.80 kVA

11.30 kVA TOTAL CONNECTED LOAD
14.13 kVA TOTAL DEMAND LOAD

PROVIDE THE FOLLOWING:

PANEL: PP

MOUNTING: SURFACE

MAIN: MLO

AMP: 100 VOLT: 208Y/120
PHASE: 3 4 WRE + GND
AIC: 22K AMPS RMS SYM

Panel PP load schedule table with columns: Branch Circuit Load Description, KVA Load (A, B, C), Trip Poles, Circuit Wiring (NO, Size, GND, C), Ckt. No., Phase, Ckt. No., Trip Poles, KVA Load (A, B, C), Branch Circuit Load Description.

PHASE A 3.50 kVA
PHASE B 3.50 kVA
PHASE C 3.50 kVA

10.50 kVA TOTAL CONNECTED LOAD
5.25 kVA TOTAL DEMAND LOAD

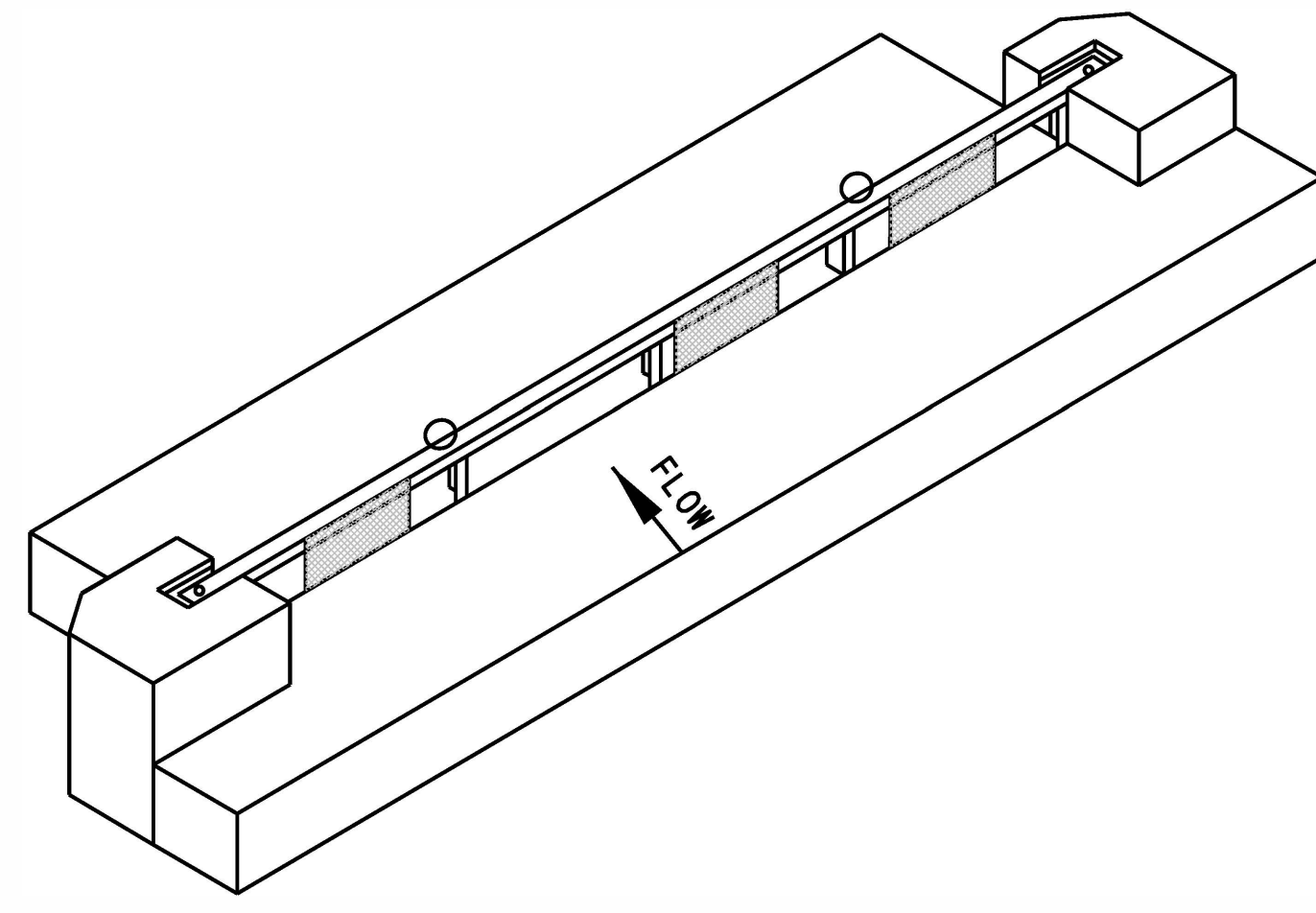
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NOTES:

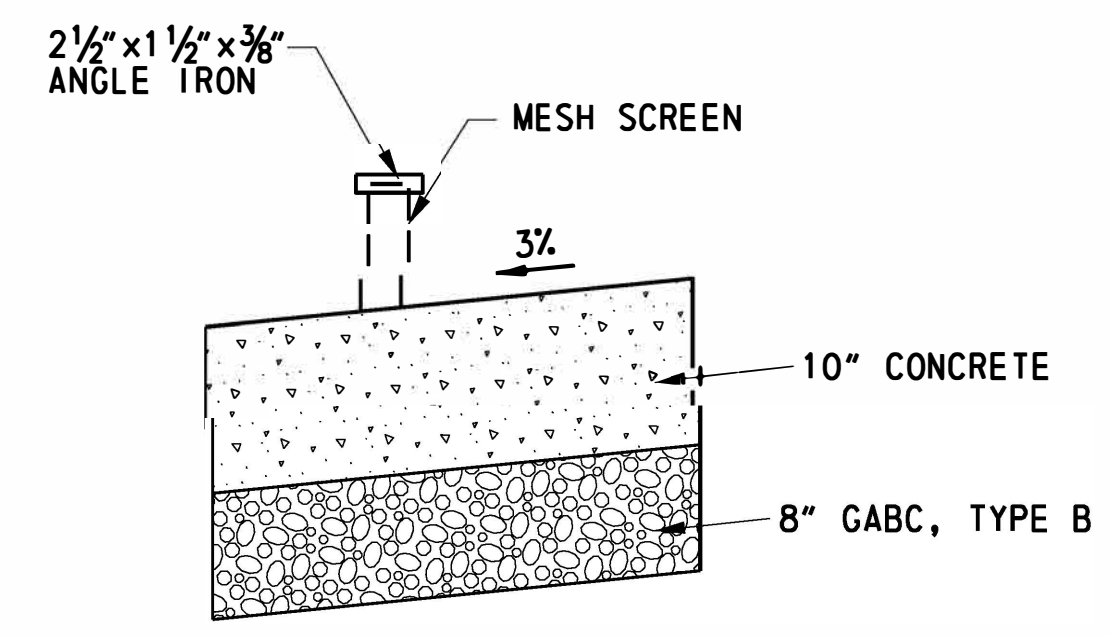
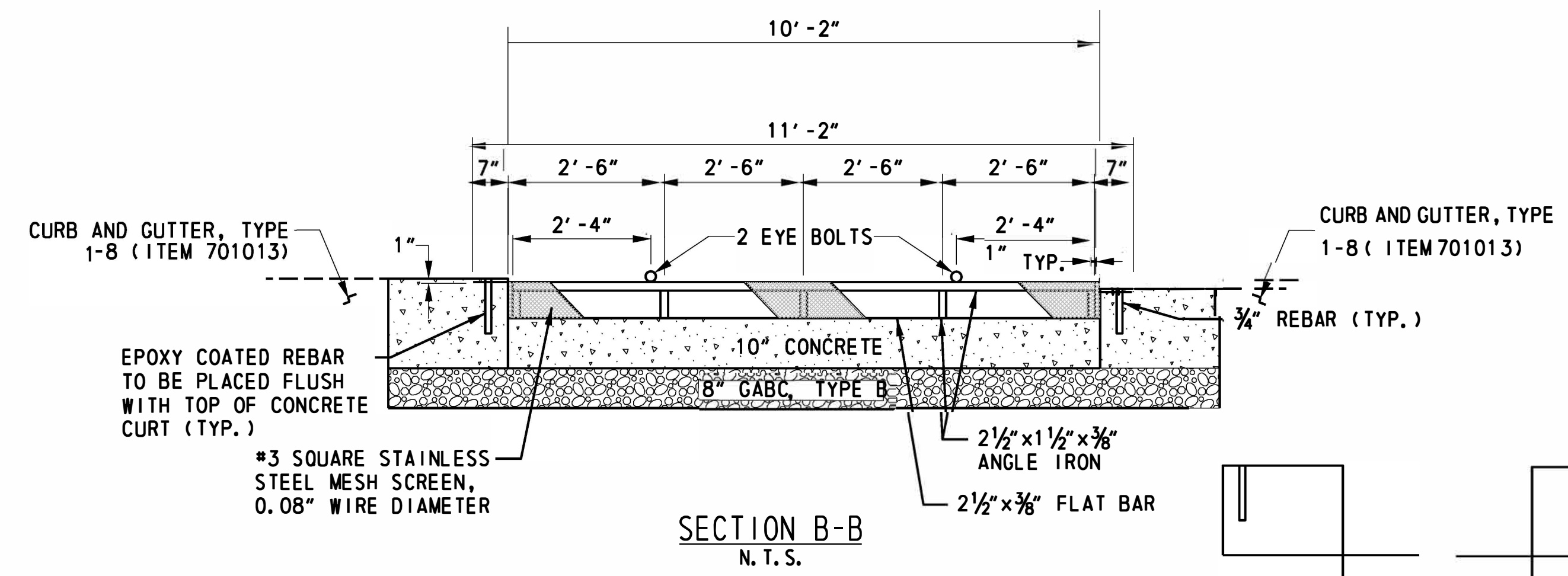
The cost for the sediment screen includes all material and labor necessary to construct and install shall be incidental to Item 701013, PCC Curb Type 1-8.

The horizontal and vertical angle irons mesh screening and eye bolts shall be welded to form one unit. The contractor shall be required to construct an additional sediment screen per these details and furnish to serve DELDOT as a spare.

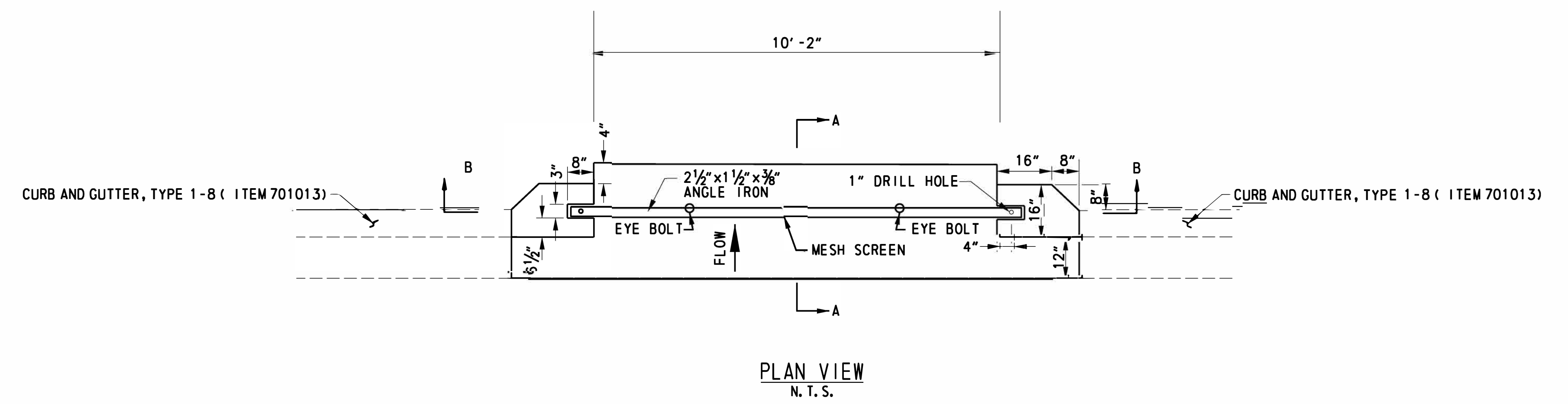
All angles irons, mesh screening eye bolts and any other necessary fasteners required to construct the sediment screen shall be stainless steel. The cost for all required curb modifications including rebar shall be incidental to 701013, PCC Curb Type 1-8.



ISOMETRIC VIEW
N. T. S.



SECTION A-A
N. T. S.



SEDIMENT SCREEN (252500)
N. T. S.

PLOTTED BY: BDOUGHERTY DATE: 8/11/2017
 FILE LOCATION: Q:\INDE\120995_021_ST_GEORGES_MAINTENANCE\CADD\AS\TE\DT-DGN [SHEET: DT02A]

ADDENDUMS / REVISIONS	
ADD SHEET - WJD - 8/10/17	

NOT TO SCALE

**ST. GEORGES MAINTENANCE
YARD IMPROVEMENTS**

CONTRACT T201680104	BRIDGE NO. N/A
COUNTY NEW CASTLE	DESIGNED BY: WJD
	CHECKED BY: BH

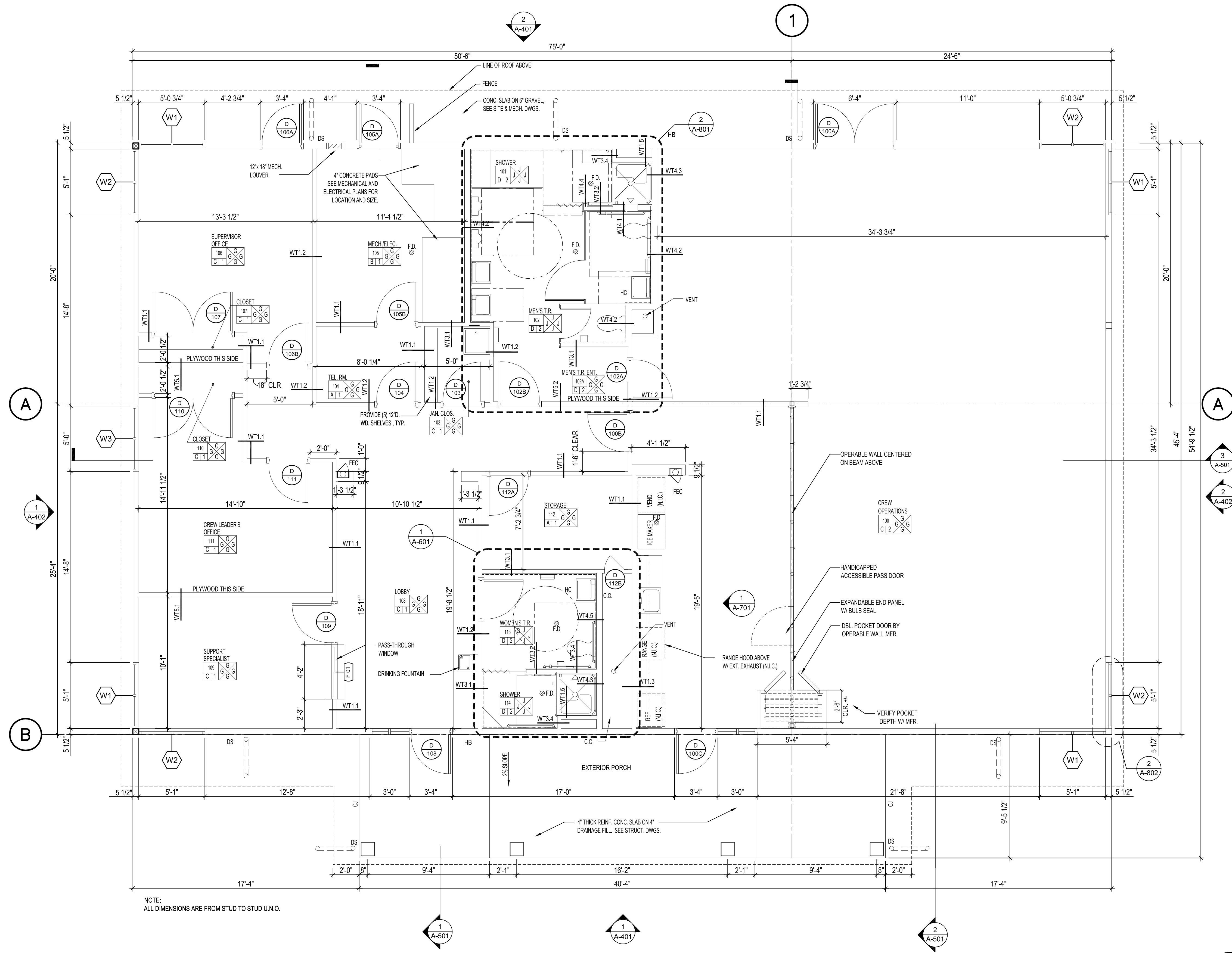
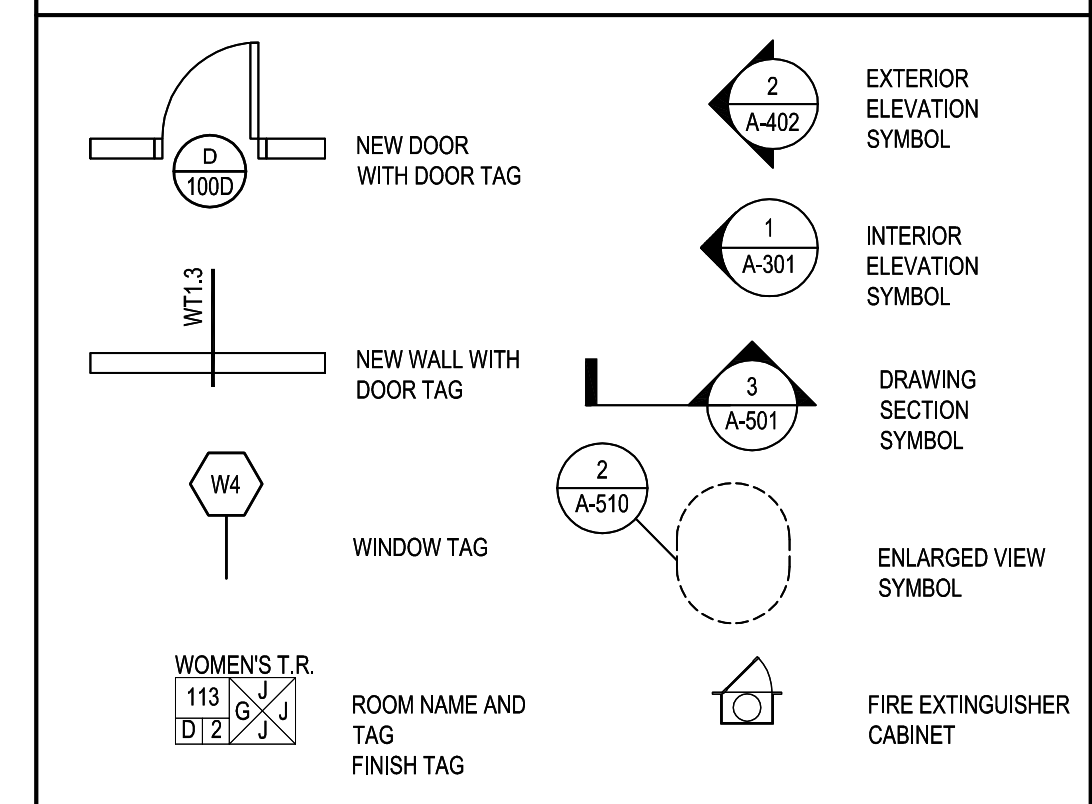
CONSTRUCTION DETAILS

SHEET NO. 9A
TOTAL SHTS. 116

ADDED SHEET

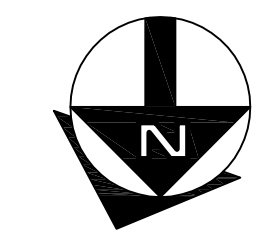
NOTES

LEGEND



NOTE: ALL DIMENSIONS ARE FROM STUD TO STUD U.N.O.

1 FLOOR PLAN-
SCALE: 1/4" = 1'-0"



CO-A-101

ADDENDUMS / REVISIONS	

CONTRACT T201680104	BRIDGE NO. 	N/A
COUNTY NEW CASTLE	DESIGNED BY: DCH	
	CHECKED BY: KNM	

SHEET NO. 29
TOTAL SHTS. 116

Q:\NOE\120995_02\St_Georges_Maintenance\CADD\Architectural\A-101 CREW OPERATION BUILDING FLOOR PLAN.dwg

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

- 1. Footings.
- 2. Foundation walls.
- 3. Slabs-on-grade.

- B. Related Sections:

- 1. Section 033300 "Architectural Concrete" for general building applications of specially finished formed concrete.
- 2. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.
- 3. Section 321313 "Concrete Paving" for concrete pavement and walks.
- 4. Section 321316 "Decorative Concrete Paving" for decorative concrete pavement and walks.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other Pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.

- 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.

e. Special concrete finish Subcontractor.

2. Review methods for achieving specified floor and slab flatness and levelness, floor and slab flatness and levelness measurement, and concrete protection.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Steel reinforcement and accessories.
 - 4. Waterstops.
 - 5. Curing compounds.
 - 6. Floor and slab treatments.
 - 7. Bonding agents.
 - 8. Adhesives.
 - 9. Vapor retarders.
 - 10. Semirigid joint filler.
 - 11. Joint-filler strips.
 - 12. Repair materials.
- C. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
- D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

- E. Field quality-control reports.
- F. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
- F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- C. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.
- C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I.

SECTION 222124

LUBRICATION PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Piping Materials
2. Compressed Air Powered Linear Reciprocating Lube Pumps
3. Compressed Air Powered Diaphragm Pump
4. Pump accessories and Piping System
Accessories
5. **Waste Oil Storage System**
6. Hose Reel Accessories
7. Dispensing Valve
8. Storage Tanks

B. Related Sections

1. Commons Work Results for Plumbing - 220500
2. Hangers and Supports for Plumbing Piping and Equipment: Section 220529.
3. Identification for Plumbing Piping and Equipment: Section 220553

1.2 REFERENCES

- A. The publications listed below form a part of this section to the extent referenced. The publications are referred to within the text by the basic definition only. Use latest edition of publication.
- B. National Fire Protection Association (NFPA):
 1. NFPA 30 — Flammable and Combustible Liquids Code
- C. The American Society of Mechanical Engineers (ASME):
 1. ASME B31.9; Specification for Building Services Piping.
- D. American Welding Society (AWS):
 1. AWS D1.1 — Code for Structural Welding — Steel
 2. AWS D10.12M/D10.12 — Guide for Welding Mild Steel Pipe

- E. American National Standards Institute (ANSI):
 - 1. ANSI B16.10; Face-to-Face and End-to-End Dimensions of Ferrous Valves.
- F. American Society for Testing and Materials (ASTM):
 - 1. ASTM B209; Standard specification for aluminum and aluminum-alloy sheet and plate.
 - 2. ASTM C 335, Steady state heat transfer properties of horizontal pipe insulation.
 - 3. ASTM C 547; Standard specification for mineral fiber pipe insulation.
- G. Manufacturer's Standardization Society (MSS) of the Valve and Fittings Industry, MSS-SP-70 and MSS-SP-71.
- H. Minimum Working Pressure Ratings: Except where otherwise indicated, the following are minimum pressure requirements:
 - 1. Low Pressure Piping (0 — 300 PSIG)
 - 2. Medium Pressure Piping (300 — 2,000 PSIG)
 - 3. High Pressure Piping (2,000 — 10,000 PSIG)

1.3 SUBMITTALS

- A. Product data including size, dimension, capacity, pressure rating, settings, and operating characteristics of selected models, for the following:
 - 1. Air operated reciprocating pumps
 - 2. Air Operated Diaphragm Pump
 - 3. Pump Accessories
 - 4. Piping and Accessories
 - 5. Hose Reels and Accessories
 - 6. Dispensing Valves
- B. Coordination drawings for piping systems, including required clearances and relationships to other services that serve the same work area.
- C. Maintenance data for each type and size of equipment specified to include in the "Operating and Maintenance Manual".

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with a minimum of 5 years' experience.
- B. Installer Qualifications: Experience on at least 5 projects of a similar nature in past 5 years, and acceptable to the Owner.

- C. Regulatory Requirements: Comply with provisions of the following:
1. NFPA 30 and 31 for oil piping materials, components, installations, inspection, and testing.
 2. Provide listing/approval stamp, label, or other marking on equipment made specified standards.
 3. Listing & Labeling: Provide equipment and accessories that are listed and labeled.
 4. UL 778 “Standard for Motor Operated Water Pumps” for construction requirements. Include UL listing and labeling.
 5. NFPA 70 “National Electrical Code” for electrical components and installation.
- D. Materials used: In all cases the materials, seals, packing, hoses, valves, etc. used in these systems will be compatible with the fluids being handled and dispensed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store equipment in a clean, dry location.
- B. Retain shipping protective covers and protective coatings during storage.
- C. Protect bearings and couplings against damage from sand, grit, or other foreign matter.
- D. Comply with equipment manufacturer’s rigging instructions for handling.
- E. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of lubrication fluids storage tanks and related equipment that fail in materials or workmanship within specified warranty period.
1. Storage Tanks:
 - a. Failures include, but are not limited to, the following when used for storage lubrication fluids and waste oil at temperatures not exceeding 150 deg F:
 - 1) Structural failures including cracking, breakup, and collapse.
 - 2) Corrosion failure including external and internal corrosion of steel tanks.

- b. Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MOTOR OIL AND HYDRAULIC OIL (MO1, MO2, HO) ABOVEGROUND INSIDE BUILDING

A. Service Requirements:

1. Motor Oil: Supply maximum operating pressure of 1200 psig
2. Hydraulic Oil: Supply maximum operating pressure of 1200 psig.

B. Pipe: Black steel, Schedule 80 ASTM A53.

1. Joints: Butt welded per ANSI B16.11
2. Fittings: Wrought carbon steel standard weight welding ASTM A234, grade WPB or WPC, ANSI B16.9

C. Valves:

1. Acceptable Manufacturers:

- a. Apollo; Model 83R-240
- b. Conbraco
- c. Nibco
- d. Or Approved Equal

2. Ball Valves: MSS SP-I 10, 1500 psig WOG, blow-out proof stem, 3-piece carbon steel body, stainless steel ball and stem, threaded ends.

D. Tube: SAE 1010, dead soft, cold drawn, seamless steel,

1. Tubing wall thickness: minimum 0.065 inches.
2. Joints: Mechanically joined with fittings rated at a 4:1 safety factor of burst over operating pressures. Materials to be compatible with fluids being transported.
3. Fittings: Steel or stainless steel, butt-joint mechanical fittings meeting the following industry standards:
 - a. JIC Pneumatic and Hydraulic Standards.
 - b. ANSI Code for Pressure Piping.
 - c. ASME Code for Pressure Piping.
 - d. MIL-F- I8280E

2.2 AUTOMATIC TRANSMISSION FLUID (ATF), ABOVEGROUND INSIDE BUILDING

A. Service Requirements:

1. Automatic Transmission Fluid: Supply maximum operating pressure of 1200 psig.
- B. Pipe: Black steel, Schedule 80 ASTM A53.
1. Joints: Butt welded per ANSI B16. II
 2. Fittings: Wrought carbon steel standard weight welding ASTM A234, grade WPB or WPC, ANSI B16.9
- C. Valves:
1. Acceptable Manufacturers:
 - a. Apollo; Model 83-440
 - b. Conbraco
 - c. Nibco
 - d. Or Approved Equal
 2. Ball Valves: MSS SP-110, 1500psig WOG, blow-out proof stem, 3-piece carbon steel body, stainless steel ball and stem, socket welded ends.
- D. Tube: SAE 1010, dead soft, cold drawn, seamless steel,
1. Tubing wall thickness: minimum 0.065 inches.
 2. Joints: Mechanically joined with fittings rated at a 4: 1 safety factor of burst over operating pressures. Materials to be compatible with fluids being transported.
 3. Fittings: Steel or stainless steel, butt-joint mechanical fittings meeting the following industry standards:
 - a. JIC Pneumatic and Hydraulic Standards.
 - b. ANSI Code for Pressure Piping.
 - c. ASME Code for Pressure Piping.
 - d. MIL-F-18280E
- 2.3 CHASSIS LUBRICATION OIL (LO), ABOVEGROUND INSIDE BUILDING
- A. Service Requirements:
1. Chassis Grease: Supply maximum operating pressure of 6000psig.
- B. Pipe: Black steel, Schedule 160 ASTM A53, seamless, Grade B.
1. Joints: Socket welded per ANSI B16. 11, with fittings rated at a 4: 1 safety factor of burst over operating pressures.

2. Fittings: Forged Class 6000.

2.4 COOLANT (COOL), ABOVEGROUND INSIDE BUILDING

A. Service Requirements:

1. Coolant: Supply maximum operating pressure of 150 psig.

B. Pipe: Copper Tube, ASTM B88, Type K

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F (220 to 280 degrees C).
3. Unions:
 - a. Copper Piping: Class 150, bronze unions with soldered
 - b. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.5 WASTE OIL (WO), ABOVEGROUND INSIDE BUILDING

A. Service requirements:

1. Waste Oil: Supply maximum operating pressure of 100 psig.

B. Pipe: Black steel, Schedule 40 ASTM A53.

1. Joints: Threaded.
2. Fittings: Malleable iron, 150lb., threaded, ASTM A47 and ANSIB16.3.

C. Valves:

1. Acceptable Manufacturers:
 - a. Apollo; Model 83R-100
 - b. Conbraco
 - c. Nibco
 - d. Or Approved Equal
2. Ball Valves: MSS SP-110, 1000 psig WOG, blow-out proof stem, 3-piece carbon steel body, stainless steel ball and stem, threaded ends.

2.6 WASTE OIL STORAGE SYSTEM

A. Acceptable Manufacturers

1. Containment Solutions - Safewaste (Basis of Design)
2. John Dow

B. General:

1. The Aboveground Used Oil Collection and Storage Systems shall be constructed in accordance with National, State, and Locally Recognized Aboveground Storage Tank Standards, such as: Underwriters Laboratory Standard 142 for the primary tank, National Fire Protection Association Sections 30 & 30A, and Uniform Fire Code.
2. The systems provide a minimum of 110% secondary containment for the primary tank, and 360° radius containment for the primary tank and control assemblies.
3. The control assemblies shall be new, and installed on top of the primary tank at the factory.
4. The anchoring tie downs shall be an integral part of the exterior support feet and shall be welded to the bottom of the Environmental Tank Enclosure.
5. All openings in the primary tank shall be from the top, with threaded NPT fittings.
6. The system shall include a one (1) year warranty for the tanks and accessories.

C. Primary Storage Tank

1. Storage tank shall have a 500-gallon capacity.
2. The primary storage tank shall be rectangular in design and constructed of UL specified steel thickness, with continuous welds.
3. The primary storage tank shall be constructed and listed in accordance with UL 142 standards.
4. The primary tank shall be fitted with a minimum of: a 3/4" product inlet, a 2" overfill prevention valve, a 2" suction tube for product withdrawal, a 2" primary working vent, either a 4" or 6" emergency vent, a 2" product level gauge, and a 1" sampling port.
5. The primary tank shall be pressure tested to UL 142 Standard (minimum 3 to maximum 5 psi) at the factory.
6. The exterior of the primary tank shall be cleansed of foreign material, and coated with a corrosion resistant industrial paint (3 to 5 mils dry film thickness).

D. Control Assemblies:

1. The control assemblies shall be installed on top of the primary tank, enclosed totally within the environmental containment cabinet and tested at the factory before shipment.
2. Pump Assembly: The pump assembly consists of a 1" UL Listed air operated double diaphragm suction pump with a capacity of 10-15 gpm at 50 psi.
3. Automatic Overfill Drain Assembly: The automatic overfill valve assembly consists of air operated valve that is preset at the factory to stop the air flow to the

suction pump when the liquid level in the storage tank reaches 95% of its capacity. This assembly also includes an air filter/regulator, pressure gauge, and flexible air supply hose to connect the valve to the 1/2" coupler and air pump.

4. Audible Alarm: The audible alarm is incorporated within the automatic overflow valve assembly, and engages at the 95% capacity level.
5. Product Intake Line: The product intake line consists of a UL Listed 3/4" by 8' hardwall suction hose with in-line strainer, one each 3/4" female quick coupler and 3/4" male quick coupler, and hose hanger bracket.
6. Product Removal: The product contained inside the primary tank shall be removed through a 2" cam and groove fitting with locking cap assembly and 2" suction tube.
7. Normal Venting: The working vent consists of a 2" mushroom vent cap and rubber grommet for sealing penetration through the secondary tank.
8. Emergency Vent: The emergency vent consists of a 4" or 6" emergency relief device.
9. Product Level Gauge: The sight level gauge is mechanical, reading in inches. A tank conversion chart shall be provided to convert the inch readings into gallons.

2.7 COMPRESSED AIR POWERED LINEAR RECIPROCATING LUBE PUMPS

A. Acceptable Manufacturers

1. Graco (Basis of Design)
2. Balcrank
3. Lincoln

B. Service Requirements:

1. Motor Oil (MO)
2. Automatic Transmission Fluid (ATF)
3. Hydraulic Oil (HO)

C. The 10:1 ratio positive displacement oil pump with pneumatically operated 4-1/4" diameter air motor, a 4" pumping stroke length and cycle on demand only. External muffler that operates below OSHA noise standards, and be equipped with a grounding lug. The design of the air motor to incorporate a valve in piston design durability and longevity. Air motor cylinder material is hard coated aluminum and corrosion resistant steel. The air motor shall feature a non-metallic poppet valve. The air motor and lower pump section of the in-line design. The pump to be tank mounted and to include hose & fitting kit, FRL, air & fluid shutoff valves, and mounting bracket. Model #205626

- | | |
|--------------------------------|-----------|
| 1. Pump ratio: | 10:1 |
| 2. Continuous duty flow rate: | 4.1 gpm |
| 3. Maximum fluid pressure: | 1,800 psi |
| 4. Maximum air inlet pressure: | 180 psi |
| 5. Fluid outlet size: | 3/4" NPT |

6. Air inlet size: 1/2" NPT
7. Air Consumption: 32 cfm per 4.1 gpm

D. Provide the following with each pump:

1. Thermal Relief Kit
2. Hose and Fitting Kit
3. Low Level Cut Off
4. Breed Type Air
5. Shut-Off Valve
6. Air Filter/Regulator
7. Lubricator, 1/2" ports
8. Automatic Drain Valve for filter
9. 3/4" fluid shut-off valve
10. Pump runaway valve
11. 1/2" Air Coupler
12. 1/2" Air Coupler

2.8 COMPRESSED AIR POWERED DIAPHRAGM PUMPS - COOLANT (COOL)

A. Acceptable Manufacturers

1. Graco Husky 1050 (Basis of Design)
2. Balcrank
3. Lincoln

B. Pump shall be an air operated double diaphragm type constructed of conductive polypropylene.

C. Wetted parts shall be polypropylene.

D. Non-wetted parts shall be polypropylene with stainless steel bolts.

E. System performance and characteristics are as follows:

1. Displacement per cycle: 0.17 gallons
2. Air consumption at 70 psi, 20 gpm: 25 scfm
3. Air pressure range: 20-125 psi
4. Fluid outlet size: 1 inch raised face
5. Air inlet size: 1/2" npt

2.9 COMPRESSED AIR POWERED LINEAR RECIPROCATING LUBE PUMPS - CHASSIS LUBRICATION OIL (LO)

A. Acceptable Manufacturers

1. Graco (Basis of Design)

2. Balcrank
 3. Lincoln
- A. The 50: 1 ratio positive displacement grease pump pneumatically operated 4 1/4" diameter air motor, a 4" pumping stroke length and cycle on demand only. External muffler that operates below OSHA noise standards, and equipped with a grounding lug. The design of the air motor shall incorporate a valve in piston design. Air motor cylinder hard coated aluminum and corrosive resistant steel. Air motor and lower pump section of the in-line design. The pump of the "Topper" type with down tube for a 400-pound drum, an integral inductor plate, hose and fitting kit and a pump elevator model #226018.

1. Pump ratio: 50:1
2. Continuous duty flow rate: 5 pounds per minute
3. Maximum fluid pressure: 7,500 psi
4. Maximum air inlet pressure: 150 psi
5. Fluid outlet size: 3/8" NPT
6. Air inlet size: 1/2" NPT
7. Air Consumption: 13 cfm per gallon

B. Provide the following at each pump:

1. 1/2" Filter/Reg./Lubricator
2. Automatic drain for air filter
3. 1/2" Air shut-off Valve
4. 1/2" Fluid shut-off, HP
5. Air Motor Muffles
6. Pump runaway valve
7. 1/2" air coupler
8. 1/2" air connector

2.10 LUBRICATION FLUID HOSE REELS

A. Acceptable Manufacturers:

1. Graco
2. Lincoln
3. Balcrank

B. Service Requirements:

1. Motor Oil (MO)
2. Automatic Transmission Fluid (ATF)
3. Hydraulic Oil (HO)
4. Coolant (COOL)

C. Hose reel with 50 feet of 1/2" ID hose. The hose reel base will be a 10 gauge, heavy-duty double pedestal frame with welded joints and formed ribs. Fully ported hub with little flow restriction for fast dispense, guide-arms adjustable to 15 different mounting positions, double pedestal arms support hose guides on both sides, ZA12 (zinc alloy) ratchet for anti-sparking applications, external brass swivel housing, anti-galling and easy service, repairable guide rollers and a long-life return-spring life. The hose guide roller assembly will be the full width of the spool, with 1-1/8" diameter rollers, a one-piece roller support and delrin bearings and seals. Designed to mount on ceilings, wall or floors. The reel shall be complete with Electronic Meter, hose inlet kit, fluid shut off. Model #224058.

1. Hose length-oil: 50' x 1/2" ID
2. Reel outlet: 1/2" npsm

3. Reel inlet: 1/2" npsm
4. Pressure rating oil: 1,800 psi

D. Provide the following for each motor oil, ATF and hydraulic fluid reel:

1. Hose Inlet Kit
2. 1/2" Fluid Shut-Off Valve
3. Digital preset metered dispense valve

2.11 COMPRESSED AIR HOSE REELS

A. Acceptable Manufacturers:

1. Graco
2. Lincoln
3. Balcrank

B. Hose reel with 50 feet of 1/2" ID hose. The hose reel base will be a 10 gauge, heavy-duty double pedestal frame with welded joints and formed ribs. Fully ported hub with little flow restriction for fast dispense, guide-arms adjustable to 15 different mounting positions, double pedestal arms support hose guides on both sides, a ZA12 (zinc alloy) ratchet for anti-sparking applications, external brass swivel housing anti-galling and easy service, repairable guide rollers return spring. The hose guide roller assembly will be the full width of the spool, with 1-1/8" diameter rollers, a one-piece roller support and Demin bearings and seals. The reel will be designed to mount on ceilings, wall or floors complete with hose inlet kit, air inlet valve.

1. Hose length: 50' x 1/2" ID
2. Reel outlet: 1/2" npsm
3. Reel inlet: 1/2" npsm
4. Pressure rating: 1,800 psi for bare reel

C. Provide the following for each reel:

1. Hose Inlet Kit
2. 1/2" Air Shut-Off Valve
3. Air Coupler

2.12 CHASSIS LUBRICATION HOSE REELS

- A. Acceptable Manufacturers:
1. Graco
 2. Lincoln
 3. Balcrank
- B. Hose reel with 50 feet of 3/8" ID hose. The hose reel base will be a 10 gauge, heavy-duty double pedestal frame with welded joints and formed ribs. Fully ported hub with little flow restriction for fast dispense, guide-arms adjustable to 15 different mounting positions, double pedestal arms support hose guides on both sides, a ZA12 (zinc alloy) ratchet for anti-sparking applications, external brass swivel housing, anti-galling and easy service, repairable guide rollers return spring. The hose guide roller assembly will be the full width of the spool, with 1-1/8" diameter rollers, a one-piece roller support and Delrin bearings and seals designed to mount on ceiling, wall or floors.
- C. Provide the following for each hose reel:
1. Hose Inlet Kit
 2. HP Shut-Off Valve
 3. Grease dispense valve
 4. 3/8" three-way swivel
- D. System shall be complete with the hose inlet kit, 3-way swivel, high pressure shut-off valve, and dispense valve.
1. Hose length-grease: 50' x 3/8" ID
 2. Reel outlet: 3/8" npsm
 3. Reel inlet: 3/8" npsm
 4. Pressure rating
grease: 8,000 psi for bare reel

2.13 LUBRICATION STORAGE TANKS

- A. Acceptable Manufacturers:
 - 1. Containment Solutions
 - 2. Highland Tank
 - 3. Balcrank

- B. All tanks shall be double-walled steel construction. Minimum tank volumes shall be as follows:
 - 1. MO1: 250 gallons
 - 2. MO2: 60 gallons
 - 3. COOL: 120 gallons
 - 4. LO: 55 gallons
 - 5. ATF: 120 gallons
 - 6. HO: 250 gallons

- C. The tank shall be designed for aboveground storage of flammable and combustible materials at atmospheric pressure.

- D. Tank shall be supplied with emergency vents for the primary and secondary containment tanks.

- E. Shop painting of tanks
 - 1. Apply manufacturer's standard prime coat to exterior steel surface of AST and supports.
 - 2. Prepare exterior steel surface of AST and tank supports.
 - 3. Shop Cleaning: After fabrication, blast clean according to SSPC- SP 6/NACE No. 3.
 - 4. After cleaning, remove dust or residue from cleaned surfaces.
 - 5. If surface develops rust before prime coat is applied, repeat surface preparation.

- F. Storage Tank Accessories
 - 1. Threaded pipe connection fittings on top of tank, for fill, primary vent, secondary vent, primary containment vent, secondary containment vent and gauge. Include PVC plugs for shipping.
 - 2. Lifting Lugs: For handling and installation.

SECTION 085113

ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes ~~operable~~ aluminum-framed windows for exterior locations.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of minimum test size required by AAMA/WDMA 101/I.S.2/NAFS.
- B. Structural Performance: Provide aluminum windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:
1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
 2. Deflection: Design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch, whichever is less, at design pressure based on testing performed according to AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Deflection Test or structural computations.
- C. Windborne-Debris Resistance: Provide glazed windows capable of resisting impact from windborne debris, based on the pass/fail criteria as determined from testing glazed windows identical to those specified, according to ASTM E 1886 and testing information in ASTM E 1996 or AAMA 506 and requirements of authorities having jurisdiction.
- D. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.

1.3 SUBMITTALS

- A. Product Data: For each type of aluminum window indicated.

- B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, and installation details
- C. Samples: For each exposed finish.
- D. Product Schedule: Use same designations indicated on Drawings.
- E. Field quality-control test reports.
- F. Product test reports.
- G. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer: A qualified installer, approved by manufacturer to install manufacturer's products.
- B. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
- D. Preinstallation Conference: Conduct conference at Project site.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of metals, other materials, and metal finishes beyond normal weathering.
 - e. Failure of insulating glass.
 - 2. Warranty Period:
 - a. Window: ~~Three~~ 10 years from date of Substantial Completion.
 - b. Glazing: Five years from date of Substantial Completion.
 - c. Metal Finish: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. EFCO Corporation.
 - 2. Kawneer; an Alcoa Company.
 - 3. Peerless Products Inc.
 - 4. Wausau Window and Wall Systems.
 - 5. YKK AP America Inc.

2.2 WINDOW

- A. Window Type: ~~Single hung~~ Horizontal Sliding and Fixed, As indicated on Drawings.
- B. Comply with AAMA/WDMA 101/I.S.2/NAFS.
- C. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 45.
- D. Thermal Transmittance: Provide aluminum windows with a whole-window, U-factor maximum indicated at 15-mph exterior wind velocity and winter condition temperatures when tested according to AAMA 1503.
 - 1. U-Factor: 0.30 Btu/sq. ft. x h x deg F or less.
- E. Solar Heat-Gain Coefficient (SHGC): Provide aluminum windows with a whole-window SHGC maximum of 0.50, determined according to NFRC 200 procedures.

2.3 GLAZING

- ~~A. Glass and Glazing Materials: Refer to Division 08 Section "Glazing" for glass units and glazing requirements applicable to glazed aluminum window units.~~
- B. Glass: Clear, insulating-glass units complying with Division 08 Section "Glazing." **ASTM C 1036, Type 1, Class 1, q3.**
 - 1. Lites: Two.
 - 2. Filling: Fill space between glass lites with argon.
 - 3. Low-E Coating: Sputtered on second surface.
- C. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

2.4 INSECT SCREENS

- A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Fabricate insect screens to fully integrate with window frame. Locate screens on outside of window and provide for each operable exterior sash or ventilator.
 - 1. Aluminum Tubular Frame Screens: Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," Architectural C-24 class.
- B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, adjustable rollers, and removable PVC spline/anchor concealing edge of frame.
 - 1. Aluminum Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet with minimum wall thickness as required for class indicated.
 - 2. Finish: Match aluminum window members.
 - 3. Finish: Baked-on organic coating in manufacturer's standard color.
- C. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch- diameter, coated aluminum wire.
 - 1. Wire-Fabric Finish: Charcoal gray.

2.5 FABRICATION

- A. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.
- B. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.
- C. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- D. Provide water-shed members above side-hinged ventilators and similar lines of natural water penetration.
- E. Glazing Stops: Provide snap-on glazing stops coordinated with Division 08 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

2.6 ALUMINUM FINISHES

- A. Baked-Enamel Finish: Thermosetting, modified-acrylic or polyester enamel primer/topcoat system complying with AAMA 2603, medium gloss.
 - 1. Color: As selected by Architect from manufacturer's full range.

brown, and yellow for 480-volt phase conductors, gray for neutrals, and green for ground conductors.

- C. Warning Signs: Provide warning signs for electrical equipment per OSHA and NFPA.
- D. Label junction boxes with panel #, and circuit breaker # of where circuits originate – use permanent marker.
- E. Steel – all steel products shall be galvanized or treated for corrosion.
- F. Conduit and fittings.
 - 1. Use only specified raceway in the following indoor and outdoor locations:
 - b. Installation in or under concrete slab shall be; galvanized steel (EMT) or schedule 40 PVC. Stub-ups out of concrete shall be galvanized steel (EMT). Applicable for branch circuits and service entrance feeder only.
 - c. Exposed outdoor locations: Only rigid galvanized steel conduit shall be used.
 - d. Concealed dry interior locations: Electrical metallic tubing or MC cable as allowed below.
 - e. Exposed dry interior locations: EMT or rigid steel in areas with motorized vehicles.
 - f. Connections to vibration producing equipment or motors shall be liquid tight flexible metallic conduit.
 - g. New Construction: raceway/conduit in finished areas shall be concealed by architectural surfaces.
 - ~~h. Electrical Feeder Distribution conduits within a building shall not be in the concrete slab or underground.~~
 - 2. Use of the following types of conduits and fittings shall not be permitted in any application for this project:
 - a. "Die-cast metal" conduit fittings.
 - b. Aluminum Conduit, Cable Tray and fittings.
 - c. PVC Type 'EB'.

G. Electrical Boxes

- 1. Interior – metal only, approved for the specific location and application.
- 2. Exterior – metal, NEMA approved for outdoor locations.

2.2 WIRE AND CABLE

A. Building Wire:

- 1. Feeders and Branch Circuits Larger Than 10 AWG: Copper, stranded conductor, 600-volt insulation, THHN/THWN, rated at 75-degree C.
- 2. Feeders and Branch Circuits 10 AWG and Smaller: Copper, 600-volt insulation, THHN/THWN solid conductor, rated at 75-degree C. No conductor smaller than #12 AWG is acceptable.

conductors, white for neutrals, and green for ground conductors. Utilize orange, brown, and yellow for 480-volt phase conductors, gray for neutrals, and green for ground conductors.

- C. Warning Signs: Provide warning signs for electrical equipment per OSHA and NFPA.
- D. Label junction boxes with panel #, and circuit breaker # of where circuits originate – use permanent marker.
- E. Steel – all steel products shall be galvanized or treated for corrosion.
- F. Conduit and fittings.
 - 1. Use only specified raceway in the following indoor and outdoor locations:
 - a. Installation in or under concrete slab shall be; galvanized steel (EMT) or schedule 40 PVC. Stub-ups out of concrete shall be galvanized steel (EMT). Applicable for branch circuits and service entrance feeder only.
 - b. Exposed outdoor locations: Only rigid galvanized steel conduit shall be used.
 - c. Concealed dry interior locations: Electrical metallic tubing or MC cable as allowed below.
 - d. Exposed dry interior locations: EMT or rigid steel in areas with motorized vehicles.
 - e. Connections to vibration producing equipment or motors shall be liquid tight flexible metallic conduit.
 - f. New Construction: raceway/conduit in finished areas shall be concealed by architectural surfaces.
 - ~~g. Electrical Feeder Distribution conduits within a building shall not be in the concrete slab or underground.~~
 - 2. Use of the following types of conduits and fittings shall not be permitted in any application for this project:
 - a. "Die-cast metal" conduit fittings.
 - b. Aluminum Conduit, Cable Tray and fittings.
 - c. PVC Type 'EB'.
- G. Electrical Boxes
 - 1. Interior – metal only, approved for the specific location and application.
 - 2. Exterior – metal, NEMA approved for outdoor locations.

2.2 WIRE AND CABLE

- A. Building [http://projectcenter.jmt.com/sites/10/10-0601-019/ProjectFiles/Forms/AllItems.aspx?RootFolder=%2Fsites%2F10%2F10%2D0601%2D019%2FProjectFiles%2F00%2DJMT%2FDeliverables%2F100%20percent Wire](http://projectcenter.jmt.com/sites/10/10-0601-019/ProjectFiles/Forms/AllItems.aspx?RootFolder=%2Fsites%2F10%2F10%2D0601%2D019%2FProjectFiles%2F00%2DJMT%2FDeliverables%2F100%20percent%20Wire):

SECTION 260573

OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes computer-based, fault-current and overcurrent protective device coordination studies. Protective devices shall be set based on results of the protective device coordination study. Provide Arc-Flash Hazard Labels on all electrical distribution equipment with level as determined by Study. **Electrical equipment shop drawings will not be reviewed/approved until the overcurrent protective device coordination study has been submitted.**

1.3 SUBMITTALS

- A. Product Data: For computer software program to be used for studies.
- B. Product Certificates: For coordination-study and fault-current-study computer software programs, certifying compliance with IEEE 399.
- C. Qualification Data: For coordination-study specialist.
- D. Other Action Submittals: The following submittals shall be made after the approval process for system protective devices has been completed. Submittals may be in digital form.
 - 1. Coordination-study input data, including completed computer program input data sheets.
 - 2. Study and Equipment Evaluation Reports.
 - 3. Coordination-Study Report.
 - 4. Arc Fault Hazards Evaluation.

1.4 QUALITY ASSURANCE

- A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are not acceptable.
- B. Coordination-Study Specialist Qualifications: An entity experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. Professional engineer, licensed in the state where Project is located, shall be responsible for the study. All elements of the study shall be performed under the direct supervision and control of engineer.
- C. Comply with IEEE 242 for short-circuit currents and coordination time intervals.
- D. Comply with IEEE 399 for general study procedures.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Engineering Analysis and Coordination Study performed by Coordinated Power Engineering, Inc., or a comparable product by one of the following:
 1. CGI CYME.
 2. EDSA Micro Corporation.
 3. SKM Systems Analysis, Inc.

2.2 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

- A. Comply with IEEE 399.
- B. Analytical features of fault-current-study computer software program shall include "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.
 1. Optional Features:
 - a. Arcing faults.
 - b. Simultaneous faults.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.

3.2 POWER SYSTEM DATA

- A. Gather and tabulate the following input data to support coordination study:
1. Product Data for overcurrent protective devices specified in other Division 26 Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
 2. Impedance of utility service entrance.
 3. Electrical Distribution System Diagram: In hard-copy and electronic-copy formats, showing the following:
 - a. Circuit-breaker and fuse-current ratings and types.
 - b. Relays and associated power and current transformer ratings and ratios.
 - c. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R ratios.
 - d. Generator kilovolt amperes, size, voltage, and source impedance.
 - e. Cables: Indicate conduit material, sizes of conductors, conductor material, insulation, and length.
 - f. Busway ampacity and impedance.
 - g. Motor horsepower and code letter designation according to NEMA MG 1.
 4. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:
 - a. Special load considerations, including starting inrush currents and frequent starting and stopping.
 - b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
 - c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
 - d. Generator thermal-damage curve.
 - e. Ratings, types, and settings of utility company's overcurrent protective devices.
 - f. Special overcurrent protective device settings or types stipulated by utility company.
 - g. Time-current-characteristic curves of devices indicated to be coordinated.
 - h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
 - i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
 - j. Panelboards, switchboards, motor-control center ampacity, and interrupting rating in amperes rms symmetrical.

3.3 FAULT-CURRENT STUDY

- A. Calculate the maximum available short-circuit current in amperes rms symmetrical at circuit-breaker positions of the electrical power distribution system. The calculation shall be for a current immediately after initiation and for a three-phase bolted short circuit at each of the following:
 - 1. Switchboard bus.
 - 2. Motor-control center.
 - 3. Distribution panelboard.
 - 4. Branch circuit panelboard.
 - 5. Automatic Transfer Switch.
- B. Study electrical distribution system from normal power sources throughout electrical distribution system for Project.
- C. Calculate momentary and interrupting duties on the basis of maximum available fault current.
- D. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with IEEE 141, and IEEE 242.
 - 1. Transformers:
 - a. IEEE C57.12.00.
 - b. IEEE C57.96.
 - 2. Low-Voltage Circuit Breakers: IEEE 1015 and IEEE C37.20.1.
 - 3. Low-Voltage Fuses: IEEE C37.46.
- E. Study Report:
 - 1. Show calculated X/R ratios and equipment interrupting rating (1/2-cycle) fault currents on electrical distribution system diagram.
- F. Equipment Evaluation Report:
 - 1. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
 - 2. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
 - 3. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

3.4 COORDINATION STUDY

- A. Perform coordination study using approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.
 - 1. Calculate the maximum and minimum 1/2-cycle short-circuit currents.
 - 2. Calculate the maximum and minimum ground-fault currents.
- B. Comply with IEEE 141 and IEEE 242 recommendations for fault currents and time intervals.
- C. Transformer Primary Overcurrent Protective Devices:
 - 1. Device shall not operate in response to the following:
 - a. Inrush current when first energized.
 - b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
 - c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.
 - 2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.
- D. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.
- E. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:
 - 1. Tabular Format of Settings Selected for Overcurrent Protective Devices:
 - a. Device tag.
 - b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.
 - c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.
 - d. Fuse-current rating and type.
 - e. Ground-fault relay-pickup and time-delay settings.
 - 2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching

schemes and for emergency periods where the power source is local generation.
Show the following information:

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

3.5 ARC-FLASH HAZARD

- A. Indicate arc-flash hazard and personnel protection level required for each switchboard, panelboard, transformer, automatic transfer switch, etc., in the electrical distribution system. Provide labels corresponding with PPE level per NEC. Contractor shall affix label to respective equipment.

END OF SECTION

SECTION 230923

DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes control equipment for HVAC systems and components, including control components for equipment not supplied with factory-wired controls.

1.3 DEFINITIONS

- A. DDC: Direct digital control.
- B. I/O: Input/Output
- C. BACnet: A control network technology platform for designing and implementing interoperable control devices and networks
- D. MS/TP: Master slave/token passing.
- E. PC: Personal computer.
- F. PID: Proportional plus integral plus derivative.
- G. RTD: Resistance temperature detector.

1.4 SYSTEM PERFORMANCE

- A. The intent is for the system to be controlled by standalone means. Contractor shall supply equipment, sensors, controllers, etc. as required to control systems per sequence or operations on the drawings.

1.5 SEQUENCE OF OPERATION: Refer to Controls Drawings.

1.6 SUBMITTALS

- A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.

1. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for operator workstation equipment, interface equipment, control units, transducers/transmitters, sensors, actuators, valves, relays/switches, control panels, and operator interface equipment.
 2. Control System Software: Include technical data for operating system software, operator interface, color graphics, and other third-party applications.
 3. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
1. Bill of materials of equipment indicating quantity, manufacturer, and model number.
 2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
 3. Wiring Diagrams: Power, signal, and control wiring.
 4. Details of control panel faces, including controls, instruments, and labeling.
 5. Written description of sequence of operation.
 6. Schedule of dampers including size, leakage, and flow characteristics.
 7. Schedule of valves including flow characteristics.
 8. DDC System Hardware:
 - a. Wiring diagrams for control units with termination numbers.
 - b. Schematic diagrams and floor plans for field sensors and control hardware.
 - c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.
 9. Controlled Systems:
 - a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
 - b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.
 - c. Written description of sequence of operation including schematic diagram.
 - d. Points list.
- C. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.
- D. Qualification Data: For Installer and manufacturer.
- E. Field quality-control test reports.

- F. Operation and Maintenance Data: For HVAC instrumentation and control system to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
1. Maintenance instructions and lists of spare parts for each type of control device and compressed-air station.
 2. Interconnection wiring diagrams with identified and numbered system components and devices.
 3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
 4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
 5. Calibration records and list of set points.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Automatic control system manufacturer's authorized representative who is trained and approved for installation of system components required for this Project.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.
- B. System Software: Update to latest version of software at Project completion.

1.9 COORDINATION

- A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.
- B. Coordinate supply of conditioned electrical branch circuits for control units and operator workstation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - a. Honeywell
 - b. Johnson Controls
 - c. Automated Logic

2.2 CONTROL SYSTEM

- A. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multiuser, multitasking environment on token- passing network and programmed to control mechanical systems.
- B. All systems shall be controlled and networked locally. Provisions shall be provided for future connection to the DelDOT network.

2.3 DDC EQUIPMENT

- A. I/O Interface: Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.
 1. Binary Inputs: Allow monitoring of on-off signals without external power.
 2. Pulse Accumulation Inputs: Accept up to 10 pulses per second.
 3. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.
 4. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation with three-position (on-off-auto) override switches and status lights.
 5. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA) with status lights, two-position (auto-manual) switch, and manually adjustable potentiometer.
 6. Tri-State Outputs: Provide two coordinated binary outputs for control of three-point, floating-type electronic actuators.
 7. Universal I/O's: Provide software selectable binary or analog outputs.
- B. Power Supplies: Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:
 1. Output ripple of 5.0 mV maximum peak to peak.
 2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.
 3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.

- C. Power Line Filtering: Internal or external transient voltage and surge suppression for workstations or controllers with the following:
 - 1. Minimum dielectric strength of 1000 V.
 - 2. Maximum response time of 10 nanoseconds.
 - 3. Minimum transverse-mode noise attenuation of 65 dB.
 - 4. Minimum common-mode noise attenuation of 150 dB at 40 to 100 Hz.

2.4 SYSTEM SOFTWARE FEATURES

- A. General
 - 1. All necessary software to form a complete operating system as described in this specification shall be provided. Provide a color graphic floor plan for all floors to show the on/off status of lighting zones.
 - 2. The software programs specified in this section shall be provided as an integral part of the DDC panel and shall not be dependent upon any higher-level computer for execution.
- B. Graphics Display: Color graphic floor plan displays and system schematic for each piece of mechanical equipment shown on plans shall be provided. Provide a color graphic floor plan for all floors to show the on/off status of lighting zones.
- C. Energy Management Applications: DDC Panels shall have the ability to perform any or all of the following energy management routines:
 - 1. Time of Day Scheduling
 - 2. Calendar Based Scheduling
 - 3. Holiday Scheduling
 - 4. Temporary Schedule Overrides
 - 5. Optimal Start
 - 6. Optimal Stop
 - 7. Night Setback Control
 - 8. Heating/Cooling Interlock
 - 9. All programs shall be executed automatically without the need for operator intervention, and shall be flexible enough to allow operator customization.
- D. Custom Process Programming Capability: DDC panels shall be able to execute custom, job-specific processes defined by the operator, to automatically perform calculations and special control routines.
 - 1. Process Inputs and Variables: It shall be possible to use any of the following in a custom process:
 - a. Any system-measured point data or status.
 - b. Any calculated data.
 - c. Any results from other processes.
 - d. User-Defined Constants.
 - e. Arithmetic functions (+, -, *, / square root, exponential, etc.).

- f. Boolean logic operators (and, or, exclusive or, etc.).
 - g. On-delay/Off-delay/One-shot timers.
 - 2. Process Triggers: Custom processes may be triggered based on any combination of the following:
 - a. Time interval.
 - b. Time of day.
 - c. Date.
 - d. Other processes.
 - e. Time programming.
 - f. Events (e.g., point alarms).
- E. Alarm Management: Alarm management shall be provided to monitor, buffer, and direct alarm reports to operator devices and memory files. Each DDC panel shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic, and prevent alarms from being lost. At no time shall the DDC panel's ability to report alarms be affected by either operator activity at a PC Workstation or local I/O device, or communications with other panels on the network.
 - 1. Point Change Report Description: All alarm or point change reports shall include the point's English language description, and the time and date of occurrence.
 - 2. Prioritization: The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of three priority levels shall be provided. Each DDC panel shall automatically inhibit the reporting of selected alarms during system shutdown and start-up. Users shall have the ability to manually inhibit alarm reporting for each point. The user shall also be able to define under which conditions point changes need to be acknowledged by an operator, and/or sent to follow-up files for retrieval and analysis at a later date.

2.5 ELECTRONIC SENSORS

- A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting, as required.
- B. Thermistor Temperature Sensors and Transmitters:
 - 1. Manufacturers:
 - a. BEC Controls Corporation.
 - b. Ebtron, Inc.
 - c. Heat-Timer Corporation.
 - d. I.T.M. Instruments Inc.
 - e. MAMAC Systems, Inc.
 - f. RDF Corporation.
 - 2. Accuracy: Plus or minus 0.5 deg F at calibration point.

3. Wire: Twisted, shielded-pair cable.
4. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft..
5. Averaging Elements in Ducts: 36 inches long, flexible or 18 inches long, rigid; use where prone to temperature stratification or where ducts are larger than 10 sq. ft.
6. Insertion Elements for Liquids: Brass or stainless-steel socket with minimum insertion length of 2-1/2 inches.
7. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
8. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.

C. Humidity Sensors: Bulk polymer sensor element.

1. Manufacturers:
 - a. BEC Controls Corporation.
 - b. General Eastern Instruments.
 - c. MAMAC Systems, Inc.
 - d. ROTRONIC Instrument Corp.
 - e. TCS/Basys Controls.
 - f. Vaisala.
2. Accuracy: 5 percent full range with linear output.
3. Room Sensor Range: 20 to 80 percent relative humidity.
4. Room Sensor Cover Construction: Manufacturer's standard locking covers.
 - a. Set-Point Adjustment: Concealed.
 - b. Set-Point Indication: Concealed.
 - c. Thermometer: Concealed.
 - d. Orientation: Vertical.
5. Duct Sensor: 20 to 80 percent relative humidity range with element guard and mounting plate.
6. Outside-Air Sensor: 20 to 80 percent relative humidity range with mounting enclosure, suitable for operation at outdoor temperatures of 32 to 120 deg F.
7. Duct and Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

D. Pressure Transmitters/Transducers:

1. Manufacturers:
 - a. BEC Controls Corporation.
 - b. General Eastern Instruments.
 - c. MAMAC Systems, Inc.
 - d. ROTRONIC Instrument Corp.
 - e. TCS/Basys Controls.
 - f. Vaisala.

2. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.
 - a. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
 - b. Output: 4 to 20 mA.
 - c. Building Static-Pressure Range: 0- to 0.25-inch wg.
 - d. Duct Static-Pressure Range: 0- to 5-inch wg.
 3. Differential-Pressure Switch (Air or Water): Snap acting, with pilot-duty rating and with suitable scale range and differential.
 4. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; linear output 4 to 20 mA.
- E. Room sensor accessories include the following:
1. Insulating Bases: For sensors located on exterior walls.
 2. Adjusting Key: As required for calibration and cover screws.

2.6 STATUS SENSORS

- A. Status Inputs for Fans: Differential-pressure switch with pilot-duty rating and with adjustable range of 0- to 5-inch wg.
- B. Status Inputs for Pumps: Differential-pressure switch with pilot-duty rating and with adjustable pressure-differential range of 8 to 60 psig, piped across pump.
- C. Status Inputs for Electric Motors: Comply with ISA 50.00.01, current-sensing fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.
- D. Voltage Transmitter (100- to 600-V ac): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy.
- E. Power Monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor.
- F. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.
- G. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

2.7 THERMOSTATS

- A. Manufacturers:
 1. Erie Controls.

2. Danfoss Inc.; Air-Conditioning and Refrigeration Div.
 3. Heat-Timer Corporation.
 4. Sauter Controls Corporation.
 5. Tekmar Control Systems, Inc.
 6. Theben AG - Lumilite Control Technology, Inc.
- B. Combination Thermostat and Fan Switches: Line-voltage thermostat with push-button or lever-operated fan switch.
1. Label switches "FAN HIGH-LOW-OFF".
 2. Mount on single electric switch box.
- C. Electric, solid-state, microcomputer-based room thermostat with remote sensor.
1. Automatic switching from heating to cooling.
 2. Preferential rate control to minimize overshoot and deviation from set point.
 3. Set up for four separate temperatures per day.
 4. Instant override of set point for continuous or timed period from 1 hour to 31 days.
 5. Short-cycle protection.
 6. Programming based on every day of week.
 7. Selection features include degree F or degree C display, 12- or 24-hour clock, keyboard disable, remote sensor, and fan on-auto.
 8. Battery replacement without program loss.
 9. Thermostat display features include the following:
 - a. Time of day.
 - b. Actual room temperature.
 - c. Programmed temperature.
 - d. Programmed time.
 - e. Duration of timed override.
 - f. Day of week.
 - g. System mode indications include "heating," "off," "fan auto," and "fan on."
- D. Low-Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.
- E. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch or equivalent solid-state type, with heat anticipator; listed for electrical rating; with concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.
1. Electric Heating Thermostats: Equip with off position on dial wired to break ungrounded conductors.
 2. Selector Switch: Integral, manual on-off-auto.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that conditioned power supply is available to control units and operator workstation.

3.2 INSTALLATION

- A. Connect and configure equipment and software to achieve sequence of operation specified.
- B. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation. Install devices 60 inches above the floor.
 - 1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.
- C. Install labels and nameplates to identify control components according to Section 230553 "Identification for HVAC piping and equipment".

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

- A. Install building wire, cable, and raceway according to Division 26 specifications.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
 - 2. Test and adjust controls and safeties.
 - 3. Test calibration of electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
 - 4. Test each point through its full operating range to verify that safety and operating control set points are as required.
 - 5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
 - 6. Test each system for compliance with sequence of operation.
 - 7. Test software and hardware interlocks.

3.5 ADJUSTING

- A. Calibrating and Adjusting:

1. Calibrate instruments.
 2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
 3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
 4. Control System Inputs and Outputs:
 - a. Check analog inputs at 0, 50, and 100 percent of span.
 - b. Check analog outputs using milliamper meter at 0, 50, and 100 percent output.
 - c. Check digital inputs using jumper wire.
 - d. Check digital outputs using ohmmeter to test for contact making or breaking.
 - e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.
 5. Pressure:
 - a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
 - b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.
 6. Temperature:
 - a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
 - b. Calibrate temperature switches to make or break contacts.
 7. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
 8. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
 9. Provide diagnostic and test instruments for calibration and adjustment of system.
 10. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.
- B. Adjust initial temperature and humidity set points.
- C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls. Refer to 018200 "Demonstration and Training."

END OF SECTION 230923

SECTION 230923

DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes control equipment for HVAC systems and components, including control components for equipment not supplied with factory-wired controls.

1.3 DEFINITIONS

- A. DDC: Direct digital control.
- B. I/O: Input/Output
- C. BACnet: A control network technology platform for designing and implementing interoperable control devices and networks
- D. MS/TP: Master slave/token passing.
- E. PC: Personal computer.
- F. PID: Proportional plus integral plus derivative.
- G. RTD: Resistance temperature detector.

1.4 SYSTEM PERFORMANCE

- A. The intent is for the system to be controlled by standalone means. Contractor shall supply equipment, sensors, controllers, etc. as required to control systems per sequence or operations on the drawings.

1.5 SEQUENCE OF OPERATION: Refer to Controls Drawings.

1.6 SUBMITTALS

- A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.

1. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for operator workstation equipment, interface equipment, control units, transducers/transmitters, sensors, actuators, valves, relays/switches, control panels, and operator interface equipment.
 2. Control System Software: Include technical data for operating system software, operator interface, color graphics, and other third-party applications.
 3. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
1. Bill of materials of equipment indicating quantity, manufacturer, and model number.
 2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
 3. Wiring Diagrams: Power, signal, and control wiring.
 4. Details of control panel faces, including controls, instruments, and labeling.
 5. Written description of sequence of operation.
 6. Schedule of dampers including size, leakage, and flow characteristics.
 7. Schedule of valves including flow characteristics.
 8. DDC System Hardware:
 - a. Wiring diagrams for control units with termination numbers.
 - b. Schematic diagrams and floor plans for field sensors and control hardware.
 - c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.
 9. Controlled Systems:
 - a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
 - b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.
 - c. Written description of sequence of operation including schematic diagram.
 - d. Points list.
- C. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.
- D. Qualification Data: For Installer and manufacturer.
- E. Field quality-control test reports.

- F. Operation and Maintenance Data: For HVAC instrumentation and control system to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
1. Maintenance instructions and lists of spare parts for each type of control device and compressed-air station.
 2. Interconnection wiring diagrams with identified and numbered system components and devices.
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- A. General
 - 1. All necessary software to form a complete operating system as described in this specification shall be provided. Provide a color graphic floor plan for all floors to show the on/off status of lighting zones.
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 - 5. Optimal Start
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 - d. User-Defined Constants.
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- f. Boolean logic operators (and, or, exclusive or, etc.).
 - g. On-delay/Off-delay/One-shot timers.
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 - e. Time programming.
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 - 2. Prioritization: The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of three priority levels shall be provided. Each DDC panel shall automatically inhibit the reporting of selected alarms during system shutdown and start-up. Users shall have the ability to manually inhibit alarm reporting for each point. The user shall also be able to define under which conditions point changes need to be acknowledged by an operator, and/or sent to follow-up files for retrieval and analysis at a later date.

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 - 1. Manufacturers:
 - a. BEC Controls Corporation.
 - b. Ebtron, Inc.
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 - d. I.T.M. Instruments Inc.
 - e. MAMAC Systems, Inc.
 - f. RDF Corporation.
 - 2. Accuracy: Plus or minus 0.5 deg F at calibration point.

3. Wire: Twisted, shielded-pair cable.
4. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft..
5. Averaging Elements in Ducts: 36 inches long, flexible or 18 inches long, rigid; use where prone to temperature stratification or where ducts are larger than 10 sq. ft.
6. Insertion Elements for Liquids: Brass or stainless-steel socket with minimum insertion length of 2-1/2 inches.
7. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
8. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.

C. Humidity Sensors: Bulk polymer sensor element.

1. Manufacturers:
 - a. BEC Controls Corporation.
 - b. General Eastern Instruments.
 - c. MAMAC Systems, Inc.
 - d. ROTRONIC Instrument Corp.
 - e. TCS/Basys Controls.
 - f. Vaisala.
2. Accuracy: 5 percent full range with linear output.
3. Room Sensor Range: 20 to 80 percent relative humidity.
4. Room Sensor Cover Construction: Manufacturer's standard locking covers.
 - a. Set-Point Adjustment: Concealed.
 - b. Set-Point Indication: Concealed.
 - c. Thermometer: Concealed.
 - d. Orientation: Vertical.
5. Duct Sensor: 20 to 80 percent relative humidity range with element guard and mounting plate.
6. Outside-Air Sensor: 20 to 80 percent relative humidity range with mounting enclosure, suitable for operation at outdoor temperatures of 32 to 120 deg F.
7. Duct and Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

D. Pressure Transmitters/Transducers:

1. Manufacturers:
 - a. BEC Controls Corporation.
 - b. General Eastern Instruments.
 - c. MAMAC Systems, Inc.
 - d. ROTRONIC Instrument Corp.
 - e. TCS/Basys Controls.
 - f. Vaisala.

2. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.
 - a. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
 - b. Output: 4 to 20 mA.
 - c. Building Static-Pressure Range: 0- to 0.25-inch wg.
 - d. Duct Static-Pressure Range: 0- to 5-inch wg.
 3. Differential-Pressure Switch (Air or Water): Snap acting, with pilot-duty rating and with suitable scale range and differential.
 4. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; linear output 4 to 20 mA.
- E. Room sensor accessories include the following:
1. Insulating Bases: For sensors located on exterior walls.
 2. Adjusting Key: As required for calibration and cover screws.

2.6 STATUS SENSORS

- A. Status Inputs for Fans: Differential-pressure switch with pilot-duty rating and with adjustable range of 0- to 5-inch wg.
- B. Status Inputs for Pumps: Differential-pressure switch with pilot-duty rating and with adjustable pressure-differential range of 8 to 60 psig, piped across pump.
- C. Status Inputs for Electric Motors: Comply with ISA 50.00.01, current-sensing fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.
- D. Voltage Transmitter (100- to 600-V ac): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy.
- E. Power Monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor.
- F. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.
- G. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

2.7 THERMOSTATS

- A. Manufacturers:
 1. Erie Controls.

2. Danfoss Inc.; Air-Conditioning and Refrigeration Div.
 3. Heat-Timer Corporation.
 4. Sauter Controls Corporation.
 5. Tekmar Control Systems, Inc.
 6. Theben AG - Lumilite Control Technology, Inc.
- B. Combination Thermostat and Fan Switches: Line-voltage thermostat with push-button or lever-operated fan switch.
1. Label switches "FAN HIGH-LOW-OFF".
 2. Mount on single electric switch box.
- C. Electric, solid-state, microcomputer-based room thermostat with remote sensor.
1. Automatic switching from heating to cooling.
 2. Preferential rate control to minimize overshoot and deviation from set point.
 3. Set up for four separate temperatures per day.
 4. Instant override of set point for continuous or timed period from 1 hour to 31 days.
 5. Short-cycle protection.
 6. Programming based on every day of week.
 7. Selection features include degree F or degree C display, 12- or 24-hour clock, keyboard disable, remote sensor, and fan on-auto.
 8. Battery replacement without program loss.
 9. Thermostat display features include the following:
 - a. Time of day.
 - b. Actual room temperature.
 - c. Programmed temperature.
 - d. Programmed time.
 - e. Duration of timed override.
 - f. Day of week.
 - g. System mode indications include "heating," "off," "fan auto," and "fan on."
- D. Low-Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.
- E. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch or equivalent solid-state type, with heat anticipator; listed for electrical rating; with concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.
1. Electric Heating Thermostats: Equip with off position on dial wired to break ungrounded conductors.
 2. Selector Switch: Integral, manual on-off-auto.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that conditioned power supply is available to control units and operator workstation.

3.2 INSTALLATION

- A. Connect and configure equipment and software to achieve sequence of operation specified.
- B. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation. Install devices 60 inches above the floor.
 - 1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.
- C. Install labels and nameplates to identify control components according to Section 230553 "Identification for HVAC piping and equipment".

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

- A. Install building wire, cable, and raceway according to Division 26 specifications.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
 - 2. Test and adjust controls and safeties.
 - 3. Test calibration of electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
 - 4. Test each point through its full operating range to verify that safety and operating control set points are as required.
 - 5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
 - 6. Test each system for compliance with sequence of operation.
 - 7. Test software and hardware interlocks.

3.5 ADJUSTING

- A. Calibrating and Adjusting:

1. Calibrate instruments.
 2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
 3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
 4. Control System Inputs and Outputs:
 - a. Check analog inputs at 0, 50, and 100 percent of span.
 - b. Check analog outputs using milliamper meter at 0, 50, and 100 percent output.
 - c. Check digital inputs using jumper wire.
 - d. Check digital outputs using ohmmeter to test for contact making or breaking.
 - e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.
 5. Pressure:
 - a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
 - b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.
 6. Temperature:
 - a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
 - b. Calibrate temperature switches to make or break contacts.
 7. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
 8. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
 9. Provide diagnostic and test instruments for calibration and adjustment of system.
 10. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.
- B. Adjust initial temperature and humidity set points.
- C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls. Refer to 018200 "Demonstration and Training."

END OF SECTION 230923

SECTION 14600

TOP RUNNING BRIDGE CRANE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. Vendor is to provide a complete 5-ton capacity top running single girder bridge crane system.

1.3 SUBMITTALS

A. Product Data

1. Submit Product Data in strict accordance with the requirements of these specifications.
2. Restrict submitted material to pertinent data. For instance, do not include a manufacturer's complete catalog when pertinent information is contained on a single page.

B. Engineering Drawings

1. Submittal engineering drawings must include the following:
 - a. Equipment general layout
 - b. Electrical layout
 - 1) Provide UL listing card or equivalent document of a Nationally Recognized Testing Laboratory from the company building the electrical panel(s) and attach with the electrical drawings indicating that the electrical panels will be built to the required standards (see section 11.10 Electric Control Panel).
 - c. Mechanical layout
 - d. Floor plan view
 - e. Isometric view with bill of materials

C. Operation and Maintenance Manual

1. Assemble and provide copies of manual in 8.5 x 11-inch format. Fold out diagrams and illustrations are acceptable. Manuals shall be reproducible by dry copy method.

D. Supplier Qualifications

1. The supplier shall have been regularly engaged in the design and supply of the type of equipment specified herein, for a period of not less than fifteen (15) years.
2. All similar items shall be the products of one manufacturer.

1.4 RESPONSIBILITIES

A. Vendor will furnish the following:

1. All material necessary for the complete installation of the above-mentioned crane.
2. Complete controls.
3. Equipment operating instructions.
4. Drawings and parts lists as specified.
5. The complete system, including the installation, must conform to the applicable requirements of the latest edition of the following:
 - a. Occupational Safety and Health Act (OSHA)
 - b. State and Local Codes
 - c. American Gear Manufacturers Standards (AGMA)
 - d. American National Standards Institute (ANSI)
 - 1) B30.10 – Hooks
 - 2) B30.17 – Top Running Single Girder Bridge Cranes B30.16 – Overhead Hoists (underhung)
 - 3) HST-1M – Performance Standard for Electric Chain Hoists
 - 4) HST-4M – Performance Standard for Overhead Electric Wire Rope Hoists
 - e. Crane Manufacturers Association of America (CMAA) CMAA Specification #70, for electric underhung cranes CMAA Specification #74, for electric underhung cranes.
 - f. Hoist Manufacturers Institute (HMI).
 - g. HMI 100-74 Specifications for electric wire rope hoists.
 - h. National Electric Manufacturing Association, Inc.
 - i. National Electric Code (NFPA 70).
 - j. Motors – NEMA MG-1.
 - k. Control Enclosures – NEMA Rated.

B. Site contractor will furnish the materials and labor for the following:

1. Complete erection.
2. Supporting steel for runway beams.
3. ASCE crane rail, with hook bolts, rail clips.
4. Electric power service, as indicated on drawings.
5. Painting as required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Harrington (Basis of Design)
 2. American Crane & Equipment Corporation
 3. Engineered Material Handling

2.2 OPERATING CONDITIONS

- A. The equipment will be installed in a pre-engineering metal building with a roof.
- B. The equipment will be operated in ambient temperatures ranging from 32 degrees F to 110 degrees F
- C. The atmospheric conditions are classified as dry, and nonhazardous.
- D. Electrical classification: safe- nonhazardous
- E. Electrical power characteristics: Power for operating the equipment will be supplied by a 230v, three-phase, 60hertz connected circuit. For DELTA connected circuits the L2 neutral of this circuit is connected to ground at the distribution transformer. A variation of + 5% from the nominal voltage can be expected at the feeder terminals during normal plant operations. For DELTA systems, the B phase is grounded and per the National Electric Code a fuse is not allowed in the B phase.

2.3 GENERAL SPECIFICATIONS

- A. Hook Capacity
1. Tons 5
- B. Operating Speeds
1. Bridge: 80 feet per minute
 2. Trolley: 80/20 feet per minute
 3. Hoist: 20/3.5 feet per minute

- C. Type of Control – AC control for pendant operation from the operating floor
 - 1. Bridge: (single speed)
 - 2. Trolley: (two speed)
 - 3. Hoist: (two speed)
- D. Type of Service
 - 1. Crane – CMAA Crane Service Class: C
 - 2. Hoist – HMI 100-71 Hoist Service Class: H4
- E. Heights
 - 1. Operating floor to hook in high position; 15'-6"
 - 2. Operating floor to top of ASCE runway rails; 16'-1 5/8"
 - 3. Operating floor to underside of building structural steel; Refer to drawings.
 - 4. Operating floor to high point of crane shall be a minimum of 3" below low obstructions.
- F. Length of runway: 45'-0"
- G. Span between centerlines of ASCE runway rail: 47'-11 1/2"
- H. Section size of runway beams: To be determined by crane manufacturer

2.4 CRANE RUNWAYS

- A. Crane runway support steel, runway beams, crane rails, and crane runway stops shall be furnished by (the steel contractor). The runway shall be designed with sufficient strength and rigidity to prevent undue lateral or vertical deflection or the wheel loading of the crane. The runway rails will be installed straight, parallel, and level, at the same elevation and center-to-center distance as specified in Sections 5.6 and 5.8. The rails will be standard ASCE 30 lb/yd sections, with splices.

2.5 BRIDGE

- A. The bridge shall consist of one precision rolled w-beam. Section shall be rigidly braced, and securely fastened to the end trucks to maintain proper alignment.
- B. The end trucks shall consist of structural sections bolted to the bridge beam. A long wheelbase shall be provided for proper weight distribution. Each carrier shall be furnished with hardened tread wheels equipped with antifriction bearings. Minimum ratio of 8:1, crane span: wheel base.
- C. The bridge shall be motor-driven through gear reducer and shaft, using (2) gear reducers, known as A-4 drives. The drives shall be shock-free on starting and stopping. Rail sweeps and bridge motor disk brakes shall be furnished on each end of carrier end truck.

2.6 TROLLEY

- A. A monorail type carrier shall be furnished to support the hoisting equipment and operate on the bridge girder. Hardened tread wheels with antifriction bearings shall be provided.
- B. The carrier shall be motor driven. An electric brake shall be furnished on each drive. The drive shall be shock-free on starting and stopping. Safety lugs shall be furnished on the trolley.
- C. The carrier shall be of welded steel construction. It shall be designed to transmit the imposed load to the bridge girder without undue deflection.

2.7 HOIST

A. Electric Wire Rope Hoist

1. A hoisting machine of proper capacity shall be mounted on the trolley. It shall consist of a motor, gear reducer, hoist drum, sheaves, load block, hook and hoisting rope. An electric brake and mechanical load brake shall be supplied on the hoist.
2. The motor shall be designed specifically for hoisting duty. The electric brake shall be of suitable size to promptly stop the motor rotation in either direction and hold the load.
3. The mechanical load brake shall be a (Weston friction disc type, high ratio worm (minimum ratio 60:1) gear set) and be capable of holding and controlling the lowering speed of the load under all conditions.
4. Precision cut, full depth teeth, (heat treated forged steel gears, centrifrically cast alloy bronze gear and heat-treated worm) shall be used in the gear reducer. These gears shall be provided with oil bath lubrication and enclosed in a drip- proof case.
5. The hoist drum and sheaves shall be of large diameter to permit maximum rope life. The drum diameter shall be at least 20 times the rope diameter and shall be grooved to provide for the entire lift without overlapping the rope. With the hook in its lowest position, at least two turns shall remain on the drum. The drum flanges shall be guarded so that the rope cannot wedge between the drum and the hoist frame.
6. A paddle or weight operated type upper final limit switch shall be provided to protect against hoisting beyond safe limits of travel. The switch system must be designed in such a manner that the switch operator mechanism cannot be over-traveled and allow the switch to become inoperative.
7. A loading limit device shall be provided to prevent overstressing the system. This device shall reenergize the hoist motor and immobilize the up-circuit when an overcapacity lift is attempted. This switch must be set to overcome dynamic loading conditions but not exceed 125% rated capacity.
8. Geared upper and lower limit switches shall be furnished to restrict motion beyond the normal operating travel. These switch contacts shall be connected in the respective motor control circuits.
9. The hoisting rope shall be improved plow steel, of suitable diameter, with a factor of safety of at least five. Connection to the drum shall be made adequately and shall be easily detachable for replacement.

10. The load block shall be of the enclosed type and equipped with a swivel type safety latch hook.

2.8 MOTORS

- A. All motors shall be rated for either hoist, trolley or bridge duty, totally enclosed, induction type, per NEMA MG-1. They shall be 230 volts, three-phase, and rated for 30-minute operation, Class "F" insulation under full load with a temperature rise not to exceed 80°C above an ambient temperature of 40°C. Service factor=1.0.
- B. Motors shall be the standard type supplied by the hoist, trolley and crane component manufacturer.

2.9 CONTROL STATION

- A. A pendant type pushbutton station shall be provided to control the motions of the bridge, trolley, and hoist. This station shall consist of buttons having the following marking:
 1. Bridge Forward - Marked North, East
 2. Bridge Reverse - Marked South, West
 3. Trolley Forward - Marked East, North
 4. Trolley Reverse - Marked West, South
 5. Hoist Up - Marked "Up"
 6. Hoist Down - Marked "Down"
 7. Start - Marked "Start"
 8. *Stop - Marked "Stop"

**Button to have red mushroom head*

Where two speed control is specified, fast/slow buttons shall be incorporated into the above arrangement.

- B. The pushbutton station shall be suspended on a bonded strain cable, from a festooned track mounted on the bridge, to a position 4'-0" above the operating floor level from the bottom of the station. It shall be possible to move the station along the bridge span independent of the trolley.
- C. The pushbutton enclosure shall be of lightweight construction in accordance with Vendor's standard.
- D. The pushbutton station shall consist of lightweight enclosure and a cover with button guards.

2.10 TRAVEL LIMIT SWITCHES

- A. Limit switches shall be provided on the bridge and trolley and wired into the respective control circuits to stop the driving motors at the extremes of travel. Triggers shall be provided by the crane manufacturer.

2.11 CURRENT CONDUCTORS (Choose 1 Type)

A. CONDUCTOR BAR

1. A four-bar, enclosed type conductor system, Duct-O-Bar, Conductix or approved equal, shall be provided along the full length of the runway. Three of these conductors will be used to supply electric power to the crane. The remaining conductor, colored green, will be used for equipment grounding.

2.12 CRANE CONTROL

- A. Speed control shall be provided for all travel and hoisting motions as outlined in these specifications.

B. SINGLE AND TWO-SPEED ONLY

1. All single or two speed motions shall be controlled by across-the-line, reversing type motor starters, with an electronic trolley and bridge soft start.

2.13 ELECTRICAL WIRING

- A. The complete electrical installation shall be made in accordance with the National Electric Code requirements.

- B. All electrical equipment shall be mounted in NEMA Type 3.4.7.9. enclosures.

- C. All wiring connections within the electrical control enclosures shall be made with 600-volt, 90 C machine tool wire. Wiring connections between control enclosures and other electrical devices shall be made with 600-volt conductors and run in rigid conduit. Flexible metal conduit may be used to devices requiring position adjustment or run less than three feet. All wiring connections to electrical equipment in control enclosures shall be terminated on terminal strips with lugs or spades and properly identified. Open trays or unguarded wire conductors with zip tied wire bundles are not permitted.

D. Nonhazardous Areas Only

1. Conduits shall be terminated at all enclosures and boxes in drilled holes or knockouts. Conduits one inch and smaller shall be fastened to the enclosure by the use of dished type lock nuts with trailing knife edge. Conduits, ¼ inch and larger, shall be terminated in a threaded hub or an Appleton "HUB" fitting inserted in a drilled hole knockout. Insulated bushings shall be furnished on all conduit terminations. Threaded conduit fitting shall be used for all other connections.

2.14 EQUIPMENT DESIGN

- A. All equipment furnished to vendor's standard design, which incorporates weldments, is to be welded in accordance with the appropriate codes and standards of the American Welding Society, D14.1.

2.15 INFORMATION AND APPROVED VENDOR

- A. Outline drawing indicating required clearances, end approaches, horsepower, and full load current rating of all motors and wheel loadings.
- B. Manufacturer's name and catalog number of any equipment to be furnished not manufactured by vendor.
- C. Any exception or difference of any equipment to be furnished from that specified and reason for the substitution.

PART 3 - EXECUTION

3.1 GENERAL

- A. Any other requirements not set forth in these specifications, but necessary for the safe and reliable operation of the equipment, shall be included.

3.2 INSTALLATION

- A. Equipment shall be installed in accordance with manufacturer's supplied installation drawings.
- B. Equipment supplier shall undertake the commissioning of the system and make all required adjustments to ensure proper operation.
- C. The equipment manufacturer shall start up the system. The Owner shall have all operating personnel present during the startup and equipment training.
- D. The Owner's personnel shall be trained for a minimum of four (4) hours in the system's operation and maintenance.
- E. The supplier shall provide the Owner with the names and addresses of all local service and maintenance personnel to assist in future service.

3.3 PAINTING

- A. All surfaces of the structural parts of the crane shall be finished in accordance with the environment and vendor's standard practice for that environment.
- B. All surfaces of electrical and mechanical parts shall be finished in accordance with the vendor's standard practice.

3.4 INSPECTION AND TESTS

- A. Inspection by an outside inspector during fabrication shall be permitted by the vendor. These inspections shall be performed to determine the general adherence to these specifications and in particular to determine the quality of welding and painting provided.

- B. Final acceptance will be made after the entire installation has been completed and a satisfactory trial has been made. All tests required to prove the ability of the crane shall be made by contractor. A vendor's representative is invited to attend.

3.5 WARRANTY

- A. The vendor shall warranty that the materials and workmanship of the equipment installed under these specifications shall be first class in every respect and shall guarantee the equipment for a period of one year after installation against defective material and/or workmanship, ordinary wear and tear excepted.

END OF SECTION